5 kV LED Emulator Input, Open Collector Output Isolators

Features

- Pin-compatible, drop-in upgrades for popular high-speed digital optocouplers
- Performance and reliability advantages vs. optocouplers
  - Resistant to temperature, age and forward current effects
  - 10x lower FIT rate for longer service life
  - Higher common-mode transient immunity: >50 kV/µs typical
  - Lower power and forward input diode current
- PCB footprint compatible with optocoupler packaging
- Wide range of product options
- 1 channel diode emulator input
- 3 to 30 V open collector output
- Propagation delay 30 ns
- Data rates dc to 15 Mbps
- Up to 5000 V_{RMS} isolation and 10 kV surge protection
- AEC-Q100 qualified
- Wide operating temperature range
  - –40 to +125 °C
- RoHS-compliant packages
  - SOIC-8 (Narrow body)
  - DIP8 (Gull-wing)
  - SDIP6 (Stretched SO-6)
  - LGA8

Applications

- Industrial automation
- Motor controls and drives
- Isolated switch mode power supplies
- Isolated data acquisition
- Test and measurement equipment

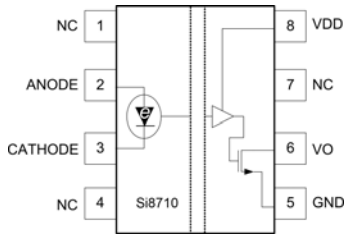
Safety Regulatory Approvals

- 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
  - IEC60747-5-2/VDE0884 Part 10 (basic/reinforced insulation)
- CQC certification approval
  - GB4943.1

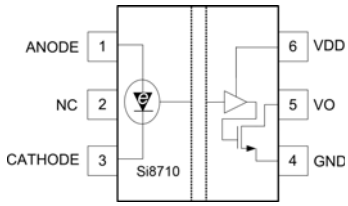
Description

The Si87xx isolators are pin-compatible, one-channel, drop-in replacements for popular optocouplers with data rates up to 15 Mbps. These devices isolate high-speed digital signals and offer performance, reliability, and flexibility advantages not available with optocoupler solutions. The Si87xx series is based on Silicon Labs' proprietary CMOS isolation technology for low-power and high-speed operation and are resistant to the wear-out effects found in optocouplers that degrade performance with increasing temperature, forward current, and device age. As a result, the Si87xx series offer longer service life and dramatically higher reliability compared to optocouplers. Ordering options include open collector output with and without integrated pull-up resistor and output enable options.

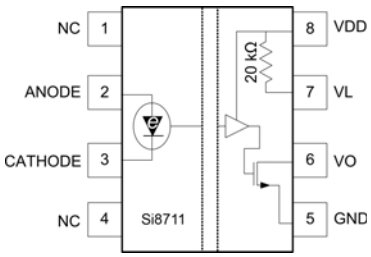
Pin Assignments:
See page 20



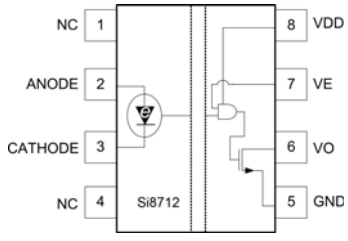
SOIC-8, DIP8, LGA8
Open Collector Output



SDIP6
Open Collector Output



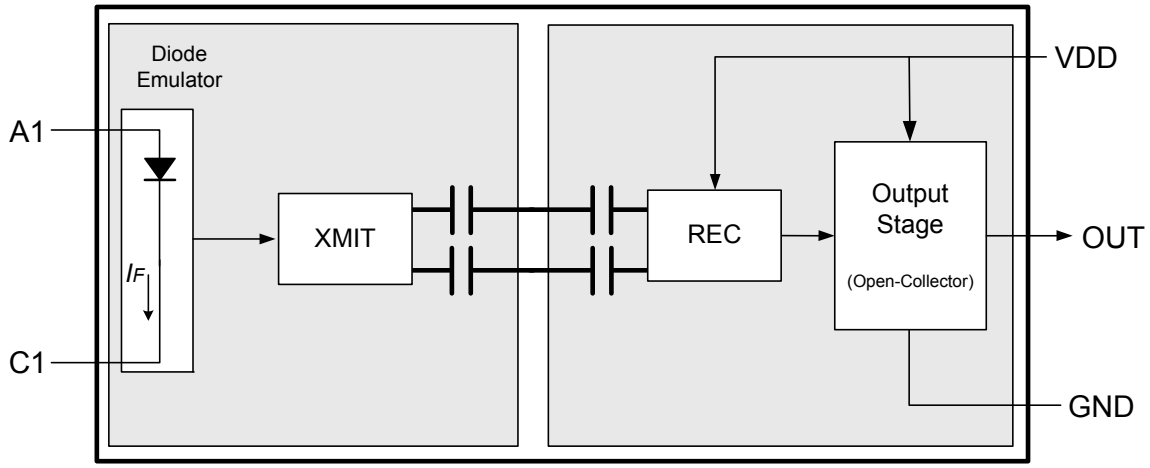
SOIC-8, DIP8, LGA8
Open Collector Output
with 20 kΩ Pull-up Resistor



SOIC-8, DIP8, LGA8
Open Collector Output
with Output Enable

Patent pending

Functional Block Diagram



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1. Electrical Specifications

Table 1. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
V_{DD} Supply Voltage	V_{DD}	3	—	30	V
Input Current Si87xxA Devices Si87xxB Devices Si87xxC Devices	$I_{F(ON)}$ (see Figure 1)	 3 6 3	 — — —	 15 30 15	 mA mA mA
Operating Temperature (Ambient)	T_A	–40	—	125	°C

Table 2. Electrical Characteristics

V_{DD} = 5 V; GND = 0 V; T_A = –40 to +125 °C; typical specs at 25 °C

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DC Parameters						
Supply Voltage	V_{DD}	(V_{DD}–GND)	3	—	30	V
Supply Current	I_{DD}	Output high or low (V_{DD} = 5 to 30 V)	—	—	1.7	mA
Input Current Threshold	$I_{F(TH)}$	Si87xxA devices Si87xxB devices Si87xxC devices	— — —	— — —	1.8 3.6 1.8	mA mA mA
Input Current Hysteresis	I_{HYS}	Si87xxA devices Si87xxB devices Si87xxC devices	— — —	0.17 0.34 0.17	— — —	mA mA mA
Input Forward Voltage (OFF)	$V_{F(OFF)}$	Measured at ANODE with respect to CATHODE.	—	—	1	V
Input Forward Voltage (ON)	$V_{F(ON)}$	Measured at ANODE with respect to CATHODE.	1.6	—	2.8	V
Input Capacitance	C_I	f = 100 kHz V_F = 0 V, V_F = 2 V	 — —	 15 15	 — —	 pF pF
Logic Low Output Voltage	V_{OL}	I_{OL} = 3 mA, V_{DD} = 3.3 or 5 V I_{OL} = 13 mA, V_{DD} = 5.5 V	— —	— —	0.4 0.7	V V
Logic High Output Current	I_{OH}	V_{DD} = V_{OUT} = 5.5 V V_{DD} = V_{OUT} = 24 V	— —	— —	0.5 1	µA µA
Peak Output Current	I_{OPK}	Peak DC collector current drive (V_{DD} = 5 V)	—	50	—	mA
Output Low Impedance	R_{OL}		—	—	54	Ω
Pull-up Resistor	R_{PU}	Using internal pull-up	—	20	—	kΩ
Enable High Min	V_{EH}		2	—	30	V
Enable Low Max	V_{EL}		—	—	0.8	V
Enable High Current Draw	I_{EH}	V_{DD} = V_{EH} = 5 V	—	20	—	µA
Enable Low Current Draw	I_{EL}	V_{DD} = 5 V, V_{EL} = 0 V	—	–10	0	µA

Table 2. Electrical Characteristics (Continued)

V_{DD} = 5 V; GND = 0 V; T_A = –40 to +125 °C; typical specs at 25 °C

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
AC Switching Parameters (V_{DD} = 5 V, R_L = 350 Ω, C_L = 15 pF)						
Maximum Data Rate	F_{DATA}	Si87xxA devices Si87xxB devices Si87xxC devices	DC DC DC	— — —	15 15 1	M_{BPS} M_{BPS} M_{BPS}
Minimum Pulse Width	MPW	Si87xxA devices Si87xxB devices Si87xxC devices	66 66 1	— — —	— — —	ns ns µs
Propagation Delay (Low-to-High)	t_{PLH}	C_L = 15 pF using 350 Ω pull-up	—	—	60	ns
Propagation Delay (High-to-Low)	t_{PHL}	C_L = 15 pF using 350 Ω pull-up	—	—	60	ns
Pulse Width Distortion	PWD	$\lvert t_{PLH} - t_{PHL} \rvert$	—	—	20	ns
Propagation Delay Skew	$t_{PSK(p-p)}$	$t_{PSK(P-P)}$ is the magnitude of the difference in prop delays between different units operating at same supply voltage, load, and ambient temp.	—	—	20	ns
Rise Time	t_R	C_L = 15 pF using 350 Ω pull-up	—	15	—	ns
Fall Time	t_F	C_L = 15 pF using 350 Ω pull-up	—	5	—	ns
Device Startup Time	t_{START}		—	—	40	µs
Common Mode Transient Immunity	CMTI	Output = low or high V_{CM} = 1500 V (See Figure 2) I_F = 3 mA for Si87xxA devices I_F = 6 mA for Si87xxB devices I_F = 3 mA for Si87xxC devices	 20 35 20	 35 50 35	 — — —	 kV/µs kV/µs kV/µs

