ISO774x EMC 性能优异的高速四通道增强型数字隔离器

1 特性

- 信号传输速率：高达 100Mbps
- 宽电源电压范围：2.25V 至 5.5V
- 2.25V 和 5V 电平转换
- 默认输出*高电平*和*低电平*选项
- 宽温度范围：–55°C 至 125°C
- 低功耗，电流典型值为 1.5mA/通道（1Mbps 时）
- 低传播延迟：典型值为 10.7ns（5V 电源供电时）
- 高共模瞬态抗扰度 (CMTI)：±100kV/μs（典型值）
- 优异的电磁兼容性 (EMC)
  - 系统级静电放电 (ESD)、瞬态放电 (EFT) 以及抗浪涌保护
  - 低辐射
- 隔离栅寿命：> 40 年
- 宽体小外形尺寸集成电路 (SOIC) (DW-16) 和 QSOP (DBQ-16) 封装选项
- 安全相关认证：
  - DIN V VDE V 0884-10 (VDE V 0884-10)：2006-12
  - UL 1577 组件认证计划
  - CSA 组件验收通知 5A，IEC 60950-1 和 IEC 60601-1 终端设备标准
  - 符合 GB4943.1-2011 的 CQC 认证
  - 符合 EN 60950-1 和 EN 61010-1 标准的 TUV 认证
  - 通过 DW 封装认证；其他全部认证纳入规划

2 应用范围

- 工业自动化
- 电机控制
- 电源
- 太阳能逆变器
- 医疗设备

3 说明

ISO774x 器件是高性能四通道数字隔离器，可提供符合 UL 1577 的 5000 V_{RMS}（DW 封装）和 2500 V_{RMS}（DBQ 封装）隔离额定值。该系列器件的增强型隔离额定值符合 VDE、CSA、TUV 和 CQC 标准。

在隔离互补金属氧化物半导体 (CMOS) 或者低电压互补金属氧化物半导体 (LVCMOS) 数字 I/O 时，ISO774x 器件可提供高电磁抗扰度和低辐射，同时具备低功耗特性。每条隔离通道的逻辑输入和输出缓冲器均由二氧化硅 (SiO_2) 绝缘栅相隔离。该器件配有使能引脚，可用于将多个主驱动应用中的相应输出置于 高阻抗状态，也可用于降低功耗。ISO7740 器件具有四条同向通道，ISO7741 器件具有三条正向通道和一条反向通道，ISO7742 器件具有两条正向通道和两条反向通道。如果输入功率或信号出现损失，不带后缀 F 的器件默认输出*高电平*，带后缀 F 的器件默认输出*低电平*。更多详细信息，请参见 *器件功能模式*部分。

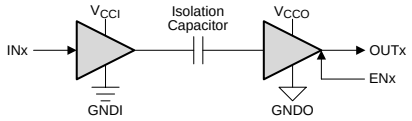
与隔离式电源结合使用时，该器件有助于防止数据总线或者其他电路中的噪声电流进入本地接地，进而干扰或损坏敏感电路。凭借创新型芯片设计和布线技术，ISO774x 器件的电磁兼容性得到了显著增强，可缓解系统级 ESD、EFT 和浪涌问题并符合辐射标准。ISO774x 系列器件采用 16 引脚小外形尺寸集成电路 (SOIC) 和 QSOP 封装。

(1)

器件型号	封装	封装尺寸（标称值）
ISO7740 ISO7741 ISO7742	SOIC (DW)	10.30mm x 7.50mm
	SSOP (DBQ)	4.90mm × 3.90mm

(1) 要了解所有可用封装，请参见数据表末尾的可订购产品附录。

简化电路原理图



V_{CCI} 和 GNDI 分别是输入通道的电源和接地连接。

V_{CCO} 和 GNDO 分别是输出通道的电源和接地连接。

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4 修订历史记录

注：之前版本的页码可能与当前版本有所不同。

Changes from Revision C (December 2016) to Revision D **Page**

- Updated the *Safety-Related Certifications* table ... 9
- Changed the minimum CMTI from 40 to 85 in all *Electrical Characteristics* tables ... 10

Changes from Revision B (October 2016) to Revision C **Page**

- Changed the *Regulatory Information* table to *Safety-Related Certifications* and updated content. ... 9
- Changed the certifications from planned to certified in the *Safety-Related Certifications* table ... 9

Changes from Revision A (June 2016) to Revision B **Page**

- 已将*特性*“高 CMTI：±75kV/μs（典型值）”更改为“高 CMTI：±100kV/μs（典型值）” ... 1
- 已将*特性*“全部认证纳入规划”更改为“通过 DW 封装的 VDE、UL 和 TUV 认证；其他全部认证纳入规划” ... 1
- Changed the unit value of CLR and CPG From: μm To: mm in *Insulation Specifications* ... 8
- Changed From: "Plan to certify" To: "Certified" in column VDE of *Safety-Related Certifications* ... 9
- Added a conditions statement to *Safety-Related Certifications* ... 9
- Changed From: "Plan to certify" To: "Certified" in column UL of *Safety-Related Certifications* ... 9
- Changed From: "Plan to certify" To: "Certified" in column TUV of *Safety-Related Certifications* ... 9
- Changed From: "Certification Planned" To: 'Certificate number: 40040142" in column VDE of *Safety-Related Certifications* ... 9
- Changed From: "Certification Planned" To: "File number: E181974" in column VDE of *Safety-Related Certifications* ... 9
- Changed From: "Certification Planned" To: "Client ID number: 77311" in column TUV of *Safety-Related Certifications* ... 9

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- Changed the CMTI TYP value From: 75 kV/μs To: 100 kV/μs in the *Electrical Characteristics—5-V Supply* 10
- Changed the CMTI TYP value From: 75 kV/μs To: 100 kV/μs in the *Electrical Characteristics—3.3-V Supply* 12
- Changed the CMTI TYP value From: 75 kV/μs To: 100 kV/μs in the *Electrical Characteristics—2.5-V Supply* 14
- Changed the t_{DO} TYP value From: 6 μs To: 0.1 μs and the MAX value From: 9 μs To: 0.3 μs in the *Switching Characteristics—5-V Supply* 16
- Changed the t_{DO} TYP value From: 6 μs To: 0.1 μs and the MAX value From: 9 μs To: 0.3 μs in the *Switching Characteristics—3.3-V Supply* 16
- Changed the t_{DO} TYP value From: 6 μs To: 0.1 μs and the MAX value From: 9 μs To: 0.3 μs in the *Switching Characteristics—2.5-V Supply* 17
- Added Note B to Figure 17 22
- Changed the *Design Requirements* paragraph 27
- Replaced the *Power Supply Recommendations* section 28

Changes from Original (March 2016) to Revision A **Page**

- 已将器件状态由“产品预览”更改为“量产数据” 1

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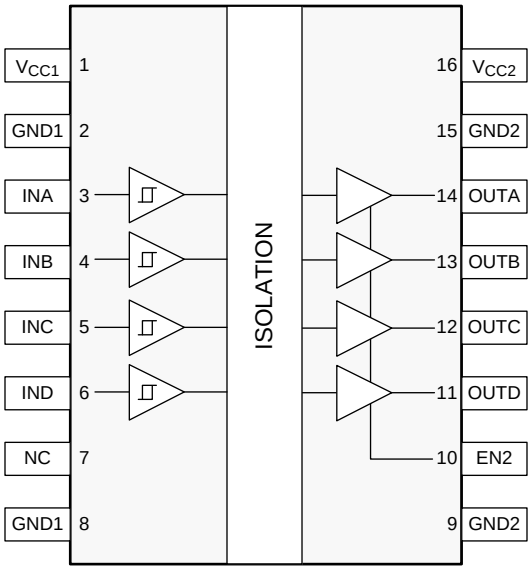
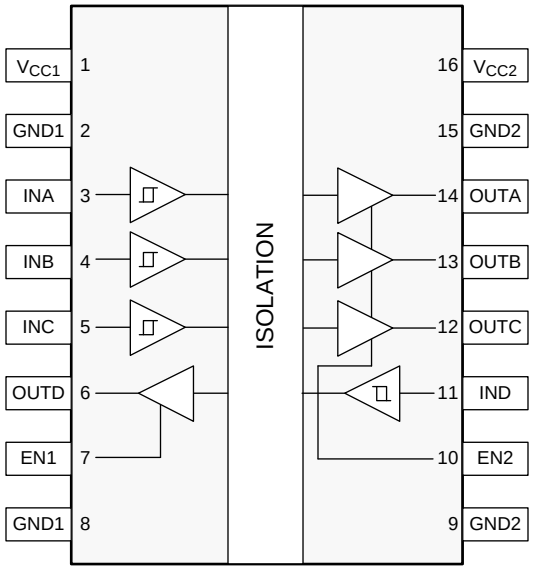
5 Pin Configuration and Functions

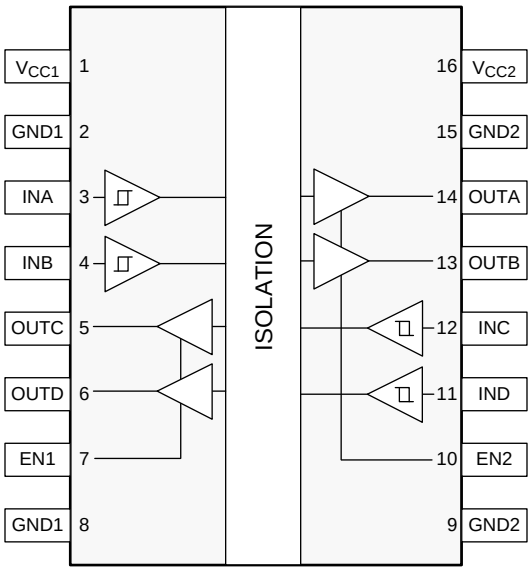
ISO7740 DW and DBQ Packages
16-Pin SOIC-WB and QSOP
Top View



ISO7741 DW and DBQ Packages
16-Pin SOIC-WB and QSOP
Top View



ISO7742 DW and DBQ Packages
16-Pin SOIC-WB and QSOP
Top View



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Pin Functions

PIN				I/O	DESCRIPTION
NAME	ISO7740	ISO7741	ISO7742		
EN1	—	7	7	I	Output enable 1. Output pins on side 1 are enabled when EN1 is high or open and in high-impedance state when EN1 is low.
EN2	10	10	10	I	Output enable 2. Output pins on side 2 are enabled when EN2 is high or open and in high-impedance state when EN2 is low.
GND1	2	2	2	—	Ground connection for V_{CC1}
	8	8	8		
GND2	9	9	9	—	Ground connection for V_{CC2}
	15	15	15		
INA	3	3	3	I	Input, channel A
INB	4	4	4	I	Input, channel B
INC	5	5	12	I	Input, channel C
IND	6	11	11	I	Input, channel D
NC	7	—	—	—	Not connected
OUTA	14	14	14	O	Output, channel A
OUTB	13	13	13	O	Output, channel B
OUTC	12	12	5	O	Output, channel C
OUTD	11	6	6	O	Output, channel D
V_{CC1}	1	1	1	—	Power supply, side 1
V_{CC2}	16	16	16	—	Power supply, side 2

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6 Specifications

6.1 Absolute Maximum Ratings

See (1)

		MIN	MAX	UNIT
V_{CC1}, V_{CC2}	Supply voltage(2)	–0.5	6	V
V	Voltage at INx, OUTx, ENx	–0.5	V_{CCX} + 0.5(3)	V
I_O	Output current	–15	15	mA
T_J	Junction temperature		150	°C
T_{stg}	Storage temperature	–65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) All voltage values except differential I/O bus voltages are with respect to the local ground terminal (GND1 or GND2) and are peak voltage values.
(3) Maximum voltage must not exceed 6 V.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins(1)	±6000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins(2)	±1500	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6.3 Recommended Operating Conditions

			MIN	NOM	MAX	UNIT
V_{CC1}, V_{CC2}	Supply voltage		2.25		5.5	V
$V_{CC(UVLO+)}$	UVLO threshold when supply voltage is rising			2	2.25	V
$V_{CC(UVLO-)}$	UVLO threshold when supply voltage is falling		1.7	1.8		V
$V_{HYS(UVLO)}$	Supply voltage UVLO hysteresis		100	200		mV
I_{OH}	High-level output current	V_{CCO}(1) = 5 V	–4			mA
		V_{CCO} = 3.3 V	–2			
		V_{CCO} = 2.5 V	–1			
I_{OL}	Low-level output current	V_{CCO} = 5 V			4	mA
		V_{CCO} = 3.3 V			2	
		V_{CCO} = 2.5 V			1	
V_{IH}	High-level input voltage		0.7 × V_{CCI} (1)		V_{CCI}	V
V_{IL}	Low-level input voltage		0		0.3 × V_{CCI}	V
DR	Data rate		0		100	Mbps
T_A	Ambient temperature		–55	25	125	°C

(1) V_{CCI} = Input-side V_{CC}; V_{CCO} = Output-side V_{CC}.

