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# Si823x Data Sheet

## 0.5 and 4.0 Amp ISOdrivers (2.5 and 5 kV<sub>RMS</sub>)

The Si823x isolated driver family combines two independent, isolated drivers into a single package. The Si8230/1/3/4 are high-side/low-side drivers, and the Si8232/5/6/7/8 are dual drivers. Versions with peak output currents of 0.5 A (Si8230/1/2/7) and 4.0 A (Si8233/4/5/6/8) are available. All drivers operate with a maximum supply voltage of 24 V.

The Si823x drivers utilize Silicon Labs' proprietary silicon isolation technology, which provides up to 5 kV<sub>RMS</sub> withstand voltage per UL1577 and fast 60 ns propagation times. Driver outputs can be grounded to the same or separate grounds or connected to a positive or negative voltage. The TTL level compatible inputs with >400 mV hysteresis are available in individual control input (Si8230/2/3/5/6/7/8) or PWM input (Si8231/4) configurations. High integration, low propagation delay, small installed size, flexibility, and cost-effectiveness make the Si823x family ideal for a wide range of isolated MOSFET/IGBT gate drive applications.

### Applications

- Power delivery systems
- Motor control systems
- Isolated dc-dc power supplies
- Lighting control systems
- Plasma displays
- Solar and industrial inverters

### Safety Approval

- UL 1577 recognized
  - Up to 5000 Vrms for 1 minute
- CSA component notice 5A approval
  - IEC 60950-1, 61010-1, 60601-1 (reinforced insulation)
- VDE certification conformity
  - IEC 60747-5-5 (VDE 0884 Part 5)
  - EN 60950-1 (reinforced insulation)
- CQC certification approval
  - GB4943.1

### KEY FEATURES

- Two completely isolated drivers in one package
  - Up to 5 kV<sub>RMS</sub> input-to-output isolation
  - Up to 1500 V<sub>DC</sub> peak driver-to-driver differential voltage
- HS/LS and dual driver versions
- Up to 8 MHz switching frequency
- 0.5 A peak output (Si8230/1/2/7)
- 4.0 A peak output (Si8233/4/5/6/8)
- High electromagnetic immunity

## 1. Feature List

The Si823x highlighted features are listed below.

- Two completely isolated drivers in one package:
  - Up to 5 kV<sub>RMS</sub> input-to-output isolation
  - Up to 1500 V<sub>DC</sub> peak driver-to-driver differential voltage
- HS/LS and dual driver versions
- Up to 8 MHz switching frequency
- 0.5 A peak output (Si8230/1/2/7)
- 4.0 A peak output (Si8233/4/5/6/8)
- High electromagnetic immunity
- 60 ns propagation delay (max)
- Independent HS and LS inputs or PWM input versions
- Transient immunity > 45 kV/μs
- Overlap protection and programmable dead time
- AEC-Q100 qualification
- Wide operating range:
  - -40 to +125 °C
- RoHS-compliant packages:
  - SOIC-16 wide body
  - SOIC-16 narrow body
  - LGA-14

## 2. Ordering Guide

**Table 2.1. Si823x Ordering Guide <sup>1,2</sup>**

Ordering Part Number (OPN)	Inputs	Configuration	Peak Current	UVLO Voltage	Isolation Rating	Temp Range	Package Type	Legacy Ordering Part Number (OPN) 2.5 kV Only
<b>Wide Body (WB) Package Options</b>								
Si8230BB-D-IS	VIA, VIB	High Side/ Low Side	0.5 A	8 V	2.5 kVrms	−40 to +125 °C	SOIC-16 Wide Body	Si8230-A-IS
Si8231BB-D-IS	PWM	High Side/ Low Side						Si8231-A-IS
Si8232BB-D-IS	VIA, VIB	Dual Driver						Si8232-A-IS
Si8234CB-D-IS	PWM	High Side/ Low Side	4.0 A	10 V				N/A
Si8233BB-D-IS	VIA, VIB	High Side/ Low Side						8 V
Si8234BB-D-IS	PWM	High Side/ Low Side		Si8234-B-IS				
Si8235BB-D-IS	VIA, VIB	Dual Driver						Si8235-B-IS
Si8230AB-D-IS	VIA, VIB	High Side/ Low Side	0.5 A	5 V	2.5 kVrms	−40 to +125 °C	SOIC-16 Wide Body	N/A
Si8231AB-D-IS	PWM							N/A
Si8232AB-D-IS	VIA, VIB							Dual Driver
Si8233AB-D-IS	VIA, VIB	High Side/ Low Side	4.0 A	5 V				N/A
Si8234AB-D-IS	PWM							N/A
Si8235AB-D-IS	VIA, VIB							Dual Driver
<b>Narrow Body (NB) Package Options</b>								
Si8230BB-D-IS1	VIA, VIB	High Side/ Low Side	0.5 A	8 V	2.5 kVrms	−40 to +125 °C	SOIC-16 Narrow Body	N/A
Si8231BB-D-IS1	PWM	High Side/ Low Side						
Si8232BB-D-IS1	VIA, VIB	Dual Driver						
Si8233BB-D-IS1	VIA, VIB	High Side/ Low Side	4.0 A	8 V				
Si8234BB-D-IS1	PWM	High Side/ Low Side						
Si8235BB-D-IS1	VIA, VIB	Dual Driver						
Si8235BA-D-IS1	VIA, VIB	Dual Driver			1.0 kVrms			

Ordering Part Number (OPN)	Inputs	Configuration	Peak Current	UVLO Voltage	Isolation Rating	Temp Range	Package Type	Legacy Ordering Part Number (OPN) 2.5 kV Only					
Si8230AB-D-IS1	VIA,VIB	High Side/ Low Side	0.5 A	5 V	2.5 kVrms	-40 to +125 °C	SOIC-16 Narrow Body	N/A					
Si8231AB-D-IS1	PWM							N/A					
Si8232AB-D-IS1	VIA,VIB	Dual Driver	4.0 A	5 V				N/A					
Si8233AB-D-IS1	VIA,VIB	High Side/ Low Side						N/A					
Si8234AB-D-IS1	PWM							N/A					
Si8235AB-D-IS1	VIA,VIB	Dual Driver						N/A					
<b>LGA Package Options</b>													
Si8233CB-D-IM	VIA,VIB	High Side/ Low Side	4.0 A	10 V	2.5 kVrms	-40 to +125 °C	LGA-14 5x5 mm	N/A					
Si8233BB-D-IM				8 V				Si8233-B-IM					
Si8233AB-D-IM				5 V				N/A					
Si8234BB-D-IM	PWM			8 V				Si8234-B-IM					
Si8234AB-D-IM				5 V				N/A					
Si8235BB-D-IM	VIA,VIB	Dual Driver		8 V				Si8235-B-IM					
Si8235AB-D-IM				5 V				N/A					
Si8236BA-D-IM				8 V	1.0 kVrms		LGA-14 5x5 mm with Thermal Pad	Si8236-B-IM					
Si8236AA-D-IM				5 V				N/A					
<b>5 kV Ordering Options</b>													
Si8230BD-D-IS	VIA, VIB	High Side/ Low Side	0.5 A	8 V	5.0 kVrms	-40 to +125 °C	SOIC-16 Wide Body	N/A					
Si8231BD-D-IS	PWM												
Si8232BD-D-IS	VIA, VIB	Dual Driver	4.0 A										
Si8233BD-D-IS	VIA, VIB	High Side/ Low Side											
Si8234BD-D-IS	PWM	High Side/ Low Side											
Si8235BD-D-IS	VIA, VIB	Dual Driver	0.5 A	5 V	5.0 kVrms	-40 to +125 °C	SOIC-16 Wide Body	N/A					
Si8230AD-D-IS	VIA, VIB	High Side/ Low Side						N/A					
Si8231AD-D-IS	PWM							N/A					
Si8232AD-D-IS	VIA, VIB	Dual Driver						N/A					
Si8233AD-D-IS	VIA, VIB	High Side/ Low Side						4.0 A	5 V				N/A
Si8234AD-D-IS	PWM												N/A
Si8235AD-D-IS	VIA, VIB	Dual Driver	N/A										
<b>3 V VDDI Ordering Options</b>													

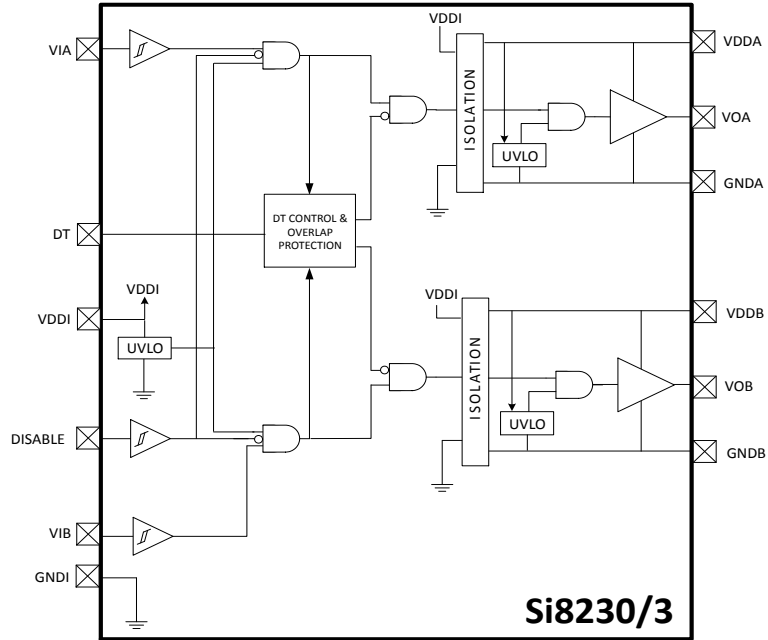
Ordering Part Number (OPN)	Inputs	Configuration	Peak Current	UVLO Voltage	Isolation Rating	Temp Range	Package Type	Legacy Ordering Part Number (OPN) 2.5 kV Only
Si8237AB-D-IS1	VIA, VIB	Dual Driver	0.5 A	5 V	2.5 kVrms	-40 to +125 °C	SOIC-16 Narrow Body	N/A
Si8237BB-D-IS1	VIA, VIB	Dual Driver		8 V				
Si8238AB-D-IS1	VIA, VIB	Dual Driver	4.0 A	5 V				
Si8238BB-D-IS1	VIA, VIB	Dual Driver		8 V				
Si8237AD-D-IS	VIA, VIB	Dual Driver	0.5 A	5 V	5.0 kVrms	SOIC-16 Wide Body		
Si8237BD-D-IS	VIA, VIB	Dual Driver		8 V				
Si8238AD-D-IS	VIA, VIB	Dual Driver	4.0 A	5 V				
Si8238BD-D-IS	VIA, VIB	Dual Driver		8 V				

1. All packages are RoHS-compliant with peak reflow temperatures of 260 °C according to the JEDEC industry standard classifications and peak solder temperatures.

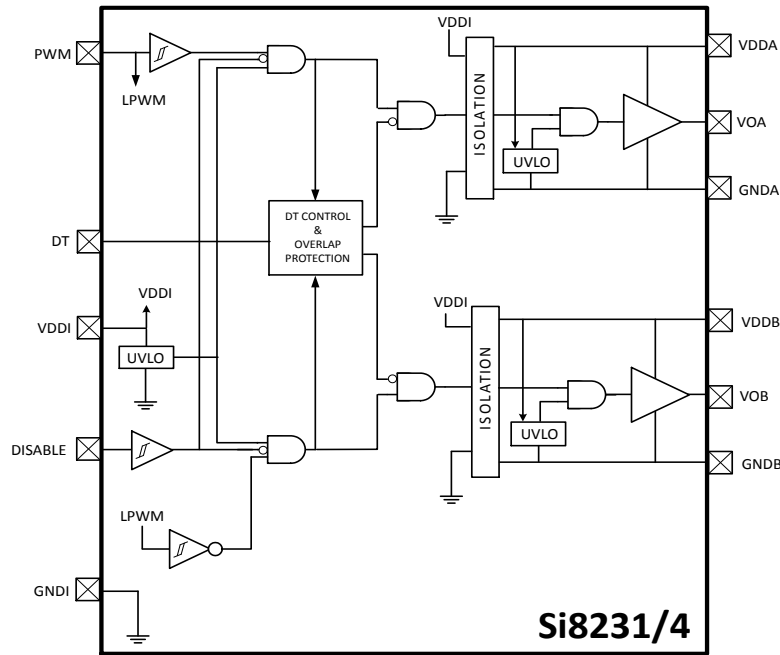
2. “Si” and “SI” are used interchangeably.

### 3. System Overview

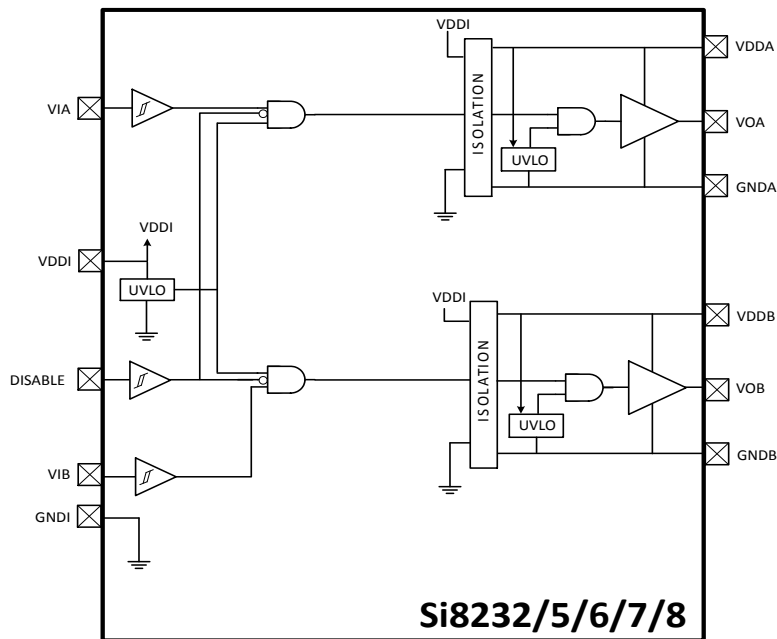
#### 3.1 Top Level Block Diagrams



**Figure 3.1. Si8230/3 Two-Input High-Side/Low-Side Isolated Drivers**



**Figure 3.2. Si8231/4 Single-Input High-Side/Low-Side Isolated Drivers**

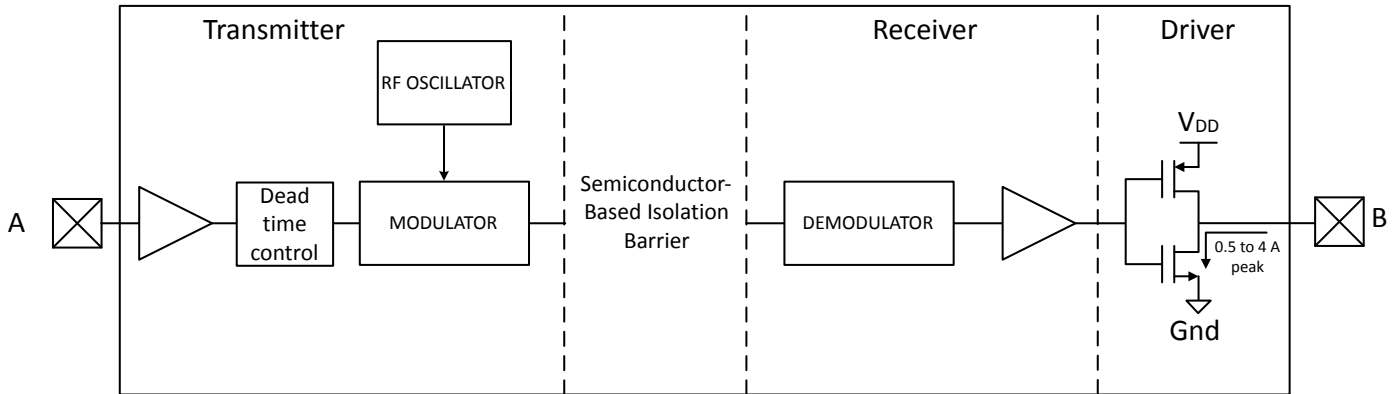


**Figure 3.3. Si8232/5/6/7/8 Dual Isolated Drivers**



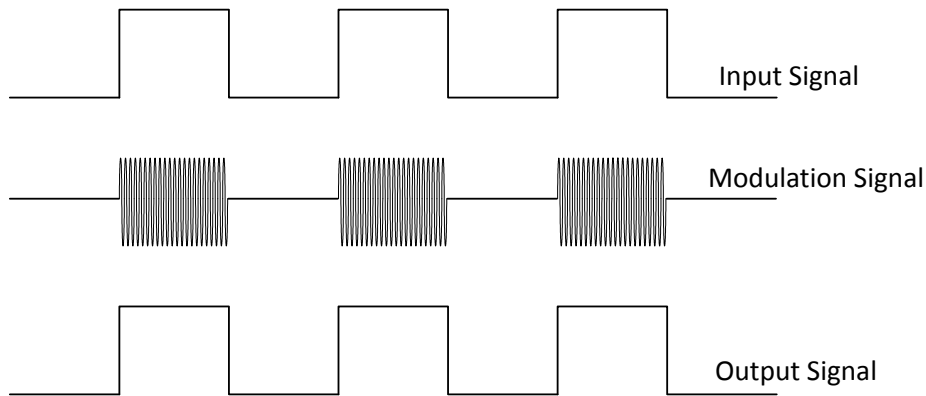
### 3.2 Functional Description

The operation of an Si823x channel is analogous to that of an optocoupler and gate driver, except an RF carrier is modulated instead of light. This simple architecture provides a robust isolated data path and requires no special considerations or initialization at start-up. A simplified block diagram for a single Si823x channel is shown in the figure below.



**Figure 3.4. Simplified Channel Diagram**

A channel consists of an RF Transmitter and RF Receiver separated by a semiconductor-based isolation barrier. Referring to the Transmitter, input A modulates the carrier provided by an RF oscillator using on/off keying. The Receiver contains a demodulator that decodes the input state according to its RF energy content and applies the result to output B via the output driver. This RF on/off keying scheme is superior to pulse code schemes as it provides best-in-class noise immunity, low power consumption, and better immunity to magnetic fields. See the figure below for more details.



**Figure 3.5. Modulation Scheme**

### 3.3 Typical Operating Characteristics (0.5 Amp)

The typical performance characteristics depicted in Figure 3.6 Rise/Fall Time vs. Supply Voltage on page 8 through Figure 3.15 Output Source Current vs. Temperature on page 9 are for information purposes only. Refer to Table 4.1 Electrical Characteristics<sup>1</sup> on page 21 for actual specification limits.

