

LOW-POWER QUAD-CHANNEL DIGITAL ISOLATOR

Features

- High-speed operation
 - DC to 150 Mbps
- No start-up initialization required
- Wide Operating Supply Voltage: 2.70-5.5 V
- Wide Operating Supply Voltage: 2.70-5.5V
- Ultra low power (typical) 5 V Operation:
 - < 1.6 mA per channel at 1 Mbps
 - < 6 mA per channel at 100 Mbps
 AEC-Q100 qualified 2.70 V Operation:
 - < 1.4 mA per channel at 1 Mbps
 - < 4 mA per channel at 100 Mbps
 RoHS-compliant packages
- High electromagnetic immunity

- Up to 2500 V_{RMS} isolation
- 60-year life at rated working voltage
- Precise timing (typical)
 - <10 ns worst case</p>
 - 1.5 ns pulse width distortion
 - 0.5 ns channel-channel skew
 - 2 ns propagation delay skew
 - 6 ns minimum pulse width
- Transient Immunity 25 kV/µs
- Wide temperature range
 - -40 to 125 °C at 150 Mbps
- - SOIC-16 wide body
 - SOIC-16 narrow body

Applications

- Industrial automation systems
- Hybrid electric vehicles
- Isolated switch mode supplies
- Isolated ADC, DAC
- Motor control
- Power inverters

Communications systems

Safety Regulatory Approvals

- UL 1577 recognized
 - Up to 2500 V_{RMS} for 1 minute
- CSA component notice 5A approval
 - IEC 60950-1, 61010-1 (reinforced insulation)
- VDE certification conformity
 - IEC 60747-5-2 (VDE0884 Part 2)

Description

Silicon Lab's family of ultra-low-power digital isolators are CMOS devices offering substantial data rate, propagation delay, power, size, reliability, and external BOM advantages when compared to legacy isolation technologies. The operating parameters of these products remain stable across wide temperature ranges throughout their service life. For ease of design, only VDD bypass capacitors are required.

Data rates up to 150 Mbps are supported, and all devices achieve worst-case propagation delays of less than 10 ns. All products are safety certified by UL, CSA, and VDE and support withstand voltages of up to 2.5 kVrms. These devices are available in 16-pin wide- and narrow-body SOIC packages.

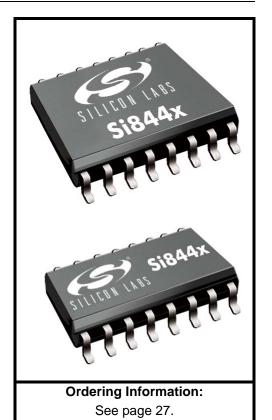




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1. Electrical Specifications

Table 1. Recommended Operating Conditions

Parameter	Symbol	Test Condition	Min	Тур	Max	Unit
Ambient Operating Temperature*	T _A	150 Mbps, 15 pF, 5 V	-40	25	125	°C
Supply Voltage	V _{DD1}		2.70	_	5.5	V
	V _{DD2}		2.70	_	5.5	V

*Note: The maximum ambient temperature is dependent on data frequency, output loading, number of operating channels, and supply voltage.

Table 2. Absolute Maximum Ratings¹

Parameter	Symbol	Min	Тур	Max	Unit
Storage Temperature ²	T _{STG}	-65	_	150	°C
Ambient Temperature Under Bias	T _A	-40	_	125	°C
Supply Voltage (Revision C) ³	V_{DD1}, V_{DD2}	-0.5	_	5.75	V
Supply Voltage (Revision D) ³	V_{DD1}, V_{DD2}	-0.5	_	6.0	V
Input Voltage	V _I	-0.5	_	V _{DD} + 0.5	V
Output Voltage	Vo	-0.5	_	V _{DD} + 0.5	V
Output Current Drive Channel	I _O	_	_	10	mA
Lead Solder Temperature (10 s)		_	_	260	°C
Maximum Isolation Voltage (1 s)		_	_	3600	V_{RMS}

Notes

- 1. Permanent device damage may occur if the above Absolute Maximum Ratings are exceeded. Functional operation should be restricted to conditions as specified in the operational sections of this data sheet. Exposure to absolute maximum ratings for extended periods may degrade performance.
- 2. VDE certifies storage temperature from -40 to 150 °C.
- 3. See "5. Ordering Guide" on page 27 for more information.

Table 3. Electrical Characteristics

 $(V_{DD1} = 5 \text{ V} \pm 10\%, V_{DD2} = 5 \text{ V} \pm 10\%, T_A = -40 \text{ to } 125 \text{ °C}; \text{ applies to narrow and wide-body SOIC packages})$

High Level Input Voltage Low Level Input Voltage High Level Output Voltage Low Level Output Voltage Input Leakage Current Output Impedance ¹	V _{IH} V _{IL} V _{OH} V _{OL} I _L Z _O	loh = -4 mA lol = 4 mA	2.0 — V _{DD1} ,V _{DD2} – 0.4 —	 4.8 0.2	0.8	V V
High Level Output Voltage Low Level Output Voltage Input Leakage Current Output Impedance ¹	V _{OH} V _{OL} I _L Z _O			4.8	_	
Low Level Output Voltage Input Leakage Current Output Impedance ¹	V _{OL} I _L Z _O		V _{DD1} ,V _{DD2} – 0.4 —		_	V
Input Leakage Current Output Impedance ¹	I _L	IoI = 4 mA	_	0.2		
Output Impedance ¹	I _L		_		0.4	V
' '				_	±10	μA
	1		_	85	_	Ω
Enable Input High Current	I _{ENH}	$V_{ENx} = V_{IH}$	_	2.0		μΑ
Enable Input Low Current	I _{ENL}	$V_{ENx} = V_{IL}$	_	2.0	_	μA
D	C Supply	Current (All inputs (V or at Supply)			<u>.L</u>
Si8440Ax, Bx and Si8445Bx						
V_{DD1}		All inputs 0 DC	_	1.5	2.3	mA
V_{DD2}		All inputs 0 DC	_	2.5	3.8	
V_{DD1}		All inputs 1 DC	_	5.7	8.6	
V_{DD2}		All inputs 1 DC	_	2.6	3.9	
Si8441Ax, Bx						
V_{DD1}		All inputs 0 DC	_	1.8	2.7	mA
V _{DD2}		All inputs 0 DC	_	2.5	3.8	
V_{DD1}		All inputs 1 DC	_	4.9	7.4	
V _{DD2}		All inputs 1 DC	_	3.6	5.4	
Si8442Ax, Bx						
V_{DD1}		All inputs 0 DC	_	2.3	3.5	mA
V_{DD2}		All inputs 0 DC	_	2.3	3.5	
V_{DD1}		All inputs 1 DC	_	4.5	6.8	
V_{DD2}		All inputs 1 DC	_	4.5	6.8	
1 Mbps Supply Cur	rent (All in	nputs = 500 kHz squa	are wave, CI = 15 pF	on all out	outs)	·I
Si8440Ax, Bx and Si8445Bx						
V _{DD1}			_	3.6	5.4	mA
V _{DD2}			_	3.0	3.9	
Si8441Ax, Bx						
V_{DD1}			_	3.5	5.3	mA
V_{DD2}			_	3.4	5.1	
Si8442Ax, Bx						
V _{DD1}			_	3.6	5.4	mA
V_{DD2}			_	3.6	5.4	

Notes:

- 1. The nominal output impedance of an isolator driver channel is approximately 85 Ω, ±40%, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.
- 2. t_{PSK(P-P)} is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and ambient temperature.
- 3. See "3. Errata and Design Migration Guidelines" on page 25 for more details.
- **4.** Start-up time is the time period from the application of power to valid data at the output.