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6.4 Thermal Information

THERMAL METRIC[1]		ISO774x		UNIT
		DW (SOIC)	DBQ (QSOP)	
		16 Pins	16 Pins	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	83.4	109	°C/W
$R_{\theta JC(top)}$	Junction-to-case(top) thermal resistance	46	54.4	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	48	51.9	°C/W
ψ_{JT}	Junction-to-top characterization parameter	19.1	14.2	°C/W
ψ_{JB}	Junction-to-board characterization parameter	47.5	51.4	°C/W
$R_{\theta JC(bottom)}$	Junction-to-case(bottom) thermal resistance	—	—	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report (SPRA953).

6.5 Power Rating

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
ISO7740						
P_D	Maximum power dissipation	$V_{CC1} = V_{CC2} = 5.5$ V, $T_J = 150$°C, $C_L = 15$ pF, Input a 50-MHz 50% duty cycle square wave			200	mW
P_{D1}	Maximum power dissipation by side-1				40	mW
P_{D2}	Maximum power dissipation by side-2				160	mW
ISO7741						
P_D	Maximum power dissipation	$V_{CC1} = V_{CC2} = 5.5$ V, $T_J = 150$°C, $C_L = 15$ pF, Input a 50-MHz 50% duty cycle square wave			200	mW
P_{D1}	Maximum power dissipation by side-1				50	mW
P_{D2}	Maximum power dissipation by side-2				150	mW
ISO7742						
P_D	Maximum power dissipation	$V_{CC1} = V_{CC2} = 5.5$ V, $T_J = 150$°C, $C_L = 15$ pF, Input a 50-MHz 50% duty cycle square wave			200	mW
P_{D1}	Maximum power dissipation by side-1				100	mW
P_{D2}	Maximum power dissipation by side-2				100	mW

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6.6 Insulation Specifications

PARAMETER		TEST CONDITIONS	VALUE		UNIT
			DW-16	DBQ-16	
CLR	External clearance(1)	Shortest terminal-to-terminal distance through air	>8	>3.7	mm
CPG	External creepage(1)	Shortest terminal-to-terminal distance across the package surface	>8	>3.7	mm
DTI	Distance through the insulation	Minimum internal gap (internal clearance)	>21	>21	μm
CTI	Comparative tracking index	DIN EN 60112 (VDE 0303-11); IEC 60112	>600	>600	V
	Material group	According to IEC 60664-1	I	I	
	Overvoltage category per IEC 60664-1	Rated mains voltage ≤ 300 V_{RMS}	I-IV	I-III	
		Rated mains voltage ≤ 600 V_{RMS}	I-IV	n/a	
		Rated mains voltage ≤ 1000 V_{RMS}	I-III	n/a	
DIN V VDE V 0884-10 (VDE V 0884-10):2006-12(2)					
V_{IORM}	Maximum repetitive peak isolation voltage	AC voltage (bipolar)	1414	566	V_{PK}
V_{IOWM}	Maximum isolation working voltage	AC voltage; Time dependent dielectric breakdown (TDDB) Test	1000	400	V_{RMS}
		DC voltage	1414	566	V_{DC}
V_{IOTM}	Maximum transient isolation voltage	$V_{TEST} = V_{IOTM}$ t = 60 s (qualification) t= 1 s (100% production)	8000	3600	V_{PK}
V_{IOSM}	Maximum surge isolation voltage(3)	Test method per IEC 60065, 1.2/50 μs waveform, $V_{TEST} = 1.6 \times V_{IOSM}$ (qualification)	8000	4000	V_{PK}
q_{pd}	Apparent charge(4)	Method a, After Input/Output safety test subgroup 2/3, $V_{ini} = V_{IOTM}$, t_{ini} = 60 s; $V_{pd(m)} = 1.2 \times V_{IORM}$, t_m = 10 s	≤5	≤5	pC
		Method a, After environmental tests subgroup 1, $V_{ini} = V_{IOTM}$, t_{ini} = 60 s; $V_{pd(m)} = 1.6 \times V_{IORM}$, t_m = 10 s	≤5	≤5	
		Method b1; At routine test (100% production) and preconditioning (type test) $V_{ini} = V_{IOTM}$, t_{ini} = 1 s; $V_{pd(m)} = 1.875 \times V_{IORM}$, t_m = 1 s	≤5	≤5	
C_{IO}	Barrier capacitance, input to output(5)	$V_{IO} = 0.4 \times \sin(2\pi ft)$, f = 1 MHz	~1	~1	pF
R_{IO}	Isolation resistance(5)	V_{IO} = 500 V, T_A = 25°C	$>10^{12}$	$>10^{12}$	Ω
		V_{IO} = 500 V, 100°C ≤ T_A ≤ 125°C	$>10^{11}$	$>10^{11}$	
		V_{IO} = 500 V at T_S = 150°C	$>10^9$	$>10^9$	
	Pollution degree		2	2	
	Climatic category		55/125/21	55/125/21	
UL 1577					
V_{ISO}	Maximum withstanding isolation voltage	$V_{TEST} = V_{ISO}$, t = 60 s (qualification), $V_{TEST} = 1.2 \times V_{ISO}$, t = 1 s (100% production)	5000	2500	V_{RMS}

(1) Creepage and clearance requirements should be applied according to the specific equipment isolation standards of an application. Care should be taken to maintain the creepage and clearance distance of a board design to ensure that the mounting pads of the isolator on the printed-circuit board do not reduce this distance. Creepage and clearance on a printed-circuit board become equal in certain cases. Techniques such as inserting grooves and/or ribs on a printed circuit board are used to help increase these specifications.
(2) This coupler is suitable for *safe electrical insulation* only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.
(3) Testing is carried out in air or oil to determine the intrinsic surge immunity of the isolation barrier.
(4) Apparent charge is electrical discharge caused by a partial discharge (pd).
(5) All pins on each side of the barrier tied together creating a two-terminal device.

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6.7 Safety-Related Certifications

DW package devices certified. All other certifications are planned.

VDE	CSA	UL	CQC	TUV
Certified according to DIN V VDE V 0884-10 (VDE V 0884-10):2006-12	Certified under CSA Component Acceptance Notice 5A, IEC 60950-1 and IEC 60601-1	Certified according to UL 1577 Component Recognition Program	Certified according to GB 4943.1-2011	Certified according to EN 61010-1:2010 (3rd Ed) and EN 60950-1:2006/A11:2009/A1:2010/A12:2011/A2:2013
Maximum transient isolation voltage, 8000 V_{PK} (DW-16) and 3600 V_{PK} (DBQ-16); Maximum repetitive peak isolation voltage, 1414 V_{PK} (DW-16, Reinforced) and 566 V_{PK} (DBQ-16); Maximum surge isolation voltage, 8000 V_{PK} (DW-16) and 4000 V_{PK} (DBQ-16)	Reinforced insulation per CSA 60950-1-07+A1+A2 and IEC 60950-1 2nd Ed., 800 V_{RMS} (DW-16) and 370 V_{RMS} (DBQ-16) max working voltage (pollution degree 2, material group I); 2 MOPP (Means of Patient Protection) per CSA 60601-1:14 and IEC 60601-1 Ed. 3.1, 250 V_{RMS} (DW-16) max working voltage	**DW-16:** Single protection, 5000 V_{RMS}; **DBQ-16:** Single protection, 2500 V_{RMS}	**DW-16:** Reinforced Insulation, Altitude ≤ 5000 m, Tropical Climate, 400 V_{RMS} maximum working voltage; **DBQ-16:** Basic Insulation, Altitude ≤ 5000 m, Tropical Climate, 250 V_{RMS} maximum working voltage	5000 V_{RMS} (DW-16) and 2500 V_{RMS} (DBQ-16) Reinforced insulation per EN 61010-1:2010 (3rd Ed) up to working voltage of 600 V_{RMS} (DW-16) and 300 V_{RMS} (DBQ-16) 5000 V_{RMS} (DW-16) and 2500 V_{RMS} (DBQ-16) Reinforced insulation per EN 60950-1:2006/A11:2009/A1:2010/A12:2011/A2:2013 up to working voltage of 800 V_{RMS} (DW-16) and 370 V_{RMS} (DBQ-16)
Certificate number: 40040142	Master contract number: 220991	File number: E181974	Certificate number: CQC15001121716	Client ID number: 77311

6.8 Safety Limiting Values

Safety limiting(1) intends to minimize potential damage to the isolation barrier upon failure of input or output circuitry. A failure of the I/O can allow low resistance to ground or the supply and, without current limiting, dissipate sufficient power to overheat the die and damage the isolation barrier potentially leading to secondary system failures.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
DW-16 PACKAGE						
I_S	Safety input, output, or supply current	$R_{\theta JA}$ = 83.4 °C/W, V_I = 5.5 V, T_J = 150°C, T_A = 25°C, see Figure 1			273	mA
		$R_{\theta JA}$ = 83.4 °C/W, V_I = 3.6 V, T_J = 150°C, T_A = 25°C, see Figure 1			416	
		$R_{\theta JA}$ = 83.4 °C/W, V_I = 2.75 V, T_J = 150°C, T_A = 25°C, see Figure 1			545	
P_S	Safety input, output, or total power	$R_{\theta JA}$ = 83.4 °C/W, T_J = 150°C, T_A = 25°C, see Figure 3			1499	mW
T_S	Maximum safety temperature				150	°C
DBQ-16 PACKAGE						
I_S	Safety input, output, or supply current	$R_{\theta JA}$ = 109 °C/W, V_I = 5.5 V, T_J = 150°C, T_A = 25°C, see Figure 2			209	mA
		$R_{\theta JA}$ = 109 °C/W, V_I = 3.6 V, T_J = 150°C, T_A = 25°C, see Figure 2			319	
		$R_{\theta JA}$ = 109 °C/W, V_I = 2.75 V, T_J = 150°C, T_A = 25°C, see Figure 2			417	
P_S	Safety input, output, or total power	$R_{\theta JA}$ = 109 °C/W, T_J = 150°C, T_A = 25°C, see Figure 4			1147	mW
T_S	Maximum safety temperature				150	°C

(1) The maximum safety temperature is the maximum junction temperature specified for the device. The power dissipation and junction-to-air thermal impedance of the device installed in the application hardware determines the junction temperature. The assumed junction-to-air thermal resistance in the *Thermal Information* is that of a device installed on a High-K test board for leaded Surface Mount Packages. The power is the recommended maximum input voltage times the current. The junction temperature is then the ambient temperature plus the power times the junction-to-air thermal resistance

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6.9 Electrical Characteristics—5-V Supply

V_{CC1} = V_{CC2} = 5 V ±10% (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	I_{OH} = –4 mA; see Figure 15	V_{CCO} (1) – 0.4	4.8		V
V_{OL}	Low-level output voltage	I_{OL} = 4 mA; see Figure 15		0.2	0.4	V
$V_{IT+(IN)}$	Rising input voltage threshold			0.6 × V_{CCI}	0.7 × V_{CCI}	V
$V_{IT-(IN)}$	Falling input voltage threshold		0.3 × V_{CCI}	0.4 × V_{CCI}		V
$V_{I(HYS)}$	Input threshold voltage hysteresis		0.1 × V_{CCI}	0.2 × V_{CCI}		V
I_{IH}	High-level input current	V_{IH} = V_{CCI} (1) at INx or ENx			10	µA
I_{IL}	Low-level input current	V_{IL} = 0 V at INx or ENx	–10			µA
CMTI	Common-mode transient immunity	V_I = V_{CCI} or 0 V, V_{CM} = 1200 V; see Figure 18	85	100		kV/µs
C_I	Input Capacitance (2)	V_I = V_{CC}/ 2 + 0.4×sin(2πft), f = 1 MHz, V_{CC} = 5 V		2		pF

(1) V_{CCI} = Input-side V_{CC}; V_{CCO} = Output-side V_{CC}.
(2) Measured from input pin to ground.