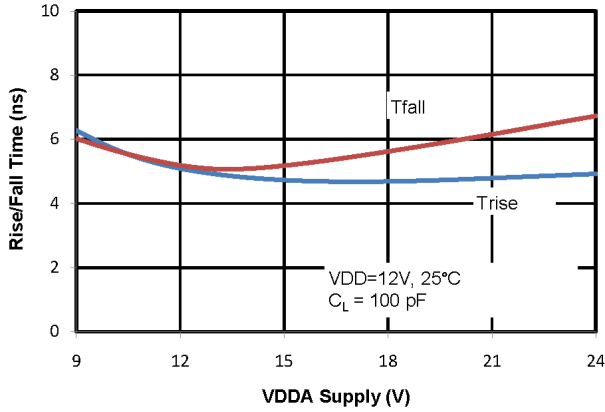


Figure 3.6. Rise/Fall Time vs. Supply Voltage

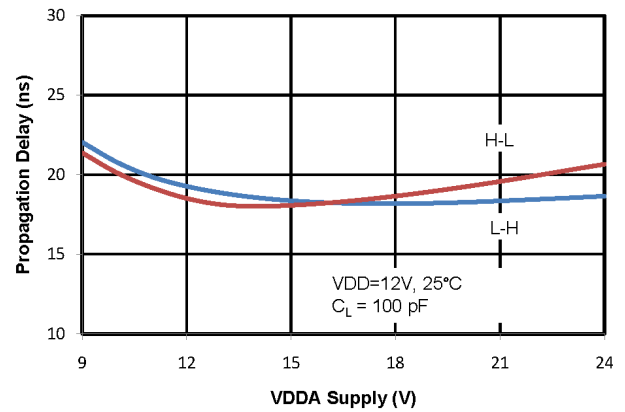


Figure 3.7. Propagation Delay vs. Supply Voltage

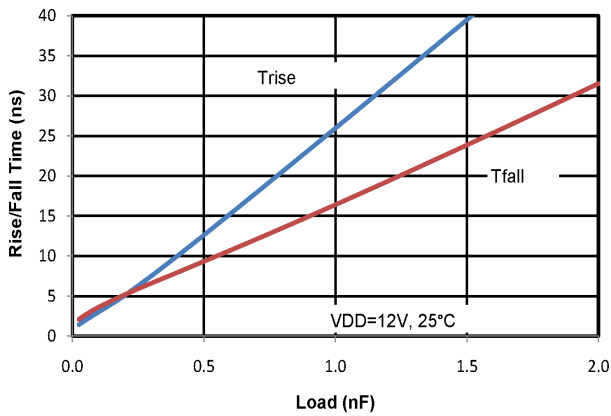


Figure 3.8. Rise/Fall Time vs. Load

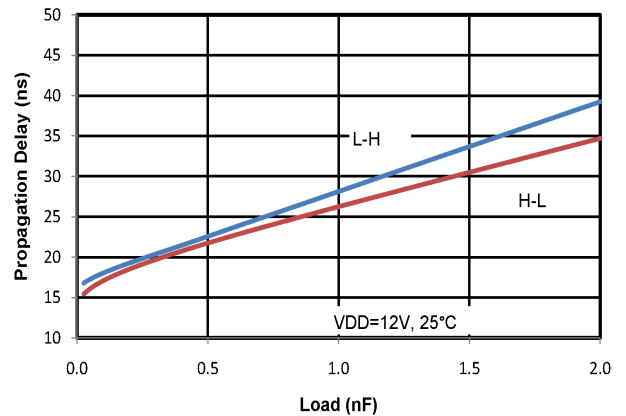


Figure 3.9. Propagation Delay vs. Load

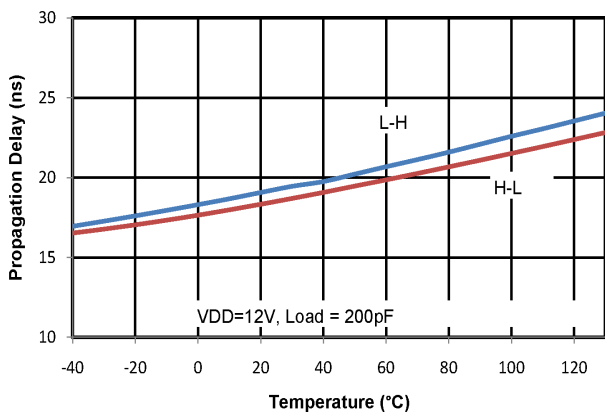


Figure 3.10. Propagation Delay vs. Temperature

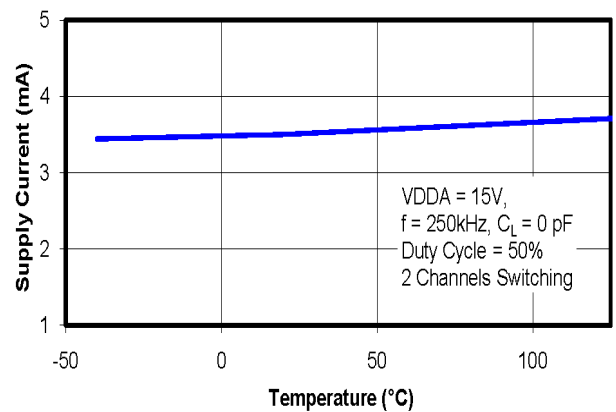


Figure 3.11. Supply Current vs. Temperature

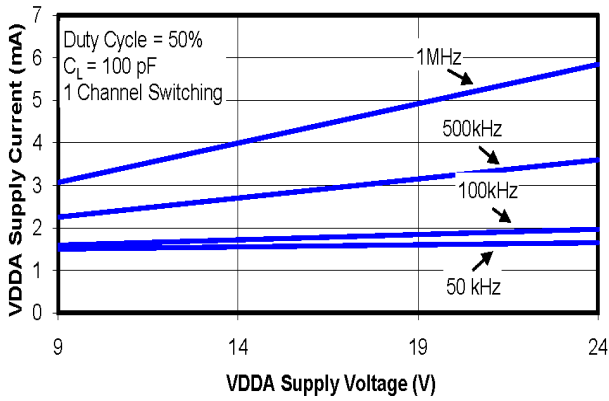


Figure 3.12. Supply Current vs. Supply Voltage

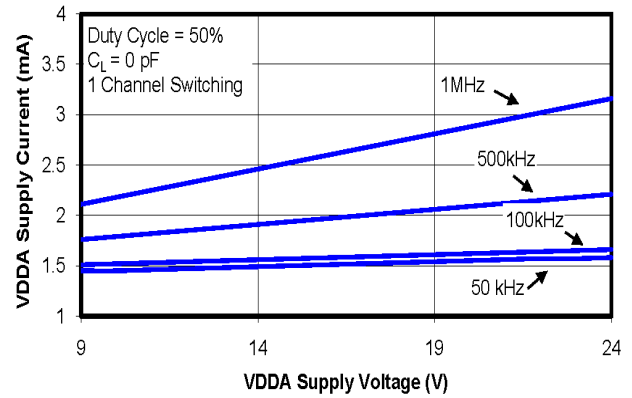


Figure 3.13. Supply Current vs. Supply Voltage

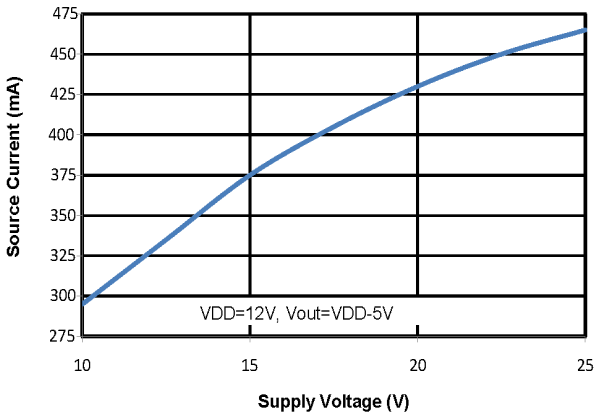


Figure 3.14. Output Source Current vs. Supply Voltage

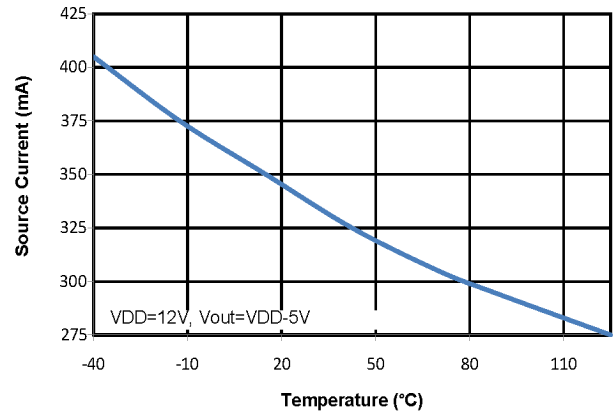


Figure 3.15. Output Source Current vs. Temperature

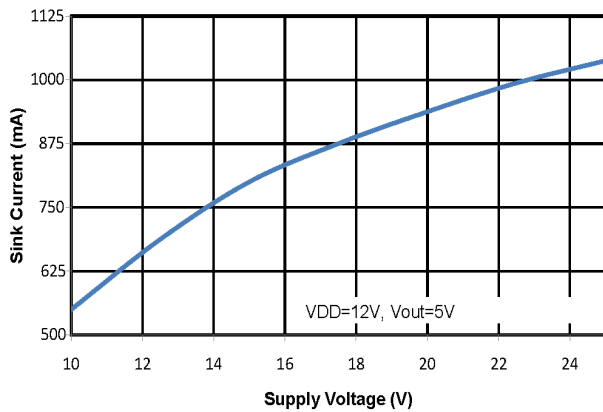


Figure 3.16. Output Sink Current vs. Supply Voltage

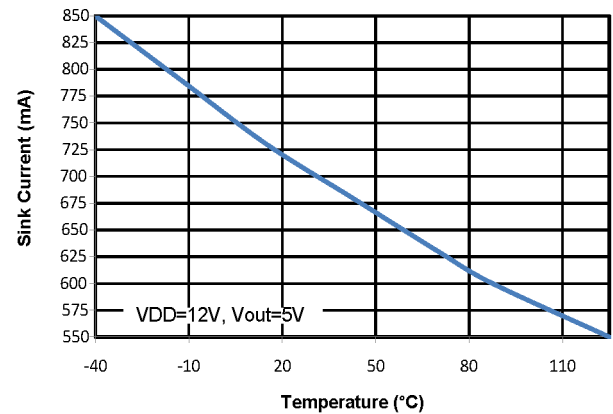


Figure 3.17. Output Sink Current vs. Temperature

### 3.4 Typical Operating Characteristics (4.0 Amp)

The typical performance characteristics depicted in Figure 3.18 Rise/Fall Time vs. Supply Voltage on page 10 through Figure 3.27 Output Source Current vs. Temperature on page 11 are for information purposes only. Refer to Table 4.1 Electrical Characteristics<sup>1</sup> on page 21 for actual specification limits.

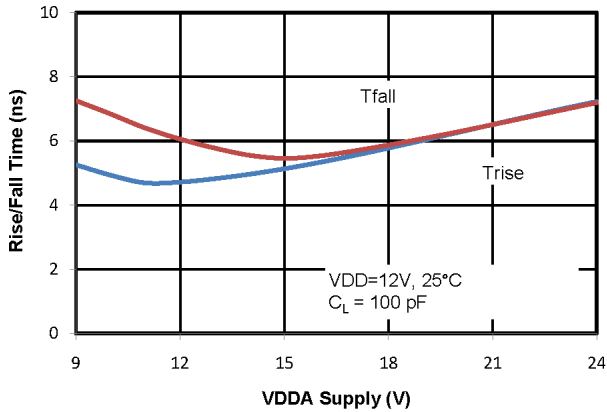


Figure 3.18. Rise/Fall Time vs. Supply Voltage

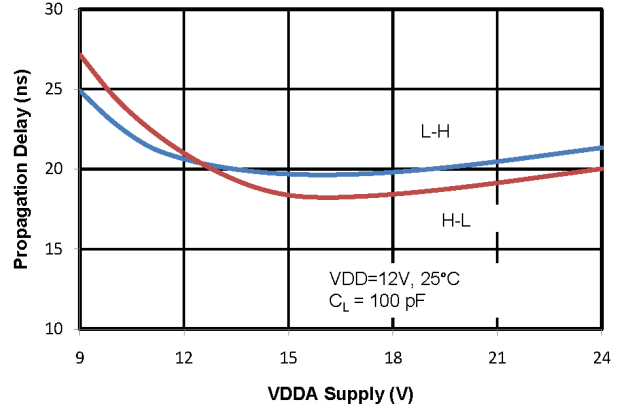


Figure 3.19. Propagation Delay vs. Supply Voltage

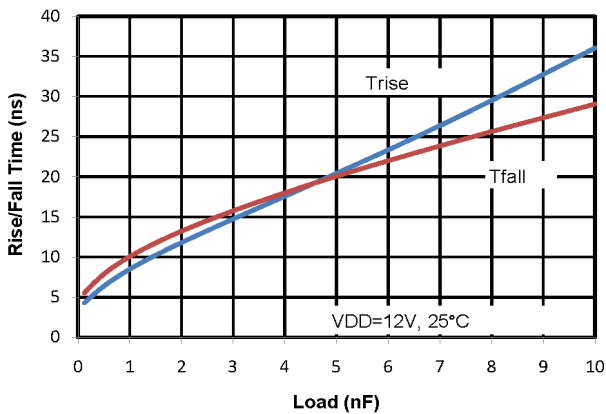


Figure 3.20. Rise/Fall Time vs. Load

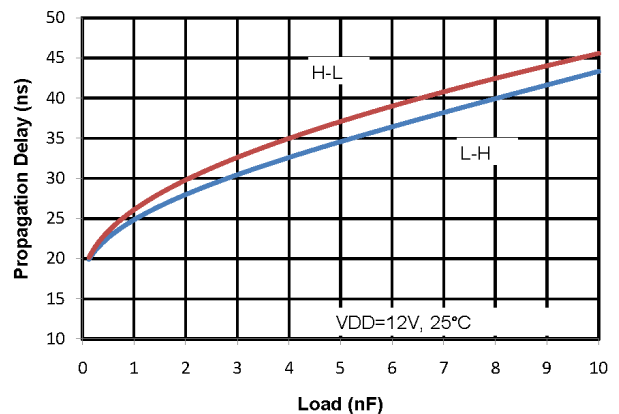


Figure 3.21. Propagation Delay vs. Load

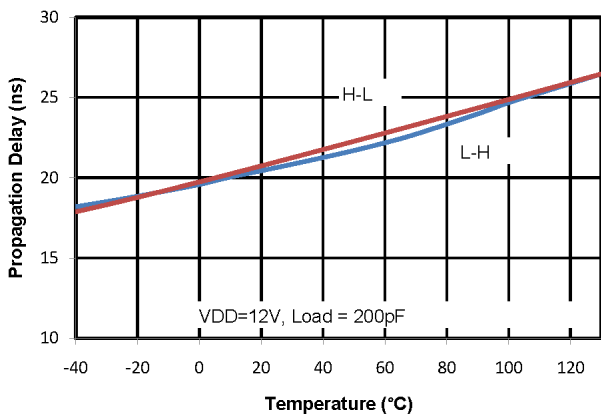


Figure 3.22. Propagation Delay vs. Temperature

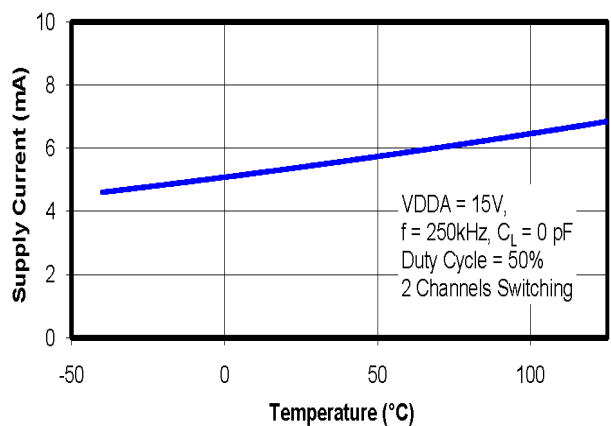


Figure 3.23. Supply Current vs. Temperature

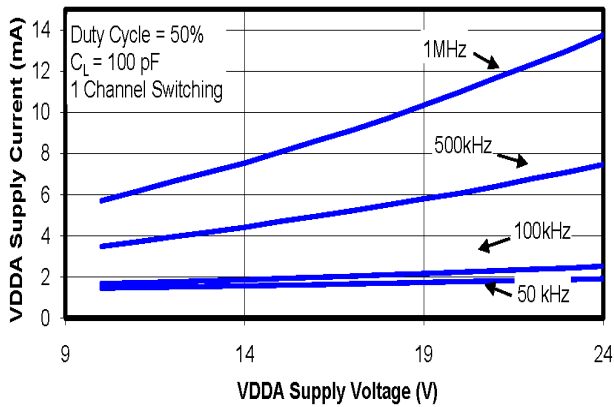


Figure 3.24. Supply Current vs. Supply Voltage

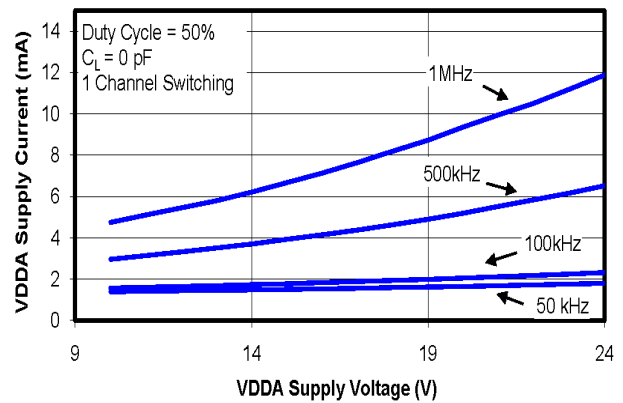


Figure 3.25. Supply Current vs. Supply Voltage

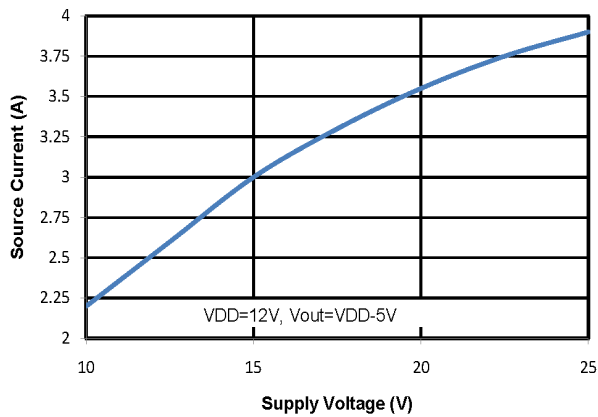


Figure 3.26. Output Source Current vs. Supply Voltage

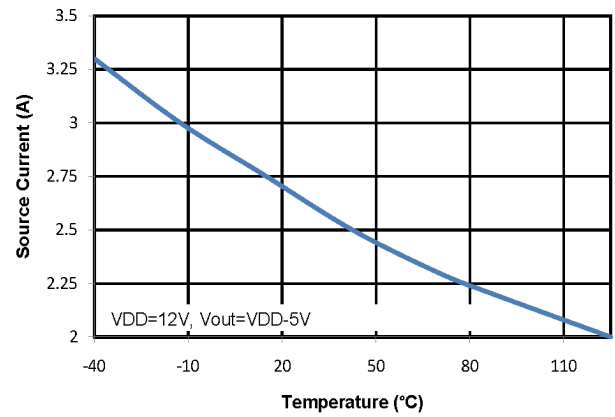


Figure 3.27. Output Source Current vs. Temperature

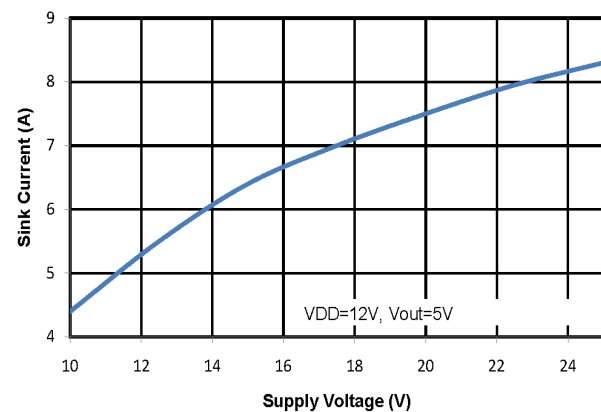


Figure 3.28. Output Sink Current vs. Supply Voltage

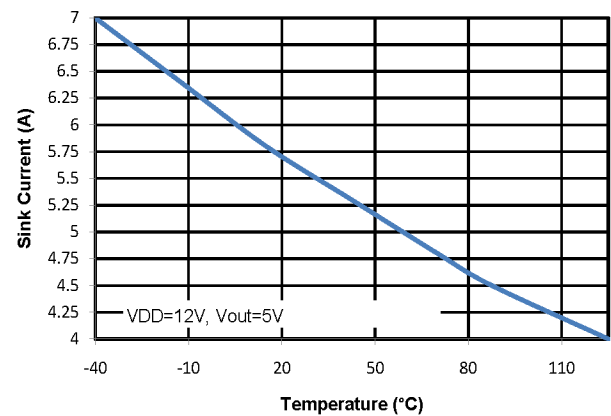


Figure 3.29. Output Sink Current vs. Temperature

### 3.5 Family Overview and Logic Operation During Startup

The Si823x family of isolated drivers consists of high-side, low-side, and dual driver configurations.