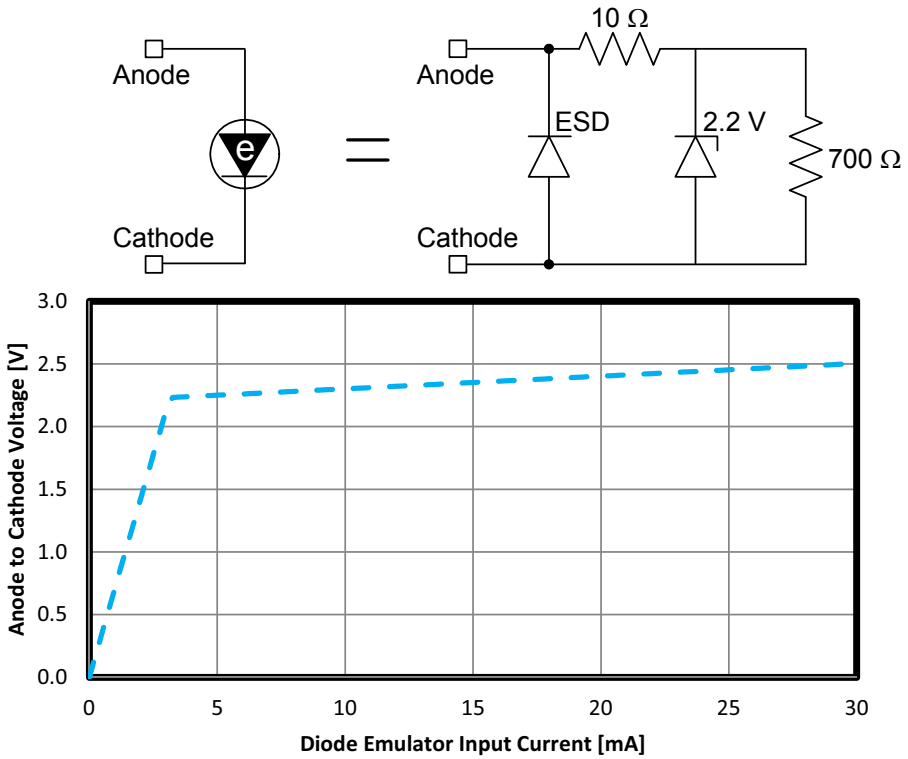


Figure 1. Diode Emulator Model and I-V Curve

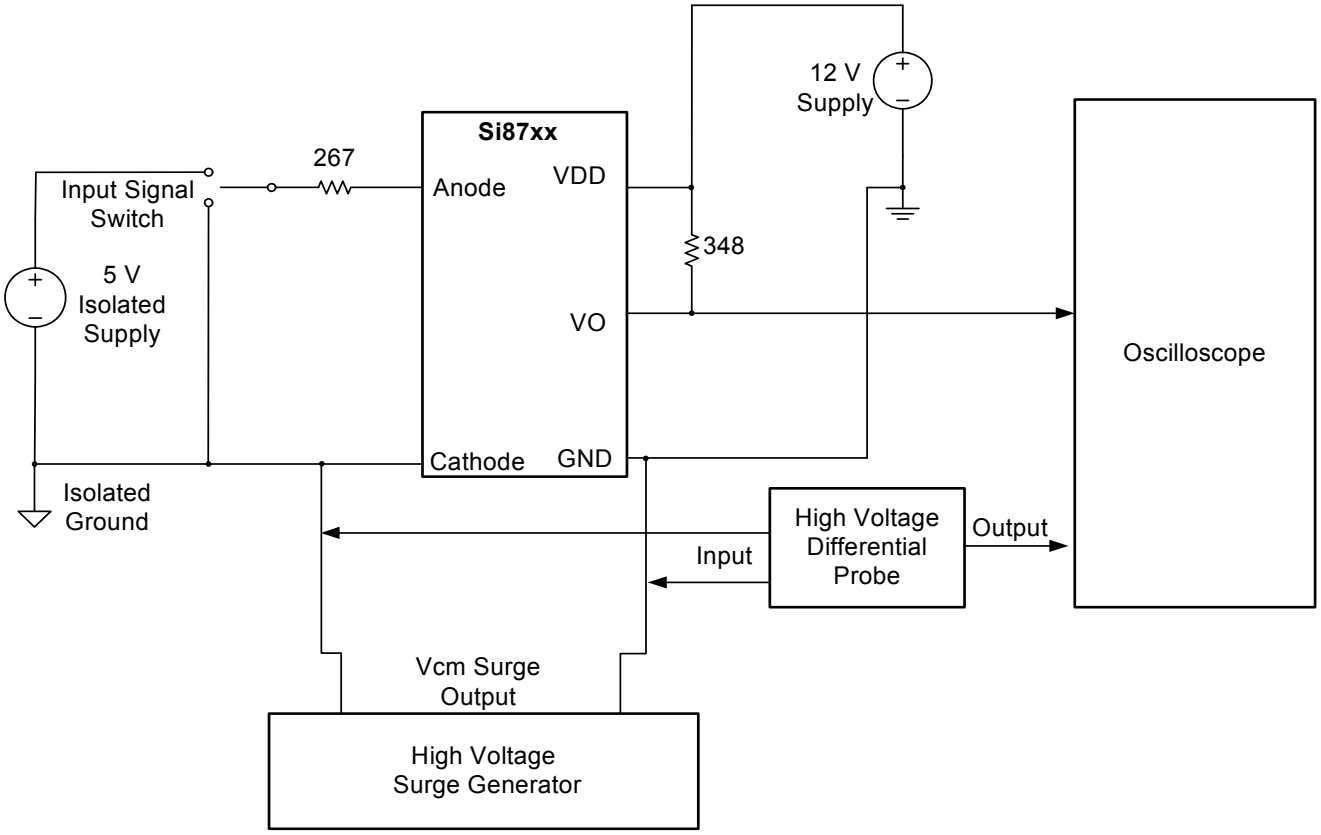


Figure 2. Common Mode Transient Immunity Characterization Circuit

Table 3. Regulatory Information*

CSA
The Si87xx is certified under CSA Component Acceptance Notice 5A. For more details, see File 232873.
61010-1: Up to 600 V_{RMS} reinforced insulation working voltage; up to 600 V_{RMS} basic insulation working voltage.
60950-1: Up to 1000 V_{RMS} reinforced insulation working voltage; up to 1000 V_{RMS} basic insulation working voltage.
60601-1: Up to 250 V_{RMS} reinforced insulation working voltage; up to 500 V_{RMS} basic insulation working voltage.
VDE
The Si87xx is certified according to IEC60747 and VDE0884. For more details, see File 5006301-4880-0001.
60747-5-2: Up to 1414 V_{peak} for basic insulation working voltage.
VDE0884 Part 10: Up to 1414 V_{peak} for reinforced insulation working voltage.
UL
The Si87xx is certified under UL1577 component recognition program. For more details, see File E257455.
Rated up to 5000 V_{RMS} isolation voltage for basic protection.
CQC
The Si87xx is certified under GB4943.1-2011. For more details, see File V2012CQC001041.
Rated up to 1000 V_{RMS} reinforced insulation working voltage; up to 1000 V_{RMS} basic insulation working voltage.
***Note:** Regulatory Certifications apply to 3.75 kV_{RMS} rated devices which are production tested to 4.5 kV_{RMS} for 1 sec. Regulatory Certifications apply to 5.0 kV_{RMS} rated devices which are production tested to 6.0 kV_{RMS} for 1 sec. For more information, see "9.Ordering Guide" on page 22.

Table 4. Insulation and Safety-Related Specifications

Parameter	Symbol	Test Condition	Value				Unit
			SOIC-8	DIP8	SDIP6	LGA8	
Nominal Air Gap (Clearance)	L(IO1)		4.7 min	7.2 min	9.6 min	10.0 min	mm
Nominal External Tracking (Creepage)	L(IO2)		3.9 min	7.0 min	8.3 min	10.0 min	mm
Minimum Internal Gap (Internal Clearance)			0.016	0.016	0.016	0.016	mm
Tracking Resistance (Proof Tracking Index)	PTI	IEC60112	600	600	600	600	V
Erosion Depth	ED		0.031	0.031	0.057	0.021	mm
Resistance (Input-Output)*	R_{IO}		10^{12}	10^{12}	10^{12}	10^{12}	Ω
Capacitance (Input-Output)*	C_{IO}	f = 1 MHz	1	1	1	1	pF

***Note:** To determine resistance and capacitance, the Si87xx is converted into a 2-terminal device. Pins 1–4 (1–3, SDIP6) are shorted together to form the first terminal, and pins 5–8 (4–6, SDIP6) are shorted together to form the second terminal. The parameters are then measured between these two terminals.

Table 5. IEC 60664-1 (VDE 0844 Part 2) Ratings

Parameter	Test Condition	Specification			
		SOIC-8	DIP8	SDIP6	LGA8
Basic Isolation Group	Material Group	I	I	I	I
Installation Classification	Rated Mains Voltages ≤ 150 V_{RMS}	I-IV	I-IV	I-IV	I-IV
	Rated Mains Voltages ≤ 300 V_{RMS}	I-IV	I-IV	I-IV	I-IV
	Rated Mains Voltages ≤ 450 V_{RMS}	I-III	I-III	I-IV	I-IV
	Rated Mains Voltages ≤ 600 V_{RMS}	I-III	I-III	I-IV	I-IV
	Rated Mains Voltages ≤ 1000 V_{RMS}	—	—	—	I-III

Table 6. IEC 60747-5-2 Insulation Characteristics*

Parameter	Symbol	Test Condition	Characteristic				Unit
			SOIC-8	DIP8	SDIP6	LGA8	
Maximum Working Insulation Voltage	V_{IORM}		630	891	1140	1414	V peak
Input to Output Test Voltage	V_{PR}	Method b1 (V_{IORM} x 1.875 = V_{PR}, 100% Production Test, t_m = 1 sec, Partial Discharge < 5 pC)	1181	1671	2138	2652	V peak
Transient Overvoltage	V_{IOTM}	t = 60 sec	6000	6000	8000	8000	V peak
Surge Voltage	V_{IOSM}	1.2 μs rise, 50 μs fall 50%	10	10	10	10	kV peak
Pollution Degree (DIN VDE 0110, Table 1)			2	2	2	2	
Insulation Resistance at T_S, V_{IO} = 500 V	R_S		$>10^9$	$>10^9$	$>10^9$	$>10^9$	Ω

***Note:** This isolator is suitable for reinforced electrical isolation only within the safety limit data. Maintenance of the safety data is ensured by protective circuits. The Si87xx provides a climate classification of 40/125/21.

Table 7. IEC Safety Limiting Values

Parameter	Symbol	Test Condition	Max				Unit
			SOIC-8	DIP8	SDIP6	LGA8	
Case Temperature	T_S		140	140	140	140	°C
Input Current	I_S	θ_{JA} = 110 °C/W (SOIC-8), 110 °C/W (DIP8), 105 °C/W (SDIP6), 220 °C (LGA8), V_F = 2.8 V, T_J = 140 °C, T_A = 25 °C	370	370	390	185	mA
Output Power	P_S		1	1	1	0.5	W
Note: Maximum value allowed in the event of a failure; also see the thermal derating curve in Figures 3, 4, 5, and 6.							

Table 8. Thermal Characteristics

Parameter	Symbol	Typ				Unit
		SOIC-8	DIP8	SDIP6	LGA8	
IC Junction-to-Air Thermal Resistance	θ_{JA}	110	110	105	220	°C/W

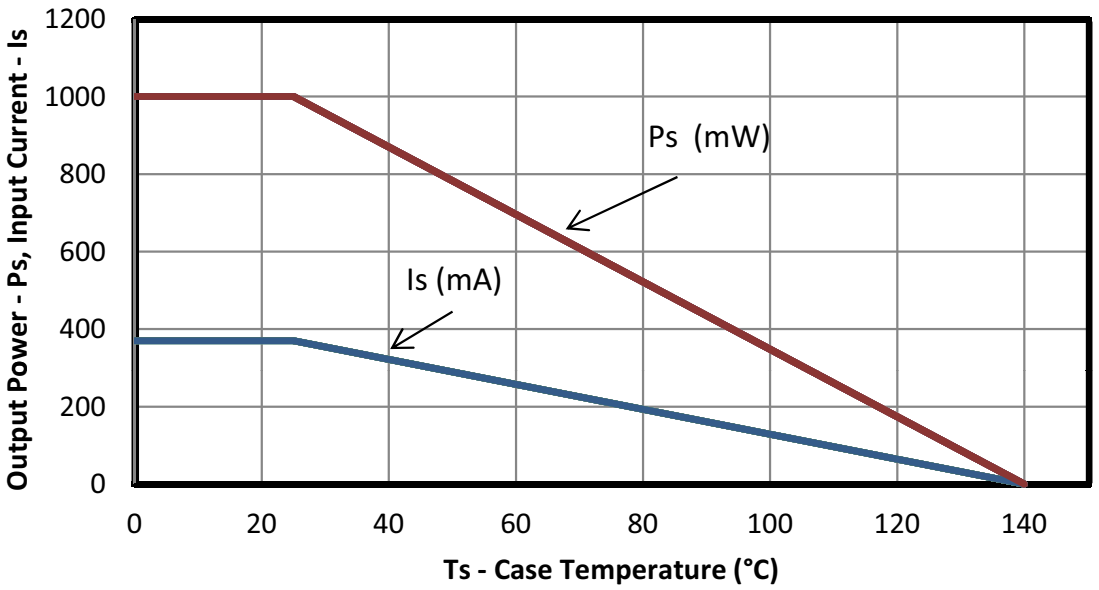


Figure 3. (SOIC-8) Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN EN 60747-5-2 and VDE0884 part 10