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6.10 Supply Current Characteristics—5-V Supply

V_{CC1} = V_{CC2} = 5 V ±10% (over recommended operating conditions unless otherwise noted).

PARAMETER	TEST CONDITIONS		SUPPLY CURRENT	MIN	TYP	MAX	UNIT
ISO7740							
Supply current - Disable	EN2 = 0 V; V_I = V_{CC1} (ISO7740); V_I = 0 V (ISO7740 with F suffix)		I_{CC1}		1.2	1.6	mA
			I_{CC2}		0.3	0.5	
	EN2 = 0 V; V_I = 0 V (ISO7740); V_I = V_{CC1} (ISO7740 with F suffix)		I_{CC1}		5.5	7.8	
			I_{CC2}		0.3	0.5	
Supply current - DC signal	EN2 = V_{CC2}; V_I = V_{CC1} (ISO7740); V_I = 0 V (ISO7740 with F suffix)		I_{CC1}		1.2	1.6	
			I_{CC2}		2	3.2	
	EN2 = V_{CC2}; V_I = 0 V (ISO7740); V_I = V_{CC1} (ISO7740 with F suffix)		I_{CC1}		5.5	7.8	
			I_{CC2}		2.2	3.6	
Supply current - AC signal	All channels switching with square wave clock input; C_L = 15 pF	1 Mbps	I_{CC1}		3.3	4.7	
			I_{CC2}		2.3	3.6	
		10 Mbps	I_{CC1}		3.4	4.8	
			I_{CC2}		4.2	5.8	
		100 Mbps	I_{CC1}		3.8	5.7	
			I_{CC2}		22.7	28	
ISO7741							
Supply current - Disable	EN1 = EN2 = 0 V; V_I = V_{CCI} (1) (ISO7741); V_I = 0 V (ISO7741 with F suffix)		I_{CC1}		1	1.5	mA
			I_{CC2}		0.8	1.1	
	EN1 = EN2 = 0 V; V_I = 0 V (ISO7741); V_I = V_{CCI} (ISO7741 with F suffix)		I_{CC1}		4.3	6.3	
			I_{CC2}		1.8	2.7	
Supply current - DC signal	EN1 = EN2 = V_{CCI}; V_I = V_{CCI} (ISO7741); V_I = 0 V (ISO7741 with F suffix)		I_{CC1}		1.5	2.3	
			I_{CC2}		2	3	
	EN1 = EN2 = V_{CCI}; V_I = 0 V (ISO7741); V_I = V_{CCI} (ISO7741 with F suffix)		I_{CC1}		4.8	6.8	
			I_{CC2}		3.2	4.9	
Supply current - AC signal	All channels switching with square wave clock input; C_L = 15 pF	1 Mbps	I_{CC1}		3.2	4.6	
			I_{CC2}		2.8	4.1	
		10 Mbps	I_{CC1}		3.7	5.2	
			I_{CC2}		4.2	5.7	
		100 Mbps	I_{CC1}		8.6	11.3	
			I_{CC2}		18	22	
ISO7742							
Supply current - Disable	EN1 = EN2 = 0 V; V_I = V_{CCI} (ISO7742); V_I = 0 V (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		0.9	1.3	mA
	EN1 = EN2 = 0 V; V_I = 0 V (ISO7742); V_I = V_{CCI} (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		3	4.6	
Supply current - DC signal	EN1 = EN2 = V_{CCI}; V_I = V_{CCI} (ISO7742); V_I = 0 V (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		1.7	2.7	
	EN1 = EN2 = V_{CCI}; V_I = 0 V (ISO7742); V_I = V_{CCI} (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		4	5.9	
Supply current - AC signal	All channels switching with square wave clock input; C_L = 15 pF	1 Mbps	I_{CC1}, I_{CC2}		3	4.4	
		10 Mbps	I_{CC1}, I_{CC2}		4	5.5	
		100 Mbps	I_{CC1}, I_{CC2}		13.4	17	

(1) V_{CCI} = Input-side V_{CC}

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6.11 Electrical Characteristics—3.3-V Supply

V_{CC1} = V_{CC2} = 3.3 V ±10% (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	I_{OH} = –2 mA; see Figure 15	V_{CCO}(1) – 0.3	3.2		V
V_{OL}	Low-level output voltage	I_{OL} = 2 mA; see Figure 15		0.1	0.3	V
$V_{IT+(IN)}$	Rising input voltage threshold			0.6 × V_{CCI}	0.7 × V_{CCI}	V
$V_{IT-(IN)}$	Falling input voltage threshold		0.3 × V_{CCI}	0.4 × V_{CCI}		V
$V_{I(HYS)}$	Input threshold voltage hysteresis		0.1 × V_{CCI}	0.2 × V_{CCI}		V
I_{IH}	High-level input current	V_{IH} = V_{CCI}(1) at INx or ENx			10	µA
I_{IL}	Low-level input current	V_{IL} = 0 V at INx or ENx	–10			µA
CMTI	Common-mode transient immunity	V_I = V_{CCI} or 0 V, V_{CM} = 1200 V; see Figure 18	85	100		kV/µs

(1) V_{CCI} = Input-side V_{CC}; V_{CCO} = Output-side V_{CC}.

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6.12 Supply Current Characteristics—3.3-V Supply

V_{CC1} = V_{CC2} = 3.3 V ±10% (over recommended operating conditions unless otherwise noted).

PARAMETER	TEST CONDITIONS		SUPPLY CURRENT	MIN	TYP	MAX	UNIT
ISO7740							
Supply current - Disable	EN2 = 0 V; V_I = V_{CC1} (ISO7740); V_I = 0 V (ISO7740 with F suffix)		I_{CC1}		1.2	1.6	mA
			I_{CC2}		0.3	0.5	
	EN2 = 0 V; V_I = 0 V (ISO7740); V_I = V_{CC1} (ISO7740 with F suffix)		I_{CC1}		5.5	7.8	
			I_{CC2}		0.3	0.5	
Supply current - DC signal	EN2 = V_{CC2}; V_I = V_{CC1} (ISO7740); V_I = 0 V (ISO7740 with F suffix)		I_{CC1}		1.2	1.6	
			I_{CC2}		1.9	3.2	
	EN2 = V_{CC2}; V_I = 0 V (ISO7740); V_I = V_{CC1} (ISO7740 with F suffix)		I_{CC1}		5.5	7.8	
			I_{CC2}		2.2	3.6	
Supply current - AC signal	All channels switching with square wave clock input; C_L = 15 pF	1 Mbps	I_{CC1}		3.3	4.7	
			I_{CC2}		2.2	3.6	
		10 Mbps	I_{CC1}		3.4	4.8	
			I_{CC2}		3.6	5	
		100 Mbps	I_{CC1}		3.3	5.5	
			I_{CC2}		17	20	
ISO7741							
Supply current - Disable	EN1 = EN2 = 0 V; V_I = V_{CCI} (1) (ISO7741); V_I = 0 V (ISO7741 with F suffix)		I_{CC1}		1	1.5	mA
			I_{CC2}		0.8	1.1	
	EN1 = EN2 = 0 V; V_I = 0 V (ISO7741); V_I = V_{CCI} (ISO7741 with F suffix)		I_{CC1}		4.3	6.3	
			I_{CC2}		1.9	2.7	
Supply current - DC signal	EN1 = EN2 = V_{CCI}; V_I = V_{CCI} (ISO7741); V_I = 0 V (ISO7741 with F suffix)		I_{CC1}		1.5	2.3	
			I_{CC2}		2	3	
	EN1 = EN2 = V_{CCI}; V_I = 0 V (ISO7741); V_I = V_{CCI} (ISO7741 with F suffix)		I_{CC1}		4.8	6.8	
			I_{CC2}		3.2	4.9	
Supply current - AC signal	All channels switching with square wave clock input; C_L = 15 pF	1 Mbps	I_{CC1}		3.2	4.6	
			I_{CC2}		2.7	4.1	
		10 Mbps	I_{CC1}		3.5	5	
			I_{CC2}		3.7	5.2	
		100 Mbps	I_{CC1}		6.8	9.3	
			I_{CC2}		13.7	16.4	
ISO7742							
Supply current - Disable	EN1 = EN2 = 0 V; V_I = V_{CCI} (ISO7742); V_I = 0 V (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		0.9	1.3	mA
	EN1 = EN2 = 0 V; V_I = 0 V (ISO7742); V_I = V_{CCI} (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		3	4.6	
Supply current - DC signal	EN1 = EN2 = V_{CCI}; V_I = V_{CCI} (ISO7742); V_I = 0 V (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		1.7	2.7	
	EN1 = EN2 = V_{CCI}; V_I = 0 V (ISO7742); V_I = V_{CCI} (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		4	5.9	
Supply current - AC signal	All channels switching with square wave clock input; C_L = 15 pF	1 Mbps	I_{CC1}, I_{CC2}		2.9	4.3	
		10 Mbps	I_{CC1}, I_{CC2}		3.6	5.1	
		100 Mbps	I_{CC1}, I_{CC2}		10.3	13	

(1) V_{CCI} = Input-side V_{CC}

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6.13 Electrical Characteristics—2.5-V Supply

V_{CC1} = V_{CC2} = 2.5 V ±10% (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	I_{OH} = –1 mA; see Figure 15	V_{CCO} (1) – 0.2	2.45		V
V_{OL}	Low-level output voltage	I_{OL} = 1 mA; see Figure 15		0.05	0.2	V
$V_{IT+(IN)}$	Rising input voltage threshold			0.6 × V_{CCI}	0.7 × V_{CCI}	V
$V_{IT-(IN)}$	Falling input voltage threshold		0.3 × V_{CCI}	0.4 × V_{CCI}		V
$V_{I(HYS)}$	Input threshold voltage hysteresis		0.1 × V_{CCI}	0.2 × V_{CCI}		V
I_{IH}	High-level input current	V_{IH} = V_{CCI} (1) at INx or ENx			10	µA
I_{IL}	Low-level input current	V_{IL} = 0 V at INx or ENx	–10			µA
CMTI	Common-mode transient immunity	V_I = V_{CCI} or 0 V, V_{CM} = 1200 V; see Figure 18	85	100		kV/µs

(1) V_{CCI} = Input-side V_{CC}; V_{CCO} = Output-side V_{CC}.

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6.14 Supply Current Characteristics—2.5-V Supply

V_{CC1} = V_{CC2} = 2.5 V ±10% (over recommended operating conditions unless otherwise noted).

PARAMETER	TEST CONDITIONS		SUPPLY CURRENT	MIN	TYP	MAX	UNIT
ISO7740							
Supply current - Disable	EN2 = 0 V; V_I = V_{CC1} (ISO7740); V_I = 0 V (ISO7740 with F suffix)		I_{CC1}		1.2	1.6	mA
			I_{CC2}		0.3	0.5	
	EN2 = 0 V; V_I = 0 V (ISO7740); V_I = V_{CC1} (ISO7740 with F suffix)		I_{CC1}		5.5	7.8	
			I_{CC2}		0.3	0.5	
Supply current - DC signal	EN2 = V_{CC2}; V_I = V_{CC1} (ISO7740); V_I = 0 V (ISO7740 with F suffix)		I_{CC1}		1.2	1.6	
			I_{CC2}		1.9	3.2	
	EN2 = V_{CC2}; V_I = 0 V (ISO7740); V_I = V_{CC1} (ISO7740 with F suffix)		I_{CC1}		5.4	7.8	
			I_{CC2}		2.2	3.6	
Supply current - AC signal	All channels switching with square wave clock input; C_L = 15 pF	1 Mbps	I_{CC1}		3.3	4.7	
			I_{CC2}		2.2	3.5	
		10 Mbps	I_{CC1}		3.4	4.8	
			I_{CC2}		3.2	4.7	
		100 Mbps	I_{CC1}		3.2	5.4	
			I_{CC2}		13	17	
ISO7741							
Supply current - Disable	EN1 = EN2 = 0 V; V_I = V_{CCI} (1) (ISO7741); V_I = 0 V (ISO7741 with F suffix)		I_{CC1}		1	1.5	mA
			I_{CC2}		0.8	1.1	
	EN1 = EN2 = 0 V; V_I = 0 V (ISO7741); V_I = V_{CCI} (ISO7741 with F suffix)		I_{CC1}		4.3	6.3	
			I_{CC2}		1.8	2.7	
Supply current - DC signal	EN1 = EN2 = V_{CCI}; V_I = V_{CCI} (ISO7741); V_I = 0 V (ISO7741 with F suffix)		I_{CC1}		1.4	2.3	
			I_{CC2}		2	3	
	EN1 = EN2 = V_{CCI}; V_I = 0 V (ISO7741); V_I = V_{CCI} (ISO7741 with F suffix)		I_{CC1}		4.7	6.8	
			I_{CC2}		3.2	4.9	
Supply current - AC signal	All channels switching with square wave clock input; C_L = 15 pF	1 Mbps	I_{CC1}		3.1	4.6	
			I_{CC2}		2.7	4	
		10 Mbps	I_{CC1}		3.4	4.9	
			I_{CC2}		3.5	4.9	
		100 Mbps	I_{CC1}		5.6	8.3	
			I_{CC2}		10.8	13.8	
ISO7742							
Supply current - Disable	EN1 = EN2 = 0 V; V_I = V_{CCI} (ISO7742); V_I = 0 V (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		0.9	1.3	mA
	EN1 = EN2 = 0 V; V_I = 0 V (ISO7742); V_I = V_{CCI} (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		3	4.6	
Supply current - DC signal	EN1 = EN2 = V_{CCI}; V_I = V_{CCI} (ISO7742); V_I = 0 V (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		1.7	2.7	
	EN1 = EN2 = V_{CCI}; V_I = 0 V (ISO7742); V_I = V_{CCI} (ISO7742 with F suffix)		I_{CC1}, I_{CC2}		4	5.9	
Supply current - AC signal	All channels switching with square wave clock input; C_L = 15 pF	1 Mbps	I_{CC1}, I_{CC2}		2.9	4.3	
		10 Mbps	I_{CC1}, I_{CC2}		3.4	4.9	
		100 Mbps	I_{CC1}, I_{CC2}		8.3	11.5	