### 3.5.1 Products

The table below shows the configuration and functional overview for each product in this family.

**Table 3.1. Si823x Family Overview**

Part Number	Configuration	Overlap Protection	Programmable Dead Time	Inputs	Peak Output Current (A)
Si8230	High-Side/Low-Side	√	√	VIA, VIB	0.5
Si8231	High-Side/Low-Side	√	√	PWM	0.5
Si8232/7	Dual Driver	—	—	VIA, VIB	0.5
Si8233	High-Side/Low-Side	√	√	VIA, VIB	4.0
Si8234	High-Side/Low-Side	√	√	PWM	4.0
Si8235/6/8	Dual Driver	—	—	VIA, VIB	4.0

### 3.5.2 Device Behavior

The table below consists of truth tables for the Si8230/3, Si8231/4, and Si8232/5/6 families.

**Table 3.2. Si823x Family Truth Table<sup>1</sup>**

Si8230/3 (High-Side/Low-Side) Truth Table						
Inputs		VDDI State	Disable	Output		Notes
VIA	VIB			VOA	VOB	
L	L	Powered	L	L	L	Output transition occurs after internal dead time expires.
L	H	Powered	L	L	H	Output transition occurs after internal dead time expires.
H	L	Powered	L	H	L	Output transition occurs after internal dead time expires.
H	H	Powered	L	L	L	Invalid state. Output transition occurs after internal dead time expires.
X <sup>2</sup>	X <sup>2</sup>	Unpowered	X	L	L	Output returns to input state within 7 μs of VDDI power restoration.
X	X	Powered	H	L	L	Device is disabled.
Si8231/4 (PWM Input High-Side/Low-Side) Truth Table						
PWM Input		VDDI State	Disable	Output		Notes
				VOA	VOB	
H		Powered	L	H	L	Output transition occurs after internal dead time expires.
L		Powered	L	L	H	Output transition occurs after internal dead time expires.
X <sup>2</sup>		Unpowered	X	L	L	Output returns to input state within 7 μs of VDDI power restoration.
X		Powered	H	L	L	Device is disabled.
Si8232/5/6/7/8 (Dual Driver) Truth Table						
Inputs		VDDI State	Disable	Output		Notes
VIA	VIB			VOA	VOB	
L	L	Powered	L	L	L	Output transition occurs immediately (no internal dead time).
L	H	Powered	L	L	H	Output transition occurs immediately (no internal dead time).
H	L	Powered	L	H	L	Output transition occurs immediately (no internal dead time).
H	H	Powered	L	H	H	Output transition occurs immediately (no internal dead time).
X <sup>2</sup>	X <sup>2</sup>	Unpowered	X	L	L	Output returns to input state within 7 μs of VDDI power restoration.
X	X	Powered	H	L	L	Device is disabled.
<b>Notes:</b>						
1. This truth table assumes VDDA and VDDB are powered. If VDDA and VDDB are below UVLO, see <a href="#">3.9 Undervoltage Lockout Operation</a> for more information.						
2. Note that an input can power the input die through an internal diode if its source has adequate current.						

### 3.6 Power Supply Connections

Isolation requirements mandate individual supplies for VDDI, VDDA, and VDDB. The decoupling caps for these supplies must be placed as close to the VDD and GND pins of the Si823x as possible. The optimum values for these capacitors depend on load current and the distance between the chip and the regulator that powers it. Low effective series resistance (ESR) capacitors, such as Tantalum, are recommended.



### 3.7 Power Dissipation Considerations

Proper system design must assure that the Si823x operates within safe thermal limits across the entire load range. The Si823x total power dissipation is the sum of the power dissipated by bias supply current, internal parasitic switching losses, and power dissipated by the series gate resistor and load. Equation 1 shows total Si823x power dissipation.

$$P_D = (V_{DD1})(I_{DD1}) + 2(I_{DD2})(V_{DD2}) + \left(f\right)\left(Q_{TL}\right)\left(V_{DD2}\right)\left[\frac{R_p}{R_p + R_g}\right] + \left(f\right)\left(Q_{TL}\right)\left(V_{DD2}\right)\left[\frac{R_p}{R_p + R_g}\right] + 2fC_{int}V_{DD2}^2$$

where:

$P_D$  is the total Si823x device power dissipation (W)

$I_{DD1}$  is the input-side maximum bias current (3 mA)

$I_{DD2}$  is the driver die maximum bias current (2.5 mA)

$C_{int}$  is the internal parasitic capacitance (75 pF for the 0.5 A driver and 370 pF for the 4.0 A driver)

$V_{DD1}$  is the input-side VDD supply voltage (2.7 to 5.5 V)

$V_{DD2}$  is the driver-side supply voltage (10 to 24 V)

$f$  is the switching frequency (Hz)

$Q_{TL}$  is the gate charge of the FET being driven

$R_G$  is the external gate resistor

$R_P$  is the  $R_{DS(ON)}$  of the driver pull-up switch: ( $R_p = 15 \Omega$  for the 0.5 A driver;  $R_p = 2.7 \Omega$  for the 4.0 A driver)

$R_n$  is the  $R_{DS(ON)}$  of the driver pull-down switch: ( $R_n = 5 \Omega$  for the 0.5 A driver and  $1 \Omega$  for the 4.0 A driver)

#### Equation 1.

Power dissipation example for 0.5 A driver using Equation 1 with the following givens:

$$V_{DD1} = 5.0 \text{ V}$$

$$V_{DD2} = 12 \text{ V}$$

$$f = 350 \text{ kHz}$$

$$R_G = 22 \Omega$$

$$Q_G = 25 \text{ nC}$$

$$P_d = 0.015 + 0.060 + \left(350 \times 10^3\right)\left(25 \times 10^{-9}\right)\left(12\right)\left[\frac{5}{5 + 22}\right] + 2\left[\left(350 \times 10^3\right)\left(75 \times 10^{-12}\right)\left(144\right)\right] = 145 \text{ mW}$$

From which the driver junction temperature is calculated using Equation 2, where:

$P_d$  is the total Si823x device power dissipation (W)

$\theta_{ja}$  is the thermal resistance from junction to air (105 °C/W in this example)

$T_A$  is the ambient temperature

$$T_j = P_d \times \theta_{ja} \times T_A = (0.145)(105) + 20 = 35.2^\circ\text{C}$$

The maximum power dissipation allowable for the Si823x is a function of the package thermal resistance, ambient temperature, and maximum allowable junction temperature, as shown in Equation 2:

$$P_{Dmax} \leq \frac{T_{jmax} - T_A}{\theta_{ja}}$$

where:

$P_{Dmax}$  = Maximum Si823x power dissipation (W)

$T_{jmax}$  = Si823x maximum junction temperature (150 °C)

$T_A$  = Ambient temperature (°C)

$\theta_{ja}$  = Si823x junction-to-air thermal resistance (105 °C/W)

$f$  = Si823x switching frequency (Hz)

**Equation 2.**

Substituting values for  $P_{Dmax}$ ,  $T_{jmax}$ ,  $T_A$ , and  $\theta_{ja}$  into Equation 2 results in a maximum allowable total power dissipation of 1.19 W. Maximum allowable load is found by substituting this limit and the appropriate data sheet values from [Table 4.1 Electrical Characteristics<sup>1</sup>](#) on page 21 into Equation 1 and simplifying. The result is Equation 3 (0.5 A driver) and Equation 4 (4.0 A driver), both of which assume  $V_{DDI} = 5\text{ V}$  and  $V_{DDA} = V_{DDB} = 18\text{ V}$ .

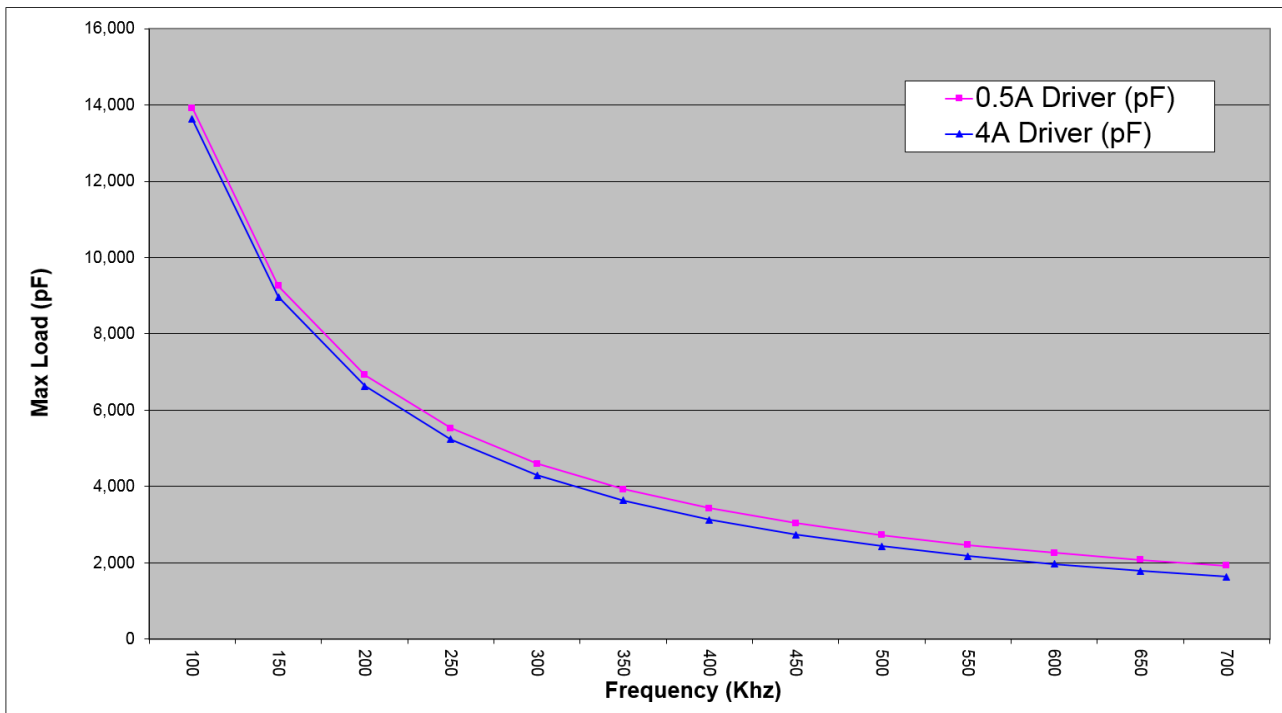
$$C_{L(MAX)} = \frac{1.4 \times 10^{-3}}{f} - 7.5 \times 10^{-11}$$

**Equation 3.**

$$C_{L(MAX)} = \frac{1.4 \times 10^{-3}}{f} - 3.7 \times 10^{-10}$$

**Equation 4.**

Equation 3 and Equation 4 are graphed in the figure below, where the points along the load line represent the package dissipation-limited value of CL for the corresponding switching frequency.



**3.8 Layout Considerations**

It is most important to minimize ringing in the drive path and noise on the Si823x VDD lines. Care must be taken to minimize parasitic inductance in these paths by locating the Si823x as close to the device it is driving as possible. In addition, the VDD supply and ground trace paths must be kept short. For this reason, the use of power and ground planes is highly recommended. A split ground plane system having separate ground and VDD planes for power devices and small signal components provides the best overall noise performance.

### 3.9 Undervoltage Lockout Operation

Device behavior during start-up, normal operation and shutdown is shown in Figure 3.30 Device Behavior during Normal Operation and Shutdown on page 17, where UVLO+ and UVLO- are the positive-going and negative-going thresholds respectively. Note that outputs VOA and VOB default low when input side power supply (VDDI) is not present.

#### 3.9.1 Device Startup

Outputs VOA and VOB are held low during power-up until VDD is above the UVLO threshold for time period tSTART. Following this, the outputs follow the states of inputs VIA and VIB.

#### 3.9.2 Undervoltage Lockout

Undervoltage Lockout (UVLO) is provided to prevent erroneous operation during device startup and shutdown or when VDD is below its specified operating circuits range. The input (control) side, Driver A and Driver B, each have their own undervoltage lockout monitors.

The Si823x input side enters UVLO when  $VDDI \leq VDDI_{UV-}$ , and exits UVLO when  $VDDI > VDDI_{UV+}$ . The driver outputs, VOA and VOB, remain low when the input side of the Si823x is in UVLO and their respective VDD supply (VDDA, VDDB) is within tolerance. Each driver output can enter or exit UVLO independently. For example, VOA unconditionally enters UVLO when VDDA falls below  $VDDA_{UV-}$  and exits UVLO when VDDA rises above  $VDDA_{UV+}$ .

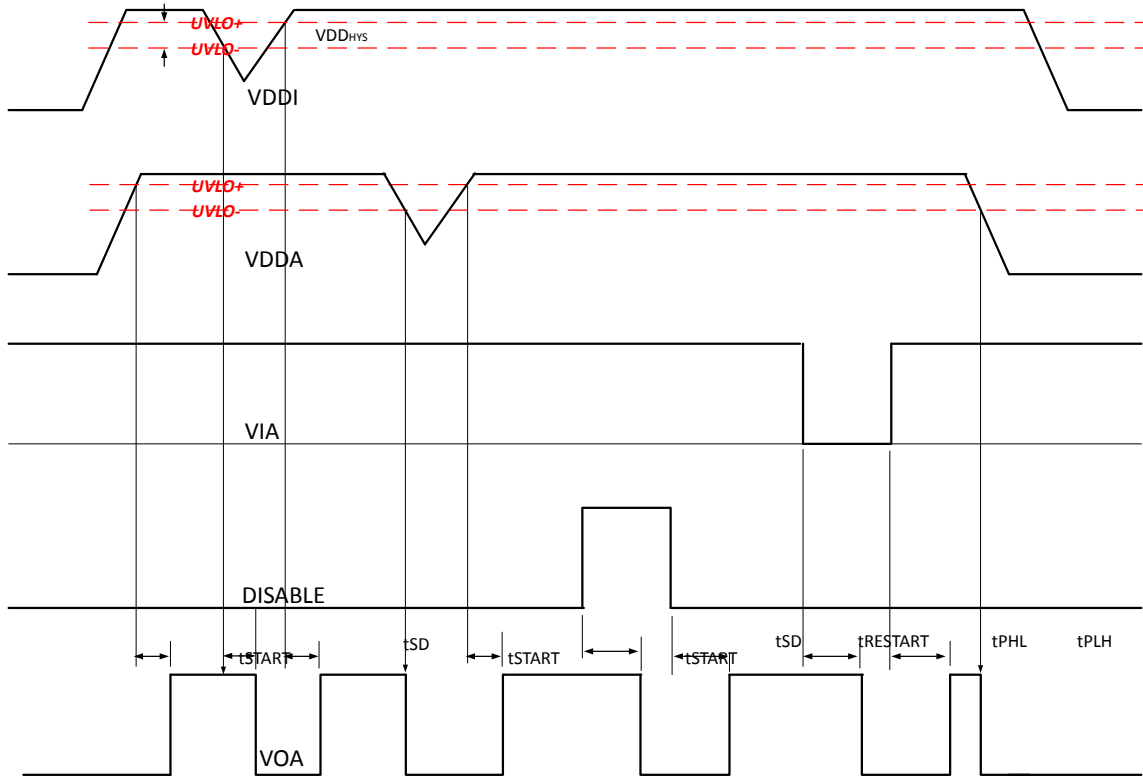


Figure 3.30. Device Behavior during Normal Operation and Shutdown

### 3.9.3 Undervoltage Lockout (UVLO)

The UVLO circuit unconditionally drives VO low when VDD is below the lockout threshold. Referring to Figure 3.31 Si823x UVLO Response (5 V) on page 18 through Figure 3.34 Si823x UVLO Response (12.5 V) on page 18, upon power up, the Si823x is maintained in UVLO until VDD rises above  $V_{DDUV+}$ . During power down, the Si823x enters UVLO when VDD falls below the UVLO threshold plus hysteresis (i.e.,  $V_{DD} \leq V_{DDUV+} - V_{DDHYS}$ ).

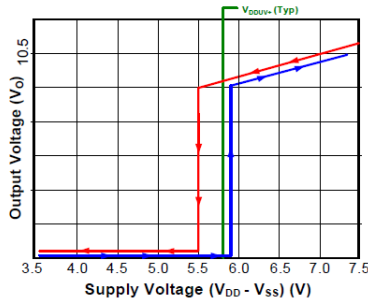


Figure 3.31. Si823x UVLO Response (5 V)

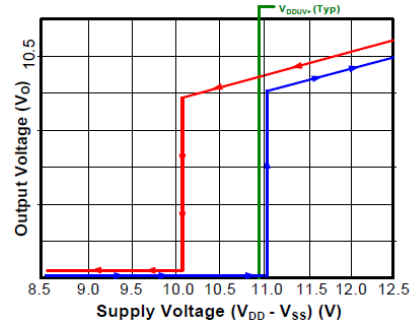


Figure 3.32. Si823x UVLO Response (10 V)

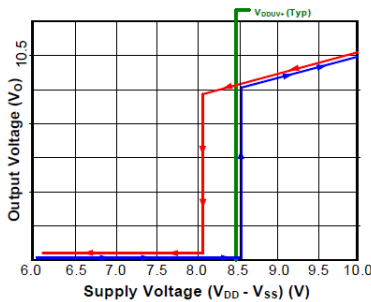


Figure 3.33. Si823x UVLO Response (8 V)

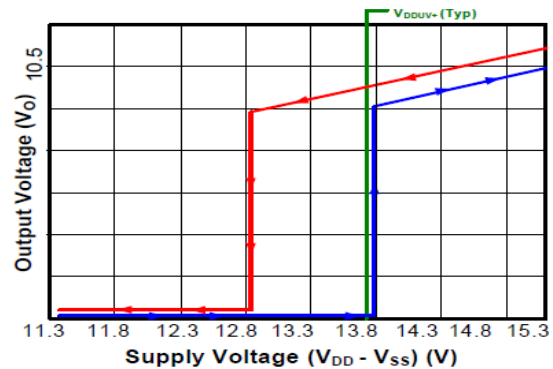


Figure 3.34. Si823x UVLO Response (12.5 V)

### 3.9.4 Control Inputs

VIA, VIB, and PWM inputs are high-true, TTL level-compatible logic inputs. A logic high signal on VIA or VIB causes the corresponding output to go high. For PWM input versions (Si8231/4), VOA is high and VOB is low when the PWM input is high, and VOA is low and VOB is high when the PWM input is low.