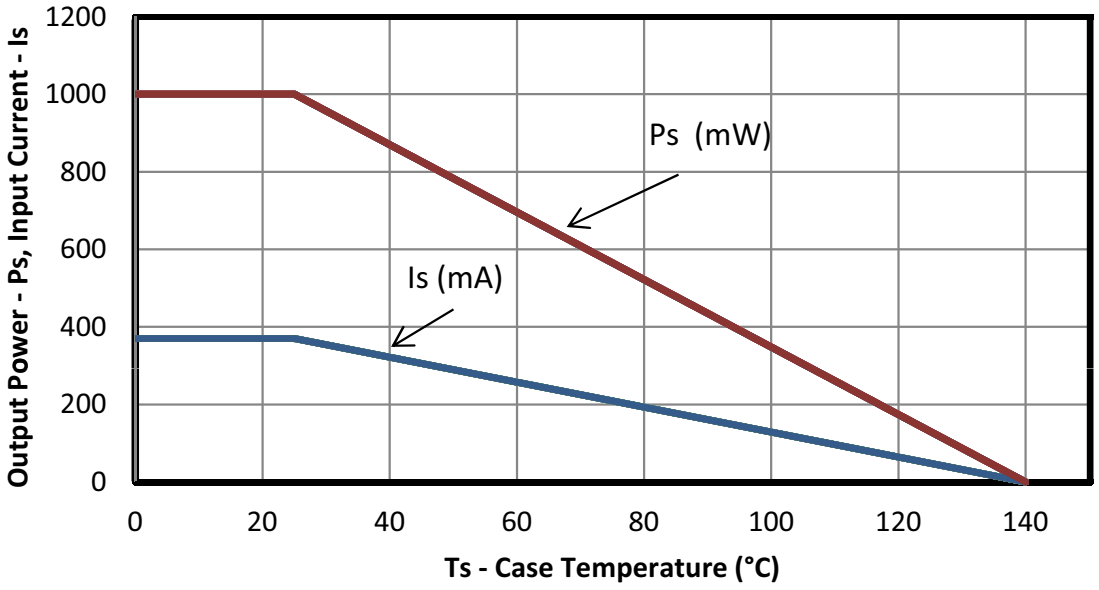


Figure 4. (DIP8) Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN EN 60747-5-2 and VDE0884 part 10

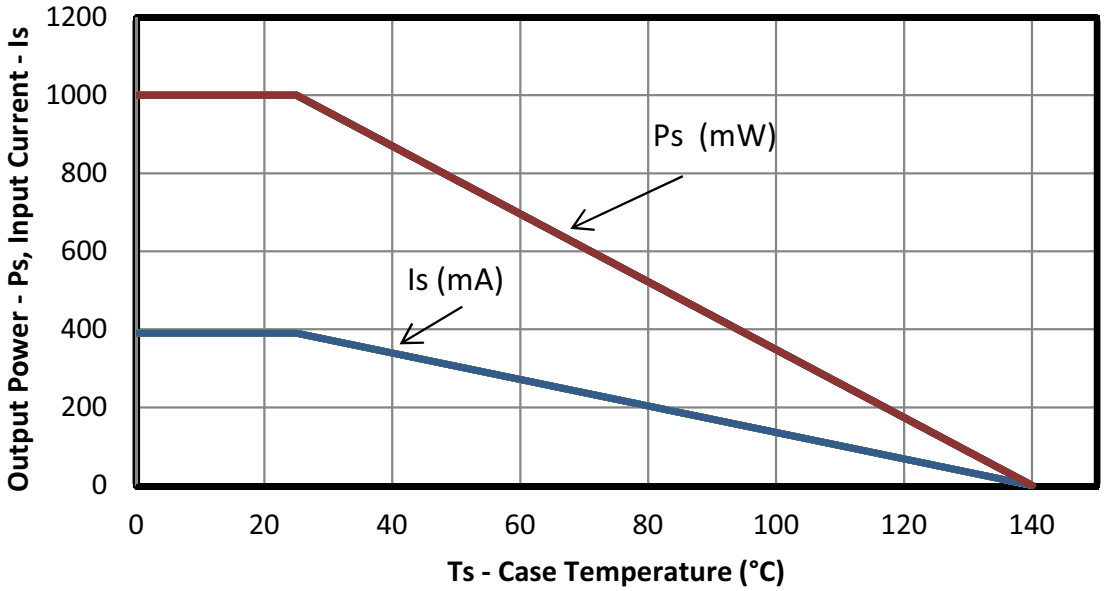


Figure 5. (SDIP6) Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN EN 60747-5-2 and VDE0884 part 10

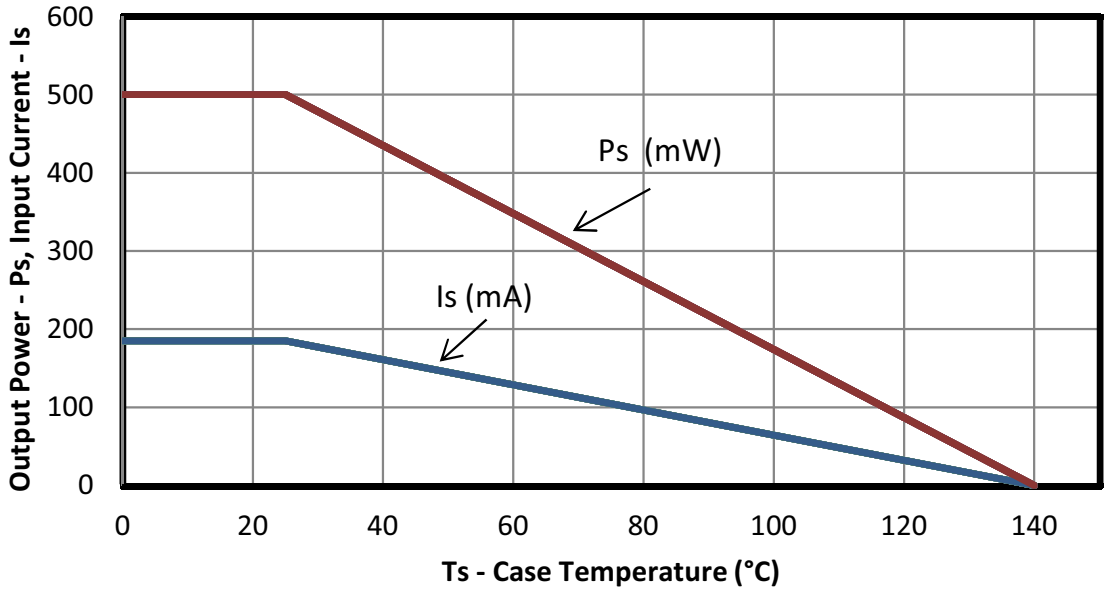


Figure 6. (LGA8) Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN EN 60747-5-2 and VDE0884 part 10

Table 9. Absolute Maximum Ratings*

Parameter	Symbol	Min	Max	Unit
Storage Temperature	T_{STG}	–65	+150	°C
Operating Temperature	T_A	–40	+125	°C
Junction Temperature	T_J	—	+140	°C
Average Forward Input Current Si87xxA Devices Si87xxB Devices Si87xxC Devices	$I_{F(AVG)}$	 — — —	 15 30 15	 mA mA mA
Peak Transient Input Current (< 1 µs pulse width, 300 ps)	I_{FTR}	—	1	A
Reverse Input Voltage	V_R	—	0.3	V
Supply Voltage	V_{DD}	–0.5	36	V
Output Voltage	V_{OUT}	–0.5	36	V
Enable Voltage	V_{OUT}	–0.5	V_{DD}+0.5	V
Output Sink Current	I_{SINK}	—	15	mA
Average Output Current	$I_{O(AVG)}$	—	8	mA
Peak Output Current (V_{DD} = 5 V)	I_{OPK}	—	75	mA
Input Power Dissipation	P_I	—	90	mW
Output Power Dissipation	P_O	—	50	mW
Total Power Dissipation	P_T	—	140	mW
Lead Solder Temperature (10 s)		—	260	°C
HBM Rating ESD		3	—	kV
Machine Model ESD		200	—	V
CDM		500	—	V
Maximum Isolation Voltage (1 s) SOIC-8		—	4500	V_{RMS}
Maximum Isolation Voltage (1 s) DIP8		—	4500	V_{RMS}
Maximum Isolation Voltage (1 s) SDIP6		—	6500	V_{RMS}
Maximum Isolation Voltage (1 s) LGA8		—	6500	V_{RMS}

***Note:** Permanent device damage may occur if the absolute maximum ratings are exceeded. Functional operation should be restricted to the conditions specified in the operational sections of this data sheet.

2. Functional Description

2.1. Theory of Operation

The Si87xx are pin-compatible, one-channel, drop-in replacements for popular optocouplers with data rates up to 15 Mbps. The operation of an Si87xx channel is analogous to that of an opto coupler, 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 the Si87xx is shown in Figure 7.

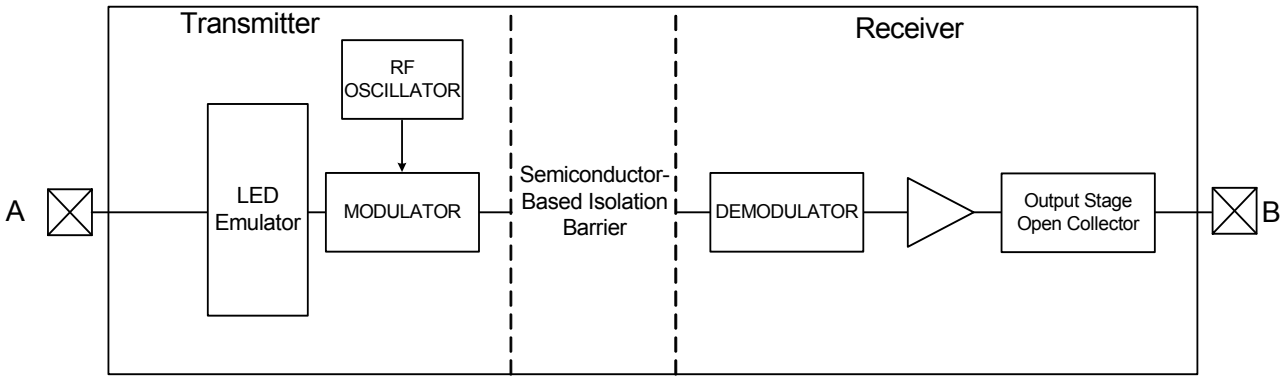


Figure 7. Simplified Channel Diagram

3. Technical Description

3.1. Device Behavior

Truth tables for the Si87xx are summarized in Table 10.