(1) V_{CCI} = Input-side V_{CC}

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6.15 Switching Characteristics—5-V Supply

V_{CC1} = V_{CC2} = 5 V ±10% (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay time	See Figure 15	6	10.7	16	ns
PWD	Pulse width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$			0	4.9	ns
$t_{sk(o)}$	Channel-to-channel output skew time(2)	Same-direction channels			4	ns
$t_{sk(pp)}$	Part-to-part skew time(3)				4.4	ns
t_r	Output signal rise time	See Figure 15		2.4	3.9	ns
t_f	Output signal fall time			2.4	3.9	ns
t_{PHZ}	Disable propagation delay, high-to-high impedance output	See Figure 16		9	20	ns
t_{PLZ}	Disable propagation delay, low-to-high impedance output			9	20	ns
t_{PZH}	Enable propagation delay, high impedance-to-high output for ISO774x			7	20	ns
	Enable propagation delay, high impedance-to-high output for ISO774x with F suffix			3	8.5	µs
t_{PZL}	Enable propagation delay, high impedance-to-low output for ISO774x			3	8.5	µs
	Enable propagation delay, high impedance-to-low output for ISO774x with F suffix			7	20	ns
t_{DO}	Default output delay time from input power loss	Measured from the time V_{CC} goes below 1.7 V. See		0.1	0.3	µs
t_{ie}	Time interval error	2^{16} – 1 PRBS data at 100 Mbps		0.8		ns

(1) Also known as pulse skew.
(2) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.
(3) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.

6.16 Switching Characteristics—3.3-V Supply

V_{CC1} = V_{CC2} = 3.3 V ±10% (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay time	See Figure 15	6	11	16	ns
PWD	Pulse width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$			0.1	5	ns
$t_{sk(o)}$	Channel-to-channel output skew time(2)	Same-direction channels			4.1	ns
$t_{sk(pp)}$	Part-to-part skew time(3)				4.5	ns
t_r	Output signal rise time	See Figure 15		1.3	3	ns
t_f	Output signal fall time			1.3	3	ns
t_{PHZ}	Disable propagation delay, high-to-high impedance output	See Figure 16		17	30	ns
t_{PLZ}	Disable propagation delay, low-to-high impedance output			17	30	ns
t_{PZH}	Enable propagation delay, high impedance-to-high output for ISO774x			17	30	ns
	Enable propagation delay, high impedance-to-high output for ISO774x with F suffix			3.2	8.5	µs
t_{PZL}	Enable propagation delay, high impedance-to-low output for ISO774x			3.2	8.5	µs
	Enable propagation delay, high impedance-to-low output for ISO774x with F suffix			17	30	ns
t_{DO}	Default output delay time from input power loss	Measured from the time V_{CC} goes below 1.7 V. See		0.1	0.3	µs
t_{ie}	Time interval error	2^{16} – 1 PRBS data at 100 Mbps		0.9		ns

(1) Also known as pulse skew.
(2) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.
(3) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.

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6.17 Switching Characteristics—2.5-V Supply

V_{CC1} = V_{CC2} = 2.5 V ±10% (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay time	See Figure 15	7.5	12	18.5	ns
PWD	Pulse width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$			0.2	5.1	ns
$t_{sk(o)}$	Channel-to-channel output skew time(2)	Same-direction Channels			4.1	ns
$t_{sk(pp)}$	Part-to-part skew time(3)				4.6	ns
t_r	Output signal rise time	See Figure 15		1	3.5	ns
t_f	Output signal fall time			1	3.5	ns
t_{PHZ}	Disable propagation delay, high-to-high impedance output	See Figure 16		22	40	ns
t_{PLZ}	Disable propagation delay, low-to-high impedance output			22	40	ns
t_{PZH}	Enable propagation delay, high impedance-to-high output for ISO774x			18	40	ns
	Enable propagation delay, high impedance-to-high output for ISO774x with F suffix			3.3	8.5	µs
t_{PZL}	Enable propagation delay, high impedance-to-low output for ISO774x			3.3	8.5	µs
	Enable propagation delay, high impedance-to-low output for ISO774x with F suffix			18	40	ns
t_{DO}	Default output delay time from input power loss	Measured from the time V_{CC} goes below 1.7 V. See		0.1	0.3	µs
t_{ie}	Time interval error	2^{16} – 1 PRBS data at 100 Mbps		0.7		ns

(1) Also known as pulse skew.
(2) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.
(3) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.

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6.18 Insulation Characteristics Curves

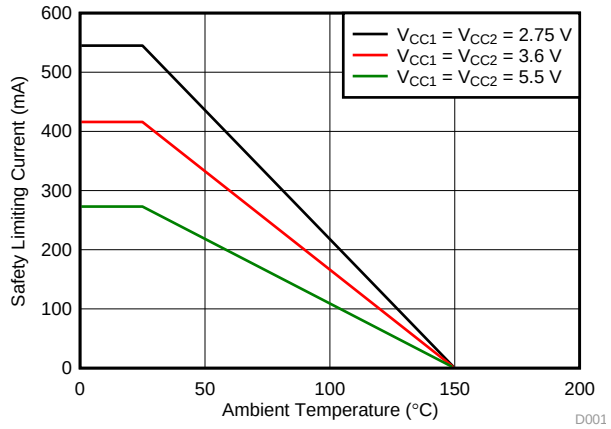

Figure 1. Thermal Derating Curve for Safety Limiting Current for DW-16 Package

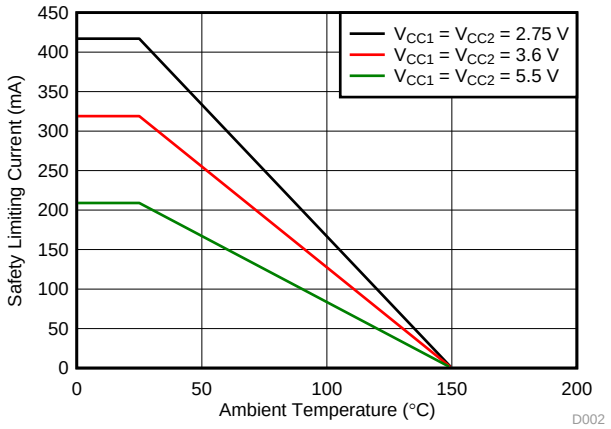

Figure 2. Thermal Derating Curve for Safety Limiting Current for DBQ-16 Package

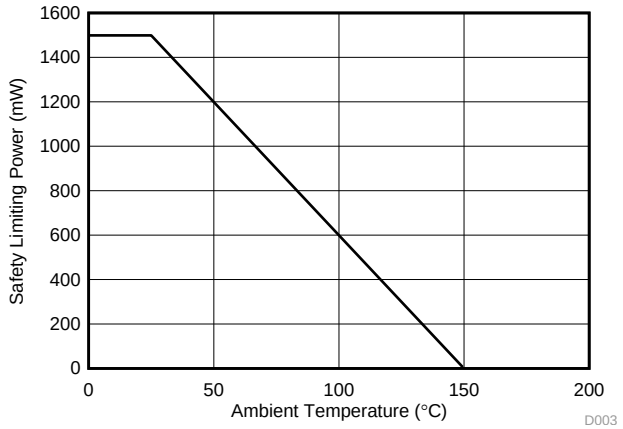

Figure 3. Thermal Derating Curve for Safety Limiting Power for DW-16 Package

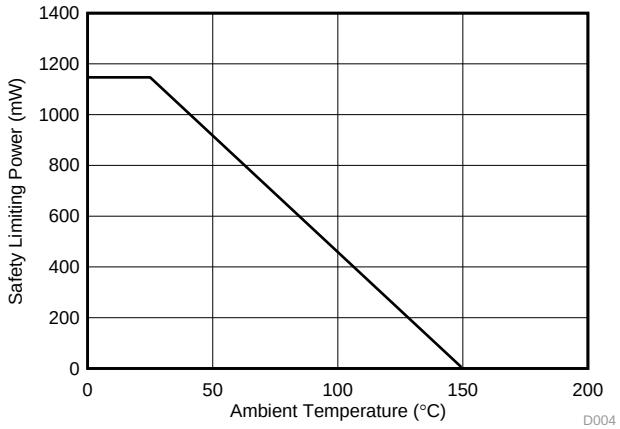

Figure 4. Thermal Derating Curve for Safety Limiting Power for DBQ-16 Package

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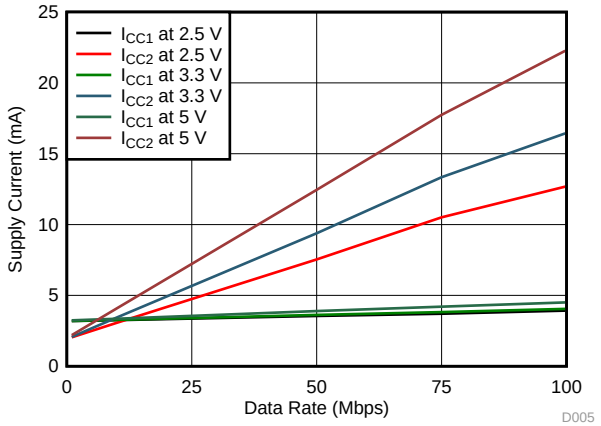
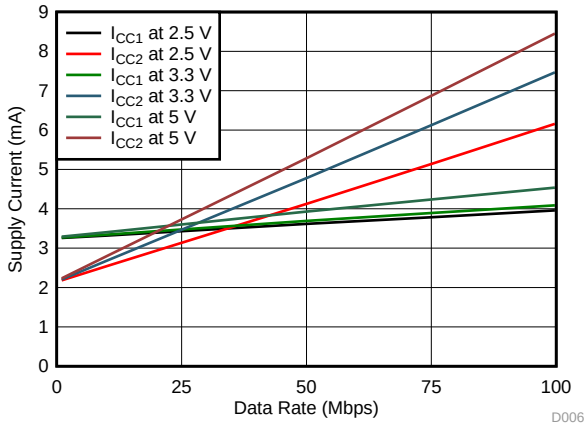
6.19 Typical Characteristics



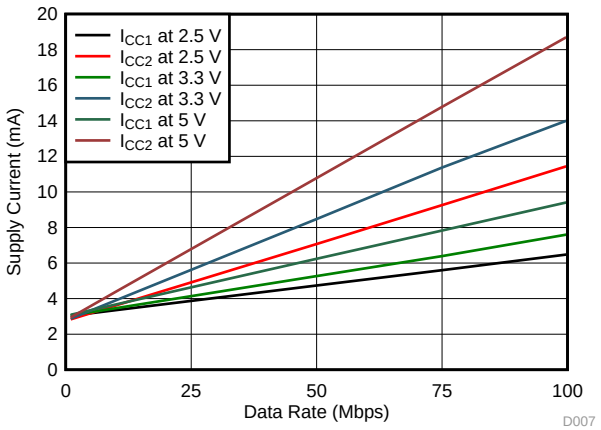
T_A = 25°C C_L = 15 pF

Figure 5. ISO7740 Supply Current vs Data Rate (With 15-pF Load)