### 3.9.5 Disable Input

When brought high, the DISABLE input unconditionally drives VOA and VOB low regardless of the states of VIA and VIB. Device operation terminates within  $t_{SD}$  after  $DISABLE = V_{IH}$  and resumes within  $t_{RESTART}$  after  $DISABLE = V_{IL}$ . The DISABLE input has no effect if VDDI is below its UVLO level (i.e., VOA, VOB remain low).

### 3.10 Programmable Dead Time and Overlap Protection

All high-side/low-side drivers (Si8230/1/3/4) include programmable overlap protection to prevent outputs VOA and VOB from being high at the same time. These devices also include programmable dead time, which adds a user-programmable delay between transitions of VOA and VOB. When enabled, dead time is present on all transitions, even after overlap recovery. The amount of dead time delay (DT) is programmed by a single resistor (RDT) connected from the DT input to ground per Equation 5. Note that the dead time pin can be tied to VDDI or left floating to provide a nominal dead time at approximately 400 ps.

$$DT \approx 10 \times RDT$$

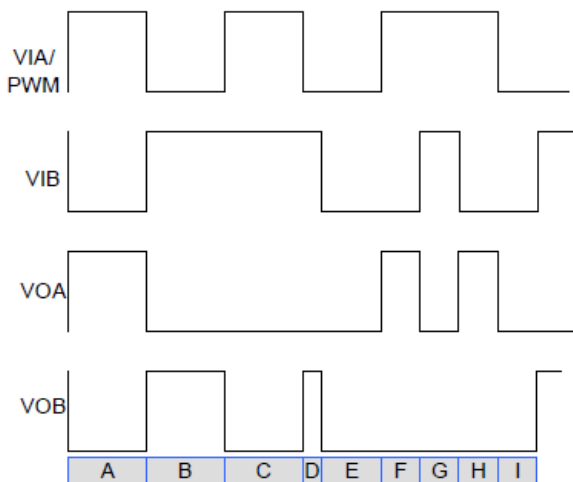
where:

DT = dead time (ns) and

RDT = dead time programming resistor (kΩ)

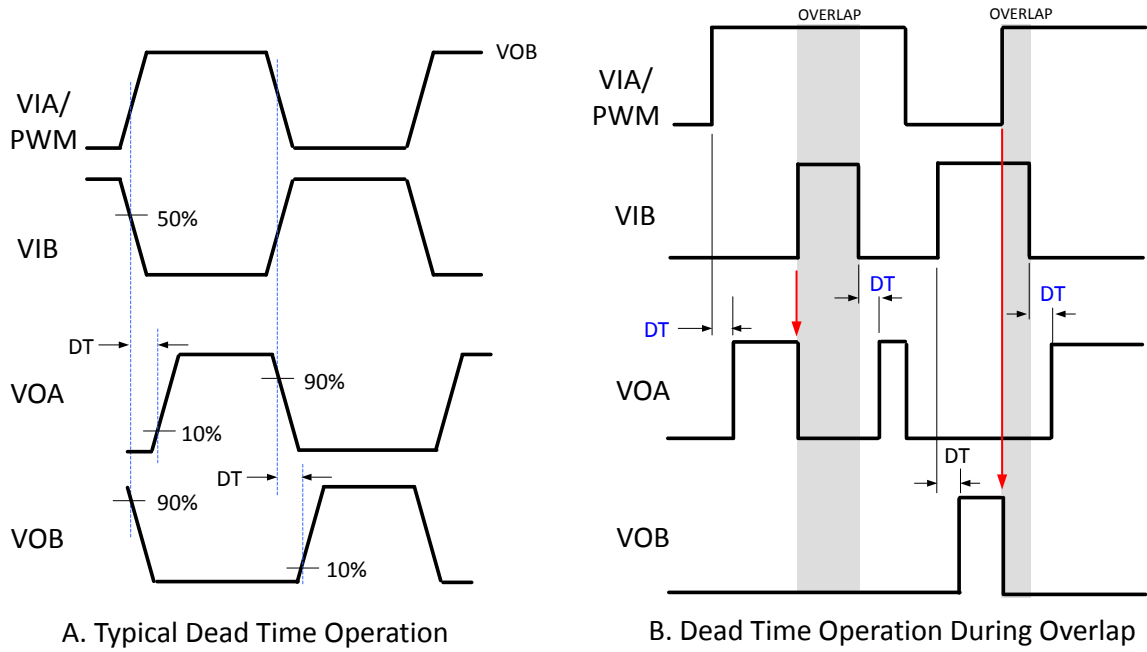
#### Equation 5.

The device driving VIA and VIB should provide a minimum dead time of TDD to avoid activating overlap protection. Input/output timing waveforms for the two-input drivers are shown in [Figure 3.35 Input / Output Waveforms for High-Side / Low-Side Two-Input Drivers on page 19](#), and dead time waveforms are shown in [Figure 3.36 Dead Time Waveforms for High-Side / Low-Side Two-input Drivers on page 20](#).



Ref	Description
A	Normal operation: VIA high, VIB low.
B	Normal operation: VIB high, VIA low.
C	Contention: VIA = VIB = high.
D	Recovery from contention: VIA transitions low.
E	Normal operation: VIA = VIB = low.
F	Normal operation: VIA high, VIB low.
G	Contention: VIA = VIB = high.
H	Recovery from contention: VIB transitions low.
I	Normal operation: VIB transitions high.

Figure 3.35. Input / Output Waveforms for High-Side / Low-Side Two-Input Drivers



**Figure 3.36. Dead Time Waveforms for High-Side / Low-Side Two-input Drivers**

## 4. Electrical Specifications

**Table 4.1. Electrical Characteristics<sup>1</sup>**

2.7 V &lt; VDDI &lt; 5.5 V, VDDA = VDDB = 12 V or 15 V. TA = -40 to +125 °C. Typical specs at 25 °C

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>DC Specifications</b>						
Input-side Power Supply Voltage	VDDI	Si8230/1/2/3/4/5/6	4.5	—	5.5	V
		Si8237/8	2.7	—	5.5	
Driver Supply Voltage	VDDA, VDDB	Voltage between VDDA and GNDA, and VDDB and GNDB (See 2. Ordering Guide)	6.5	—	24	V
Input Supply Quiescent Current	IDDI(Q)	Si8230/2/3/5/6/7/8	—	2	3	mA
		Si8231/4	—	3.5	5	mA
Output Supply Quiescent Current	IDDA(Q), IDDB(Q)	Current per channel	—	—	3.0	mA
Input Supply Active Current	IDDI	Input freq = 500 kHz, no load	—	3.5	—	mA
Output Supply Active Current	IDDA	Current per channel with	—	6	—	mA
	IDDB	Input freq = 500 kHz, no load	—	—	—	—
Input Pin Leakage Current	IVIA, IVIB, IPWM		-10	—	+10	μA dc
Input Pin Leakage Current (Si8230/1/2/3/4/5/6)	IDISABLE		-10	—	+10	μA dc
Input Pin Leakage Current (Si8237/8)			-1000	+1000		
Logic High Input Threshold	VIH		2.0	—	—	V
Logic Low Input Threshold	VIL		—	—	0.8	V
Input Hysteresis	VIHYST	Si8230/1/2/3/4/5/6/7/8	400	450	—	mV
Logic High Output Voltage	VOAH, VOBH	IOA, IOB = -1 mA	(VDDA / VDDB) - 0.04	—	—	V
Logic Low Output Voltage	VOAL, VOBL	IOA, IOB = 1 mA	—	—	0.04	V
Output Short-Circuit Pulsed Sink Current	IOA(SCL), IOB(SCL)	Si8230/1/2/7, Figure 4.1 IOL Sink Current Test Circuit on page 24	—	0.5	—	A
		Si8233/4/5/6/8, Figure 4.1 IOL Sink Current Test Circuit on page 24	—	4.0	—	A
Output Short-Circuit Pulsed Source Current	IOA(SCH), IOB(SCH)	Si8230/1/2/7, Figure 4.2 IOH Source Current Test Circuit on page 24	—	0.25	—	A
		Si8233/4/5/6/8, Figure 4.2 IOH Source Current Test Circuit on page 24	—	2.0	—	A
Output Sink Resistance	RON(SINK)	Si8230/1/2/7	—	5.0	—	Ω
		Si8233/4/5/6/8	—	1.0	—	Ω

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output Source Resistance	R <sub>ON(SOURCE)</sub>	Si8230/1/2/7	—	15	—	Ω
		Si8233/4/5/6/8	—	2.7	—	Ω
VDDI Undervoltage Threshold	VDDI <sub>UV+</sub>	VDDI rising (Si8230/1/2/3/4/5/6)	3.60	4.0	4.45	V
VDDI Undervoltage Threshold	VDDI <sub>UV-</sub>	VDDI falling (Si8230/1/2/3/4/5/6)	3.30	3.70	4.15	V
VDDI Lockout Hysteresis	VDDI <sub>HYS</sub>	(Si8230/1/2/3/4/5/6)	—	250	—	mV
VDDI Undervoltage Threshold	VDDI <sub>UV+</sub>	VDDI rising (Si8237/8)	2.15	2.3	2.5	V
VDDI Undervoltage Threshold	VDDI <sub>UV-</sub>	VDDI falling (Si8237/8)	2.10	2.22	2.40	V
VDDI Lockout Hysteresis	VDDI <sub>HYS</sub>	(Si8237/8)	—	75	—	mV
VDDA, VDDB Undervoltage Threshold	VDDA <sub>UV+</sub> , VDDB <sub>UV+</sub>	VDDA, VDDB rising				
5 V Threshold		See Figure 3.31 Si823x UVLO Response (5 V) on page 18.	5.20	5.80	6.30	V
8 V Threshold		See Figure 3.33 Si823x UVLO Response (8 V) on page 18.	7.50	8.60	9.40	V
10 V Threshold		See Figure 3.32 Si823x UVLO Response (10 V) on page 18.	9.60	11.1	12.2	V
12.5 V Threshold		See Figure 3.34 Si823x UVLO Response (12.5 V) on page 18.	12.4	13.8	14.8	V
VDDA, VDDB Undervoltage Threshold	VDDA <sub>UV-</sub> , VDDB <sub>UV-</sub>	VDDA, VDDB falling				
5 V Threshold		See Figure 3.31 Si823x UVLO Response (5 V) on page 18.	4.90	5.52	6.0	V
8 V Threshold		See Figure 3.33 Si823x UVLO Response (8 V) on page 18.	7.20	8.10	8.70	V
10 V Threshold		See Figure 3.32 Si823x UVLO Response (10 V) on page 18.	9.40	10.1	10.9	V
12.5 V Threshold		See Figure 3.34 Si823x UVLO Response (12.5 V) on page 18.	11.6	12.8	13.8	V
VDDA, VDDB Lockout Hysteresis	VDDA <sub>HYS</sub> , VDDB <sub>HYS</sub>	UVLO voltage = 5 V	—	280	—	mV
VDDA, VDDB Lockout Hysteresis	VDDA <sub>HYS</sub> , VDDB <sub>HYS</sub>	UVLO voltage = 8 V	—	600	—	mV
VDDA, VDDB Lockout Hysteresis	VDDA <sub>HYS</sub> , VDDB <sub>HYS</sub>	UVLO voltage = 10 V or 12.5 V	—	1000	—	mV
<b>AC Specifications</b>						
Minimum Pulse Width			—	10	—	ns
Propagation Delay	t <sub>PHL</sub> , t <sub>PLH</sub>	CL = 200 pF	—	30	60	ns
Pulse Width Distortion (t <sub>PLH</sub> - t <sub>PHL</sub> )	PWD		—	—	5.60	ns
Minimum Overlap Time <sup>2</sup>	TDD	DT = VDDI, No-Connect	—	0.4	—	ns



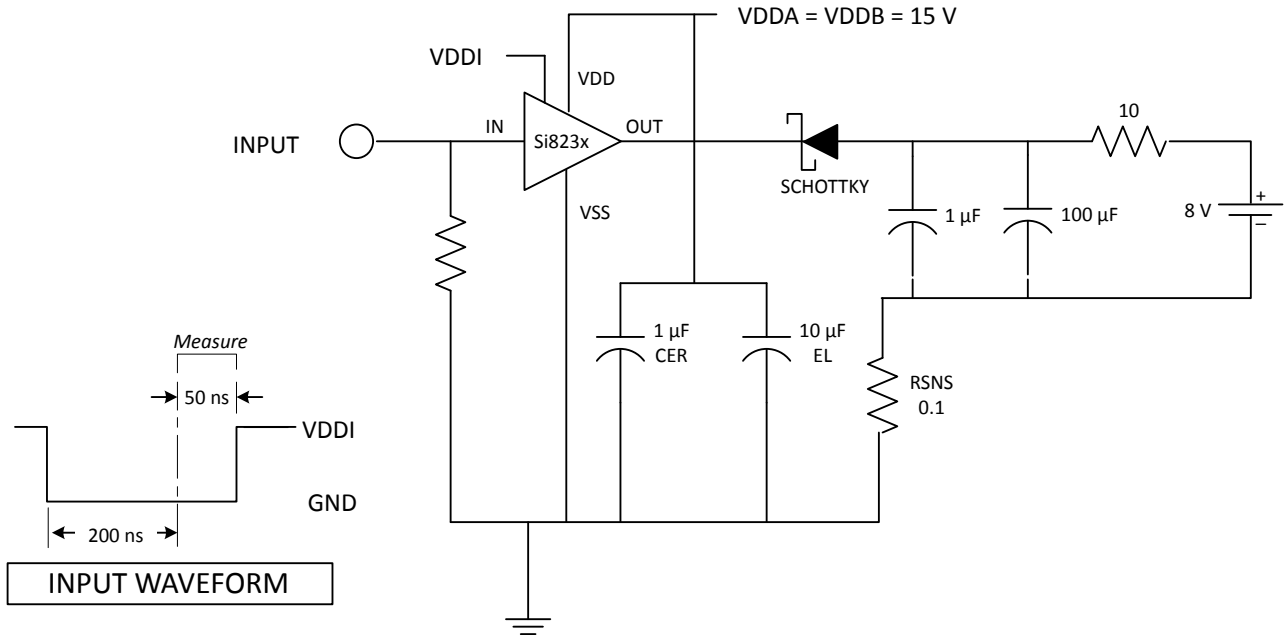
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Programmed Dead Time <sup>3</sup>	DT	Figure 3.36 Dead Time Waveforms for High-Side / Low-Side Two-input Drivers on page 20, RDT = 100 k	—	900	—	ns
		Figure 3.36 Dead Time Waveforms for High-Side / Low-Side Two-input Drivers on page 20, RDT = 6 k	—	70	—	ns
Output Rise and Fall Time	$t_R, t_F$	$C_L = 200$ pF (Si8230/1/2/7)	—	—	20	ns
		$C_L = 200$ pF (Si8233/4/5/6/8)	—	—	12	ns
Shutdown Time from Disable True	$t_{SD}$		—	—	60	ns
Restart Time from Disable False	$t_{RESTART}$		—	—	60	ns
Device Start-up Time	$t_{START}$	Time from $VDD\_ = VDD\_UV+$ to $VOA, VOB = VIA, VIB$	—	—	40	$\mu$ s
Common Mode Transient Immunity	CMTI	$VIA, VIB, PWM = VDDI$ or 0 V  $V_{CM} = 1500$ V (see Figure 4.3 Common Mode Transient Immunity Test Circuit on page 25)	20	45	—	kV/ $\mu$ s

**Notes:**

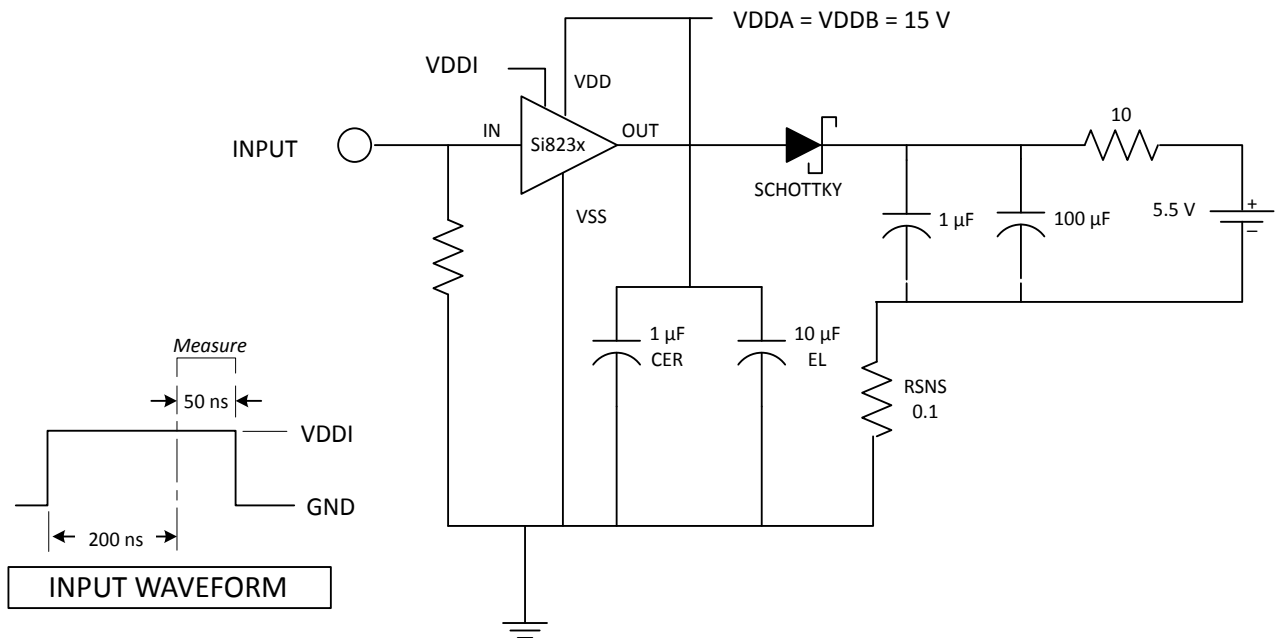
1.  $VDDA = VDDB = 12$  V for 5, 8, and 10 V UVLO devices;  $VDDA = VDDB = 15$  V for 12.5 V UVLO devices.
2. TDD is the minimum overlap time without triggering overlap protection (Si8230/1/3/4 only).
3. The largest RDT resistor that can be used is 220 k $\Omega$ .