Table 3. Electrical Characteristics (Continued)

 $(V_{DD1} = 5 \text{ V} \pm 10\%, V_{DD2} = 5 \text{ V} \pm 10\%, T_A = -40 \text{ to } 125 \text{ °C};$ applies to narrow and wide-body SOIC packages)

Parameter	Symbol	Test Condition	Min	Тур	Max	Unit
10 Mbps Supp	ly Current (All	inputs = 5 MHz squa	are wave, CI = 15	pF on all out	outs)	
Si8440Bx, Si8445Bx						
V_{DD1}			_	3.6	5.4	mA
V_{DD2}			_	4.0	5.6	
Si8441Bx						
V_{DD1}			_	3.7	5.5	mA
V_{DD2}			_	4.1	5.7	
Si8442Bx						
V_{DD1}			_	4.2	5.9	mA
V_{DD2}				4.2	5.9	
100 Mbps Supp	ly Current (All	inputs = 50 MHz squ	uare wave, CI = 15	5 pF on all ou	itputs)	
Si8440Bx, Si8445Bx						
V_{DD1}			_	3.8	5.7	mA
V_{DD2}			_	19.4	24.3	
Si8441Bx						
V_{DD1}			_	8.0	10	mA
V_{DD2}				15.8	19.8	
Si8442Bx						
V_{DD1}			_	11.8	14.8	mA
V_{DD2}			_	11.8	14.8	
		Timing Characteris	stics			
Si844xAx						
Maximum Data Rate			0	_	1.0	Mbps
Minimum Pulse Width			_	_	250	ns
Propagation Delay	t _{PHL} , t _{PLH}	See Figure 2	_	T -	35	ns
Pulse Width Distortion	PWD	See Figure 2	_	_	25	ns
t _{PLH} - t _{PHL}		-				
Propagation Delay Skew ²	t _{PSK(P-P)}		_	_	40	ns
Channel-Channel Skew	t _{PSK}		_	1 –	35	ns

Notes:

- 1. The nominal output impedance of an isolator driver channel is approximately 85 Ω , \pm 40%, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.
- 2. t_{PSK(P-P)} is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and ambient temperature.
- 3. See "3. Errata and Design Migration Guidelines" on page 25 for more details.
- 4. Start-up time is the time period from the application of power to valid data at the output.



Table 3. Electrical Characteristics (Continued)

 $(V_{DD1} = 5 \text{ V} \pm 10\%, V_{DD2} = 5 \text{ V} \pm 10\%, T_A = -40 \text{ to } 125 \text{ °C}; \text{ applies to narrow and wide-body SOIC packages})$

Parameter	Symbol	Test Condition	Min	Тур	Max	Unit
Si844xBx	1		1			<u>'</u>
Maximum Data Rate			0	_	150	Mbps
Minimum Pulse Width			_	_	6.0	ns
Propagation Delay	t _{PHL} , t _{PLH}	See Figure 2	3.0	6.0	9.5	ns
Pulse Width Distortion t _{PLH} - t _{PHL}	PWD	See Figure 2	_	1.5	2.5	ns
Propagation Delay Skew ²	t _{PSK(P-P)}		_	2.0	3.0	ns
Channel-Channel Skew	t _{PSK}		_	0.5	1.8	ns
All Models				•		•
Output Rise Time	t _r	C _L = 15 pF See Figure 2	_	3.8	5.0	ns
Output Fall Time	t _f	C _L = 15 pF See Figure 2	_	2.8	3.7	ns
Common Mode Transient Immunity	CMTI	$V_I = V_{DD}$ or 0 V	_	25	_	kV/μs
Enable to Data Valid ³	t _{en1}	See Figure 1	_	5.0	8.0	ns
Enable to Data Tri-State ³	t _{en2}	See Figure 1	_	7.0	9.2	ns
Start-up Time ^{3,4}	t _{SU}		_	15	40	μs

Notes:

- 1. The nominal output impedance of an isolator driver channel is approximately 85 Ω, ±40%, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.
- 2. t_{PSK(P-P)} is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and ambient temperature.
- 3. See "3. Errata and Design Migration Guidelines" on page 25 for more details.
- **4.** Start-up time is the time period from the application of power to valid data at the output.



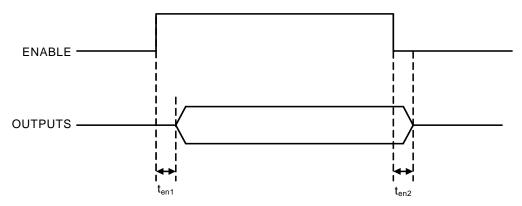


Figure 1. ENABLE Timing Diagram

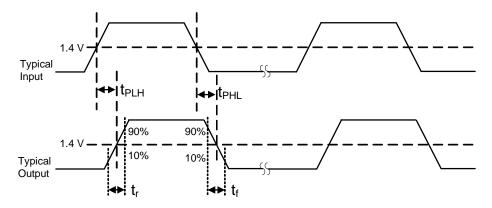


Figure 2. Propagation Delay Timing



Table 4. Electrical Characteristics

 $(V_{DD1} = 3.3 \text{ V} \pm 10\%, V_{DD2} = 3.3 \text{ V} \pm 10\%, T_A = -40 \text{ to } 125 \,^{\circ}\text{C};$ applies to narrow and wide-body SOIC packages)

Parameter	Symbol	Test Condition	Min	Тур	Max	Unit
High Level Input Voltage	V_{IH}		2.0	_		V
Low Level Input Voltage	V_{IL}		_	_	0.8	V
High Level Output Voltage	V _{OH}	loh = -4 mA	$V_{DD1}, V_{DD2} - 0.4$	3.1	_	V
Low Level Output Voltage	V _{OL}	lol = 4 mA	_	0.2	0.4	V
Input Leakage Current	ΙL		_	_	±10	μA
Output Impedance ¹	Z _O		_	85		Ω
Enable Input High Current	I _{ENH}	$V_{ENx} = V_{IH}$	_	2.0	_	μA
Enable Input Low Current	I _{ENL}	$V_{ENx} = V_{IL}$	_	2.0		μA
DC	Supply Cu	urrent (All inputs 0	V or at supply)			
Si8440Ax, Bx and Si8445Bx						
V_{DD1}		All inputs 0 DC	_	1.5	2.3	mA
V_{DD2}		All inputs 0 DC	_	2.5	3.8	
V_{DD1}		All inputs 1 DC	_	5.7	8.6	
V_{DD2}		All inputs 1 DC	_	2.6	3.9	
Si8441Ax, Bx						
V_{DD1}		All inputs 0 DC	_	1.8	2.7	mΑ
V_{DD2}		All inputs 0 DC	_	2.5	3.8	
V _{DD1}		All inputs 1 DC	_	4.9	7.4	
V_{DD2}		All inputs 1 DC	_	3.6	5.4	
Si8442Ax, Bx						
V_{DD1}		All inputs 0 DC	_	2.3	3.5	mΑ
V_{DD2}		All inputs 0 DC	_	2.3	3.5	
V_{DD1}		All inputs 1 DC	_	4.5	6.8	
V_{DD2}		All inputs 1 DC	_	4.5	6.8	
1 Mbps Supply Curre	ent (All inpu	ts = 500 kHz squar	e wave, CI = 15 pF	on all outp	outs)	
Si8440Ax, Bx and Si8445Bx						
V _{DD1}			_	3.6	5.4	mA
V_{DD2}			_	3.0	3.9	
Si8441Ax, Bx						
V_{DD1}			_	3.5	5.3	mΑ
V_{DD2}			_	3.4	5.1	
Si8442Ax, Bx						
V_{DD1}			_	3.6	5.4	mA
V_{DD2}			-	3.6	5.4	
	l	<u>l</u>	1			1

Notes:

- 1. The nominal output impedance of an isolator driver channel is approximately 85 Ω , \pm 40%, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.
- 2. t_{PSK(P-P)} is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and ambient temperature.
- 3. See "3. Errata and Design Migration Guidelines" on page 25 for more details.
- 4. Start-up time is the time period from the application of power to valid data at the output.