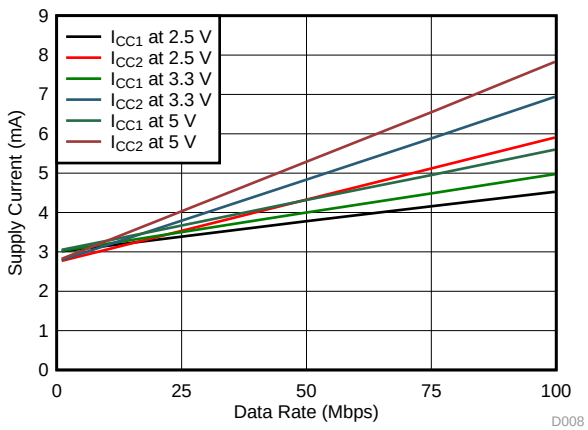
T_A = 25°C C_L = No Load

Figure 6. ISO7740 Supply Current vs Data Rate (With No Load)



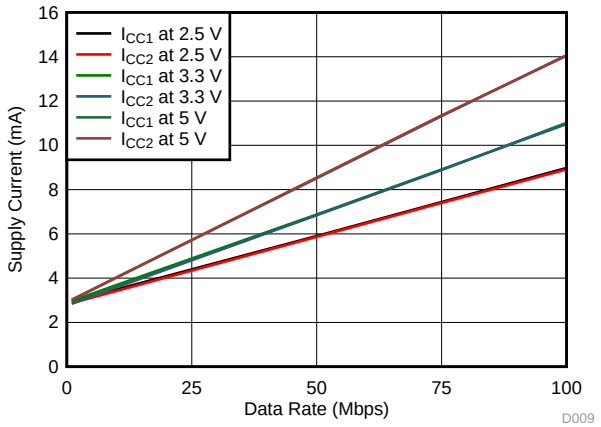
T_A = 25°C C_L = 15 pF

Figure 7. ISO7741 Supply Current vs Data Rate (With 15-pF Load)



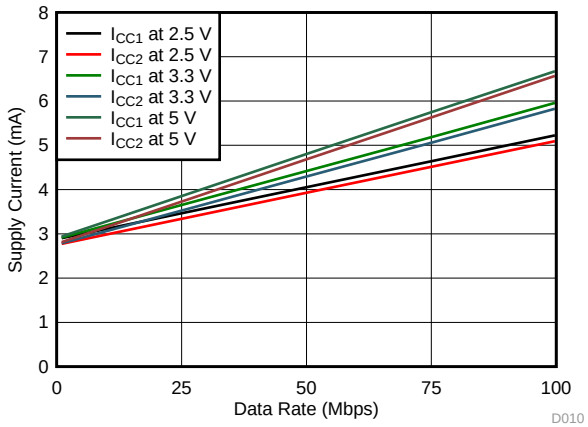
T_A = 25°C C_L = No Load

Figure 8. ISO7741 Supply Current vs Data Rate (With No Load)



T_A = 25°C C_L = 15 pF

Figure 9. ISO7742 Supply Current vs Data Rate (With 15-pF Load)



T_A = 25°C C_L = No Load

Figure 10. ISO7742 Supply Current vs Data Rate (With No Load)

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Typical Characteristics (continued)

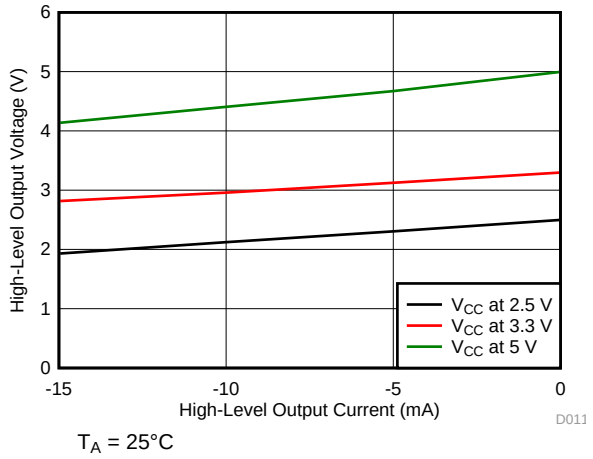

Figure 11. High-Level Output Voltage vs High-level Output Current

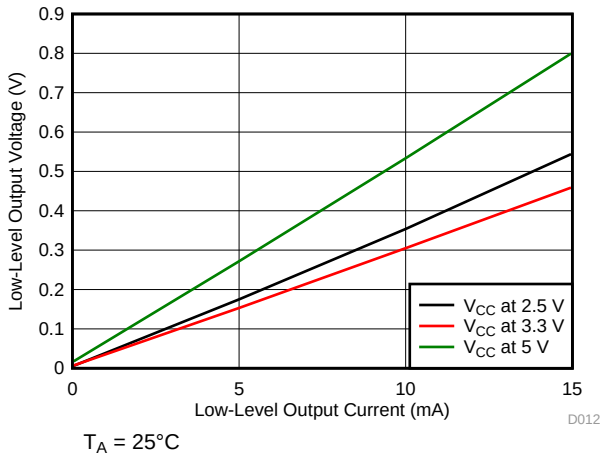

Figure 12. Low-Level Output Voltage vs Low-Level Output Current

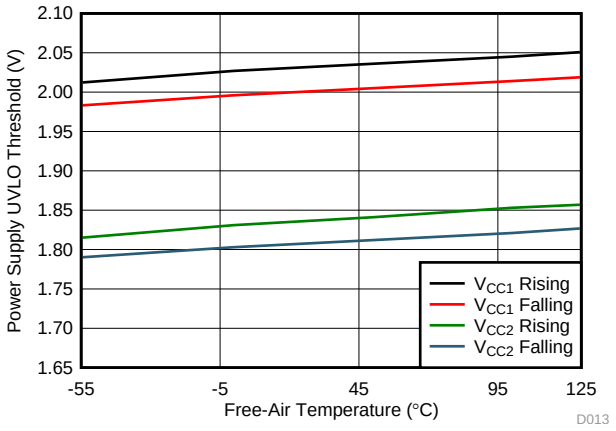

Figure 13. Power Supply Undervoltage Threshold vs Free-Air Temperature

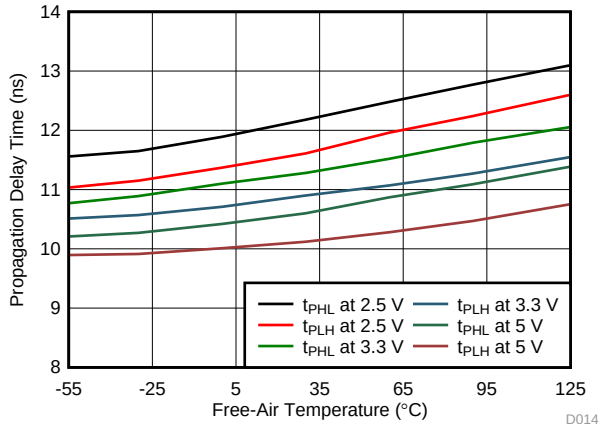

Figure 14. Propagation Delay Time vs Free-Air Temperature

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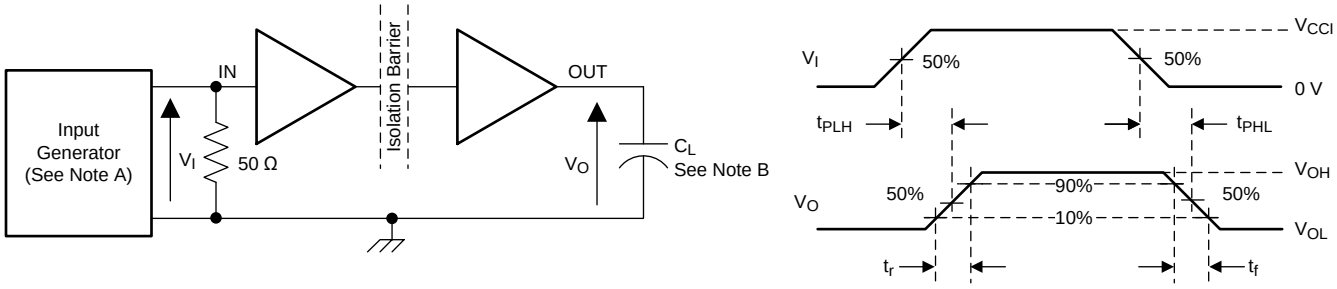
7 Parameter Measurement Information



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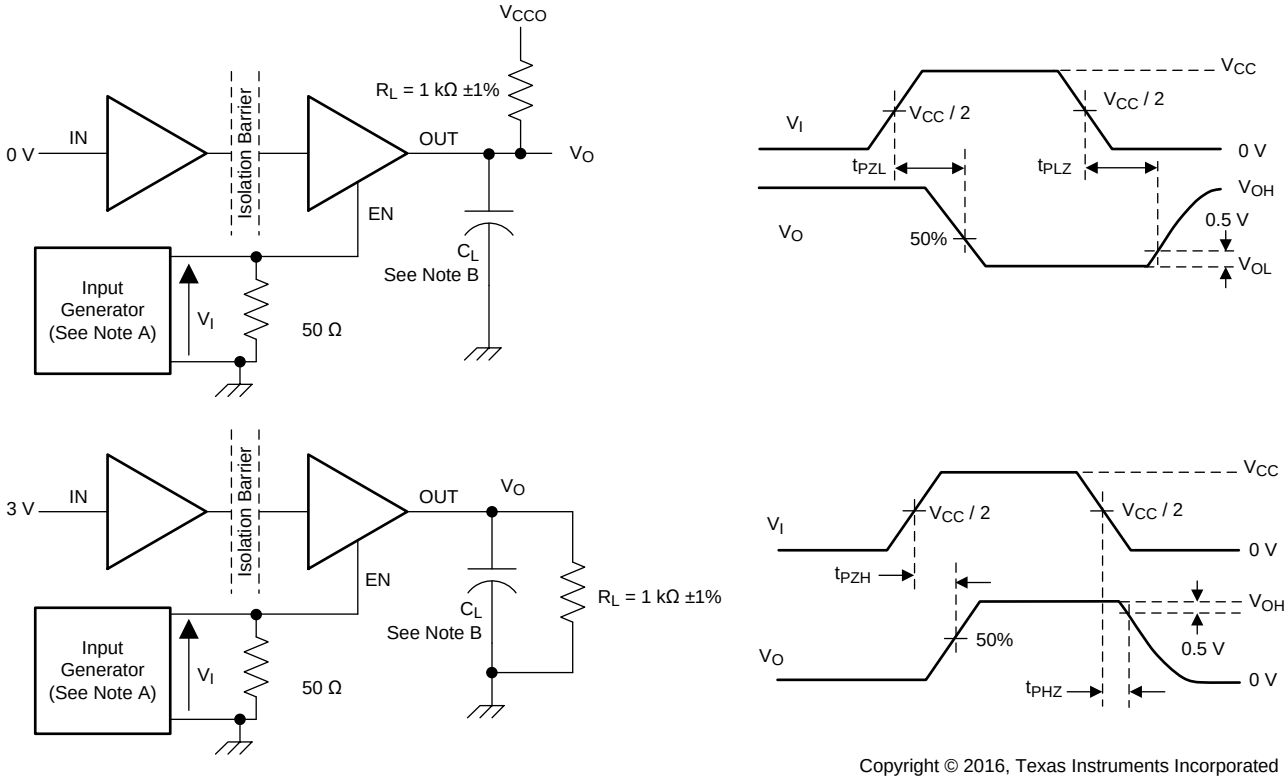
A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 50 kHz, 50% duty cycle, t_r ≤ 3 ns, t_f ≤ 3ns, Z_O = 50 Ω. At the input, 50 Ω resistor is required to terminate Input Generator signal. It is not needed in actual application.