Table 10. Si87xx Truth Table Summary[1]

Input	V_{DD}	EN[2]	V_O[3]
OFF	> UVLO	H	HIGH
OFF	> UVLO	L	HIGH
OFF	< UVLO	H	HIGH
OFF	< UVLO	L	HIGH
ON	> UVLO	H	LOW
ON	> UVLO	L	HIGH
ON	< UVLO	H	HIGH
ON	< UVLO	L	HIGH

Notes:
1. This truth table assumes V_{DD} is powered. UVLO is typically 2.8 V.
2. Si8712 only.
3. The output voltage level is determined by the external pull-up supply.

3.2. Device Startup

During start-up, Output V_O floats and its voltage level is determined by the external pull-up until V_{DD} rises above the UVLO+ threshold for a minimum time period of t_{START}. Following this, the output is low when the current flowing from anode to cathode is > $I_{F(ON)}$. Device startup, normal operation, and shutdown behavior is shown in Figure 8.

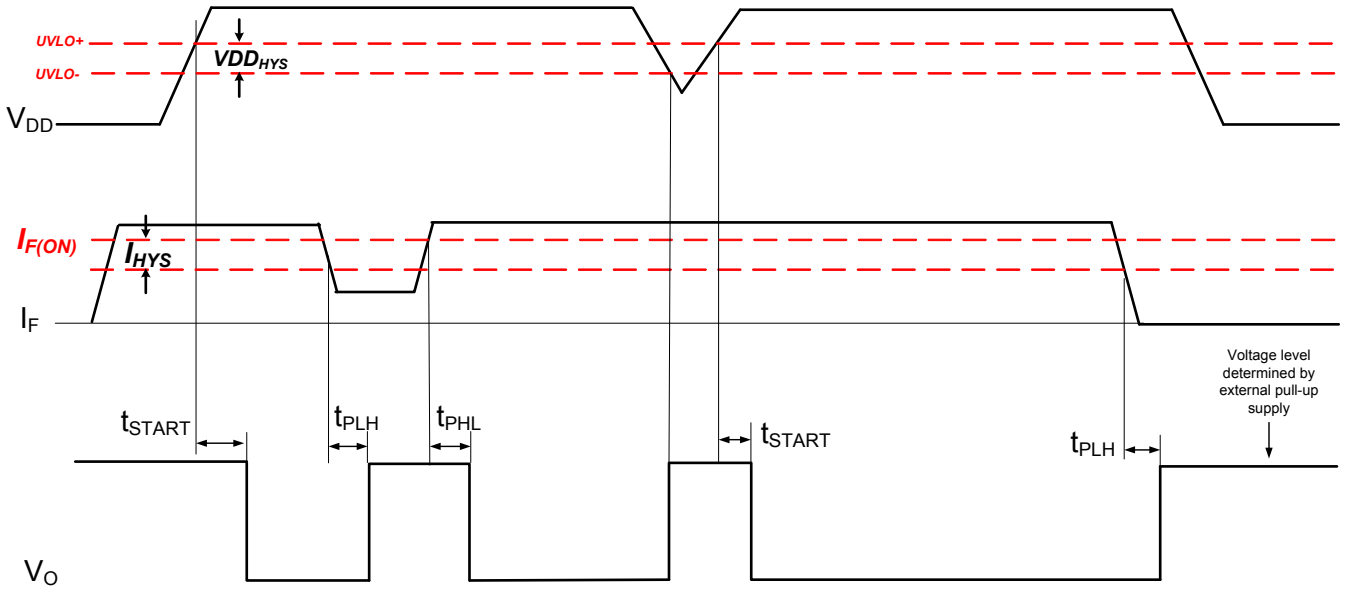


Figure 8. Si87xx Operating Behavior ($I_F \geq I_{F(MIN)}$ when $V_F \geq V_{F(MIN)}$)

4. Applications

The following sections detail the input and output circuits necessary for proper operation of the Si87xx family.

4.1. Input Circuit Design

Opto coupler manufacturers typically recommend the circuits shown in Figures 9 and 10. These circuits are specifically designed to improve opto-coupler input common-mode rejection and increase noise immunity.

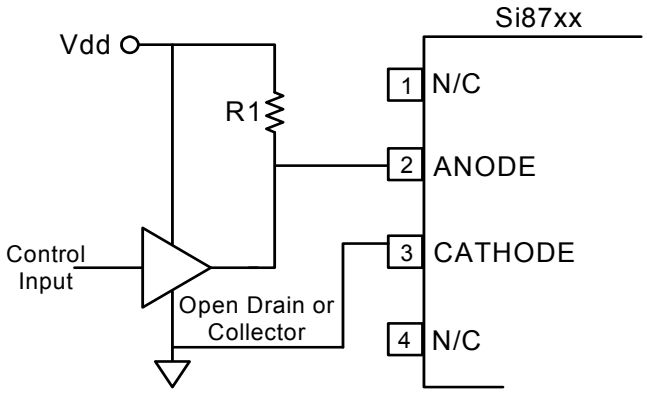


Figure 9. Si87xx Input Circuit

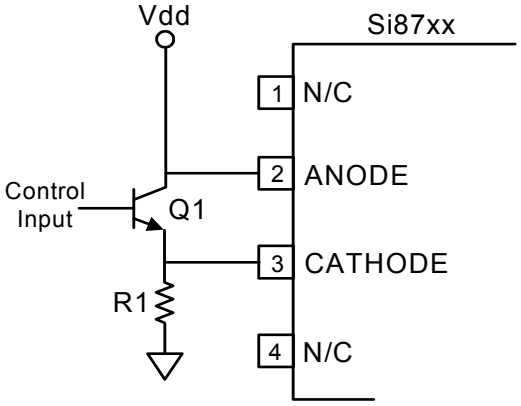


Figure 10. High CMR Si87xx Input Circuit

The optically-coupled circuit of Figure 9 turns the LED on when the control input is high. However, internal capacitive coupling from the LED to the power and ground conductors can momentarily force the LED into its off state when the anode and cathode inputs are subjected to a high common-mode transient. The circuit shown in Figure 10 addresses this issue by using a value of R1 sufficiently low to overdrive the LED, ensuring it remains on during an input common-mode transient. Q1 shorts the LED off in the low output state, again increasing common-mode transient immunity.

Some opto coupler applications recommend reverse-biasing the LED when the control input is off to prevent coupled noise from energizing the LED. The Si87xx input circuit requires less current and has twice the off-state noise margin compared to opto couplers. However, high CMR opto coupler designs that overdrive the LED (see Figure 10) may require increasing the value of R1 to limit input current I_F to its maximum rating when using the Si87xx. In addition, there is no benefit in driving the Si87xx input diode into reverse bias when in the off state. Consequently, opto coupler circuits using this technique should either leave the negative bias circuitry unpopulated or modify the circuitry (e.g., add a clamp diode or current limiting resistor) to ensure that the anode pin of the Si87xx is no more than –0.3 V with respect to the cathode when reverse-biased.

New designs should consider the input circuit configurations of Figure 11, which are more efficient than those of Figures 9 and 10. As shown, S1 and S2 represent any suitable switch, such as a BJT or MOSFET, analog transmission gate, processor I/O, etc. Also, note that the Si87xx input can be driven from the I/O port of any MCU or FPGA capable of sourcing a minimum of 6 mA (see Figure 11B). Additionally, note that the Si87xx propagation delay and output drive do not significantly change for values of I_F between $I_{F(MIN)}$ and $I_{F(MAX)}$.

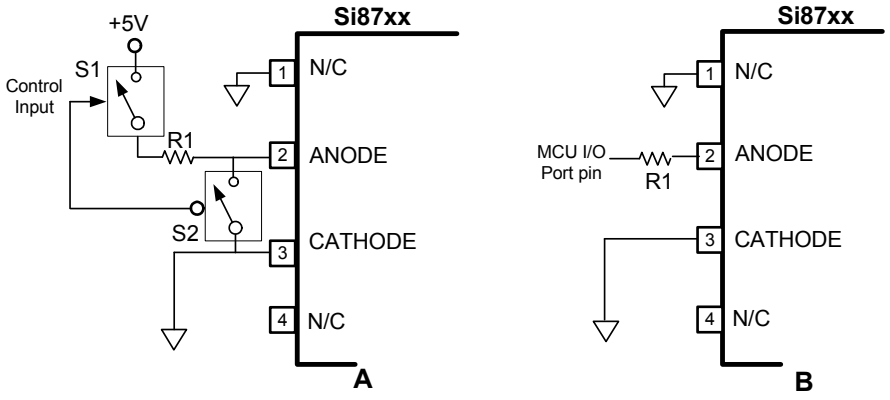


Figure 11. Si87xx Other Input Circuit Configurations

4.2. Output Circuit Design and Power Supply Connections

The speed of the open collector circuit is dependent upon the supply, VCC, the pullup resistor, R_L, and the load modeled by C_L. Figure 12 illustrates three common circuit output configurations. For V_{DD} = 5 V operation, R_L>350 Ω is recommended to ensure proper V_{OL} levels. For V_{DD} = 30 V operation, R_L > 2.1 kΩ is recommended to ensure proper V_{OL} levels. If the enable pin is used (see Figure 12B) and two separate supplies power V_{DD} and the V_O pullup resistor, the enable pin should be referenced to the V_{DD} pin because V_O cannot exceed V_{DD} by more than 0.5 V. Figure 12C illustrates a circuit using the internal 20 kΩ resistor.

Note that GND can be biased at, above, or below ground as long as the voltage on V_{DD} with respect to GND is a maximum of 30 V. V_{DD} decoupling capacitors should be placed as close to the package pins as possible. The optimum values for these capacitors depend on load current and the distance between the chip and its power source. It is recommended that 0.1 and 1 µF bypass capacitors be used to reduce high-frequency noise and maximize performance. Opto replacement applications should limit their supply voltages to 30 V or less.