Table 4. Electrical Characteristics (Continued)

 $(V_{DD1} = 3.3 \text{ V} \pm 10\%, V_{DD2} = 3.3 \text{ V} \pm 10\%, T_A = -40 \text{ to } 125 \,^{\circ}\text{C}$; applies to narrow and wide-body SOIC packages)

Parameter	Symbol	Test Condition	Min	Тур	Max	Unit
10 Mbps Supply	Current (All inp	uts = 5 MHz square	e wave, CI = 15 p	oF on all outp	outs)	
Si8440Bx, Si8445Bx						
V_{DD1}			_	3.6	5.4	mA
V_{DD2}			_	4.0	5.6	
Si8441Bx						
V_{DD1}			_	3.7	5.5	mA
V_{DD2}			_	4.1	5.7	
Si8442Bx						
V_{DD1}			_	4.2	5.9	mA
V_{DD2}			_	4.2	5.9	
100 Mbps Supply	Current (All inp	uts = 50 MHz squa	re wave, CI = 15	pF on all ou	tputs)	
Si8440Bx, Si8445Bx						
V_{DD1}			_	3.6	5.5	mA
V_{DD2}			_	14	17.5	
Si8441Bx						
V_{DD1}			_	6.4	8.0	mA
V_{DD2}			_	11.4	14.5	
Si8442Bx						
V_{DD1}				8.6	10.8	mA
V_{DD2}			_	8.6	10.8	
	Tir	ning Characteristi	cs			
Si844xAx						
Maximum Data Rate			0	_	1.0	Mbps
Minimum Pulse Width			_	_	250	ns
Propagation Delay	t _{PHL} ,t _{PLH}	See Figure 2	_	_	35	ns
Pulse Width Distortion	PWD	See Figure 2	_	_	25	ns
t _{PLH} - t _{PHL}						
Propagation Delay Skew ²	t _{PSK(P-P)}			-	40	ns
Channel-Channel Skew	t _{PSK}		_	_	35	ns
Notes:	I.	I	ı	ı	1	

Notes:

- 1. The nominal output impedance of an isolator driver channel is approximately 85 Ω, ±40%, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.
- 2. $t_{PSK(P-P)}$ is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and ambient temperature.
- 3. See "3. Errata and Design Migration Guidelines" on page 25 for more details.
- 4. Start-up time is the time period from the application of power to valid data at the output.



Table 4. Electrical Characteristics (Continued)

 $(V_{DD1} = 3.3 \text{ V} \pm 10\%, V_{DD2} = 3.3 \text{ V} \pm 10\%, T_A = -40 \text{ to } 125 \,^{\circ}\text{C}$; applies to narrow and wide-body SOIC packages)

Parameter	Symbol	Test Condition	Min	Тур	Max	Unit
Si844xBx						•
Maximum Data Rate			0	_	150	Mbps
Minimum Pulse Width			_	_	6.0	ns
Propagation Delay	t _{PHL} , t _{PLH}	See Figure 2	3.0	6.0	9.5	ns
Pulse Width Distortion t _{PLH} - t _{PHL}	PWD	See Figure 2	_	1.5	2.5	ns
Propagation Delay Skew ²	t _{PSK(P-P)}		_	2.0	3.0	ns
Channel-Channel Skew	t _{PSK}		_	0.5	1.8	ns
All Models						•
Output Rise Time	t _r	C _L = 15 pF See Figure 2	_	4.3	6.1	ns
Output Fall Time	t _f	C _L = 15 pF See Figure 2	_	3.0	4.3	ns
Common Mode Transient Immunity at Logic Low Output	CMTI	$V_I = V_{DD}$ or 0 V	_	25	_	kV/µs
Enable to Data Valid ³	t _{en1}	See Figure 1	_	5.0	8.0	ns
Enable to Data Tri-State ³	t _{en2}	See Figure 1	_	7.0	9.2	ns
Start-up Time ^{3,4}	t _{SU}		_	15	40	μs

Notes:

- 1. The nominal output impedance of an isolator driver channel is approximately 85 Ω, ±40%, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.
- 2. t_{PSK(P-P)} is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and ambient temperature.
- 3. See "3. Errata and Design Migration Guidelines" on page 25 for more details.
- 4. Start-up time is the time period from the application of power to valid data at the output.



Table 5. Electrical Characteristics¹

 $(V_{DD1} = 2.70 \text{ V}, V_{DD2} = 2.70 \text{ V}, T_A = -40 \text{ to } 125 \,^{\circ}\text{C}$; applies to narrow and wide-body SOIC packages)

Parameter	Symbol	Test Condition	Min	Тур	Max	Unit
High Level Input Voltage	V _{IH}		2.0	_	_	V
Low Level Input Voltage	V_{IL}		_	_	0.8	V
High Level Output Voltage	V _{OH}	loh = −4 mA	$V_{DD1}, V_{DD2} - 0.$	2.3	_	V
Low Level Output Voltage	V _{OL}	lol = 4 mA	_	0.2	0.4	V
Input Leakage Current	ΙL		_	_	±10	μA
Output Impedance ²	Z _O		_	85	_	Ω
Enable Input High Current	I _{ENH}	$V_{ENx} = V_{IH}$	_	2.0	_	μA
Enable Input Low Current	I _{ENL}	$V_{ENx} = V_{IL}$	_	2.0	_	μA
D	C Supply C	current (All inputs 0	V or at supply)			
Si8440Ax, Bx and Si8445Bx						
V_{DD1}		All inputs 0 DC	_	1.5	2.3	mA
V_{DD2}		All inputs 0 DC	_	2.5	3.8	
V_{DD1}		All inputs 1 DC	_	5.7	8.6	
V_{DD2}		All inputs 1 DC	_	2.6	3.9	
Si8441Ax, Bx						
V_{DD1}		All inputs 0 DC	_	1.8	2.7	mΑ
V_{DD2}		All inputs 0 DC	_	2.5	3.8	
V _{DD1}		All inputs 1 DC	_	4.9	7.4	
V _{DD2}		All inputs 1 DC	_	3.6	5.4	
Si8442Ax, Bx		•				
V_{DD1}		All inputs 0 DC	_	2.3	3.5	mΑ
V _{DD2}		All inputs 0 DC	_	2.3	3.5	
V _{DD1}		All inputs 1 DC	_	4.5	6.8	
V _{DD2}		All inputs 1 DC	_	4.5	6.8	
1 Mbps Supply Cur	<u>l</u> rent (All inp	•	l e wave. CI = 15 pF			
Si8440Ax, Bx and Si8445Bx	(,	
V _{DD1}			_	3.6	5.4	mΑ
V _{DD2}			_	3.0	3.9	, \
Si8441Ax, Bx					5.0	
V _{DD1}			_	3.5	5.3	mA
V_{DD2}			_	3.4	5.1	, \
Si8442Ax, Bx						
V _{DD1}			_	3.6	5.4	mA
V _{DD2}			_	3.6	5.4	
טטע						

- 1. Specifications in this table are also valid at VDD1 = 2.6 V and VDD2 = 2.6 V when the operating temperature range is constrained to $T_A = 0$ to 85 °C.
- 2. The nominal output impedance of an isolator driver channel is approximately 85 Ω, ±40%, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.
- **3.** t_{PSK(P-P)} is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and ambient temperature.
- 4. See "3. Errata and Design Migration Guidelines" on page 25 for more details.
- 5. Start-up time is the time period from the application of power to valid data at the output.