B. C_L = 15 pF and includes instrumentation and fixture capacitance within ±20%.

Figure 15. Switching Characteristics Test Circuit and Voltage Waveforms



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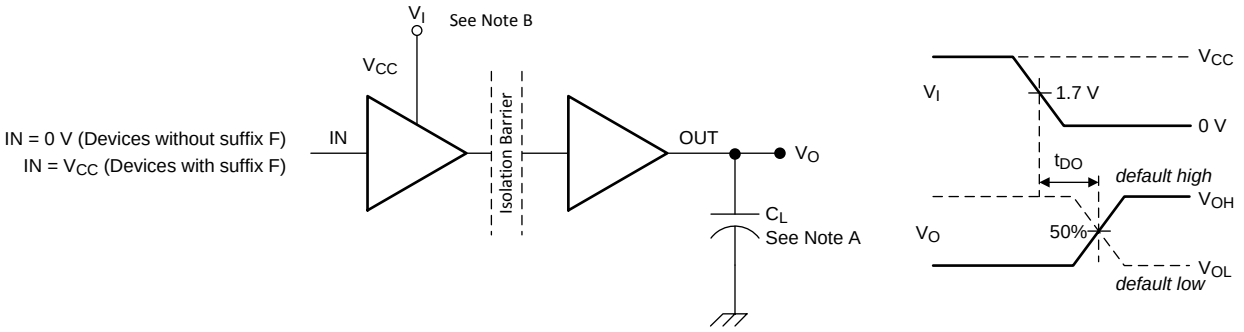
A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 10 kHz, 50% duty cycle, t_r ≤ 3 ns, t_f ≤ 3 ns, Z_O = 50 Ω.

B. C_L = 15 pF and includes instrumentation and fixture capacitance within ±20%.

Figure 16. Enable/Disable Propagation Delay Time Test Circuit and Waveform

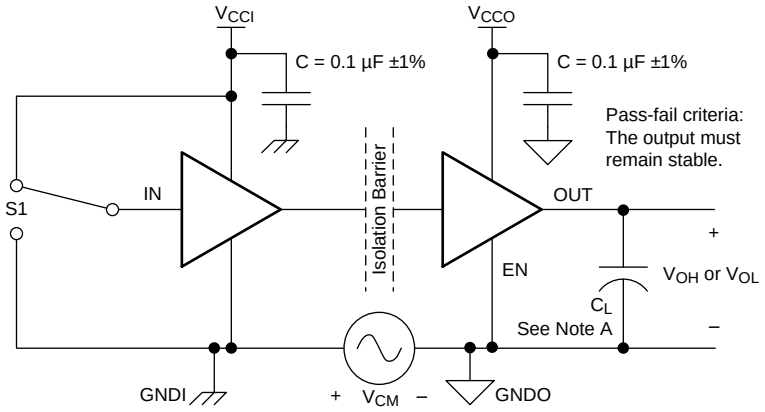
Parameter Measurement Information (continued)



A. C_L = 15 pF and includes instrumentation and fixture capacitance within ±20%.

B. Power Supply Ramp Rate = 10 mV/ns

Figure 17. Default Output Delay Time Test Circuit and Voltage Waveforms



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A. C_L = 15 pF and includes instrumentation and fixture capacitance within ±20%.

Figure 18. Common-Mode Transient Immunity Test Circuit

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8 Detailed Description

8.1 Overview

The ISO774x family of devices have an ON-OFF keying (OOK) modulation scheme to transmit the digital data across a silicon dioxide based isolation barrier. The transmitter sends a high frequency carrier across the barrier to represent one digital state and sends no signal to represent the other digital state. The receiver demodulates the signal after advanced signal conditioning and produces the output through a buffer stage. If the ENx pin is low then the output goes to high impedance. The ISO774x devices also incorporate advanced circuit techniques to maximize the CMTI performance and minimize the radiated emissions due the high frequency carrier and IO buffer switching. The conceptual block diagram of a digital capacitive isolator, Figure 19, shows a functional block diagram of a typical channel.

8.2 Functional Block Diagram

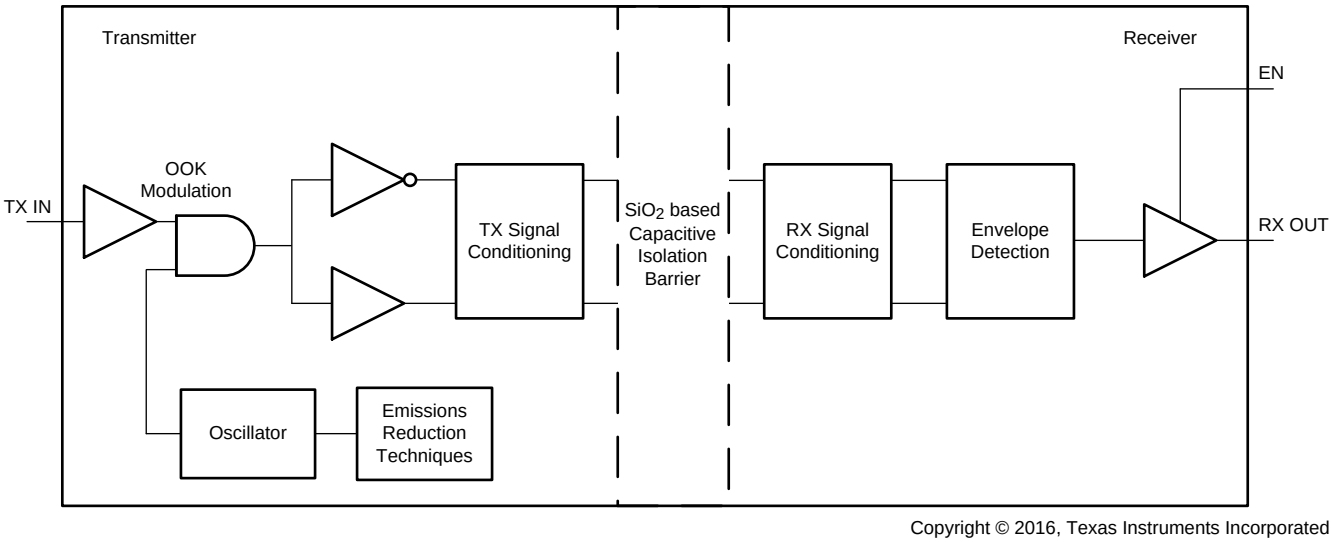

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Figure 19. Conceptual Block Diagram of a Digital Capacitive Isolator

Figure 20 shows a conceptual detail of how the ON-OFF keying scheme works.

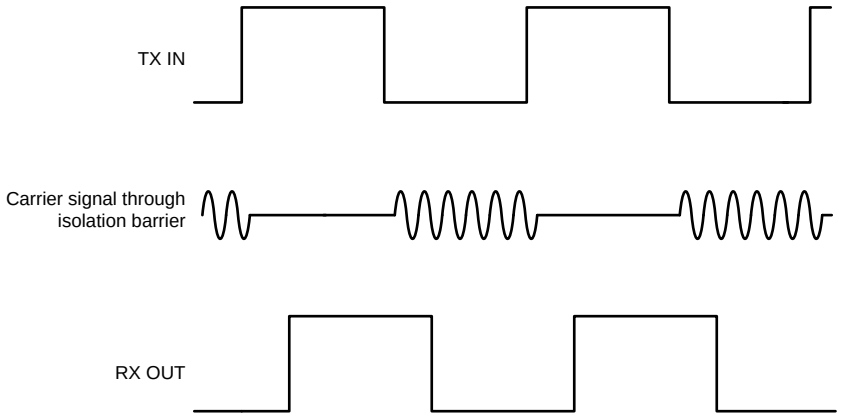

Figure 20. On-Off Keying (OOK) Based Modulation Scheme

8.3 Feature Description

Table 1 provides an overview of the device features.

Table 1. Device Features

PART NUMBER	CHANNEL DIRECTION	MAXIMUM DATA RATE	DEFAULT OUTPUT	PACKAGE	RATED ISOLATION(1)
ISO7740	4 Forward, 0 Reverse	100 Mbps	High	DW-16	5000 V_{RMS} / 8000 V_{PK}
				DBQ-16	2500 V_{RMS} / 3600 V_{PK}
ISO7740 with F suffix	4 Forward, 0 Reverse	100 Mbps	Low	DW-16	5000 V_{RMS} / 8000 V_{PK}
				DBQ-16	2500 V_{RMS} / 3600 V_{PK}
ISO7741	3 Forward, 1 Reverse	100 Mbps	High	DW-16	5000 V_{RMS} / 8000 V_{PK}
				DBQ-16	2500 V_{RMS} / 3600 V_{PK}
ISO7741 with F suffix	3 Forward, 1 Reverse	100 Mbps	Low	DW-16	5000 V_{RMS} / 8000 V_{PK}
				DBQ-16	2500 V_{RMS} / 3600 V_{PK}
ISO7742	2 Forward, 2 Reverse	100 Mbps	High	DW-16	5000 V_{RMS} / 8000 V_{PK}
				DBQ-16	2500 V_{RMS} / 3600 V_{PK}
ISO7742 with F suffix	2 Forward, 2 Reverse	100 Mbps	Low	DW-16	5000 V_{RMS} / 8000 V_{PK}
				DBQ-16	2500 V_{RMS} / 3600 V_{PK}

(1) See *Safety-Related Certifications* for detailed isolation ratings.

8.3.1 Electromagnetic Compatibility (EMC) Considerations

Many applications in harsh industrial environment are sensitive to disturbances such as electrostatic discharge (ESD), electrical fast transient (EFT), surge and electromagnetic emissions. These electromagnetic disturbances are regulated by international standards such as IEC 61000-4-x and CISPR 22. Although system-level performance and reliability depends, to a large extent, on the application board design and layout, the ISO774x family of devices incorporates many chip-level design improvements for overall system robustness. Some of these improvements include:

- Robust ESD protection cells for input and output signal pins and inter-chip bond pads.
- Low-resistance connectivity of ESD cells to supply and ground pins.
- Enhanced performance of high voltage isolation capacitor for better tolerance of ESD, EFT and surge events.
- Bigger on-chip decoupling capacitors to bypass undesirable high energy signals through a low impedance path.
- PMOS and NMOS devices isolated from each other by using guard rings to avoid triggering of parasitic SCRs.
- Reduced common mode currents across the isolation barrier by ensuring purely differential internal operation.

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8.4 Device Functional Modes

Table 2 lists the functional modes for the ISO774x devices.

Table 2. Function Table(1)

V_{CCI}	V_{CCO}	INPUT (INx)(2)	OUTPUT ENABLE (ENx)	OUTPUT (OUTx)	COMMENTS
PU	PU	H	H or open	H	Normal Operation: A channel output assumes the logic state of its input.
		L	H or open	L	
		Open	H or open	Default	Default mode: When INx is open, the corresponding channel output goes to its default logic state. Default is *High* for ISO774x and *Low* for ISO774x with F suffix.
X	PU	X	L	Z	A low value of output enable causes the outputs to be high-impedance.
PD	PU	X	H or open	Default	Default mode: When V_{CCI} is unpowered, a channel output assumes the logic state based on the selected default option. Default is *High* for ISO774x and *Low* for ISO774x with F suffix. When V_{CCI} transitions from unpowered to powered-up, a channel output assumes the logic state of the input. When V_{CCI} transitions from powered-up to unpowered, channel output assumes the selected default state.
X	PD	X	X	Undetermined	When V_{CCO} is unpowered, a channel output is undetermined(3). When V_{CCO} transitions from unpowered to powered-up, a channel output assumes the logic state of the input.

(1) V_{CCI} = Input-side V_{CC}; V_{CCO} = Output-side V_{CC}; PU = Powered up (V_{CC} ≥ 2.25 V); PD = Powered down (V_{CC} ≤ 1.7 V); X = Irrelevant; H = High level; L = Low level ; Z = High Impedance
(2) A strongly driven input signal can weakly power the floating V_{CC} through an internal protection diode and cause undetermined output.
(3) The outputs are in undetermined state when 1.7 V < V_{CCI}, V_{CCO} < 2.25 V.