**4.1 Test Circuits**

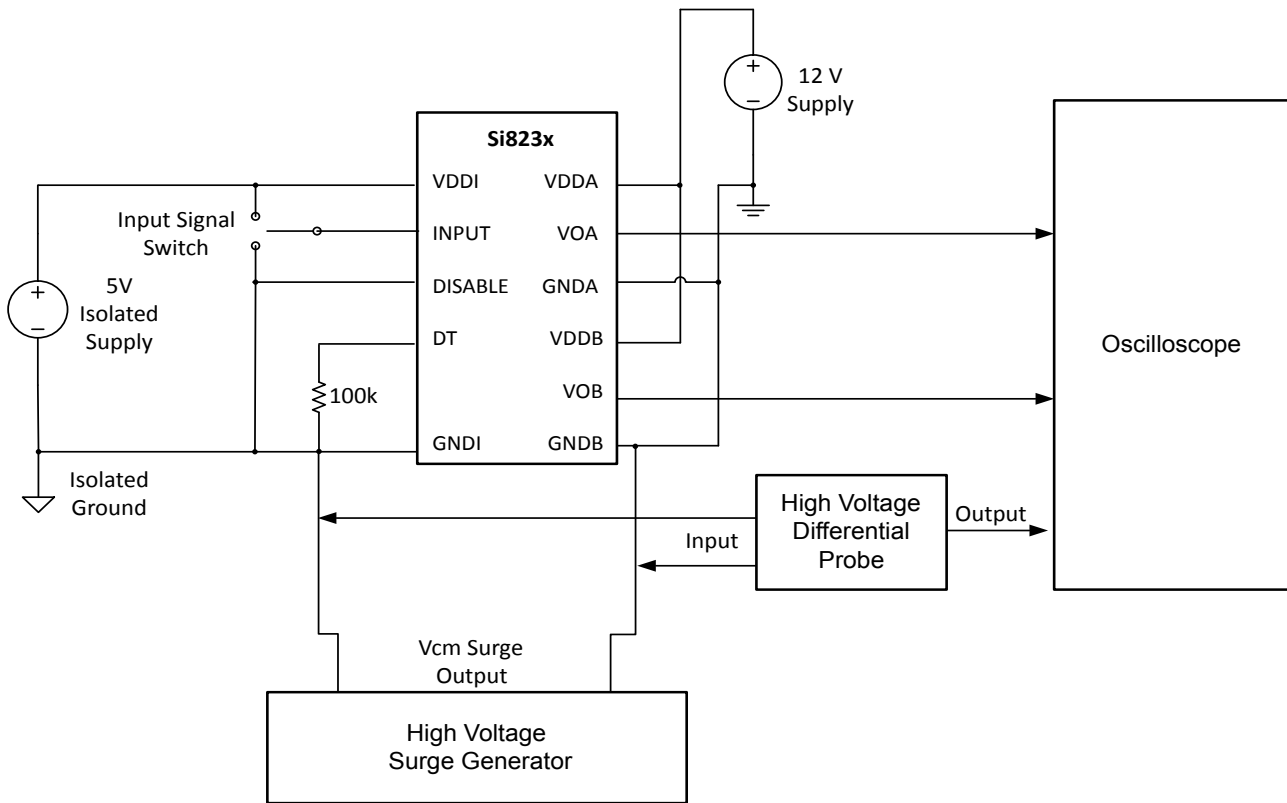
Figures Figure 4.1 IOL Sink Current Test Circuit on page 24, Figure 4.2 IOH Source Current Test Circuit on page 24, and Figure 4.3 Common Mode Transient Immunity Test Circuit on page 25 depict sink current, source current, and common-mode transient immunity test circuits, respectively.



**Figure 4.1. IOL Sink Current Test Circuit**



**Figure 4.2. IOH Source Current Test Circuit**



**Figure 4.3. Common Mode Transient Immunity Test Circuit**

**Table 4.2. Regulatory Information<sup>1, 2, 3, 4</sup>**

<b>CSA</b>
The Si823x is certified under CSA Component Acceptance Notice 5A. For more details, see File 232873.
61010-1: Up to 600 V <sub>RMS</sub> reinforced insulation working voltage; up to 600 V <sub>RMS</sub> basic insulation working voltage.
60950-1: Up to 600 V <sub>RMS</sub> reinforced insulation working voltage; up to 1000 V <sub>RMS</sub> basic insulation working voltage.
60601-1: Up to 125 V <sub>RMS</sub> reinforced insulation working voltage; up to 380 V <sub>RMS</sub> basic insulation working voltage.
<b>VDE</b>
The Si823x is certified according to IEC 60747-5-5. For more details, see File 5006301-4880-0001.
60747-5-5: Up to 891 V <sub>peak</sub> for basic insulation working voltage.
60950-1: Up to 600 V <sub>RMS</sub> reinforced insulation working voltage; up to 1000 V <sub>RMS</sub> basic insulation working voltage.
<b>UL</b>
The Si823x is certified under UL1577 component recognition program. For more details, see File E257455.
Rated up to 5000 V <sub>RMS</sub> isolation voltage for basic protection.
<b>CQC</b>
The Si823x is certified under GB4943.1-2011. For more details, see certificates CQC13001096106 and CQC13001096108.
Rated up to 600 V <sub>RMS</sub> reinforced insulation working voltage; up to 1000 V <sub>RMS</sub> basic insulation working voltage.

**Notes:**

1. Regulatory Certifications apply to 2.5 kV<sub>RMS</sub> rated devices which are production tested to 3.0 kV<sub>RMS</sub> for 1 sec.
2. Regulatory Certifications apply to 3.75 kV<sub>RMS</sub> rated devices which are production tested to 4.5 kV<sub>RMS</sub> for 1 sec.
3. Regulatory Certifications apply to 5.0 kV<sub>RMS</sub> rated devices which are production tested to 6.0 kV<sub>RMS</sub> for 1 sec.
4. For more information, see [2. Ordering Guide](#).

**Table 4.3. Insulation and Safety-Related Specifications**

Parameter	Symbol	Test Condition	Value				Unit
			WBSOIC-16 5 kV <sub>RMS</sub>	WBSOIC-16 NBSOIC-16 2.5 kV <sub>RMS</sub>	14 LD LGA 2.5 kV <sub>RMS</sub>	14 LD LGA with Pad 1.0 kV <sub>RMS</sub>	
Nominal Air Gap (Clearance) <sup>1</sup>	L(1O1)		8.0	8.0/4.01	3.5	1.75	mm
Nominal External Tracking (Creepage) <sup>1</sup>	L(1O2)		8.0	8.0/4.01	3.5	1.75	mm
Minimum Internal Gap (Internal Clearance)			0.014	0.014	0.014	0.014	mm
Tracking Resistance (Proof Tracking Index)	PTI	IEC60112	600	600	600	600	V
Erosion Depth	ED		0.019	0.019	0.021	0.021	mm
Resistance (Input-Output) <sup>2</sup>	R <sub>IO</sub>		10 <sup>12</sup>	10 <sup>12</sup>	10 <sup>12</sup>	10 <sup>12</sup>	Ω
Capacitance (Input-Output) <sup>2</sup>	X <sub>IO</sub>	f = 1 MHz	1.4	1.4	1.4	1.4	pF
Input Capacitance <sup>3</sup>	X <sub>I</sub>		4.0	4.0	4.0	4.0	pF

**Notes:**

1. The values in this table correspond to the nominal creepage and clearance values as detailed in [7.1 Package Outline: 16-Pin Wide Body SOIC](#), [7.2 Package Outline: 16-Pin Narrow Body SOIC](#), [7.3 Package Outline: 14 LD LGA \(5 x 5 mm\)](#), and [7.4 Package Outline: 14 LD LGA with Thermal Pad \(5 x 5 mm\)](#). VDE certifies the clearance and creepage limits as 4.7 mm minimum for the NB SOIC-16 and 8.5 mm minimum for the WB SOIC-16 package. UL does not impose a clearance and creepage minimum for component level certifications. CSA certifies the clearance and creepage limits as 3.9 mm minimum for the NB SOIC 16 and 7.6 mm minimum for the WB SOIC-16 package.
2. To determine resistance and capacitance, the Si823x is converted into a 2-terminal device. Pins 1–8 (1-7, 14 LD LGA) are shorted together to form the first terminal and pins 9–16 (8-14, 14 LD LGA) are shorted together to form the second terminal. The parameters are then measured between these two terminals.
3. Measured from input pin to ground.

**Table 4.4. IEC 60664-1 (VDE 0884 Part 5) Ratings**

Parameter	Test Condition	Specification			
		WB SO- IC-16	NB SO- IC-16	14 LD LGA	14 LD LGA with Pad
Basic Isolation Group	Material Group	I	I	I	I

Parameter	Test Condition	Specification			
		WB SO-IC-16	NB SO-IC-16	14 LD LGA	14 LD LGA with Pad
Installation Classification	Rated Mains Voltages < 150 V <sub>RMS</sub>	I-IV	I-IV	I-IV	I-IV
	Rated Mains Voltages < 300 V <sub>RMS</sub>	I-IV	I-III	I-III	I-III
	Rated Mains Voltages < 400 V <sub>RMS</sub>	I-III	I-II	I-II	I-II
	Rated Mains Voltages < 600 V <sub>RMS</sub>	I-III	I-II	I-II	I-I

**Table 4.5. IEC 60747-5-5 Insulation Characteristics<sup>1</sup>**

Parameter	Symbol	Test Condition	Characteristic			Unit
			WB SOIC-16	NB SOIC-16 14 LD LGA	14 LD LGA with Pad	
Maximum Working Insulation Voltage	V <sub>IORM</sub>		891	560	373	V peak
Input to Output Test Voltage	V <sub>PR</sub>	Method b1 (V <sub>IORM</sub> × 1.875 = V <sub>PR</sub> , 100% Production Test, t <sub>m</sub> = 1 sec, Partial Discharge < 5 pC)	1671	1050	700	V peak
Transient Overvoltage	V <sub>IOTM</sub>	t = 60 sec	6000	4000	2650	V peak
Pollution Degree (DIN VDE 0110, Table 1)			2	2	2	
Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V	R <sub>S</sub>		>10 <sup>9</sup>	>10 <sup>9</sup>	>10 <sup>9</sup>	Ω

**\*Note:**

1. Maintenance of the safety data is ensured by protective circuits. The Si823x provides a climate classification of 40/125/21.

**Table 4.6. IEC Safety Limiting Values<sup>1</sup>**

Parameter	Symbol	Test Condition	WB SOIC-16	NB SOIC-16	14 LD LGA	14 LD LGA with Pad	Unit
Case Temperature	T <sub>S</sub>		150	150	150	150	°C
Safety Input Current	I <sub>S</sub>	θ <sub>JA</sub> = 100 °C/W (WB SOIC-16), 105 °C/W (NB SO-IC-16, 14 LD LGA), 50 °C/W (14 LD LGA with Pad)  V <sub>DDI</sub> = 5.5 V,  V <sub>DDA</sub> = V <sub>DDB</sub> = 24 V,  T <sub>J</sub> = 150 °C, T <sub>A</sub> = 25 °C	50	50	50	100	mA

Parameter	Symbol	Test Condition	WB SOIC-16	NB SOIC-16	14 LD LGA	14 LD LGA with Pad	Unit
Device Power Dissipation <sup>2</sup>	$P_D$		1.2	1.2	1.2	1.2	$\Omega$

**Notes:**

- Maximum value allowed in the event of a failure. Refer to the thermal derating curve in Figures [Figure 4.4 WB SOIC-16](#), [NB SOIC-16](#), [14 LD LGA Thermal Derating Curve](#), [Dependence of Safety Limiting Values with Case Temperature per DIN EN 60747-5-5 on page 29](#) and [Figure 4.5 14 LD LGA with Pad Thermal Derating Curve](#), [Dependence of Safety Limiting Values with Case Temperature per DIN EN 60747-5-5 on page 30](#).
- The Si82xx is tested with  $V_{DDI} = 5.5\text{ V}$ ,  $V_{DDA} = V_{DDB} = 24\text{ V}$ ,  $T_J = 150\text{ }^\circ\text{C}$ ,  $C_L = 100\text{ pF}$ , input 2 MHz 50% duty cycle square wave.

**Table 4.7. Thermal Characteristics**

Parameter	Symbol	WB SOIC-16	NB SOIC-16	14 LD LGA	14 LD LGA with Pad	Unit
IC Junction-to-Air Thermal Resistance	$\theta_{JA}$	100	105	105	50	$^\circ\text{C/W}$

**Table 4.8. Absolute Maximum Ratings<sup>1</sup>**

Parameter	Symbol	Min	Max	Unit
Storage Temperature <sup>2</sup>	$T_{STG}$	-65	+150	$^\circ\text{C}$
Ambient Temperature under Bias	$T_A$	-40	+125	$^\circ\text{C}$
Junction Temperature	$T_J$	—	+150	$^\circ\text{C}$
Input-side Supply Voltage	$V_{DDI}$	-0.6	6.0	V
Driver-side Supply Voltage	$V_{DDA}, V_{DDB}$	-0.6	30	V
Voltage on any Pin with respect to Ground	$V_{IO}$	-0.5	$V_{DD} + 0.5$	V
Peak Output Current ( $t_{PW} = 10\text{ }\mu\text{s}$ , duty cycle = 0.2%) (0.5 Amp versions)	$I_{OPK}$	—	0.5	A
Peak Output Current ( $t_{PW} = 10\text{ }\mu\text{s}$ , duty cycle = 0.2%) (4.0 Amp versions)	$I_{OPK}$	—	4.0	A
Lead Solder Temperature (10 sec.)		—	260	$^\circ\text{C}$
Maximum Isolation (Input to Output) (1 sec) WB SOIC-16		—	6500	$V_{RMS}$
Maximum Isolation (Output to Output) (1 sec) WB SOIC-16		—	2500	$V_{RMS}$
Maximum Isolation (Input to Output) (1 sec) NB SOIC-16		—	4500	$V_{RMS}$
Maximum Isolation (Output to Output) (1 sec) NB SOIC-16		—	2500	$V_{RMS}$

Parameter	Symbol	Min	Max	Unit
Maximum Isolation (Input to Output) (1 sec) 14 LD LGA without Thermal Pad		—	3850	V <sub>RMS</sub>
Maximum Isolation (Output to Output) (1 sec) 14 LD LGA without Thermal Pad		—	650	V <sub>RMS</sub>
Maximum Isolation (Input to Output) (1 sec) 14 LD LGA with Thermal Pad		—	1850	V <sub>RMS</sub>
Maximum Isolation (Output to Output) (1 sec) 14 LD LGA with Thermal Pad	—	—	0	V <sub>RMS</sub>

**Notes:**

- Permanent device damage may occur if the absolute maximum ratings are exceeded. Functional operation should be restricted to the conditions as specified in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
- VDE certifies storage temperature from -40 to 150 °C.

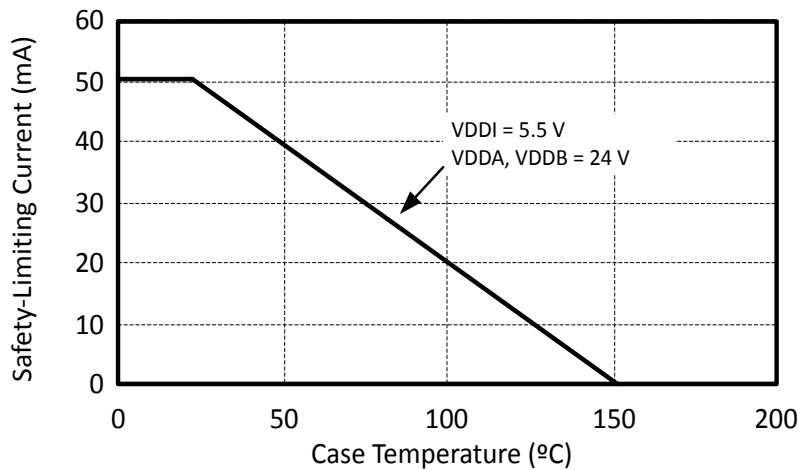
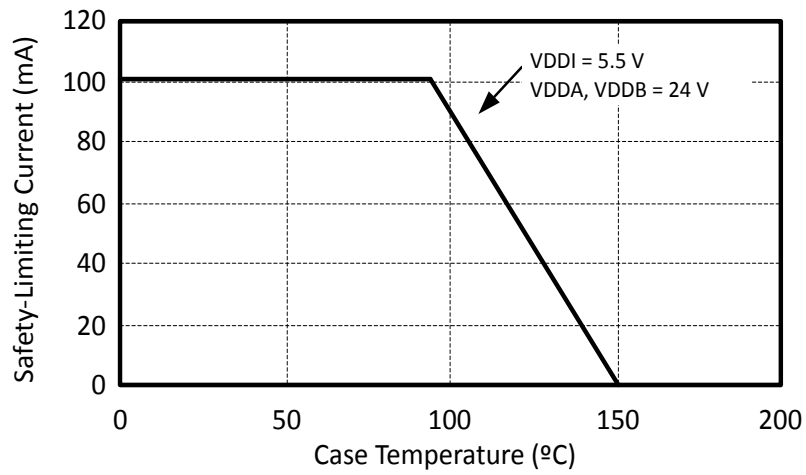


Figure 4.4. WB SOIC-16, NB SOIC-16, 14 LD LGA Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN EN 60747-5-5



**Figure 4.5. 14 LD LGA with Pad Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN EN 60747-5-5**



## 5. Applications

The following examples illustrate typical circuit configurations using the Si823x.

### 5.1 High-Side/Low-Side Driver

The Figure A in the drawing below shows the Si8230/3 controlled using the VIA and VIB input signals, and Figure B shows the Si8231/4 controlled by a single PWM signal.