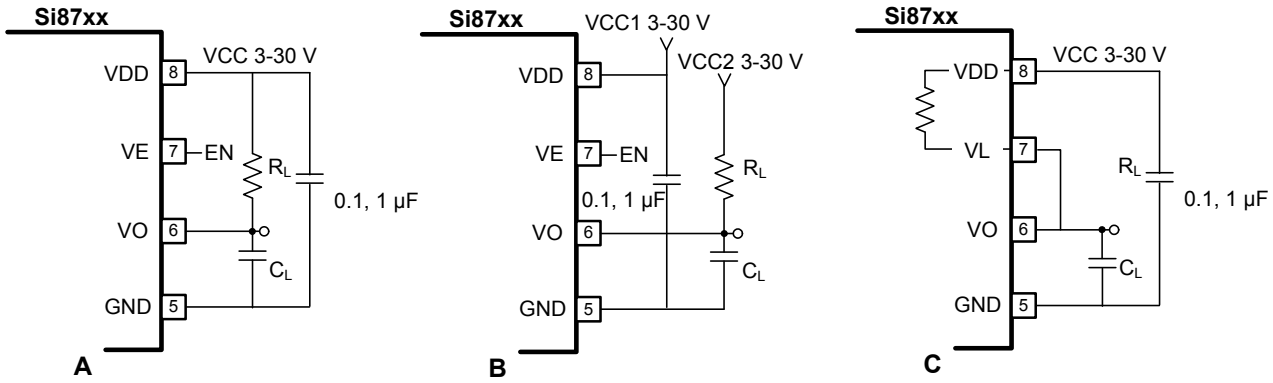


Figure 12. Si87xx Output Circuit Configurations

5. Pin Descriptions (SOIC-8, DIP8, LGA8) Open Collector

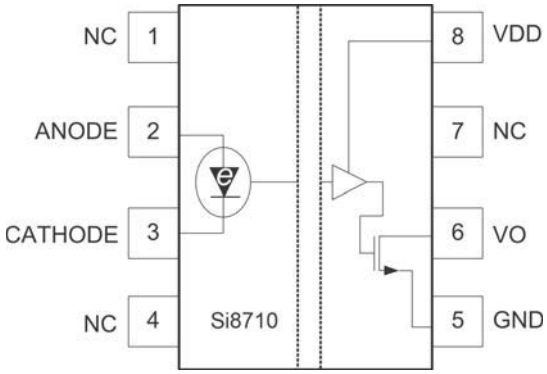


Figure 13. Pin Configuration

Table 11. Pin Descriptions (SOIC-8, DIP8, LGA8) Open Collector

Pin	Name	Description
1	NC*	No connect.
2	ANODE	Anode of LED emulator. V_O follows the signal applied to this input with respect to the CATHODE input.
3	CATHODE	Cathode of LED emulator. V_O follows the signal applied to ANODE with respect to this input.
4	NC*	No connect.
5	GND	External MOSFET source connection and ground reference for V_{DD}. This terminal is typically connected to ground but may be tied to a negative or positive voltage.
6	V_O	Output signal.
7	NC*	No connect.
8	V_{DD}	Output-side power supply input referenced to GND (30 V max).
***Note:** No Connect. These pins are not internally connected. To maximize CMTI performance, these pins should be connected to the ground plane.		

6. Pin Descriptions (SOIC-8, DIP8, LGA8) Output Enable

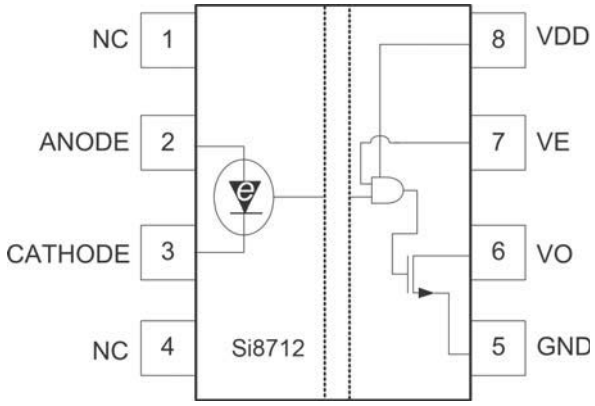


Figure 14. Pin Configuration

Table 12. Pin Descriptions (SOIC-8, DIP8, LGA8) Output Enable

Pin	Name	Description
1	NC*	No connect.
2	ANODE	Anode of LED emulator. V_O follows the signal applied to this input with respect to the CATHODE input.
3	CATHODE	Cathode of LED emulator. V_O follows the signal applied to ANODE with respect to this input.
4	NC*	No connect.
5	GND	External MOSFET source connection and ground reference for V_{DD}. This terminal is typically connected to ground but may be tied to a negative or positive voltage.
6	V_O	Output signal.
7	V_E	Output enable. Tied to V_{DD} to enable output.
8	V_{DD}	Output-side power supply input referenced to GND (30 V max).
***Note:** No Connect. These pins are not internally connected. To maximize CMTI performance, these pins should be connected to the ground plane.		

7. Pin Descriptions (SDIP6) Open Collector

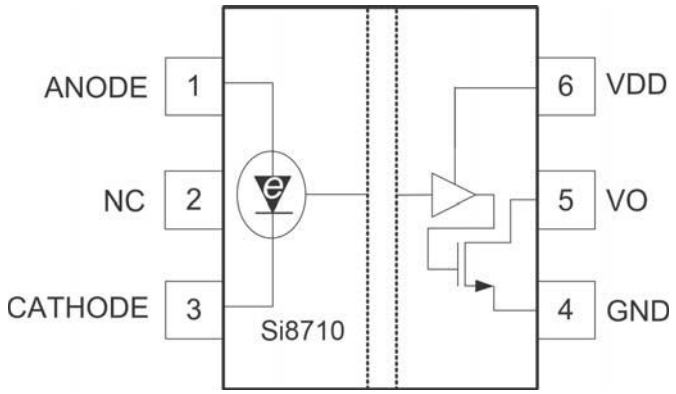


Figure 15. Pin Configuration

Table 13. Pin Descriptions (SDIP6) Open Collector

Pin	Name	Description
1	ANODE	Anode of LED emulator. V_O follows the signal applied to this input with respect to the CATHODE input.
2	NC*	No connect.
3	CATHODE	Cathode of LED emulator. V_O follows the signal applied to ANODE with respect to this input.
4	GND	External MOSFET source connection and ground reference for V_{DD}. This terminal is typically connected to ground but may be tied to a negative or positive voltage.
5	V_O	Output signal.
6	V_{DD}	Output-side power supply input referenced to GND (30 V max).
***Note:** No Connect. These pins are not internally connected. To maximize CMTI performance, these pins should be connected to the ground plane.		

8. Pin Descriptions (SOIC-8, DIP8, LGA8) 20 kΩ Pull-Up Resistor

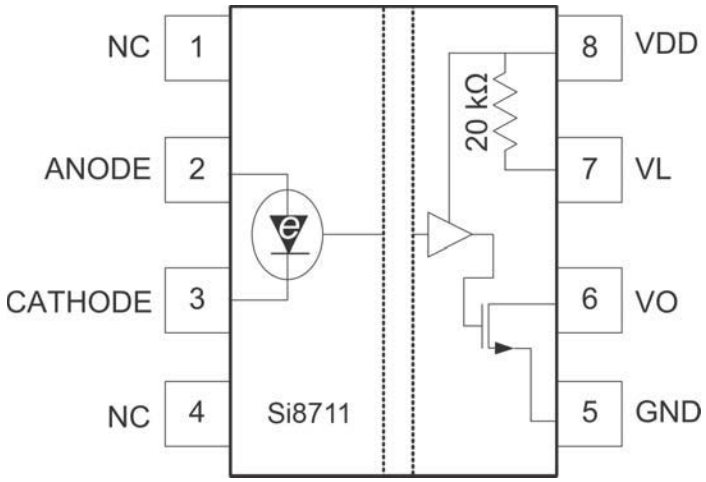


Figure 16. Pin Configuration

Table 14. Pin Descriptions (SOIC-8, DIP8, LGA8) 20 kΩ Pull-Up Resistor

Pin	Name	Description
1	NC*	No connect.
2	ANODE	Anode of LED emulator. V_O follows the signal applied to this input with respect to the CATHODE input.
3	CATHODE	Cathode of LED emulator. V_O follows the signal applied to ANODE with respect to this input.
4	NC*	No connect.
5	GND	External MOSFET source connection and ground reference for V_{DD}. This terminal is typically connected to ground but may be tied to a negative or positive voltage.
6	V_O	Output signal.
7	V_L	Output Pull-Up Load. Tie to V_O to enable load.
8	V_{DD}	Output-side power supply input referenced to GND (30 V max).
***Note:** No Connect. These pins are not internally connected. To maximize CMTI performance, these pins should be connected to the ground plane.		

9. Ordering Guide

Table 15. Si87xx Ordering Guide[1,2,3]

New Ordering Part Number (OPN)	Ordering Options				
	Input/Output Configuration	Data Rate (Cross Reference)	Insulation Rating	Temp Range	Pkg Type
Open Collector Output (Available in SOIC-8, DIP8, and SDIP6)					
Si8710AC-B-IS	LED input Open collector output	15 Mbps ACPL-W611, PS9303L2 (Functional Match)	3.75 kVrms	–40 to +125 °C	SOIC-8
Si8710BC-B-IS	High CMTI LED input Open collector output	15 Mbps ACPL-W611, PS9303L2 (Functional Match)	3.75 kVrms	–40 to +125 °C	SOIC-8
Si8710CC-B-IS	LED input Open collector output	1 Mbps ACPL-W611, PS9303L2 (Functional Match)	3.75 kVrms	–40 to +125 °C	SOIC-8
Si8710AC-B-IP	LED input Open collector output	15 Mbps HCPL-4502	3.75 kVrms	–40 to +125 °C	DIP8/GW
Si8710BC-B-IP	High CMTI LED input Open collector output	15 Mbps HCPL-4502	3.75 kVrms	–40 to +125 °C	DIP8/GW
Si8710CC-B-IP	LED input Open collector output	1 Mbps HCPL-4502	3.75 kVrms	–40 to +125 °C	DIP8/GW
Si8710AD-B-IS	LED input Open collector output	15 Mbps ACPL-W611, PS9303L2	5.0 kVrms	–40 to +125 °C	SDIP6
Si8710BD-B-IS	High CMTI LED input Open collector output	15 Mbps ACPL-W611, PS9303L2	5.0 kVrms	–40 to +125 °C	SDIP6
Si8710CD-B-IS	LED input Open collector output	1 Mbps ACPL-W611, PS9303L2	5.0 kVrms	–40 to +125 °C	SDIP6

Notes:
1. All packages are RoHS-compliant with peak solder reflow temperatures of 260 °C according to the JEDEC industry standard classifications.
2. “Si” and “SI” are used interchangeably.
3. AEC-Q100 qualified.

Table 15. Si87xx Ordering Guide[1,2,3] (Continued)

New Ordering Part Number (OPN)	Ordering Options				
	Input/Output Configuration	Data Rate (Cross Reference)	Insulation Rating	Temp Range	Pkg Type
Open Collector Output with 20 kΩ Pullup Resistor (Available in SOIC-8, DIP8, and LGA8)					
Si8711AC-B-IS	LED input Open collector output with integrated pullup	15 Mbps HCPL-4506 (Functional Match)	3.75 kVrms	–40 to +125 °C	SOIC-8
Si8711BC-B-IS	High CMTI LED input Open collector output with integrated pullup	15 Mbps HCPL-4506 (Functional Match)	3.75 kVrms	–40 to +125 °C	SOIC-8
Si8711CC-B-IS	LED input Open collector output with integrated pullup	1 Mbps HCPL-4506 (Functional Match)	3.75 kVrms	–40 to +125 °C	SOIC-8
Si8711AC-B-IP	LED input Open collector output with integrated pullup	15 Mbps HCPL-4506	3.75 kVrms	–40 to +125 °C	DIP8/GW
Si8711BC-B-IP	High CMTI LED input Open collector output with integrated pullup	15 Mbps HCPL-4506	3.75 kVrms	–40 to +125 °C	DIP8/GW
Si8711CC-B-IP	LED input Open collector output with integrated pullup	1 Mbps HCPL-4506	3.75 kVrms	–40 to +125 °C	DIP8/GW
Si8711AD-B-IM	LED input Open collector output with integrated pullup	15 Mbps HCNW-4506	5.0 kVrms	–40 to +125 °C	LGA8
Si8711BD-B-IM	High CMTI LED input Open collector output with integrated pullup	15 Mbps HCNW-4506	5.0 kVrms	–40 to +125 °C	LGA8
Si8711CD-B-IM	LED input Open collector output with integrated pullup	1 Mbps HCNW-4506	5.0 kVrms	–40 to +125 °C	LGA8

Notes:
1. All packages are RoHS-compliant with peak solder reflow temperatures of 260 °C according to the JEDEC industry standard classifications.
2. “Si” and “SI” are used interchangeably.
3. AEC-Q100 qualified.