8.4.1 Device I/O Schematics

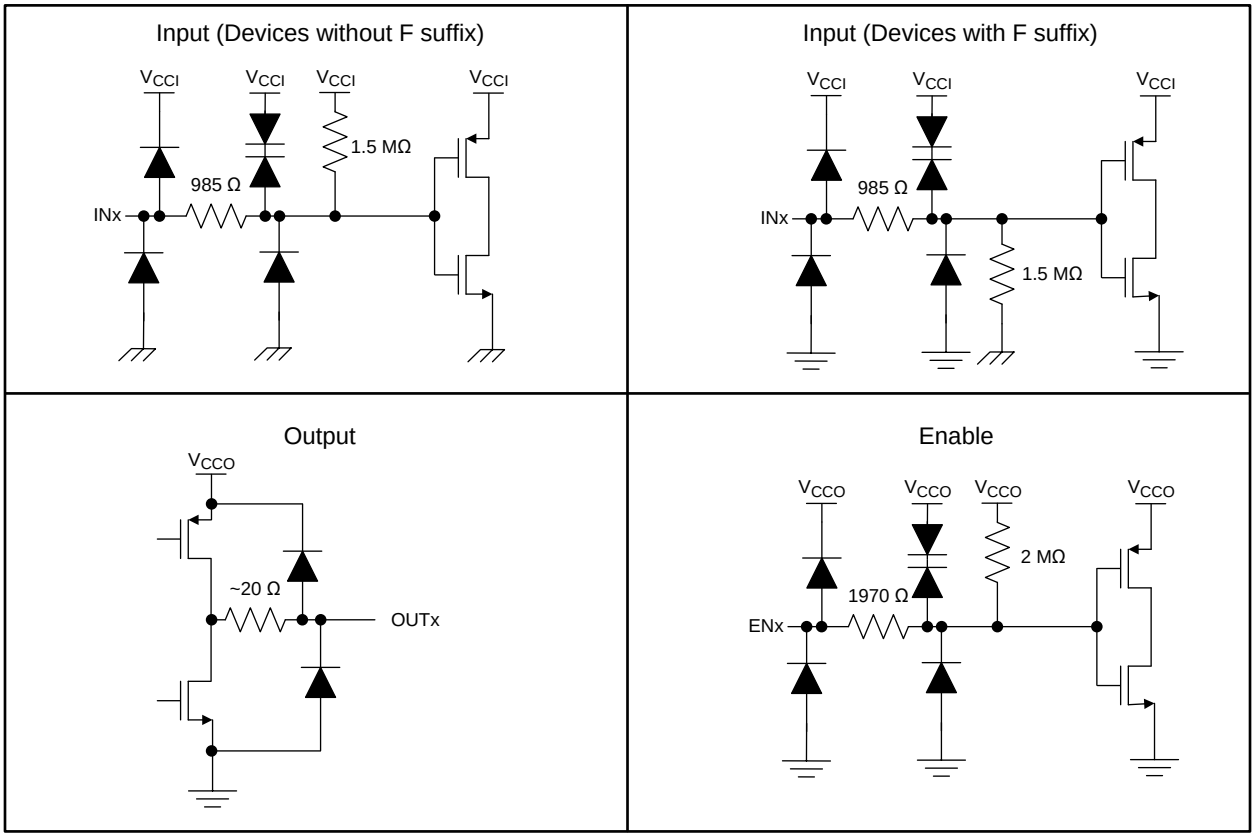

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Figure 21. Device I/O Schematics

9 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information

The ISO774x devices are high-performance, quad-channel digital isolators. These devices come with enable pins on each side which can be used to put the respective outputs in high impedance for multi master driving applications and reduce power consumption. The ISO774x devices use single-ended CMOS-logic switching technology. The voltage range is from 2.25 V to 5.5 V for both supplies, V_{CC1} and V_{CC2}. When designing with digital isolators, keep in mind that because of the single-ended design structure, digital isolators do not conform to any specific interface standard and are only intended for isolating single-ended CMOS or TTL digital signal lines. The isolator is typically placed between the data controller (that is, μC or UART), and a data converter or a line transceiver, regardless of the interface type or standard.

9.2 Typical Application

Figure 22 shows the isolated serial peripheral interface (SPI).

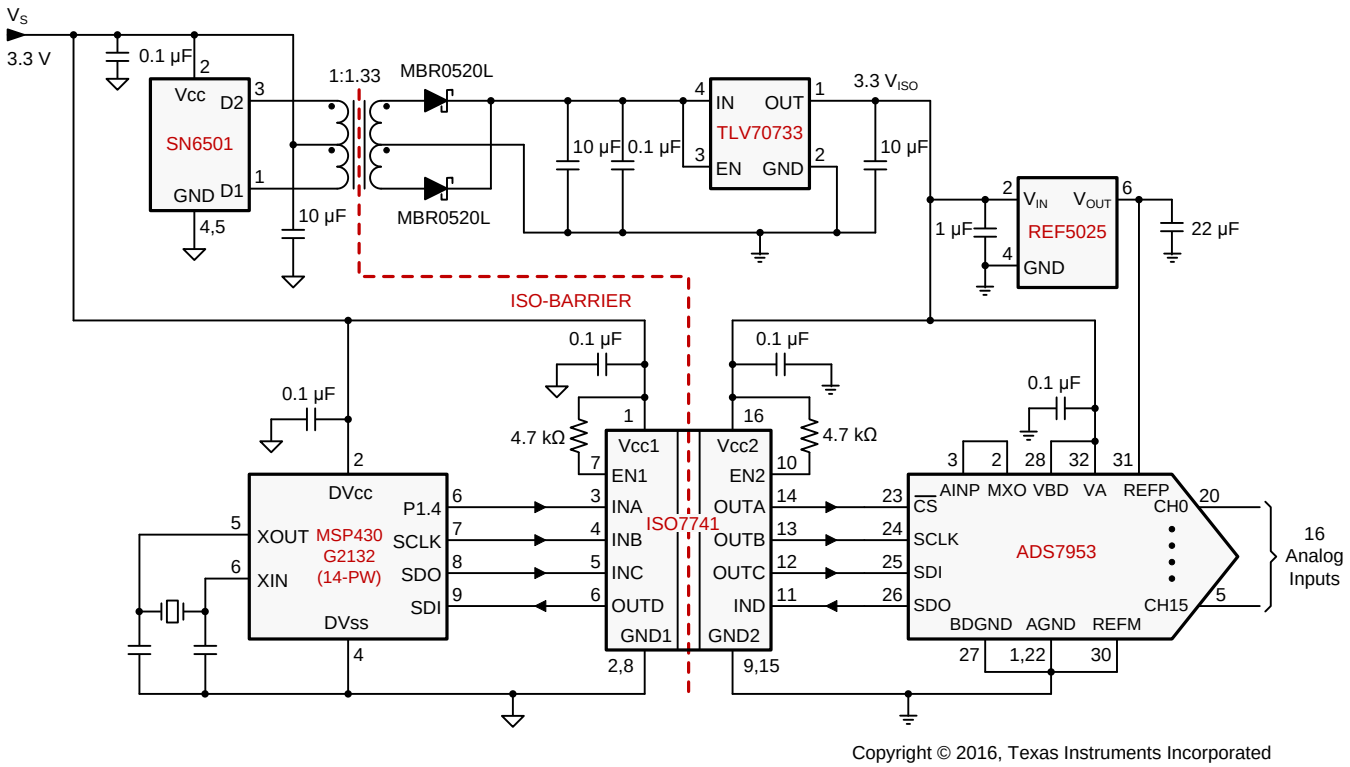

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Figure 22. Isolated SPI for an Analog Input Module With 16 Input

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Typical Application (continued)

9.2.1 Design Requirements

To design with these devices, use the parameters listed in Table 3.

Table 3. Design Parameters

PARAMETER	VALUE
Supply voltage, V_{CC1} and V_{CC2}	2.25 to 5.5 V
Decoupling capacitor between V_{CC1} and GND1	0.1 µF
Decoupling capacitor from V_{CC2} and GND2	0.1 µF

9.2.2 Detailed Design Procedure

Unlike optocouplers, which require external components to improve performance, provide bias, or limit current, the ISO774x family of devices only require two external bypass capacitors to operate.

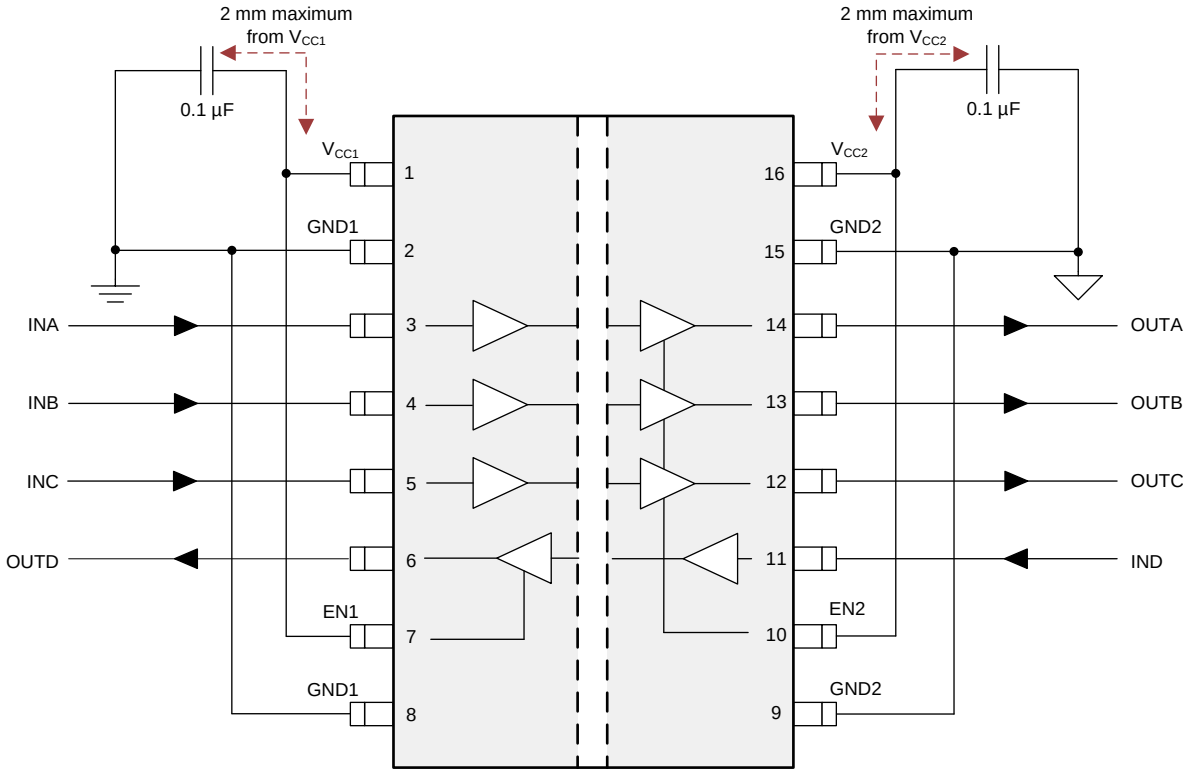

Figure 23. Typical ISO7741 Circuit Hook-up

9.2.3 Application Curve

The following typical eye diagrams of the ISO774x family of devices indicates low jitter and wide open eye at the maximum data rate of 100 Mbps.

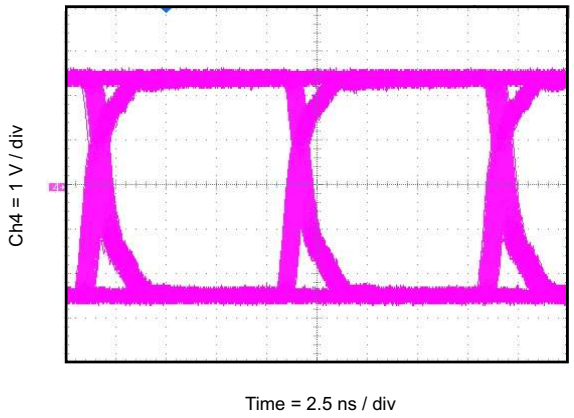

Figure 24. Eye Diagram at 100 Mbps PRBS 2^{16} – 1, 5 V and 25°C

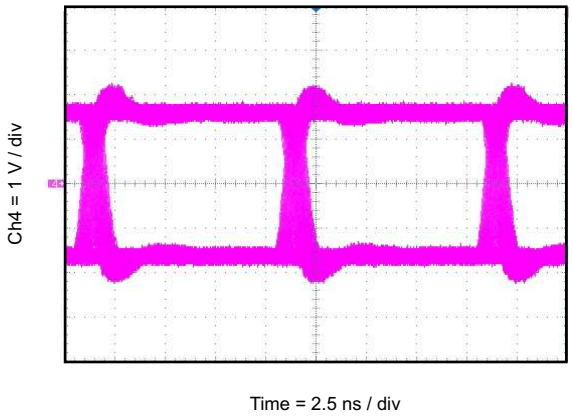

Figure 25. Eye Diagram at 100 Mbps PRBS 2^{16} – 1, 3.3 V and 25°C

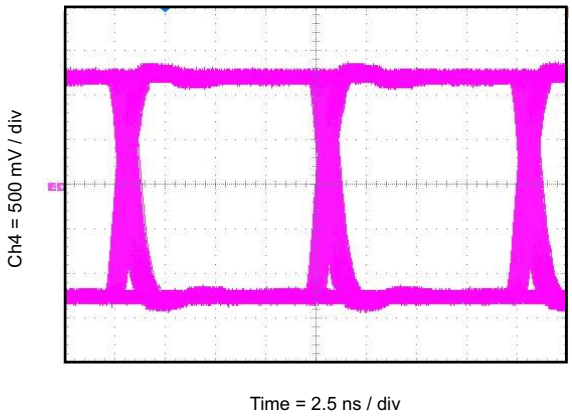

Figure 26. Eye Diagram at 100 Mbps PRBS 2^{16} – 1, 2.5 V and 25°C

10 Power Supply Recommendations

To help ensure reliable operation at data rates and supply voltages, a 0.1-μF bypass capacitor is recommended at the input and output supply pins (V_{CC1} and V_{CC2}). The capacitors should be placed as close to the supply pins as possible. If only a single primary-side power supply is available in an application, isolated power can be generated for the secondary-side with the help of a transformer driver such as Texas Instruments' SN6501 or SN6505A. For such applications, detailed power supply design and transformer selection recommendations are available in *SN6501 Transformer Driver for Isolated Power Supplies* (SLLSEA0) or *SN6505A Low-Noise 1-A Transformer Drivers for Isolated Power Supplies* (SLLSEP9).