Table 5. Electrical Characteristics¹ (Continued)

 $(V_{DD1} = 2.70 \text{ V}, V_{DD2} = 2.70 \text{ V}, T_A = -40 \text{ to } 125 \,^{\circ}\text{C};$ applies to narrow and wide-body SOIC packages)

Parameter	Symbol	Test Condition	Min	Тур	Max	Unit
10 Mbps Supply	Current (All in	puts = 5 MHz square	wave, CI = 15 pF	on all outp	outs)	
Si8440Bx, Si8445Bx						T
V_{DD1}			_	3.6	5.4	mA
V_{DD2}			_	4.0	5.6	
Si8441Bx						
V_{DD1}			_	3.7	5.5	mA
V_{DD2}			_	4.1	5.7	
Si8442Bx						
V_{DD1}			_	4.2	5.9	mA
V_{DD2}			_	4.2	5.9	
100 Mbps Supply	Current (All in	puts = 50 MHz squa	re wave, CI = 15 p	F on all ou	tputs)	
Si8440Bx, Si8445Bx						
V_{DD1}			_	3.6	5.5	mA
V_{DD2}			_	10.8	13.5	
Si8441Bx						
V_{DD1}			_	5.6	7.0	mA
V_{DD2}			_	9.3	11.6	
Si8442Bx						
V_{DD1}			_	7.2	9.0	mA
V_{DD2}			_	7.2	9.0	
	Ti	iming Characteristi	cs			
Si844xAx						
Maximum Data Rate			0	_	1.0	Mbps
Minimum Pulse Width			_	_	250	ns
Propagation Delay	t _{PHL} ,t _{PLH}	See Figure 2	_	_	35	ns
Pulse Width Distortion	PWD	See Figure 2	_	_	25	ns
t _{PLH} - t _{PHL}						
Propagation Delay Skew ³	t _{PSK(P-P)}		_		40	ns
Channel-Channel Skew	t _{PSK}		_	_	35	ns
1 Specifications in this table	oro oloo valid at \	/DD4 261/and1/DD	20 26 V when the	onorotina to	man a ratura i	

- 1. Specifications in this table are also valid at VDD1 = 2.6 V and VDD2 = 2.6 V when the operating temperature range is constrained to $T_A = 0$ to 85 °C.
- 2. The nominal output impedance of an isolator driver channel is approximately 85 Ω, ±40%, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.
- **3.** t_{PSK(P-P)} is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and ambient temperature.
- **4.** See "3. Errata and Design Migration Guidelines" on page 25 for more details.
- 5. Start-up time is the time period from the application of power to valid data at the output.



Table 5. Electrical Characteristics¹ (Continued)

 $(V_{DD1} = 2.70 \text{ V}, V_{DD2} = 2.70 \text{ V}, T_A = -40 \text{ to } 125 \,^{\circ}\text{C}$; applies to narrow and wide-body SOIC packages)

Parameter	Symbol	Test Condition	Min	Тур	Max	Unit
Si844xBx	•			•		•
Maximum Data Rate			0	_	150	Mbps
Minimum Pulse Width			_	_	6.0	ns
Propagation Delay	t _{PHL} , t _{PLH}	See Figure 2	3.0	6.0	9.5	ns
Pulse Width Distortion t _{PLH} - t _{PHL}	PWD	See Figure 2	_	1.5	2.5	ns
Propagation Delay Skew ³	t _{PSK(P-P)}		_	2.0	3.0	ns
Channel-Channel Skew	t _{PSK}		_	0.5	1.8	ns
All Models						•
Output Rise Time	t _r	C _L = 15 pF See Figure 2	_	4.8	6.5	ns
Output Fall Time	t _f	C _L = 15 pF See Figure 2	_	3.2	4.6	ns
Common Mode Transient Immunity at Logic Low Output	CMTI	$V_I = V_{DD}$ or 0 V	_	25	_	kV/µs
Enable to Data Valid ⁴	t _{en1}	See Figure 1	_	5.0	8.0	ns
Enable to Data Tri-State ⁴	t _{en2}	See Figure 1	_	7.0	9.2	ns
Start-up Time ^{4,5}	t _{SU}		_	15	40	μs

- 1. Specifications in this table are also valid at VDD1 = 2.6 V and VDD2 = 2.6 V when the operating temperature range is constrained to $T_A = 0$ to 85 °C.
- 2. The nominal output impedance of an isolator driver channel is approximately 85 Ω, ±40%, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.
- **3.** t_{PSK(P-P)} is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and ambient temperature.
- 4. See "3. Errata and Design Migration Guidelines" on page 25 for more details.
- 5. Start-up time is the time period from the application of power to valid data at the output.



Table 6. Regulatory Information*

CSA

The Si84xx 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 130 V_{RMS} reinforced insulation working voltage; up to 1000 V_{RMS} basic insulation working voltage.

VDE

The Si84xx is certified according to IEC 60747-5-2. For more details, see File 5006301-4880-0001.

60747-5-2: Up to 560 V_{peak} for basic insulation working voltage.

UL

The Si84xx is certified under UL1577 component recognition program. For more details, see File E257455.

Rated up to 2500 V_{RMS} isolation voltage for basic insulation.

*Note: Regulatory Certifications apply to 2.5 kV_{RMS} rated devices which are production tested to 3.0 kV_{RMS} for 1 sec. For more information, see "5. Ordering Guide" on page 27.

Table 7. Insulation and Safety-Related Specifications

			Val	ue	
Parameter	Symbol	Test Condition	WB SOIC-16	NB SOIC-16	Unit
Nominal Air Gap (Clearance) ¹	L(IO1)		8.0	4.9	mm
Nominal External Tracking (Creepage) ¹	L(IO2)		8.0	4.01	mm
Minimum Internal Gap (Internal Clearance)			0.008	0.008	mm
Tracking Resistance (Proof Tracking Index)	PTI	IEC60112	600	600	V _{RMS}
Erosion Depth	ED		0.040	0.019	mm
Resistance (Input-Output) ²	R _{IO}		10 ¹²	10 ¹²	Ω
Capacitance (Input-Output) ²	C _{IO}	f = 1 MHz	2.0	2.0	pF
Input Capacitance ³	C _I		4.0	4.0	pF

Notes:

- 1. The values in this table correspond to the nominal creepage and clearance values as detailed in "6. Package Outline: 16-Pin Wide Body SOIC" and "8. Package Outline: 16-Pin Narrow Body SOIC". VDE certifies the clearance and creepage limits as 4.7 mm minimum for the NB SOIC-16 package 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 package and 7.6 mm minimum for the WB SOIC-16 package.
- 2. To determine resistance and capacitance, the Si84xx is converted into a 2-terminal device. Pins 1–8 are shorted together to form the first terminal and pins 9–16 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 8. IEC 60664-1 (VDE 0844 Part 2) Ratings

Parameter	Test Condition	Specification
Basic Isolation Group	Material Group	I
	Rated Mains Voltages ≤ 150 V _{RMS}	I-IV
Installation Classification	Rated Mains Voltages ≤ 300 V _{RMS}	1-111
Installation Classification	Rated Mains Voltages ≤ 400 V _{RMS}	I-II
	Rated Mains Voltages ≤ 600 V _{RMS}	I-II

Table 9. IEC 60747-5-2 Insulation Characteristics for Si84xxxB*

Parameter	Symbol	Test Condition	Characteristic	Unit
Maximum Working Insulation Voltage	V _{IORM}		560	V peak
Input to Output Test Voltage	V _{PR}	Method b1 $(V_{IORM} \times 1.875 = V_{PR}, 100\%$ Production Test, $t_m = 1$ sec, Partial Discharge < 5 pC)	1050	V peak
Transient Overvoltage	V _{IOTM}	t = 60 sec	4000	V peak
Pollution Degree (DIN VDE 0110, Table 1)			2	
Insulation Resistance at T _S , V _{IO} = 500 V	R _S		>10 ⁹	Ω

*Note: Maintenance of the safety data is ensured by protective circuits. The Si84xx provides a climate classification of 40/125/21.

Table 10. IEC Safety Limiting Values¹

					Ma		
Parameter	Symbol	Test Condition	Min	Тур	WB SOIC-16	NB SOIC-16	Unit
Case Temperature	T _S				150	150	°C
Safety input, output, or supply current	I _S	θ _{JA} = 100 °C/W (WB SOIC-16), 105 °C/W (NB SOIC-16), V _I = 5.5 V, T _J = 150 °C, T _A = 25 °C	_	_	220	210	mA
Device Power Dissipation ²	P _D		_	_	275	275	mW

Notes:

- 1. Maximum value allowed in the event of a failure; also see the thermal derating curve in Figures 3 and 4.
- 2. The Si844x is tested with VDD1 = VDD2 = 5.5 V, TJ = 150 °C, CL = 15 pF, input a 150 Mbps 50% duty cycle square wave.