Table 15. Si87xx Ordering Guide[1,2,3] (Continued)

New Ordering Part Number (OPN)	Ordering Options				
	Input/Output Configuration	Data Rate (Cross Reference)	Insulation Rating	Temp Range	Pkg Type
Open Collector Output with Output Enable (Available in SOIC-8, DIP8, and LGA8)					
Si8712AC-B-IS	LED input Open collector output with enable	15 Mbps HCPL-261x/260x (Functional Match)	3.75 kVrms	–40 to +125 °C	SOIC-8
Si8712BC-B-IS	High CMTI LED input Open collector output with enable	15 Mbps HCPL-261x/260x (Functional Match)	3.75 kVrms	–40 to +125 °C	SOIC-8
Si8712CC-B-IS	LED input Open collector output with enable	1 Mbps HCPL-261x/260x (Functional Match)	3.75 kVrms	–40 to +125 °C	SOIC-8
Si8712AC-B-IP	LED input Open collector output with enable	15 Mbps HCPL-261x/260x	3.75 kVrms	–40 to +125 °C	DIP8/GW
Si8712BC-B-IP	High CMTI LED input Open collector output with enable	15 Mbps HCPL-261x/260x	3.75 kVrms	–40 to +125 °C	DIP8/GW
Si8712CC-B-IP	LED input Open collector output with enable	1 Mbps HCPL-261x/260x	3.75 kVrms	–40 to +125 °C	DIP8/GW
Si8712AD-B-IM	LED input Open collector output with enable	15 Mbps HCNW-2611	5.0 kVrms	–40 to +125 °C	LGA8
Si8712BD-B-IM	High CMTI LED input Open collector output with enable	15 Mbps HCNW-2611	5.0 kVrms	–40 to +125 °C	LGA8
Si8712CD-B-IM	LED input Open collector output with enable	1 Mbps HCNW-2611	5.0 kVrms	–40 to +125 °C	LGA8

Notes:
1. All packages are RoHS-compliant with peak solder reflow temperatures of 260 °C according to the JEDEC industry standard classifications.
2. “Si” and “SI” are used interchangeably.
3. AEC-Q100 qualified.

10. Package Outline: 8-Pin Narrow Body SOIC

Figure 17 illustrates the package details for the Si87xx in an 8-pin narrow-body SOIC package. Table 16 lists the values for the dimensions shown in the illustration.

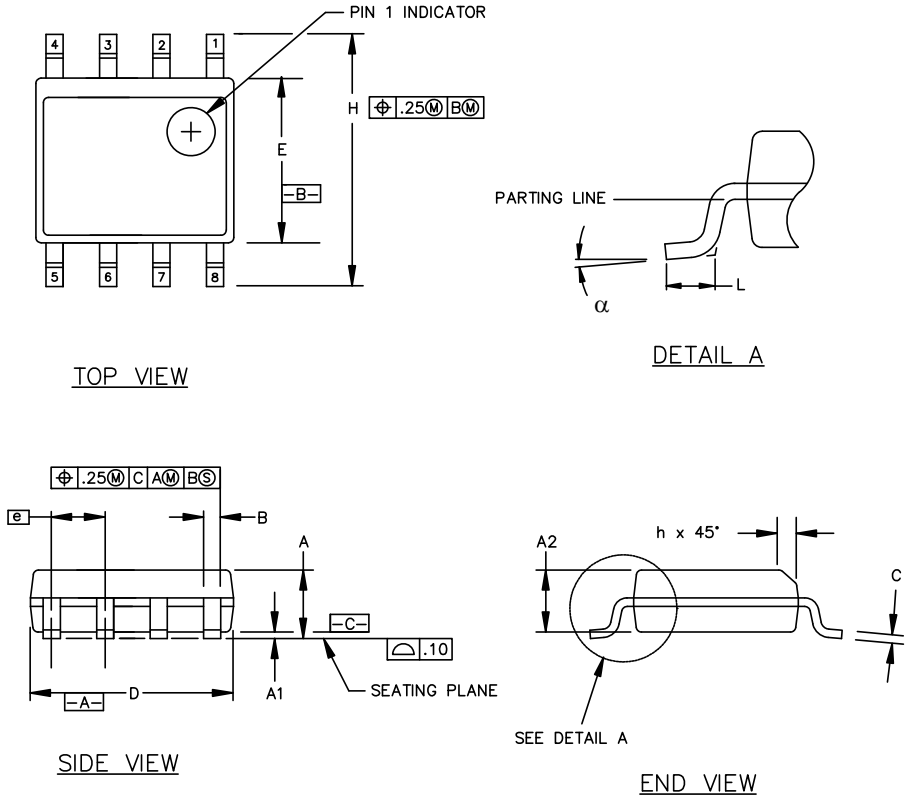


Figure 17. 8-Pin Narrow Body SOIC Package

Table 16. 8-Pin Narrow Body SOIC Package Diagram Dimensions

Symbol	Millimeters	
	Min	Max
A	1.35	1.75
A1	0.10	0.25
A2	1.40 REF	1.55 REF
B	0.33	0.51
C	0.19	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.27
∝	0°	8°

11. Land Pattern: 8-Pin Narrow Body SOIC

Figure 18 illustrates the recommended land pattern details for the Si87xx in an 8-pin narrow-body SOIC. Table 17 lists the values for the dimensions shown in the illustration.

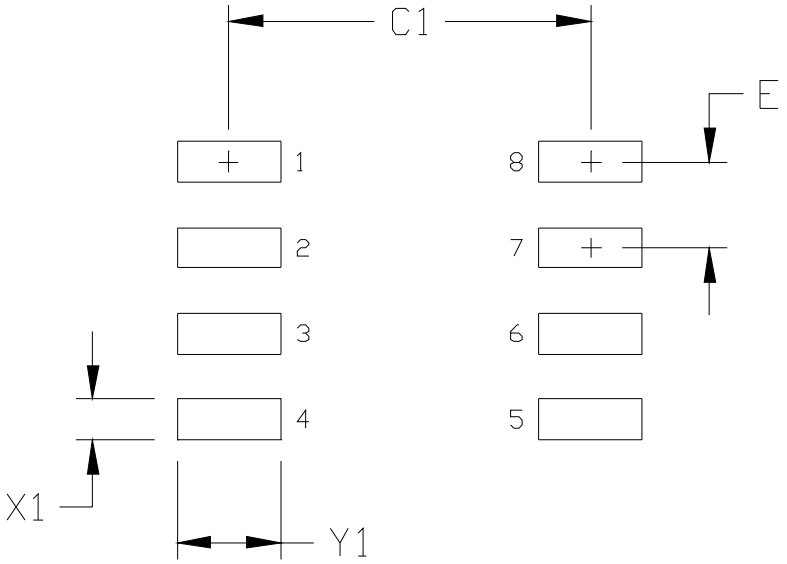


Figure 18. 8-Pin Narrow Body SOIC Land Pattern

Table 17. 8-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 SOIC127P600X173-8N 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.

12. Package Outline: DIP8

Figure 19 illustrates the package details for the Si87xx in a DIP8 package. Table 18 lists the values for the dimensions shown in the illustration.

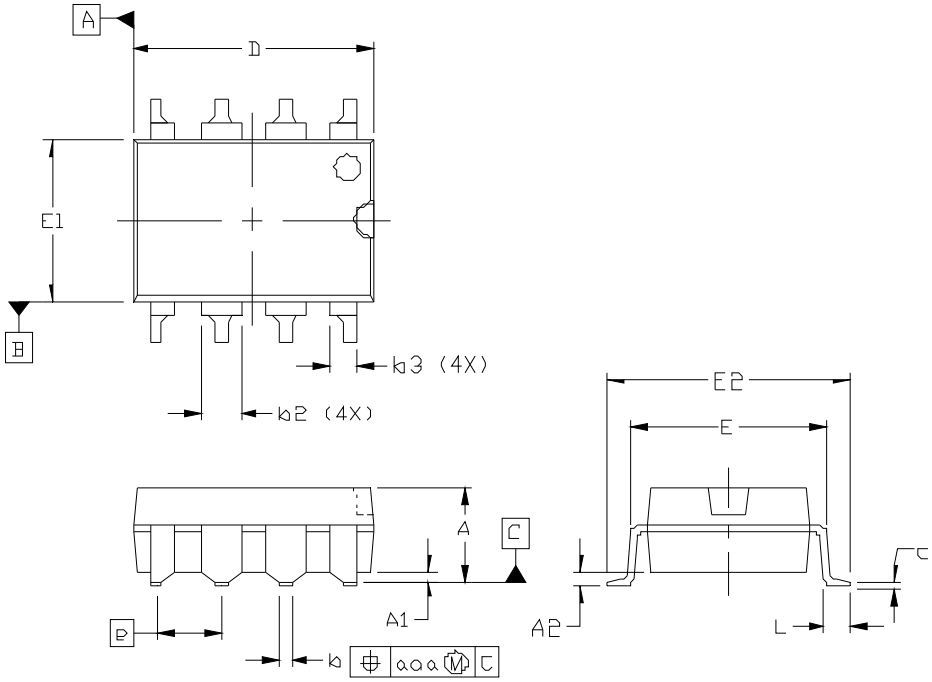


Figure 19. DIP8 Package

Table 18. DIP8 Package Diagram Dimensions

Dimension	Min	Max
A	—	4.19
A1	0.55	0.75
A2	3.17	3.43
b	0.35	0.55
b2	1.14	1.78
b3	0.76	1.14
c	0.20	0.33
D	9.40	9.90
E	7.37	7.87
E1	6.10	6.60
E2	9.40	9.90
e	2.54 BSC.	
L	0.38	0.89
aaa	—	0.25

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

13. Land Pattern: DIP8

Figure 20 illustrates the recommended land pattern details for the Si87xx in a DIP8 package. Table 19 lists the values for the dimensions shown in the illustration.

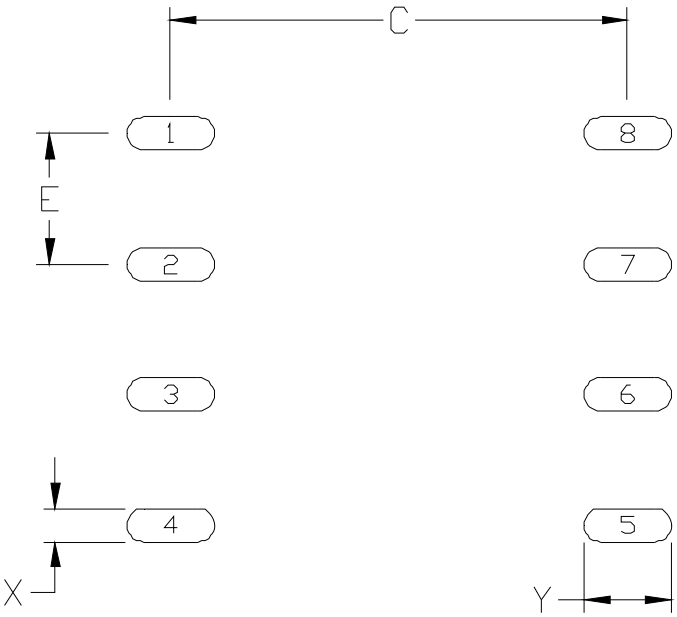


Figure 20. DIP8 Land Pattern

Table 19. DIP8 Land Pattern Dimensions*

Dimension	Min	Max
C	8.85	8.90
E	2.54 BSC	
X	0.60	0.65
Y	1.65	1.70
***Note:** This Land Pattern Design is based on the IPC-7351 specification.		