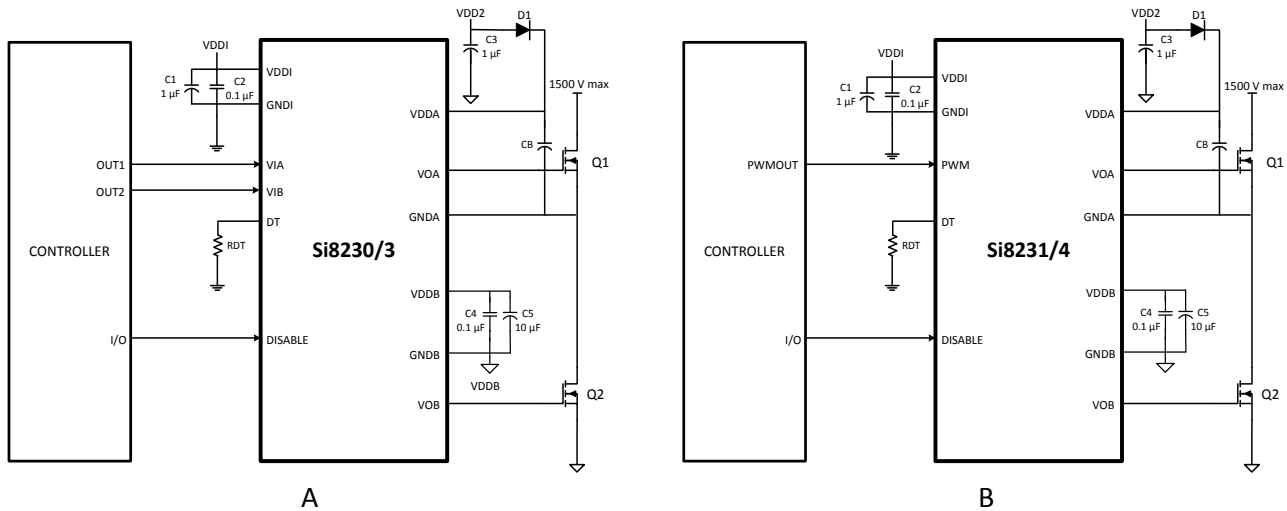
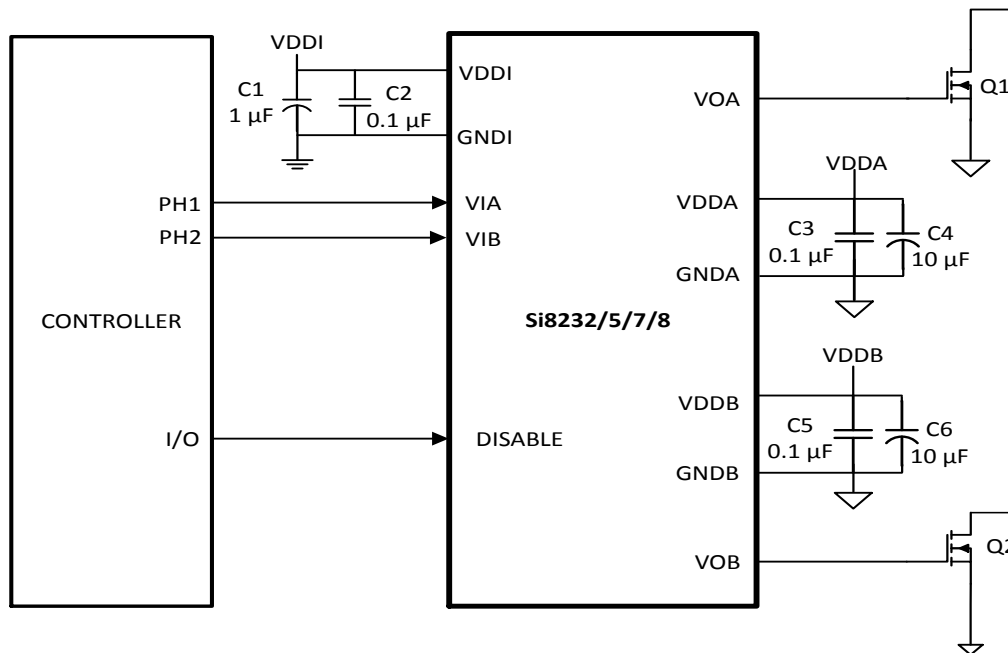


Figure 5.1. Si823x in Half-Bridge Application

For both cases, D1 and CB form a conventional bootstrap circuit that allows VOA to operate as a high-side driver for Q1, which has a maximum drain voltage of 1500 V. The boot-strap start up time will depend on the CB cap chosen. See application note, "AN486: High-Side Bootstrap Design Using Si823x ISODrivers in Power Delivery Systems". VOB is connected as a conventional low-side driver, and, in most cases, VDD2 is the same as VDDB. Note that the input side of the Si823x requires VDD in the range of 4.5 to 5.5 V (2.7 to 5.5 V for Si8237/8), while the VDDA and VDDB output side supplies must be between 6.5 and 24 V with respect to their respective grounds. It is recommended that bypass capacitors of 0.1 and 1  $\mu\text{F}$  value be used on the Si823x input side and that they be located as close to the chip as possible. Moreover, it is recommended that 0.1 and 10  $\mu\text{F}$  bypass capacitors, located as close to the chip as possible, be used on the Si823x output side to reduce high-frequency noise and maximize performance.

## 5.2 Dual Driver

The figure below shows the Si823x configured as a dual driver. Note that the drain voltages of Q1 and Q2 can be referenced to a common ground or to different grounds with as much as 1500 V dc between them.



**Figure 5.2. Si8232/5/7/8 in a Dual Driver Application**

Because each output driver resides on its own die, the relative voltage polarities of VOA and VOB can reverse without damaging the driver. That is, the voltage at VOA can be higher or lower than that of VOB by VDD without damaging the driver. Therefore, a dual driver in a low-side high side/low side drive application can use either VOA or VOB as the high side driver. Similarly, a dual driver can operate as a dual low-side or dual high-side driver and is unaffected by static or dynamic voltage polarity changes.

## 5.3 Dual Driver with Thermally Enhanced Package (Si8236)

The thermal pad of the Si8236 must be connected to a heat spreader to lower thermal resistance. Generally, the larger the thermal shield's area, the lower the thermal resistance. It is recommended that thermal vias also be used to add mass to the shield. Vias generally have much more mass than the shield alone and consume less space, thus reducing thermal resistance more effectively. While the heat spreader is not generally a circuit ground, it is a good reference plane for the Si8236 and is also useful as a shield layer for EMI reduction.

With a 10mm<sup>2</sup> thermal plane on the outer layers (including 20 thermal vias), the thermal impedance of the Si8236 was measured at 50 °C/W. This is a significant improvement over the Si8235 which does not include a thermal pad. The Si8235's thermal resistance was measured at 105 °C /W. In addition, note that the GNDA and GNDB pins for the Si8236 are connected together through the thermal pad.

## 6. Pin Descriptions

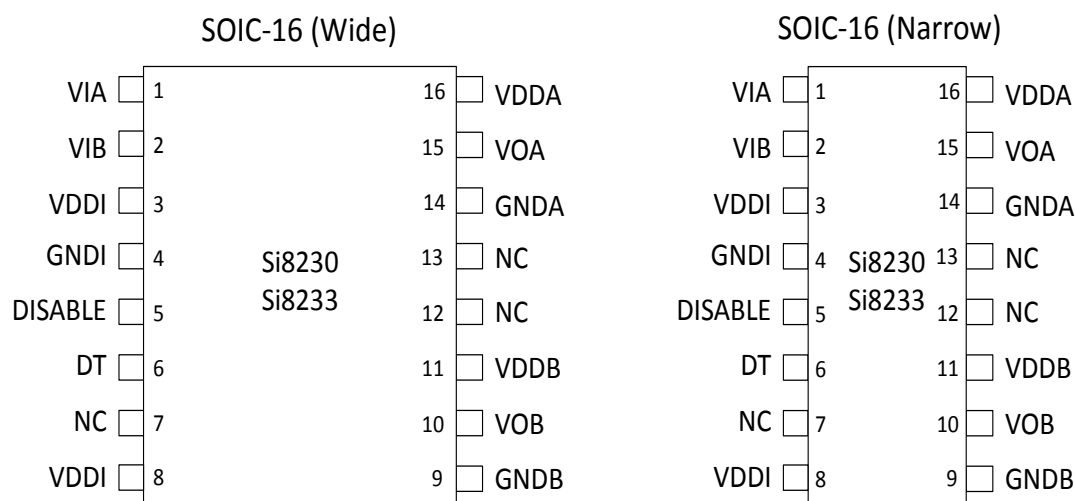


Table 6.1. Si8230/3 Two-Input HS/LS Isolated Driver (SOIC-16)

Pin	Name	Description
1	VIA	Non-inverting logic input terminal for Driver A.
2	VIB	Non-inverting logic input terminal for Driver B.
3	VDDI	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
4	GNDI	Input-side ground terminal.
5	DISABLE	Device Disable. When high, this input unconditionally drives outputs VOA, VOB LOW. It is strongly recommended that this input be connected to external logic level to avoid erroneous operation due to capacitive noise coupling.
6	DT	Dead time programming input. The value of the resistor connected from DT to ground sets the dead time between output transitions of VOA and VOB. Defaults to 400 ps dead time when connected to VDDI or left open (see <a href="#">3.10 Programmable Dead Time and Overlap Protection</a> ).
7	NC	No connection.
8	VDDI	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
9	GNDB	Ground terminal for Driver B.
10	VOB	Driver B output (low-side driver).
11	VDDB	Driver B power supply voltage terminal; connect to a source of 6.5 to 24 V.
12	NC	No connection.
13	NC	No connection.
14	GNDA	Ground terminal for Driver A.
15	VOA	Driver A output (high-side driver).
16	VDDA	Driver A power supply voltage terminal; connect to a source of 6.5 to 24 V.

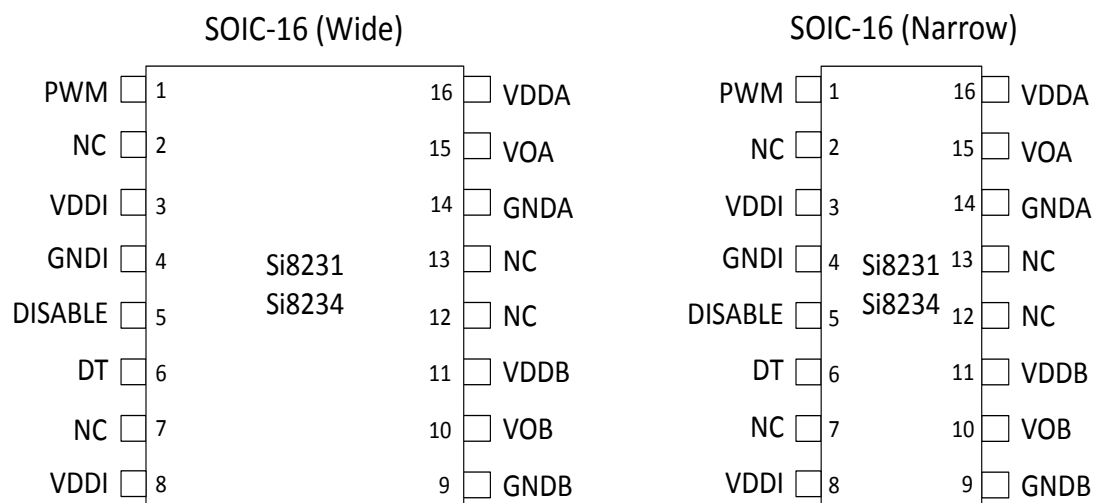
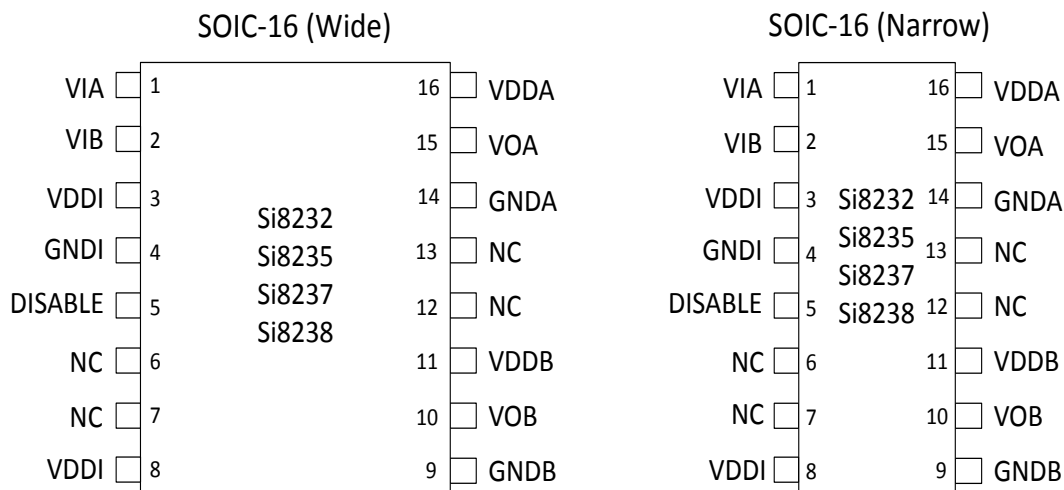


Table 6.2. Si8231/4 PWM Input HS/LS Isolated Driver (SOIC-16)

Pin	Name	Description
1	PWM	PWM input.
2	NC	No connection.
3	VDDI	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
4	GNDI	Input-side ground terminal.
5	DISABLE	Device Disable. When high, this input unconditionally drives outputs VOA, VOB LOW. It is strongly recommended that this input be connected to external logic level to avoid erroneous operation due to capacitive noise coupling.
6	DT	Dead time programming input. The value of the resistor connected from DT to ground sets the dead time between output transitions of VOA and VOB. Defaults to 400 ps dead time when connected to VDDI or left open (see <a href="#">3.10 Programmable Dead Time and Overlap Protection</a> ).
7	NC	No connection.
8	VDDI	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
9	GNDB	Ground terminal for Driver B.
10	VOB	Driver B output (low-side driver).
11	VDDDB	Driver B power supply voltage terminal; connect to a source of 6.5 to 24 V.
12	NC	No connection.
13	NC	No connection.
14	GNDA	Ground terminal for Driver A.
15	VOA	Driver A output (high-side driver).
16	VDDA	Driver A power supply voltage terminal; connect to a source of 6.5 to 24 V.



**Table 6.3. Si8232/5/7/8 Dual Isolated Driver (SOIC-16)**

Pin	Name	Description
1	VIA	Non-inverting logic input terminal for Driver A.
2	VIB	Non-inverting logic input terminal for Driver B.
3	VDDI	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V, (2.7 to 5.5 V for Si8237/8).
4	GNDI	Input-side ground terminal.
5	DISABLE	Device Disable. When high, this input unconditionally drives outputs VOA, VOB LOW. It is strongly recommended that this input be connected to external logic level to avoid erroneous operation due to capacitive noise coupling.
6	NC	No connection.
7	NC	No connection.
8	VDDI	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V, (2.7 to 5.5 V for Si8237/8).
9	GNDB	Ground terminal for Driver B.
10	VOB	Driver B output.
11	VDDDB	Driver B power supply voltage terminal; connect to a source of 6.5 to 24 V.
12	NC	No connection.
13	NC	No connection.
14	GNDA	Ground terminal for Driver A.
15	VOA	Driver A output.
16	VDDA	Driver A power supply voltage terminal; connect to a source of 6.5 to 24 V.

LGA-14 (5 x 5 mm)

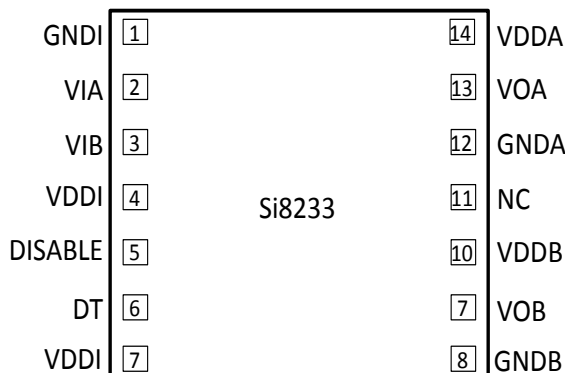
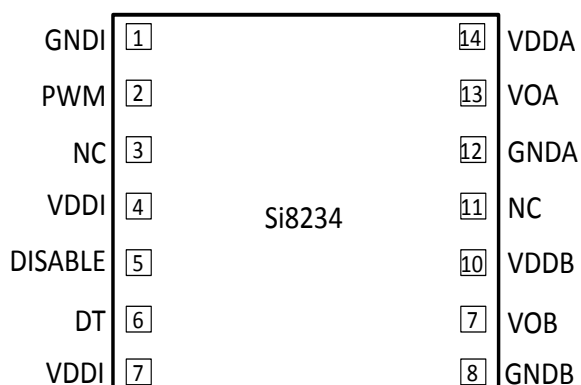


Table 6.4. Si8233 Two-Input HS/LS Isolated Driver (14 LD LGA)

Pin	Name	Description
GNDI	1	Input-side ground terminal.
VIA	2	Non-inverting logic input terminal for Driver A.
VIB	3	Non-inverting logic input terminal for Driver B.
VDDI	4	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
DISABLE	5	Device Disable. When high, this input unconditionally drives outputs VOA, VOB LOW. It is strongly recommended that this input be connected to external logic level to avoid erroneous operation due to capacitive noise coupling.
DT	6	Dead time programming input. The value of the resistor connected from DT to ground sets the dead time between output transitions of VOA and VOB. Defaults to 400 ps dead time when connected to VDDI or left open (see <a href="#">3.10 Programmable Dead Time and Overlap Protection</a> ).
VDDI	7	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
GNDB	8	Ground terminal for Driver B.
VOB	9	Driver B output (low-side driver).
VDDB	10	Driver B power supply voltage terminal; connect to a source of 6.5 to 24 V.
NC	11	No connection.
GNDA	12	Ground terminal for Driver A.
VOA	13	Driver A output (high-side driver).
VDDA	14	Driver A power supply voltage terminal; connect to a source of 6.5 to 24 V.

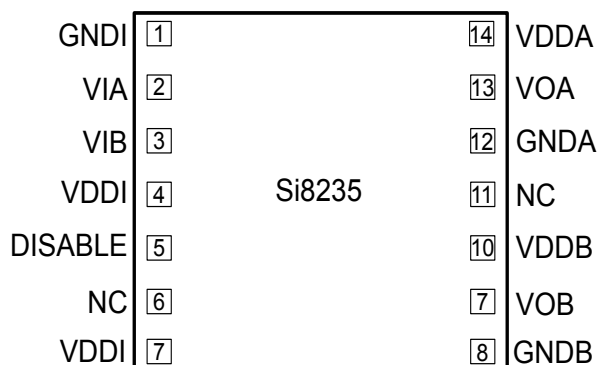
LGA-14 (5 x 5 mm)



**Table 6.5. Si8234 PWM Input HS/LS Isolated Driver (14 LD LGA)**

Pin	Name	Description
GNDI	1	Input-side ground terminal.
PWM	2	PWM input.
NC	3	No connection.
VDDI	4	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
DISABLE	5	Device Disable. When high, this input unconditionally drives outputs VOA, VOB LOW. It is strongly recommended that this input be connected to external logic level to avoid erroneous operation due to capacitive noise coupling.
DT	6	Dead time programming input. The value of the resistor connected from DT to ground sets the dead time between output transitions of VOA and VOB. Defaults to 400 ps dead time when connected to VDDI or left open (see <a href="#">3.10 Programmable Dead Time and Overlap Protection</a> ).
VDDI	7	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
GNDB	8	Ground terminal for Driver B.
VOB	9	Driver B output (low-side driver).
VDDB	10	Driver B power supply voltage terminal; connect to a source of 6.5 to 24 V.
NC	11	No connection.
GNDA	12	Ground terminal for Driver A.
VOA	13	Driver A output (high-side driver).
VDDA	14	Driver A power supply voltage terminal; connect to a source of 6.5 to 24 V.

LGA-14 (5 x 5 mm)



**Table 6.6. Si8235 Dual Isolated Driver (14 LD LGA)**

Pin	Name	Description
GNDI	1	Input-side ground terminal.
VIA	2	Non-inverting logic input terminal for Driver A.
VIB	3	Non-inverting logic input terminal for Driver B.
VDDI	4	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
DISABLE	5	Device Disable. When high, this input unconditionally drives outputs VOA, VOB LOW. It is strongly recommended that this input be connected to external logic level to avoid erroneous operation due to capacitive noise coupling.
NC	6	No connection.
VDDI	7	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
GNDB	8	Ground terminal for Driver B.
VOB	9	Driver B output (low-side driver).
VDDB	10	Driver B power supply voltage terminal; connect to a source of 6.5 to 24 V.
NC	11	No connection.
GNDA	12	Ground terminal for Driver A.
VOA	13	Driver A output (high-side driver).
VDDA	14	Driver A power supply voltage terminal; connect to a source of 6.5 to 24 V.