Table 11. Thermal Characteristics

				Ту	Max	Unit	
Parameter	Symbol Test Condition M	Min	WB SOIC-16	NB SOIC-16			
IC Junction-to-Air Thermal Resistance	$\theta_{\sf JA}$		1	100	105	1	°C/W

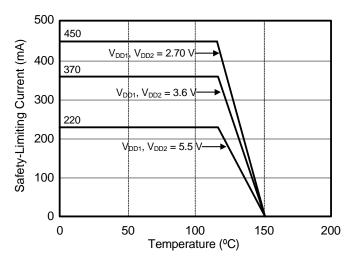


Figure 3. (WB SOIC-16) Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN EN 60747-5-2

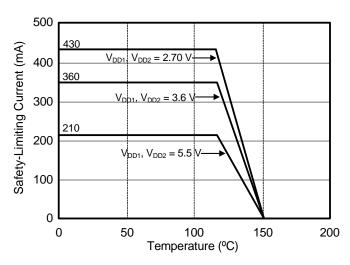


Figure 4. (NB SOIC-16) Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN EN 60747-5-2



2. Functional Description

2.1. Theory of Operation

The operation of an Si844x 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 a single Si844x channel is shown in Figure 5.

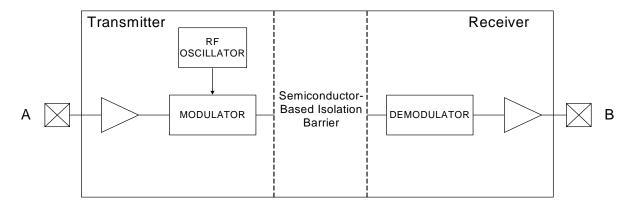
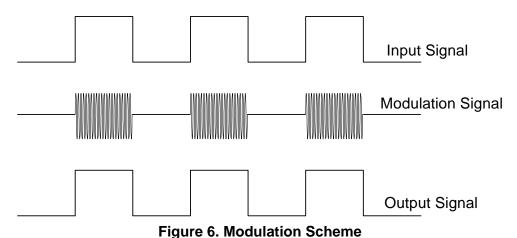


Figure 5. Simplified Channel Diagram

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 Figure 6 for more details.





2.2. Eye Diagram

Figure 7 illustrates an eye-diagram taken on an Si8440. For the data source, the test used an Anritsu (MP1763C) Pulse Pattern Generator set to 1000 ns/div. The output of the generator's clock and data from an Si8440 were captured on an oscilloscope. The results illustrate that data integrity was maintained even at the high data rate of 150 Mbps. The results also show that 2 ns pulse width distortion and 250 ps peak jitter were exhibited.

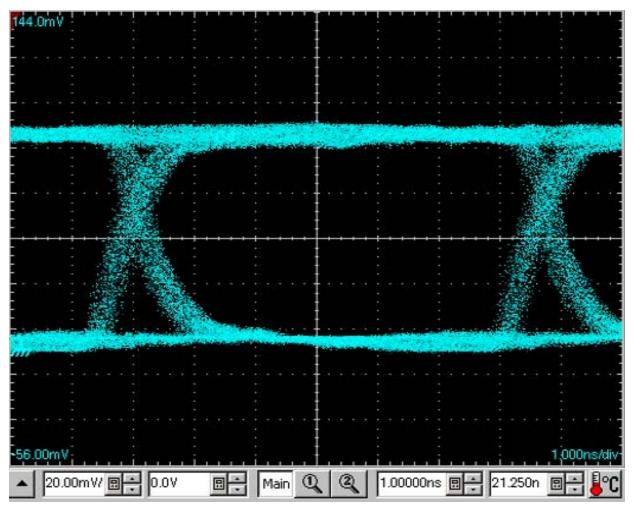


Figure 7. Eye Diagram



2.3. Device Operation

Device behavior during start-up, normal operation, and shutdown is shown in Table 12. Table 13 provides an overview of the output states when the Enable pins are active.

Table 12. Si84xx Logic Operation Table

V _I Input ^{1,2}	EN Input ^{1,2,3,4}	VDDI State ^{1,5,6}	VDDO State ^{1,5,6}	V _O Output ^{1,2}	Comments
Н	H or NC	Р	Р	Н	Enabled normal energtion
L	H or NC	Р	Р	L	Enabled, normal operation.
X ⁷	L	Р	Р	Hi-Z or L ⁸	Disabled.
X ⁷	H or NC	UP	Р	L	Upon transition of VDDI from unpowered to powered, V_{O} returns to the same state as V_{I} in less than 1 μ s.
X ⁷	L	UP	Р	Hi-Z or L ⁸	Disabled.
X ⁷	X ⁷	Р	UP	Undetermined	Upon transition of VDDO from unpowered to powered, V_O returns to the same state as V_I within 1 μ s, if EN is in either the H or NC state. Upon transition of VDDO from unpowered to powered, V_O returns to Hi-Z within 1 μ s if EN is L.

Notes:

- VDDI and VDDO are the input and output power supplies. V_I and V_O are the respective input and output terminals. EN
 is the enable control input located on the same output side.
- 2. X = not applicable; H = Logic High; L = Logic Low; Hi-Z = High Impedance.
- 3. It is recommended that the enable inputs be connected to an external logic high or low level when the Si84xx is operating in noisy environments.
- 4. No Connect (NC) replaces EN1 on Si8440/45. No Connect replaces EN2 on the Si8445. No Connects are not internally connected and can be left floating, tied to VDD, or tied to GND.
- 5. "Powered" state (P) is defined as 2.70 V < VDD < 5.5 V.
- 6. "Unpowered" state (UP) is defined as VDD = 0 V.
- 7. Note that an I/O can power the die for a given side through an internal diode if its source has adequate current.
- 8. When using the enable pin (EN) function, the output pin state is driven to a logic low state when the EN pin is disabled (EN = 0) in Revision C. Revision D outputs go into a high-impedance state when the EN pin is disabled (EN = 0). See "3. Errata and Design Migration Guidelines" on page 25 for more details.



Table 13. Enable Input Truth Table¹

P/N	EN1 ^{1,2}	EN2 ^{1,2}	Operation
Si8440	_	Н	Outputs B1, B2, B3, B4 are enabled and follow the input state.
	_	L	Outputs B1, B2, B3, B4 are disabled and Logic Low or in high impedance state. ³
Si8441	Н	Х	Output A4 enabled and follows the input state.
	L	Х	Output A4 disabled and Logic Low or in high impedance state. ³
	Х	Н	Outputs B1, B2, B3 are enabled and follow the input state.
	Х	L	Outputs B1, B2, B3 are disabled and Logic Low or in high impedance state. ³
Si8442	Н	Х	Outputs A3 and A4 are enabled and follow the input state.
	L	Х	Outputs A3 and A4 are disabled and Logic Low or in high impedance state. ³
	Х	Н	Outputs B1 and B2 are enabled and follow the input state.
	Х	L	Outputs B1 and B2 are disabled and Logic Low or in high impedance state. ³
Si8445	_	_	Outputs B1, B2, B3, B4 are enabled and follow the input state.

Notes:

- 1. Enable inputs EN1 and EN2 can be used for multiplexing, for clock sync, or other output control. EN1, EN2 logic operation is summarized for each isolator product in Table 13. These inputs are internally pulled-up to local VDD by a 3 μA current source allowing them to be connected to an external logic level (high or low) or left floating. To minimize noise coupling, do not connect circuit traces to EN1 or EN2 if they are left floating. If EN1, EN2 are unused, it is recommended they be connected to an external logic level, especially if the Si84xx is operating in a noisy environment.
- **2.** X = not applicable; H = Logic High; L = Logic Low.
- 3. When using the enable pin (EN) function, the output pin state is driven to a logic low state when the EN pin is disabled (EN = 0) in Revision C. Revision D outputs go into a high-impedance state when the EN pin is disabled (EN = 0). See "3. Errata and Design Migration Guidelines" on page 25 for more details.