14. Package Outline: SDIP6

Figure 21 illustrates the package details for the Si87xx in an SDIP6 package. Table 20 lists the values for the dimensions shown in the illustration.

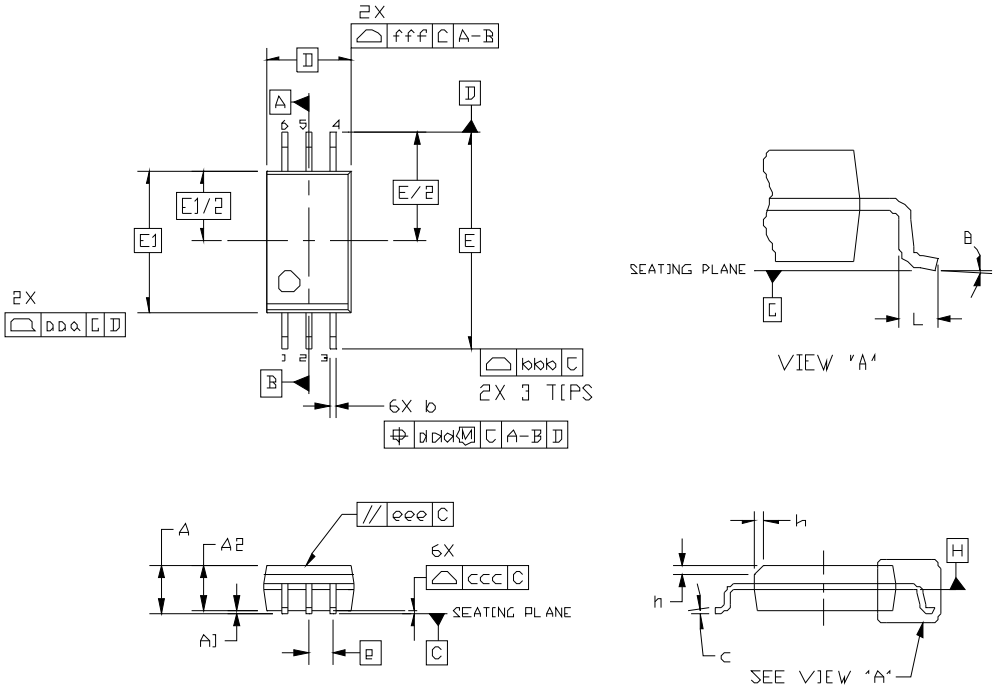


Figure 21. SDIP6 Package

Table 20. SDIP6 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	4.58 BSC	
E	11.50 BSC	
E1	7.50 BSC	
e	1.27 BSC	
L	0.40	1.27
h	0.25	0.75

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

Table 20. SDIP6 Package Diagram Dimensions (Continued)

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.

15. Land Pattern: SDIP6

Figure 22 illustrates the recommended land pattern details for the Si87xx in an SDIP6 package. Table 21 lists the values for the dimensions shown in the illustration.

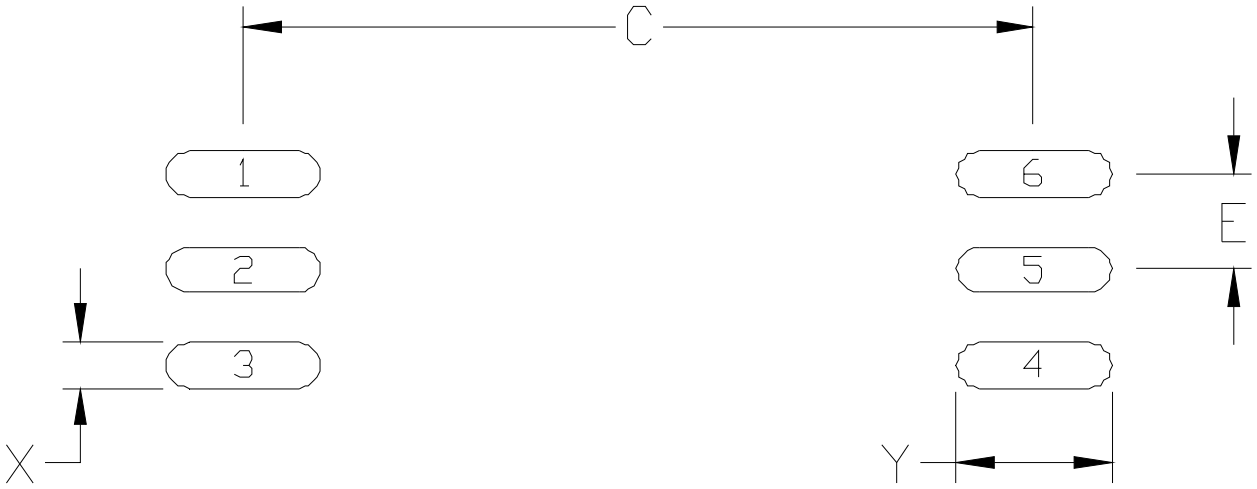


Figure 22. SDIP6 Land Pattern

Table 21. SDIP6 Land Pattern Dimensions*

Dimension	Min	Max
C	10.45	10.50
E	1.27 BSC	
X	0.55	0.60
Y	2.00	2.05
***Note:** This Land Pattern Design is based on the IPC-7351 specification.		

16. Package Outline: LGA8

Figure 23 illustrates the package details for the Si87xx in an LGA8 package. Table 22 lists the values for the dimensions shown in the illustration.

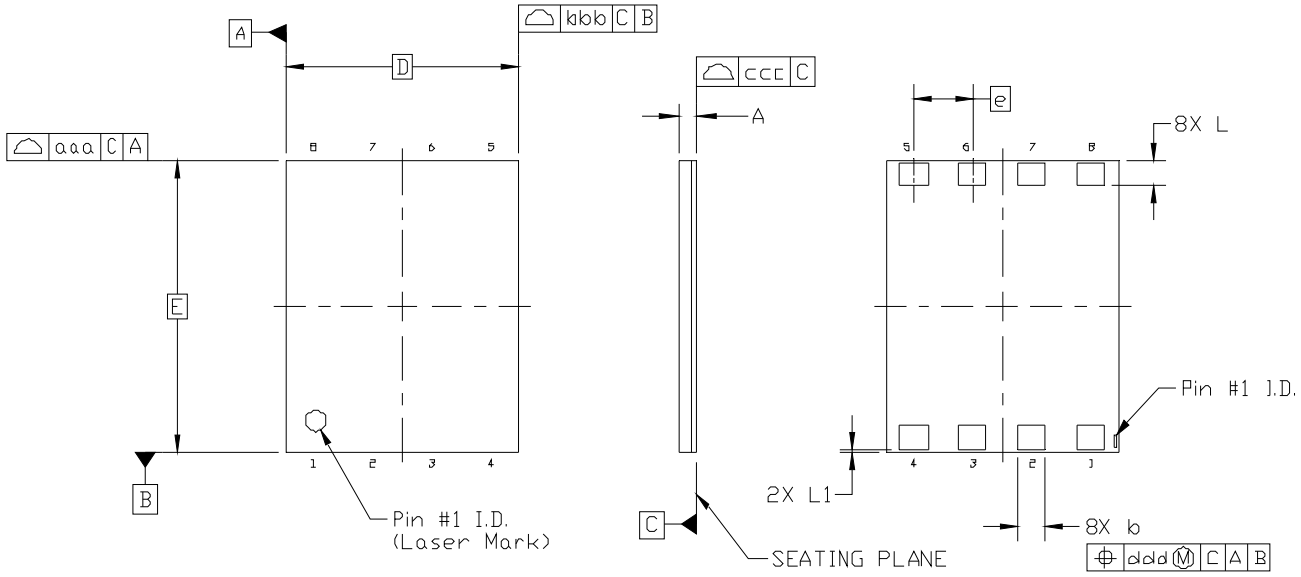


Figure 23. LGA8 Package

Table 22. Package Diagram Dimensions

Dimension	Min	Nom	Max
A	0.74	0.84	0.94
b	1.15	1.20	1.25
D	10.00 BSC.		
e	2.54 BSC.		
E	12.50 BSC.		
L	1.05	1.10	1.15
L1	0.05	0.10	0.15
aaa	—	—	0.10
bbb	—	—	0.10
ccc	—	—	0.10
ddd	—	—	0.10

Notes:
1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.
3. Recommended card reflow profile is per the JEDEC/IPC J-STD-020 specification for Small Body Components.

17. Land Pattern: LGA8

Figure 24 illustrates the recommended land pattern details for the Si87xx in an LGA8 package. Table 23 lists the values for the dimensions shown in the illustration.

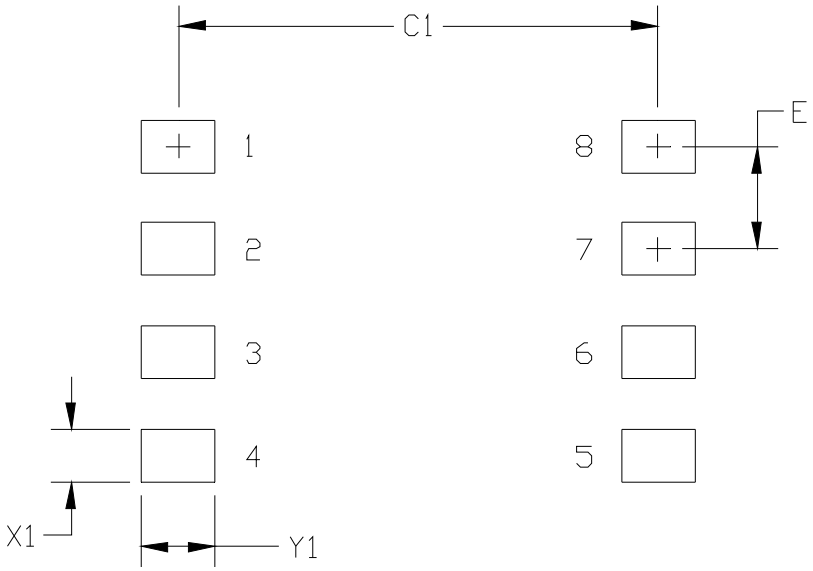


Figure 24. LGA8 Land Pattern

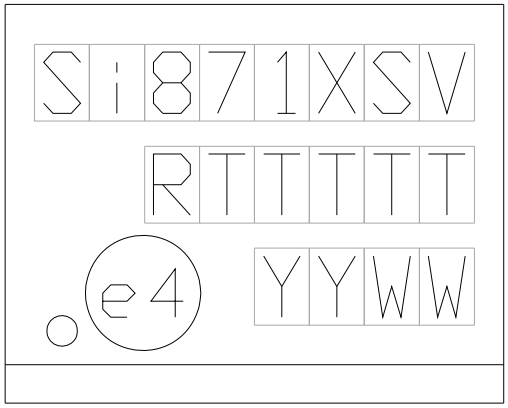
Table 23. LGA8 Land Pattern Dimensions

Dimension	Feature	(mm)
C1	Pad Column Spacing	11.80
E	Pad Row Pitch	2.54
X1	Pad Width	1.30
Y1	Pad Length	1.80

Notes:
1. This Land Pattern Design is based on IPC-7351 specifications.
2. All feature sizes shown are at Maximum Material Condition (MMC) and a card fabrication tolerance of 0.05 mm is assumed.