LGA-14 (5 x 5 mm)

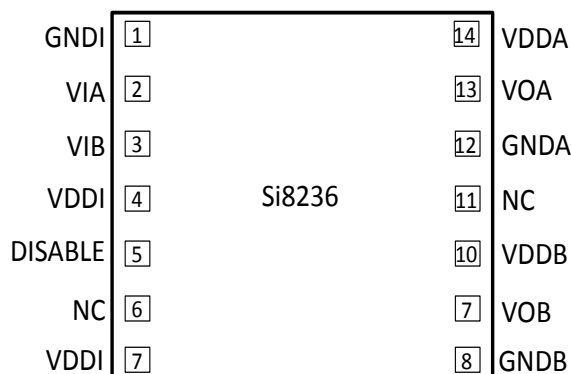


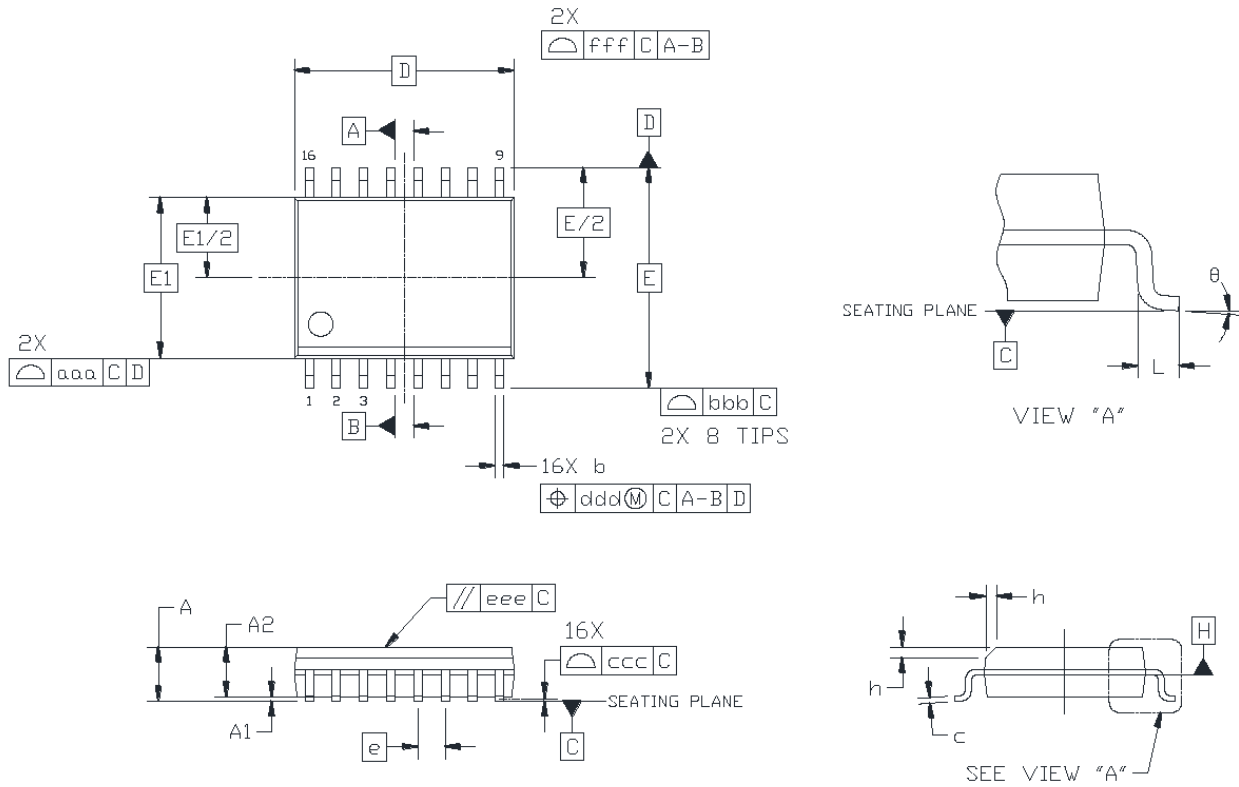
Table 6.7. Si8236 Dual Isolated Driver (14 LD LGA)

Pin	Name	Description
GNDI	1	Input-side ground terminal.
VIA	2	Non-inverting logic input terminal for Driver A.
VIB	3	Non-inverting logic input terminal for Driver B.
VDDI	4	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
DISABLE	5	Device Disable. When high, this input unconditionally drives outputs VOA, VOB LOW. It is strongly recommended that this input be connected to external logic level to avoid erroneous operation due to capacitive noise coupling.
NC	6	No connection.
VDDI	7	Input-side power supply terminal; connect to a source of 4.5 to 5.5 V.
GNDB	8	Ground terminal for Driver B. GNDA and GNDB pins for the Si8236 are connected together through the thermal pad.
VOB	9	Driver B output (low-side driver).
VDDB	10	Driver B power supply voltage terminal; connect to a source of 6.5 to 24 V.
NC	11	No connection.
GNDA	12	Ground terminal for Driver A. GNDA and GNDB pins for the Si8236 are connected together through the thermal pad.
VOA	13	Driver A output (high-side driver).
VDDA	14	Driver A power supply voltage terminal; connect to a source of 6.5 to 24 V.

## 7. Package Outlines

### 7.1 Package Outline: 16-Pin Wide Body SOIC

Figure 7.1 16-Pin Wide Body SOIC on page 40 illustrates the package details for the Si823x in a 16-Pin Wide Body SOIC. Table 7.1 Package Diagram Dimensions on page 40 lists the values for the dimensions shown in the illustration.



**Figure 7.1. 16-Pin Wide Body SOIC**

**Table 7.1. Package Diagram Dimensions**

Dimension	Min	Max
A	—	2.65
A1	0.10	0.30
A2	2.05	—
b	0.31	0.51
c	0.20	0.33
D	10.30 BSC	
E	10.30 BSC	
E1	7.50 BSC	
e	1.27 BSC	
L	0.40	1.27
h	0.25	0.75

Dimension	Min	Max
θ	0°	8°
aaa	—	0.10
bbb	—	0.33
ccc	—	0.10
ddd	—	0.25
eee	—	0.10
fff	—	0.20

**Notes:**

1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.
3. This drawing conforms to JEDEC Outline MS-013, Variation AA.
4. Recommended reflow profile per JEDEC J-STD-020 specification for small body, lead-free components.

7.2 Package Outline: 16-Pin Narrow Body SOIC

Figure 7.2 16-pin Small Outline Integrated Circuit (SOIC) Package on page 42 illustrates the package details for the Si823x in a 16-pin narrow-body SOIC (SO-16). Table 7.2 Package Diagram Dimensions on page 42 lists the values for the dimensions shown in the illustration.

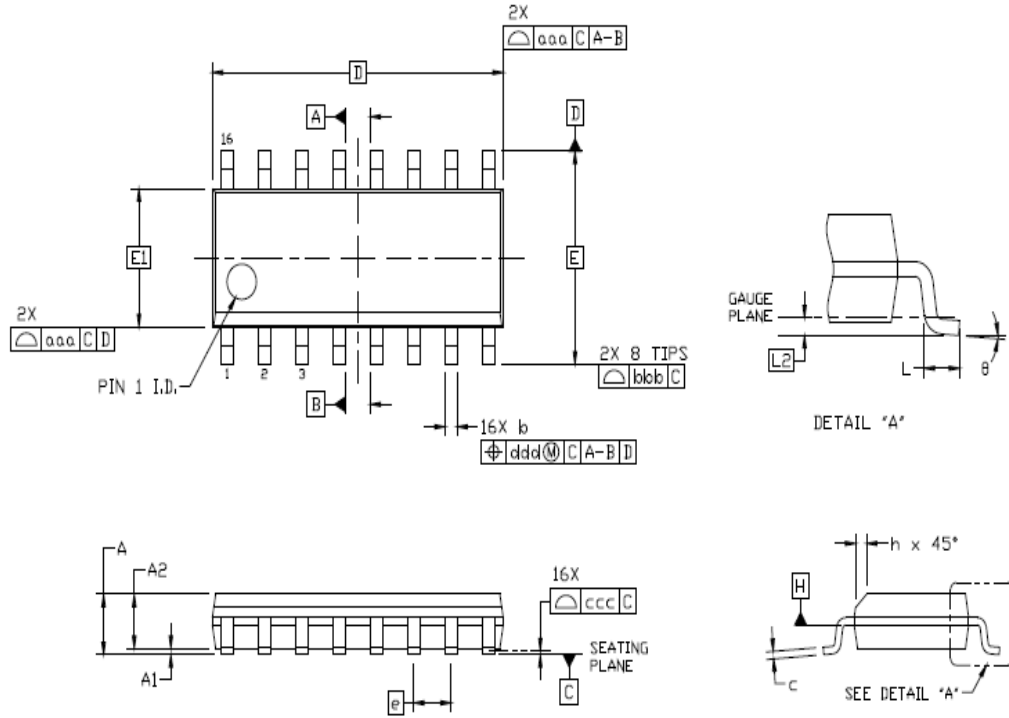


Figure 7.2. 16-pin Small Outline Integrated Circuit (SOIC) Package

Table 7.2. Package Diagram Dimensions

Dimension	Min	Max	Dimension	Min	Max
A	—	1.75	L	0.40	1.27
A1	0.10	0.25	L2	0.25 BSC	
A2	1.25	—	h	0.25	0.50
b	0.31	0.51	θ	0°	8°
c	0.17	0.25	aaa	0.10	
D	9.90 BSC		bbb	0.20	
E	6.00 BSC		ccc	0.10	
E1	3.90 BSC		ddd	0.25	
e	1.27 BSC				

Notes:

1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.
3. This drawing conforms to the JEDEC Solid State Outline MS-012, Variation AC.
4. Recommended card reflow profile is per the JEDEC/IPC J-STD-020 specification for Small Body Components.

### 7.3 Package Outline: 14 LD LGA (5 x 5 mm)

Figure 7.3 Si823x LGA Outline on page 43 illustrates the package details for the Si823x in an LGA outline. Table 7.3 Package Diagram Dimensions on page 43 lists the values for the dimensions shown in the illustration.

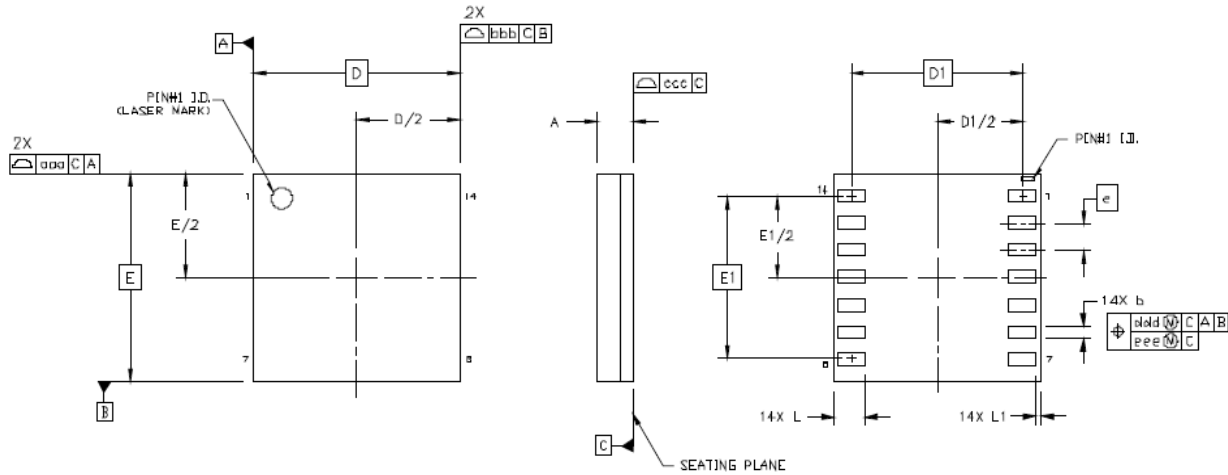


Figure 7.3. Si823x LGA Outline

Table 7.3. Package Diagram Dimensions

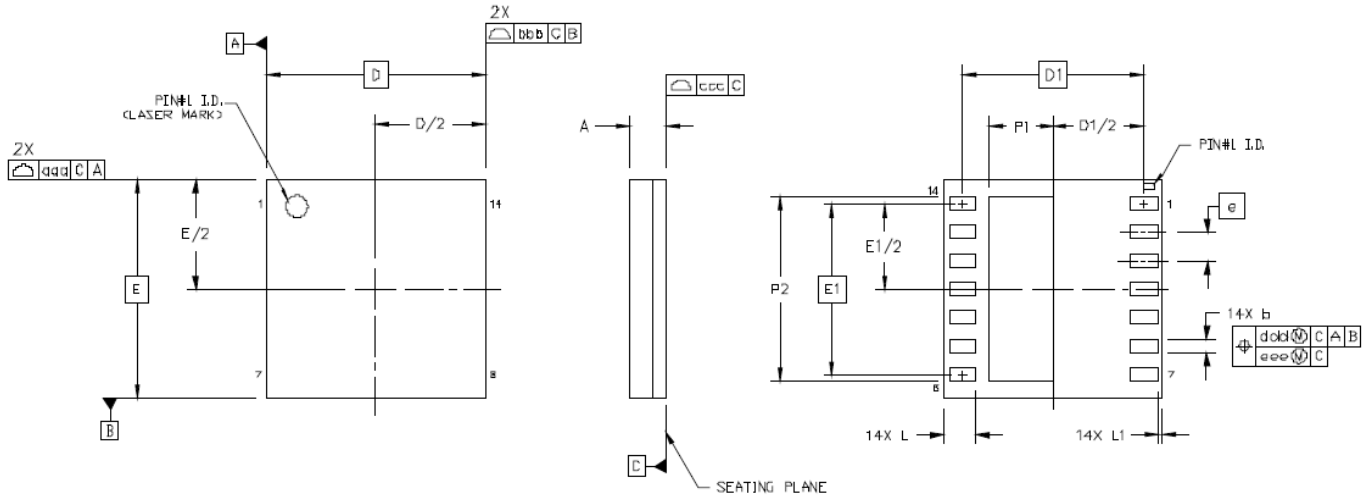
Dimension	MIN	NOM	MAX
A	0.74	0.84	0.94
b	0.25	0.30	0.35
D	5.00 BSC		
D1	4.15 BSC		
e	0.65 BSC		
E	5.00 BSC		
E1	3.90 BSC		
L	0.70	0.75	0.80
L1	0.05	0.10	0.15
aaa	—	—	0.10
bbb	—	—	0.10
ccc	—	—	0.08
ddd	—	—	0.15
eee	—	—	0.08

**Notes:**

1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.

**7.4 Package Outline: 14 LD LGA with Thermal Pad (5 x 5 mm)**

Figure 7.4 Si823x LGA Outline with Thermal Pad on page 44 illustrates the package details for the Si8236 ISOdriver in an LGA outline. Table 7.4 Package Diagram Dimensions on page 44 lists the values for the dimensions shown in the illustration.



**Figure 7.4. Si823x LGA Outline with Thermal Pad**

**Table 7.4. Package Diagram Dimensions**

Dimension	MIN	NOM	MAX
A	0.74	0.84	0.94
b	0.25	0.30	0.35
D	5.00 BSC		
D1	4.15 BSC		
e	0.65 BSC		
E	5.00 BSC		
E1	3.90 BSC		
L	0.70	0.75	0.80
L1	0.05	0.10	0.15
P1	1.40	1.45	1.50
P2	4.15	4.20	4.25
aaa	—	—	0.10
bbb	—	—	0.10
ccc	—	—	0.08
ddd	—	—	0.15
eee	—	—	0.08

**Notes:**

1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.

## 8. Land Patterns

### 8.1 Land Pattern: 16-Pin Wide Body SOIC

Figure 8.1 16-Pin SOIC Land Pattern on page 45 illustrates the recommended land pattern details for the Si823x in a 16-pin wide-body SOIC. Table 8.1 16-Pin Wide Body SOIC Land Pattern Dimensions on page 45 lists the values for the dimensions shown in the illustration.

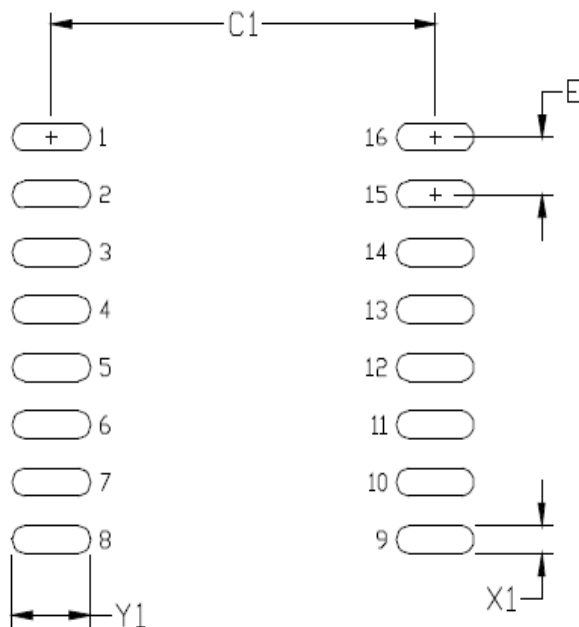


Figure 8.1. 16-Pin SOIC Land Pattern

Table 8.1. 16-Pin Wide Body SOIC Land Pattern Dimensions

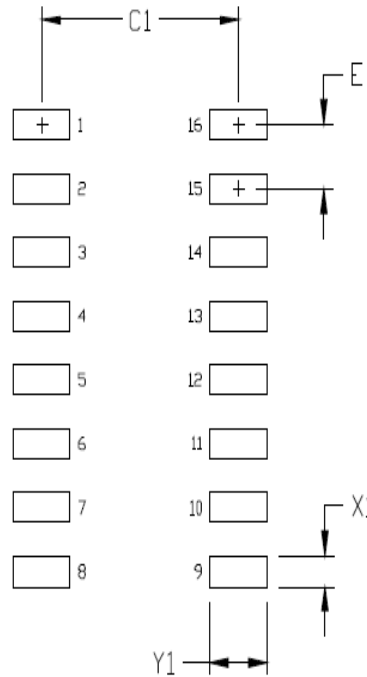
Dimension	Feature	(mm)
C1	Pad Column Spacing	9.40
E	Pad Row Pitch	1.27
X1	Pad Width	0.60
Y1	Pad Length	1.90

**Notes:**

1. This Land Pattern Design is based on IPC-7351 pattern SOIC127P1032X265-16AN for Density Level B (Median Land Protrusion).
2. All feature sizes shown are at Maximum Material Condition (MMC) and a card fabrication tolerance of 0.05 mm is assumed.

### 8.2 Land Pattern: 16-Pin Narrow Body SOIC

Figure 8.2 16-Pin Narrow Body SOIC PCB Land Pattern on page 46 illustrates the recommended land pattern details for the Si823x in a 16-pin narrow-body SOIC. Table 8.2 16-Pin Narrow Body SOIC Land Pattern Dimensions on page 46 lists the values for the dimensions shown in the illustration.



**Figure 8.2. 16-Pin Narrow Body SOIC PCB Land Pattern**

**Table 8.2. 16-Pin Narrow Body SOIC Land Pattern Dimensions**

Dimension	Feature	(mm)
C1	Pad Column Spacing	5.40
E	Pad Row Pitch	1.27
X1	Pad Width	0.60
Y1	Pad Length	1.55

**Notes:**

1. This Land Pattern Design is based on IPC-7351 pattern SOIC127P600X165-16N for Density Level B (Median Land Protrusion).
2. All feature sizes shown are at Maximum Material Condition (MMC) and a card fabrication tolerance of 0.05 mm is assumed.



### 8.3 Land Pattern: 14 LD LGA

Figure 8.3 14-Pin LGA Land Pattern on page 47 illustrates the recommended land pattern details for the Si823x in a 14-pin LGA. Table 8.3 14-Pin LGA Land Pattern Dimensions on page 47 lists the values for the dimensions shown in the illustration.