2.4. Layout Recommendations

To ensure safety in the end user application, high voltage circuits (i.e., circuits with $>30 \text{ V}_{AC}$) must be physically separated from the safety extra-low voltage circuits (SELV is a circuit with $<30 \text{ V}_{AC}$) by a certain distance (creepage/clearance). If a component, such as a digital isolator, straddles this isolation barrier, it must meet those creepage/clearance requirements and also provide a sufficiently large high-voltage breakdown protection rating (commonly referred to as working voltage protection). Table 6 on page 15 and Table 7 on page 15 detail the working voltage and creepage/clearance capabilities of the Si84xx. These tables also detail the component standards (UL1577, IEC60747, CSA 5A), which are readily accepted by certification bodies to provide proof for end-system specifications requirements. Refer to the end-system specification (61010-1, 60950-1, etc.) requirements before starting any design that uses a digital isolator.

The following sections detail the recommended bypass and decoupling components necessary to ensure robust overall performance and reliability for systems using the Si84xx digital isolators.

2.4.1. Supply Bypass

Digital integrated circuit components typically require 0.1 μ F (100 nF) bypass capacitors when used in electrically quiet environments. However, digital isolators are commonly used in hazardous environments with excessively noisy power supplies. To counteract these harsh conditions, it is recommended that an additional 1 μ F bypass capacitor be added between VDD and GND on both sides of the package. The capacitors should be placed as close as possible to the package to minimize stray inductance. If the system is excessively noisy, it is recommended that the designer add 50 to 100 Ω resistors in series with the VDD supply voltage source and 50 to 300 Ω resistors in series with the digital inputs/outputs (see Figure 8). For more details, see "3. Errata and Design Migration Guidelines" on page 25.

All components upstream or downstream of the isolator should be properly decoupled as well. If these components are not properly decoupled, their supply noise can couple to the isolator inputs and outputs, potentially causing damage if spikes exceed the maximum ratings of the isolator (6 V). In this case, the 50 to 300 Ω resistors protect the isolator's inputs/outputs (note that permanent device damage may occur if the absolute maximum ratings are exceeded). Functional operation should be restricted to the conditions specified in Table 1, "Recommended Operating Conditions," on page 4.

2.4.2. Pin Connections

No connect pins are not internally connected. They can be left floating, tied to V_{DD}, or tied to GND.

2.4.3. Output Pin Termination

The nominal output impedance of an isolator driver channel is approximately 85 Ω , $\pm 40\%$, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces. The series termination resistor values should be scaled appropriately while keeping in mind the recommendations described in "2.4.1. Supply Bypass" above.

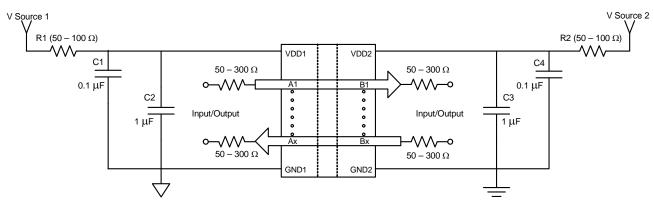
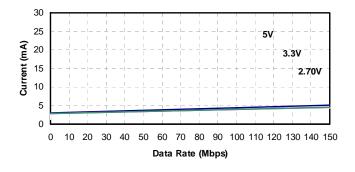


Figure 8. Recommended Bypass Components for the Si84xx Digital Isolator Family

2.5. Typical Performance Characteristics

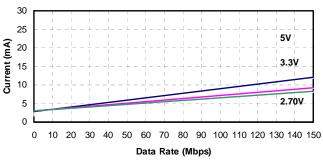
The typical performance characteristics depicted in the following diagrams are for information purposes only. Refer to Tables 3, 4, and 5 for actual specification limits.



30 5V 25 Current (mA) 20 3.3V 15 2.70V 10 5 0 10 20 30 40 50 70 80 90 100 110 120 130 140 150 0 Data Rate (Mbps)

Figure 9. Si8440/45 Typical V_{DD1} Supply Current vs. Data Rate 5, 3.3, and 2.70 V Operation

Figure 12. Si8440/45 Typical V_{DD2} Supply Current vs. Data Rate 5, 3.3, and 2.70 V



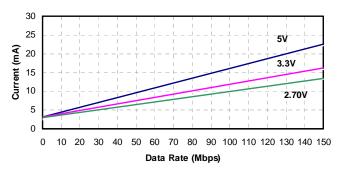
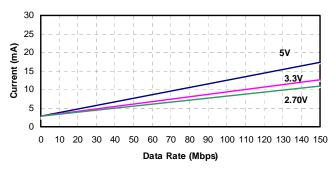


Figure 10. Si8441 Typical V_{DD1} Supply Current vs. Data Rate 5, 3.3, and 2.70 V Operation

Figure 13. Si8441 Typical V_{DD2} Supply Current vs. Data Rate 5, 3.3, and 2.70 V Operation (15 pF Load)



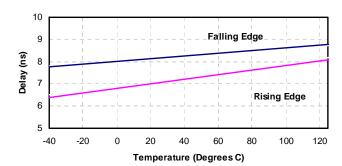


Figure 11. Si8442 Typical V_{DD1} or V_{DD2} Supply Current vs. Data Rate 5, 3.3, and 2.70 V Operation (15 pF Load)

Figure 14. Propagation Delay vs. Temperature



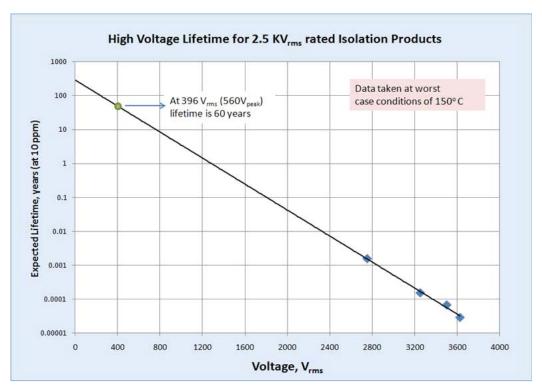


Figure 15. Si84xx Time-Dependent Dielectric Breakdown



3. Errata and Design Migration Guidelines

The following errata apply to Revision C devices only. See "5. Ordering Guide" on page 27 for more details. No errata exist for Revision D devices.

3.1. Enable Pin Causes Outputs to Go Low (Revision C Only)

When using the enable pin (EN1, EN2) function on the 4-channel (Si8440/1/2) isolators, the corresponding output pin states (pin = An, Bn, where n can be 1...4) are driven to a logic low (to ground) when the enable pin is disabled (EN1 or EN2 = 0). This functionality is different from the legacy 4-channel (Si8440/1/2) isolators. On those devices, the isolator outputs go into a high-impedance state (Hi-Z) when the enable pin is disabled (EN1 = 0 or EN2 = 0).

3.1.1. Resolution

The enable pin functionality causing the outputs to go low is supported in production for Revision C of the Si844x devices. Revision D corrects the enable pin functionality (i.e., the outputs will go into the high-impedance state to match the legacy isolator products). Refer to the Ordering Guide sections of the data sheet(s) for current ordering information.

3.2. Power Supply Bypass Capacitors (Revision C and Revision D)

When using the Si844x isolators with power supplies \geq 4.5 V, sufficient VDD bypass capacitors must be present on both the VDD1 and VDD2 pins to ensure the VDD rise time is less than 0.5 V/ μ s (which is > 9 μ s for a \geq 4.5 V supply). Although rise time is power supply dependent, \geq 1 μ F capacitors are required on both power supply pins (VDD1, VDD2) of the isolator device.

3.2.1. Resolution

For recommendations on resolving this issue, see "2.4.1. Supply Bypass" on page 22. Additionally, refer to "5. Ordering Guide" on page 27 for current ordering information.

3.3. Latch Up Immunity (Revision C Only)

Latch up immunity generally exceeds \pm 200 mA per pin. Exceptions: Certain pins provide < 100 mA of latch-up immunity. To increase latch-up immunity on these pins, 100 Ω of equivalent resistance must be included in series with *all* of the pins listed in Table 14. The 100 Ω equivalent resistance can be comprised of the source driver's output resistance and a series termination resistor. The Si8441 is not affected when using power supply voltages (VDD1 and VDD2) \leq 3.5 V.