18. Top Markings

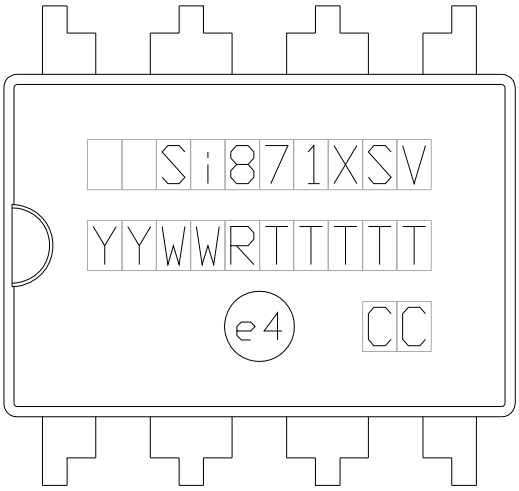
18.1. Top Marking (8-Pin Narrow Body SOIC)



18.2. Top Marking Explanation (8-Pin Narrow Body SOIC)

Line 1 Marking:	Customer Part Number	Si871 = Isolator product series X = Output configuration 0 = open collector output only 1 = open collector output w/ internal pull-up 2 = open collector output w/ output enable S = Performance Grade: A = 15 Mbps, 20 kV/µs minimum CMTI B = 15 Mbps, 35 kV/µs minimum CMTI C = 1 Mbps, 20 kV/µs minimum CMTI V = Insulation rating C = 3.75 kV
Line 2 Marking:	RTTTTT = Mfg Code	Manufacturing Code from the Assembly Purchase Order form. “R” indicates revision.
Line 3 Marking:	Circle = 43 mils Diameter Left-Justified	“e4” Pb-Free Symbol
	YY = Year WW = Work Week	Assigned by the Assembly House. Corresponds to the year and work week of the mold date.

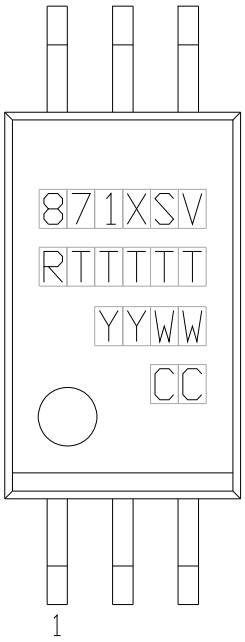
18.3. Top Marking (DIP8)



18.4. Top Marking Explanation (DIP8)

Line 1 Marking:	Customer Part Number	Si871 = Isolator product series X = Output configuration 0 = open collector output only 1 = open collector output w/ internal pull-up 2 = open collector output w/ output enable S = Performance Grade: A = 15 Mbps, 20 kV/µs minimum CMTI B = 15 Mbps, 35 kV/µs minimum CMTI C = 1 Mbps, 20 kV/µs minimum CMTI V = Insulation rating C = 3.75 kV
Line 2 Marking:	YY = Year WW = Work Week	Assigned by the Assembly House. Corresponds to the year and work week of the mold date.
	RTTTTT = Mfg Code	Manufacturing Code from the Assembly Purchase Order form. “R” indicates revision.
Line 3 Marking:	Circle = 51 mils Diameter Center-Justified	“e4” Pb-Free Symbol
	Country of Origin (Iso-Code Abbreviation)	CC

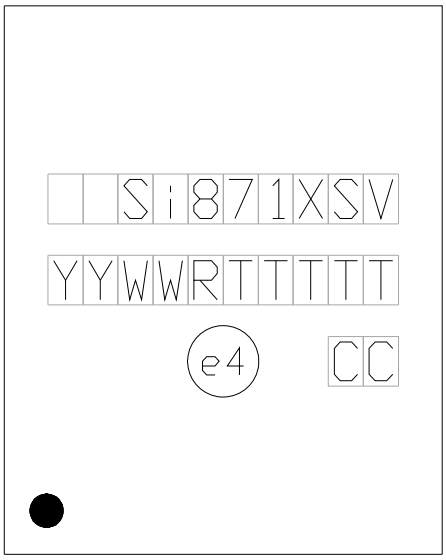
18.5. Top Marking (SDIP6)



18.6. Top Marking Explanation (SDIP6)

Line 1 Marking:	Device	871 = Isolator product series X = Output configuration 0 = open collector output only 1 = open collector output w/ internal pull-up 2 = open collector output w/ output enable S = Performance Grade: A = 15 Mbps, 20 kV/µs minimum CMTI B = 15 Mbps, 35 kV/µs minimum CMTI C = 1 Mbps, 20 kV/µs minimum CMTI V = Insulation rating C = 3.75 kV; D = 5.0 kV
Line 2 Marking:	RTTTTT = Mfg Code	Manufacturing Code from the Assembly Purchase Order form. “R” indicates revision.
Line 3 Marking:	YY = Year WW = Work Week	Assigned by the Assembly House. Corresponds to the year and work week of the mold date.
Line 4 Marking:	Country of Origin (Iso-Code Abbreviation)	CC

18.7. Top Marking (LGA8)



18.8. Top Marking Explanation (LGA8)

Line 1 Marking:	Device Part Number	Si871 = Isolator product series X = Output configuration 0 = open collector output only 1 = open collector output w/ internal pull-up 2 = open collector output w/ output enable S = Performance Grade: A = 15 Mbps, 20 kV/µs minimum CMTI B = 15 Mbps, 35 kV/µs minimum CMTI C = 1 Mbps, 20 kV/µs minimum CMTI V = Insulation rating C = 3.75 kV; D = 5.0 kV
Line 2 Marking:	YY = Year WW = Work Week	Assigned by the Assembly House. Corresponds to the year and work week of the assembly release.
	RTTTTT = Mfg Code	Manufacturing Code from the Assembly Purchase Order form. “R” indicates revision.
Line 3 Marking:	Circle = 1.6 mm Diameter Center-Justified	"e4" Pb-Free Symbol
	Country of Origin ISO Code Abbreviation	CC
Line 4 Marking:	Circle = 0.75 mm Diameter Lower Left-Justified	Pin 1 Identifier

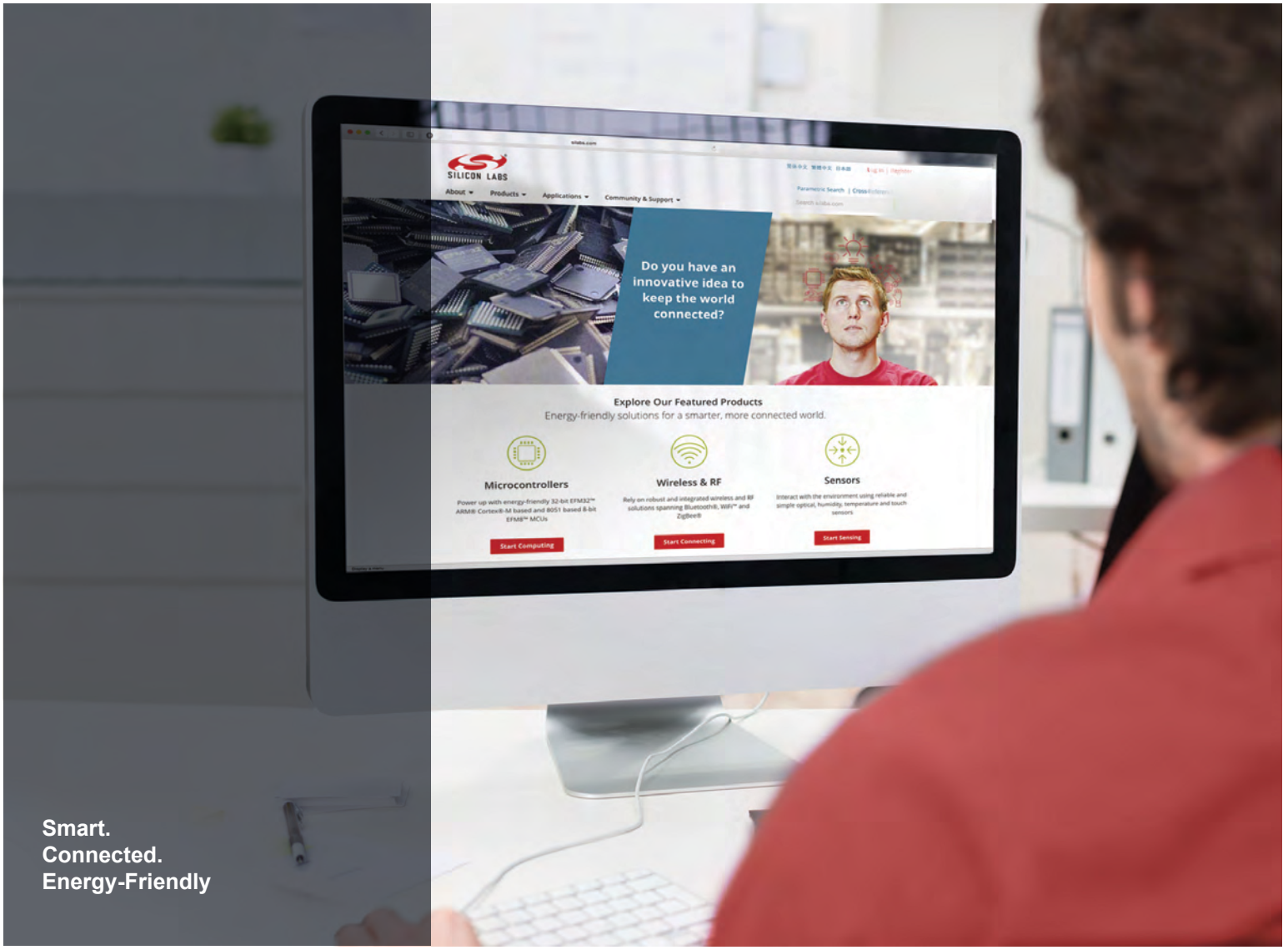
Document Change List

Revision 0.5 to Revision 1.0

- Updated various specs in Table 2 on page 4.
- Added Figure 1 on page 6.
- Added Figure 2 on page 7.
- Added Figure 8 on page 15.
- Updated various specs in Table 10 on page 16.
- Removed “pending” throughout.
- Added references to “CQC” throughout.
- Added references to “AEC-Q100 qualified” throughout.
- Updated all Top Marking figures and descriptions.

Revision 1.0 to Revision 1.1

- Updated Figure 1 on page 6.
- Updated Ordering Guide Table 15 on page 22.
  - Removed references to moisture sensitivity levels from table note.



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