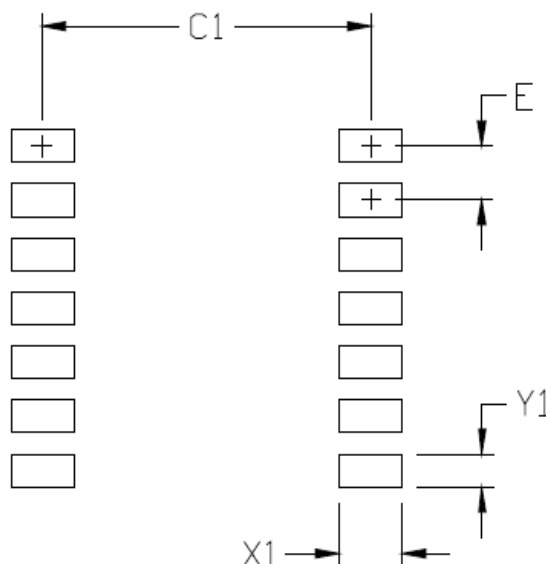


Figure 8.3. 14-Pin LGA Land Pattern

Table 8.3. 14-Pin LGA Land Pattern Dimensions

Dimension	(mm)
C1	4.20
E	0.65
X1	0.80
Y1	0.40

**Notes:**

**General**

1. All dimensions shown are in millimeters (mm).
2. This Land Pattern Design is based on the IPC-7351 guidelines.
3. All dimensions shown are at Maximum Material Condition (MMC). Least Material Condition (LMC) is calculated based on a Fabrication Allowance of 0.05 mm.

**Solder Mask Design**

1. All metal pads are to be non-solder mask defined (NSMD). Clearance between the solder mask and the metal pad is to be 60 μm minimum, all the way around the pad.

**Stencil Design**

1. A stainless steel, laser-cut and electro-polished stencil with trapezoidal walls should be used to assure good solder paste release.
2. The stencil thickness should be 0.125 mm (5 mils).
3. The ratio of stencil aperture to land pad size should be 1:1.

**Card Assembly**

1. A No-Clean, Type-3 solder paste is recommended.
2. The recommended card reflow profile is per the JEDEC/IPC J-STD-020 specification for Small Body Components.

### 8.4 Land Pattern: 14 LD LGA with Thermal Pad

Figure 8.4 14-Pin LGA with Thermal Pad Land Pattern on page 48 illustrates the recommended land pattern details for the Si8236 in a 14-pin LGA with thermal pad. Table 8.4 14-Pin LGA with Thermal Pad Land Pattern Dimensions on page 48 lists the values for the dimensions shown in the illustration.

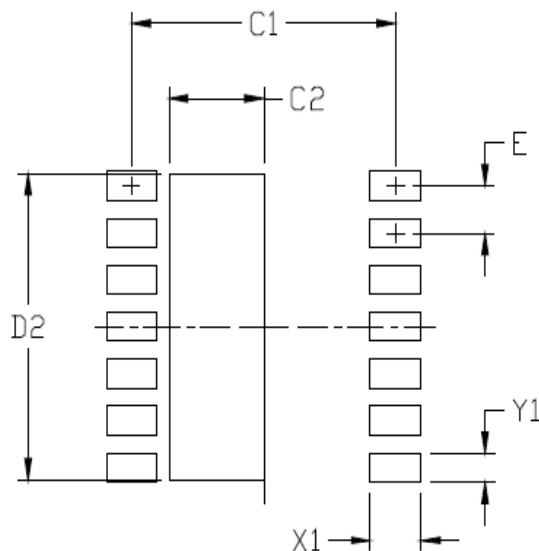


Figure 8.4. 14-Pin LGA with Thermal Pad Land Pattern

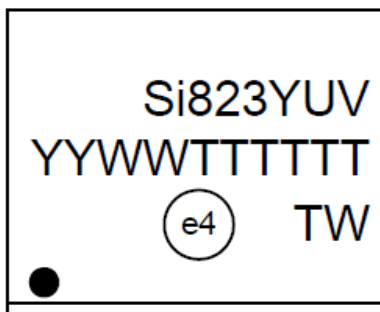
Table 8.4. 14-Pin LGA with Thermal Pad Land Pattern Dimensions

Dimension	(mm)
C1	4.20
C2	1.50
D2	4.25
E	0.65
X1	0.80
Y1	0.40

Dimension	(mm)
<b>Notes:</b>	
<b>General</b>	
<ol style="list-style-type: none"> <li>All dimensions shown are in millimeters (mm).</li> <li>This Land Pattern Design is based on the IPC-7351 guidelines.</li> <li>All dimensions shown are at Maximum Material Condition (MMC). Least Material Condition (LMC) is calculated based on a Fabrication Allowance of 0.05 mm.</li> </ol>	
<b>Solder Mask Design</b>	
<ol style="list-style-type: none"> <li>All metal pads are to be non-solder mask defined (NSMD). Clearance between the solder mask and the metal pad is to be 60 <math>\mu\text{m}</math> minimum, all the way around the pad.</li> </ol>	
<b>Stencil Design</b>	
<ol style="list-style-type: none"> <li>A stainless steel, laser-cut and electro-polished stencil with trapezoidal walls should be used to assure good solder paste release.</li> <li>The stencil thickness should be 0.125 mm (5 mils).</li> <li>The ratio of stencil aperture to land pad size should be 1:1.</li> </ol>	
<b>Card Assembly</b>	
<ol style="list-style-type: none"> <li>A No-Clean, Type-3 solder paste is recommended.</li> <li>The recommended card reflow profile is per the JEDEC/IPC J-STD-020 specification for Small Body Components.</li> </ol>	

## 9. Top Markings

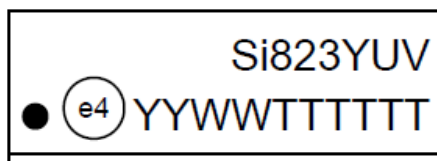
### 9.1 Si823x Top Marking (16-Pin Wide Body SOIC)



**Table 9.1. Top Marking Explanation (16-Pin Wide Body SOIC)**

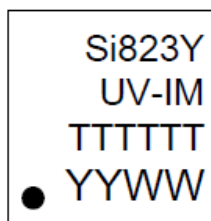
<b>Line 1 Marking:</b>	Base Part Number	Si823 = ISOdriver product series
	Ordering Options See Ordering Guide for more information.	Y = Peak output current 0, 1, 2, 7 = 0.5 A 3, 4, 5, 8 = 4.0 A U = UVLO level A = 5 V; B = 8 V; C = 10 V; D = 12.5 V V = Isolation rating B = 2.5 kV; C = 3.75 kV; D = 5.0 kV
<b>Line 2 Marking:</b>	YY = Year	Assigned by the Assembly House. Corresponds to the year and workweek of the mold date.
	WW = Workweek	
<b>Line 3 Marking:</b>	TTTTTT = Mfg Code	Manufacturing Code from Assembly Purchase Order form.
	Circle = 1.5 mm Diameter (Center Justified)	"e4" Pb-Free Symbol
	Country of Origin ISO Code Abbreviation	TW = Taiwan

### 9.2 Si823x Top Marking (16-Pin Narrow Body SOIC)



<b>Line 1 Marking:</b>	Base Part Number Ordering Options See Ordering Guide for more information.	Si823 = ISOdriver product series Y = Peak output current • 0, 1, 2, 7 = 0.5 A • 3, 4, 5, 8 = 4.0 A U = UVLO level • A = 5 V; B = 8 V; C = 10 V; D = 12.5 V V = Isolation rating • B = 2.5 kV; C = 3.75 kV; D = 5.0 kV
<b>Line 2 Marking:</b>	YY = Year WW = Workweek	Assigned by the Assembly House. Corresponds to the year and workweek of the mold date.
	TTTTTT = Mfg Code	Manufacturing Code from Assembly Purchase Order form.

### 9.3 Si823x Top Marking (14 LD LGA)



<b>Line 1 Marking:</b>	Base Part Number Ordering Options See Ordering Guide for more information.	Si823 = ISOdriver product series Y = Peak output current • 0, 1, 2 = 0.5 A • 3, 4, 5, 6 = 4.0 A
<b>Line 2 Marking:</b>	Ordering options	U = UVLO level • A = 5 V; B = 8 V; C = 10 V; D = 12.5 V V = Isolation rating • A = 1.0 kV; B = 2.5 kV; C = 3.75 kV; D = 5.0 kV I = -40 to +125 °C ambient temperature range M = LGA package type
<b>Line 3 Marking:</b>	TTTTTT	Manufacturing Code from Assembly
<b>Line 4 Marking:</b>	Circle = 1.5 mm diameter	Pin 1 identifier
	YYWW	Manufacturing date code

## 10. Revision History

### 10.1 Revision 0.11

- Initial release.

### 10.2 Revision 0.2

- Updated all specs to reflect latest silicon revision.
- Updated [Table 4.1 Electrical Characteristics<sup>1</sup>](#) on page 21 to include new UVLO options.
- Updated [Table 4.8 Absolute Maximum Ratings<sup>1</sup>](#) on page 28 to reflect new maximum package isolation ratings
- Added Figures 34, 35, and 36.
- Updated Ordering Guide to reflect new package offerings.
- Added "Undervoltage Lockout (UVLO)" section to describe UVLO operation.

### 10.3 Revision 0.3

- Moved Sections 2, 3, and 4 to after Section 5.
- Updated Tables [Table 6.4 Si8233 Two-Input HS/LS Isolated Driver \(14 LD LGA\)](#) on page 36, [Table 6.5 Si8234 PWM Input HS/LS Isolated Driver \(14 LD LGA\)](#) on page 37, and [Table 6.7 Si8236 Dual Isolated Driver \(14 LD LGA\)](#) on page 39.
  - Removed Si8230, Si8231, and Si8232 from pinout and from title.
- Updated and added Ordering Guide footnotes.
- Updated UVLO specifications in [Table 4.1 Electrical Characteristics<sup>1</sup>](#) on page 21.
- Added PWD and Output Supply Active Current specifications in [Table 4.1 Electrical Characteristics<sup>1</sup>](#) on page 21.
- Updated and added typical operating condition graphs in [3.3 Typical Operating Characteristics \(0.5 Amp\)](#) and [3.4 Typical Operating Characteristics \(4.0 Amp\)](#).

### 10.4 Revision 1.0

- Updated Tables [Table 4.2 Regulatory Information<sup>1, 2, 3, 4</sup>](#) on page 25, [Table 4.3 Insulation and Safety-Related Specifications](#) on page 26, [Table 4.4 IEC 60664-1 \(VDE 0884 Part 5\) Ratings](#) on page 26, and [Table 4.5 IEC 60747-5-5 Insulation Characteristics<sup>1</sup>](#) on page 27.
- Updated [2. Ordering Guide](#).
  - Added 5 V UVLO ordering options
- Added Device Marking sections.

### 10.5 Revision 1.1

- Updated [1. Feature List](#).
  - Updated CMTI specification.
- Updated [Table 4.1 Electrical Characteristics<sup>1</sup>](#) on page 21.
  - Updated CMTI specification.
- Updated [Table 4.5 IEC 60747-5-5 Insulation Characteristics<sup>1</sup>](#) on page 27.
- Updated [5.2 Dual Driver](#).
- Updated [2. Ordering Guide](#).
- Replaced pin descriptions on page 1 with chip graphics.

## 10.6 Revision 1.2

- Updated [2. Ordering Guide](#).
  - Updated moisture sensitivity level (MSL) for all package types.
- Updated [Table 4.8 Absolute Maximum Ratings<sup>1</sup>](#) on page 28.
  - Added junction temperature spec.
- Updated [Table 4.2 Regulatory Information<sup>1, 2, 3, 4</sup>](#) on page 25 with new notes.
- Added [Table 6.7 Si8236 Dual Isolated Driver \(14 LD LGA\)](#) on page 39 and pinout.
- Updated [Figures 3.16 Output Sink Current vs. Supply Voltage](#) on page 9, [Figure 3.14 Output Source Current vs. Supply Voltage](#) on page 9, [Figure 3.17 Output Sink Current vs. Temperature](#) on page 9, and [Figure 3.15 Output Source Current vs. Temperature](#) on page 9 to reflect correct y-axis scaling.
- Updated [Figure 5.2 Si8232/5/7/8 in a Dual Driver Application](#) on page 32.
- Updated [5.3 Dual Driver with Thermally Enhanced Package \(Si8236\)](#).
- Updated [7.1 Package Outline: 16-Pin Wide Body SOIC](#).
- Updated [Table 7.1 Package Diagram Dimensions](#) on page 40.
- Change references to 1.5 kV<sub>RMS</sub> rated devices to 1.0 kV<sub>RMS</sub> throughout.
- Updated [3.7 Power Dissipation Considerations](#).

## 10.7 Revision 1.3

- Added Si8237/8 throughout.
- Updated [Table 4.1 Electrical Characteristics<sup>1</sup>](#) on page 21.
- Updated [Figure 4.1 IOL Sink Current Test Circuit](#) on page 24.
- Updated [Figure 4.2 IOH Source Current Test Circuit](#) on page 24.
- Added [Figure 4.3 Common Mode Transient Immunity Test Circuit](#) on page 25.
- Updated Si823x Family Truth Table to include notes 1 and 2.
- Updated [3.10 Programmable Dead Time and Overlap Protection](#).
- Removed references to Figures 26A and 26B.
- Updated [Table 2.1 Si823x Ordering Guide<sup>1, 2</sup>](#) on page 2.
- Added Si8235-BA-C-IS1 ordering part number.
- Added table note.

## 10.8 Revision 1.4

- Updated [2. Ordering Guide](#).
  - Updated 3 V VDDI Ordering Options.

## 10.9 Revision 1.5

- Updated [Table 4.1 Electrical Characteristics<sup>1</sup>](#) on page 21, input and output supply current.
- Added references to AEC-Q100 qualified throughout.
- Changed all 60747-5-2 references to 60747-5-5.
- Added references to CQC throughout.
- Updated pin descriptions throughout.
  - Corrected dead time default to 400 ps from 1 ns.
- Updated [Table 2.1 Si823x Ordering Guide<sup>1, 2</sup>](#) on page 2, Ordering Part Numbers.
  - Removed moisture sensitivity level table notes.

## 10.10 Revision 1.6

- Updated [Table 2.1 Si823x Ordering Guide<sup>1, 2</sup>](#) on page 2, Ordering Part Numbers.
- Added Revision D Ordering Part Numbers.
- Removed all Ordering Part Numbers of previous revisions.

#### 10.11 Revision 1.7

- Updated [Table 4.2 Regulatory Information<sup>1, 2, 3, 4</sup>](#) on page 25
  - Added CQC certificate numbers.
- Updated [Table 4.3 Insulation and Safety-Related Specifications](#) on page 26
  - Updated Erosion Depth.
- Updated [Table 4.5 IEC 60747-5-5 Insulation Characteristics<sup>1</sup>](#) on page 27
  - Updated  $V_{PR}$  for WBSOIC-16.
- Updated [Table 4.8 Absolute Maximum Ratings<sup>1</sup>](#) on page 28
  - Removed  $I_o$  and added Peak Output Current specifications.
- Updated Equation 1.
- Updated [Figure 5.1 Si823x in Half-Bridge Application](#) on page 31.
- Updated [Figure 5.2 Si8232/5/7/8 in a Dual Driver Application](#) on page 32.
- Updated Ordering Guide [Table 2.1 Si823x Ordering Guide<sup>1, 2</sup>](#) on page 2.
  - Removed Note 2.

#### 10.12 Revision 1.8

May 17, 2016

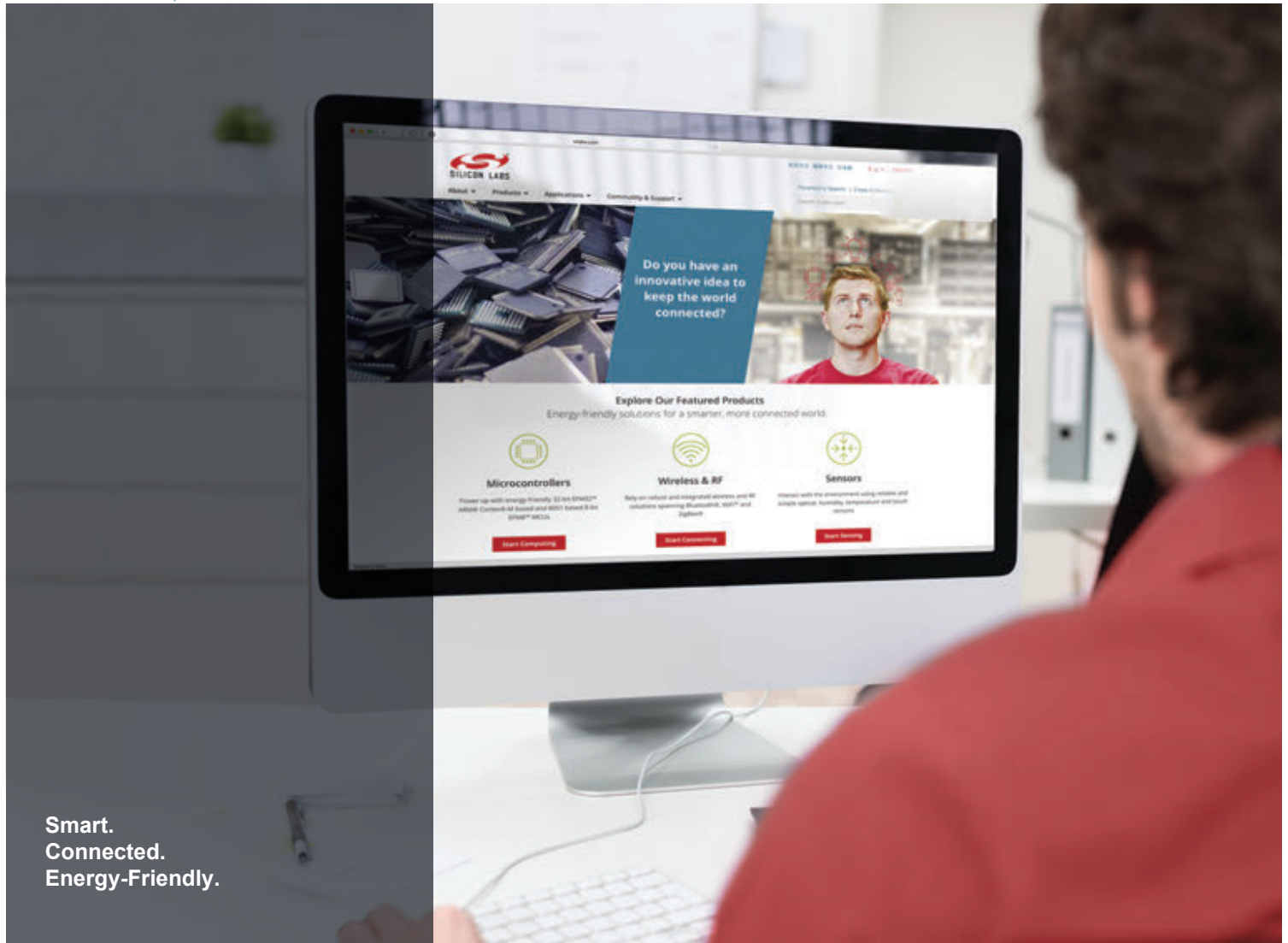
- Converted document from Framemaker to DITA.



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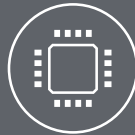
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