3.3.1. Resolution

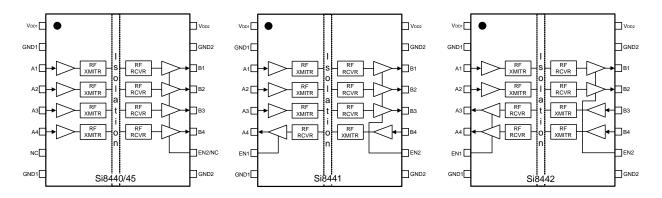
This issue has been corrected with Revision D of the device. Refer to "5. Ordering Guide" for current ordering information.

Table 14. Affected Ordering Part Numbers (Revision C Only)

Affected Ordering Part Numbers*	Device Revision	Pin#	Name	Pin Type
		6	A4	Input or Output
SI8440SV-C-IS/IS1, SI8441SV-C-IS/IS1, SI8442SV-C-IS/IS1	С	10	EN2	Input
0.01.207 0.10/101		14	B1	Output
01044507/ 0 10/104		6	A4	Input
SI8445SV-C-IS/IS1	С	14	B1	Output
*Note: SV = Speed Grade/Isolation Rating (AA,		14		B1



4. Pin Descriptions



Name	SOIC-16 Pin#	Туре	Description ¹
V _{DD1}	1	Supply	Side 1 power supply.
GND1	2	Ground	Side 1 ground.
A1	3	Digital Input	Side 1 digital input.
A2	4	Digital Input	Side 1 digital input.
A3	5	Digital I/O	Side 1 digital input or output.
A4	6	Digital I/O	Side 1 digital input or output.
EN1/NC ²	7	Digital Input	Side 1 active high enable. NC on Si8440/45.
GND1	8	Ground	Side 1 ground.
GND2	9	Ground	Side 2 ground.
EN2/NC ²	10	Digital Input	Side 2 active high enable. NC on Si8445.
B4	11	Digital I/O	Side 2 digital input or output.
В3	12	Digital I/O	Side 2 digital input or output.
B2	13	Digital Output	Side 2 digital output.
B1	14	Digital Output	Side 2 digital output.
GND2	15	Ground	Side 2 ground.
V _{DD2}	16	Supply	Side 2 power supply.

Notes:

- 1. For narrow-body devices, Pin 2 and Pin 8 GND must be externally connected to respective ground. Pin 9 and Pin 15 must also be connected to external ground.
- 2. No Connect. These pins are not internally connected. They can be left floating, tied to V_{DD} or tied to GND.



5. Ordering Guide

Revision D devices are recommended for all new designs.

Table 15. Ordering Guide for Valid OPNs¹

Ordering Part Number (OPN)	Number of Inputs VDD1 Side	Number of Inputs VDD2 Side	Maximum Data Rate (Mbps)	Isolation Rating	Temp Range	Package Type
Revision D Devices	s ²					
Si8440AA-D-IS1	4	0	1			
Si8440BA-D-IS1	4	0	150			
Si8441AA-D-IS1	3	1	1			
Si8441BA-D-IS1	3	1	150	1 kVrms	–40 to 125 °C	NB SOIC-16 ¹
Si8442AA-D-IS1	2	2	1			
Si8442BA-D-IS1	2	2	150			
Si8445BA-D-IS1	4	0	150			
Si8440AB-D-IS	4	0	1			
Si8440BB-D-IS	4	0	150			
Si8441AB-D-IS	3	1	1			
Si8441BB-D-IS	3	1	150	2.5 kVrms	–40 to 125 °C	WB SOIC-16 ^{1,3}
Si8442AB-D-IS	2	2	1			
Si8442BB-D-IS	2	2	150			
Si8445BB-D-IS	4	0	150			
Si8440AB-D-IS1	4	0	1			
Si8440BB-D-IS1	4	0	150			
Si8441AB-D-IS1	3	1	1			
Si8441BB-D-IS1	3	1	150	2.5 kVrms	–40 to 125 °C	NB SOIC-16 ¹
Si8442AB-D-IS1	2	2	1			
Si8442BB-D-IS1	2	2	150			
Si8445BB-D-IS1	4	0	150			

Notes:

- 1. All packages are RoHS-compliant with peak reflow temperatures of 260 °C according to the JEDEC industry standard classifications and peak solder temperatures.
 - Moisture sensitivity level is MSL2A for wide-body SOIC-16 packages.
 - Moisture sensitivity level is MSL2A for narrow-body SOIC-16 packages.
- 2. Revision C devices are supported for existing designs, but Revision D is recommended for all new designs.
- 3. AEC-Q100 qualified.



Table 15. Ordering Guide for Valid OPNs¹ (Continued)

Ordering Part Number (OPN)	Number of Inputs VDD1 Side	Number of Inputs VDD2 Side	Maximum Data Rate (Mbps)	Isolation Rating	Temp Range	Package Type
Revision C Device	s ²					
Si8440AA-C-IS1	4	0	1			
Si8440BA-C-IS1	4	0	150			
Si8441AA-C-IS1	3	1	1			
Si8441BA-C-IS1	3	1	150	1 kVrms	–40 to 125 °C	NB SOIC-16 ¹
Si8442AA-C-IS1	2	2	1			
Si8442BA-C-IS1	2	2	150			
Si8445BA-C-IS1	4	0	150			
Si8440AB-C-IS	4	0	1			
Si8440BB-C-IS	4	0	150			
Si8441AB-C-IS	3	1	1			
Si8441BB-C-IS	3	1	150	2.5 kVrms	−40 to 125 °C	WB SOIC-16 ¹
Si8442AB-C-IS	2	2	1			
Si8442BB-C-IS	2	2	150			
Si8445BB-C-IS	4	0	150			
Si8440AB-C-IS1	4	0	1			
Si8440BB-C-IS1	4	0	150			
Si8441AB-C-IS1	3	1	1			
Si8441BB-C-IS1	3	1	150	2.5 kVrms	−40 to 125 °C	NB SOIC-16 ¹
Si8442AB-C-IS1	2	2	1			
Si8442BB-C-IS1	2	2	150			
Si8445BB-C-IS1	4	0	150			

Notes:

- 1. All packages are RoHS-compliant with peak reflow temperatures of 260 °C according to the JEDEC industry standard classifications and peak solder temperatures.
 - Moisture sensitivity level is MSL2A for wide-body SOIC-16 packages.
 - Moisture sensitivity level is MSL2A for narrow-body SOIC-16 packages.
- 2. Revision C devices are supported for existing designs, but Revision D is recommended for all new designs.
- 3. AEC-Q100 qualified.



6. Package Outline: 16-Pin Wide Body SOIC

Figure 16 illustrates the package details for the Si844x Digital Isolator. Table 16 lists the values for the dimensions shown in the illustration.

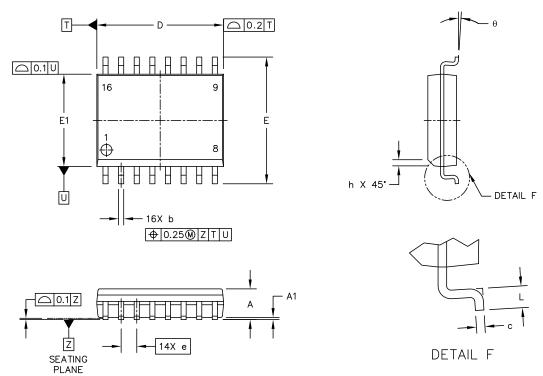


Figure 16. 16-Pin Wide Body SOIC

Table 16. Package Diagram Dimensions

	Millimeters				
Symbol	Min	Max			
Α	_	2.65			
A1	0.1	0.3			
D	10.3	BSC			
Е	10.3	BSC			
E1	7.5	BSC			
b	0.31	0.51			
С	0.20	0.33			
е	1.27	BSC			
h	0.25	0.75			
L	0.4	1.27			
θ	0°	7°			



7. Land Pattern: 16-Pin Wide-Body SOIC

Figure 17 illustrates the recommended land pattern details for the Si844x in a 16-pin wide-body SOIC. Table 17 lists the values for the dimensions shown in the illustration.

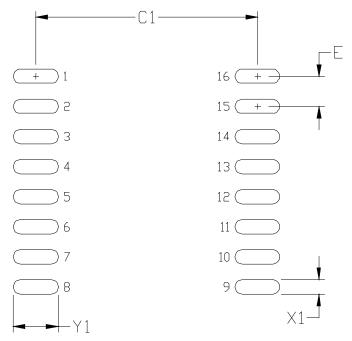


Figure 17. 16-Pin SOIC Land Pattern

Table 17. 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. Package Outline: 16-Pin Narrow Body SOIC

Figure 18 illustrates the package details for the Si844x in a 16-pin narrow-body SOIC (SO-16). Table 18 lists the values for the dimensions shown in the illustration.

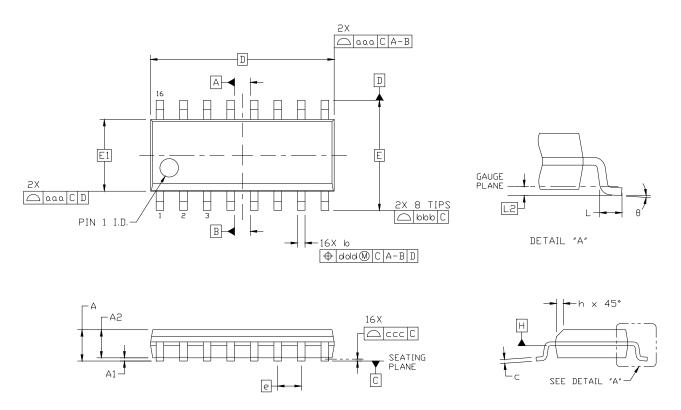


Figure 18. 16-pin Small Outline Integrated Circuit (SOIC) Package

Table 18. Package Diagram Dimensions

Dimension	Min	Max
А		1.75
A1	0.10	0.25
A2	1.25	_
b	0.31	0.51
С	0.17	0.25
D	9.90 [BSC
E	6.00 I	BSC
E1	3.90 [BSC
е	1.27 [BSC
L	0.40	1.27
L2	0.25 l	BSC



Table 18. Package Diagram Dimensions (Continued)

h	0.25	0.50
θ	0°	8°
aaa	0.1	0
bbb	0.2	0
ccc	0.1	0
ddd	0.2	5

Notes:

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

9. Land Pattern: 16-Pin Narrow Body SOIC

Figure 19 illustrates the recommended land pattern details for the Si844x in a 16-pin narrow-body SOIC. Table 19 lists the values for the dimensions shown in the illustration.

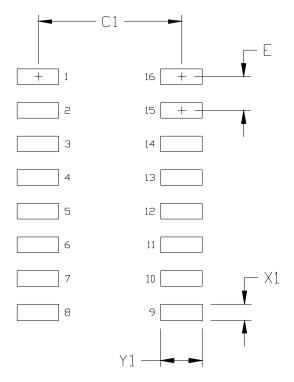


Figure 19. 16-Pin Narrow Body SOIC PCB Land Pattern

Table 19. 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

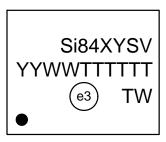
Notes:

- **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.



10. Top Marking: 16-Pin Wide Body SOIC

10.1. 16-Pin Wide Body SOIC Top Marking



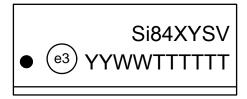
10.2. Top Marking Explanation

Line 1 Marking:	Base Part Number Ordering Options (See Ordering Guide for more information).	Si84 = Isolator product series XY = Channel Configuration X = # of data channels (4, 3, 2, 1) Y = # of reverse channels (2, 1, 0)* S = Speed Grade A = 1 Mbps; B = 150 Mbps V = Insulation rating A = 1 kV; B = 2.5 kV
Line 2 Marking:	YY = Year WW = Workweek	Assigned by Assembly House. Corresponds to the year and workweek of the mold date.
	TTTTTT = Mfg Code	Manufacturing Code from Assembly House
Line 3 Marking:	Circle = 1.5 mm Diameter (Center-Justified)	"e3" Pb-Free Symbol
	Country of Origin ISO Code Abbreviation	TW = Taiwan
*Note: Si8445 has 0 reverse channels.		



11. Top Marking: 16-Pin Narrow Body SOIC

11.1. 16-Pin Narrow Body SOIC Top Marking



11.2. Top Marking Explanation

Line 1 Marking:	Base Part Number Ordering Options (See Ordering Guide for more information).	Si84 = Isolator product series XY = Channel Configuration X = # of data channels (4, 3, 2, 1) Y = # of reverse channels (2, 1, 0)* S = Speed Grade A = 1 Mbps; B = 150 Mbps V = Insulation rating A = 1 kV; B = 2.5 kV
Line 2 Marking:	Circle = 1.2 mm Diameter YY = Year WW = Work Week	"e3" Pb-Free Symbol Assigned by the Assembly House. Corresponds to the year and work week of the mold date.
	TTTTTT = Mfg code	Manufacturing Code from Assembly Purchase Order form.
	Circle = 1.2 mm diameter	"e3" Pb-Free Symbol.
*Note: Si8445 has 0 reverse channels.		



DOCUMENT CHANGE LIST

Revision 0.62 to Revision 0.63

- Rev 0.63 is the first revision of this document that applies to the new series of ultra low power isolators featuring pinout and functional compatibility with previous isolator products.
- Updated "1. Electrical Specifications".
- Updated "5. Ordering Guide".
- Added "10. Top Marking: 16-Pin Wide Body SOIC".

Revision 0.63 to Revision 0.64

Updated all specs to reflect latest silicon.

Revision 0.64 to Revision 0.65

- Updated all specs to reflect latest silicon.
- Added "3. Errata and Design Migration Guidelines" on page 25.
- Added "11. Top Marking: 16-Pin Narrow Body SOIC" on page 35.

Revision 0.65 to Revision 1.0

- Updated document to reflect availability of Revision D silicon.
- Updated Tables 3,4, and 5.
 - Updated all supply currents and channel-channel skew.
- Updated Table 2.
 - Updated absolute maximum supply voltage.
- Updated Table 7.
 - Updated clearance and creepage dimensions.
- Updated Table 12.
 - Updated Note 7.
- Updated Table 13.
 - Updated Note 3.
- Updated "3. Errata and Design Migration Guidelines" on page 25.
- Updated "5. Ordering Guide" on page 27.

Revision 1.0 to Revision 1.1

- Updated Tables 3, 4, and 5.
 - Updated notes in both tables to reflect output impedance of 85 Ω.
 - Updated rise and fall time specifications.
 - Updated CMTI value.

Revision 1.1 to Revision 1.2

- Updated document throughout to include MSL improvements to MSL2A.
- Updated "5. Ordering Guide" on page 27.
 - Updated Note 1 in ordering guide table to reflect improvement and compliance to MSL2A moisture sensitivity level.

Revision 1.2 to Revision 1.3

- Updated "Features" on page 1.
- Moved Tables 1 and 2 to page 4.
- Updated Tables 6, 7, 8, and 9.
- Updated Table 12 footnotes.
- Added Figure 15, "Si84xx Time-Dependent Dielectric Breakdown," on page 24.

Revision 1.3 to Revision 1.4

- Updated "2.4.1. Supply Bypass" on page 22.
- Added Figure 8, "Recommended Bypass Components for the Si84xx Digital Isolator Family," on page 22.
- Updated "3.2. Power Supply Bypass Capacitors (Revision C and Revision D)" on page 25.

Revision 1.4 to Revision 1.5

 Updated "5. Ordering Guide" on page 27 to include MSL2A.



Notes:



Si8440/41/42/45

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