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11 Layout

11.1 Layout Guidelines

A minimum of four layers is required to accomplish a low EMI PCB design (see Figure 27). Layer stacking should be in the following order (top-to-bottom): high-speed signal layer, ground plane, power plane and low-frequency signal layer.

- Routing the high-speed traces on the top layer avoids the use of vias (and the introduction of their inductances) and allows for clean interconnects between the isolator and the transmitter and receiver circuits of the data link.
- Placing a solid ground plane next to the high-speed signal layer establishes controlled impedance for transmission line interconnects and provides an excellent low-inductance path for the return current flow.
- Placing the power plane next to the ground plane creates additional high-frequency bypass capacitance of approximately 100 pF/inch^2.
- Routing the slower speed control signals on the bottom layer allows for greater flexibility as these signal links usually have margin to tolerate discontinuities such as vias.

If an additional supply voltage plane or signal layer is needed, add a second power or ground plane system to the stack to keep it symmetrical. This makes the stack mechanically stable and prevents it from warping. Also the power and ground plane of each power system can be placed closer together, thus increasing the high-frequency bypass capacitance significantly.

For detailed layout recommendations, refer to the *Digital Isolator Design Guide* (SLLA284).

11.1.1 PCB Material

For digital circuit boards operating below 150 Mbps, (or rise and fall times higher than 1 ns), and trace lengths of up to 10 inches, use standard FR-4 UL94V-0 printed circuit boards. This PCB is preferred over cheaper alternatives due to its lower dielectric losses at high frequencies, less moisture absorption, greater strength and stiffness, and self-extinguishing flammability-characteristics.

11.2 Layout Example

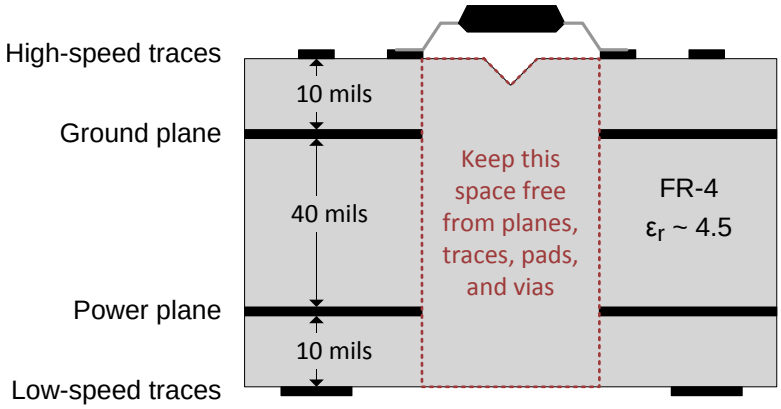

Figure 27. Layout Example Schematic

12 器件和文档支持

12.1 文档支持

12.1.1 相关文档

相关文档如下：

- 《ADS79xx 12/10/8 位、1MSPS、16/12/8/4 通道、单端、微功耗串行接口 ADC》（文献编号：SLAS605）
- 《数字隔离器设计指南》（文献编号：SLLA284）
- 《隔离相关术语》（文献编号：SLLA353）
- 《MSP430G2132 混合信号微控制器》（文献编号：SLAS723）
- 《REF50xx 低噪声、极低漂移、高精度电压基准》（文献编号：SBOS410）
- 《SN6501 适用于隔离式电源的变压器驱动器》（文献编号：SLLSEA0）
- 《SN6505A 适用于隔离式电源的低噪声 1A 变压器驱动器》（文献编号：SLLSEP9）
- 《TLV707、TLV707P 适用于便携式设备的 200mA、低 IQ、低噪声、低压降稳压器》（文献编号：SBVS153）

12.2 相关链接

下面的表格列出了快速访问链接。类别包括技术文档、支持与社区资源、工具和软件，以及申请样片或购买产品的快速链接。

表 4. 相关链接

器件	产品文件夹	立即订购	技术文档	工具和软件	支持和社区
ISO7740	请单击此处	请单击此处	请单击此处	请单击此处	请单击此处
ISO7741	请单击此处	请单击此处	请单击此处	请单击此处	请单击此处
ISO7742	请单击此处	请单击此处	请单击此处	请单击此处	请单击此处

12.3 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。请单击右上角的*通知我* 进行注册，即可收到任意产品信息更改每周摘要。有关更改的详细信息，请查看任意已修订文档中包含的修订历史记录。

12.4 社区资源

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

TI E2E™ Online Community ***TI's Engineer-to-Engineer (E2E) Community.*** Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support ***TI's Design Support*** Quickly find helpful E2E forums along with design support tools and contact information for technical support.

12.5 商标

E2E is a trademark of Texas Instruments.
All other trademarks are the property of their respective owners.

12.6 静电放电警告

ESD 可能会损坏该集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理措施和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。 精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

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12.7 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

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13 机械、封装和可订购信息

以下页中包括机械封装、封装和可订购信息。这些信息是针对指定器件可提供的最新数据。这些数据发生变化时，我们可能不会另行通知或修订此文档。如欲获取此产品说明书的浏览器版本，请参见左侧的导航栏。

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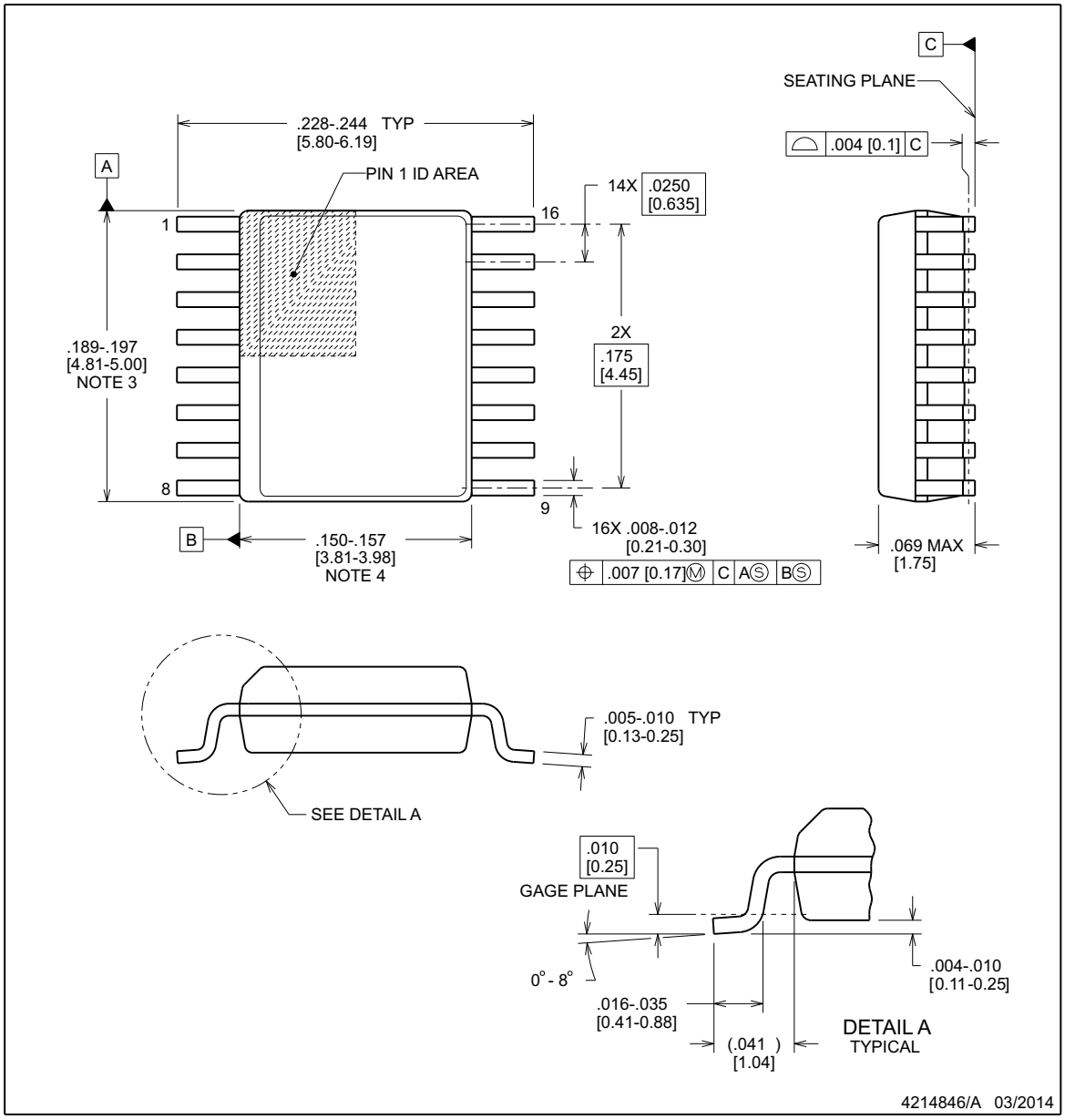
PACKAGE OUTLINE

DBQ0016A

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 inch, per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MO-137, variation AB.

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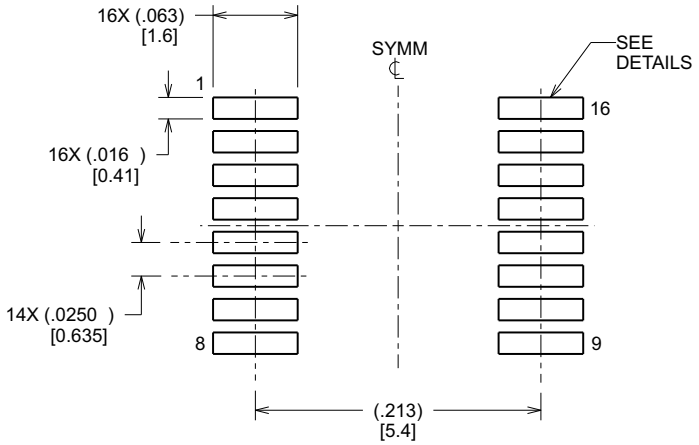
EXAMPLE BOARD LAYOUT

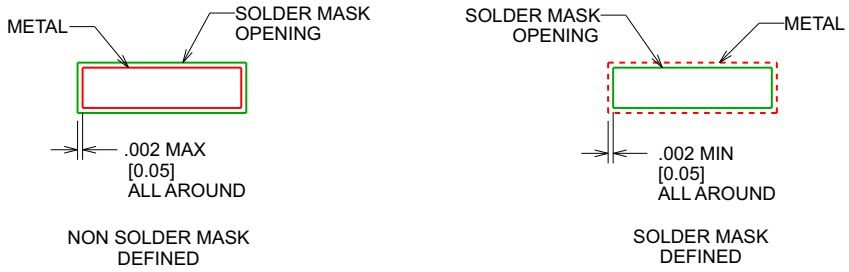
DBQ0016A

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



LAND PATTERN EXAMPLE
SCALE:8X



SOLDER MASK DETAILS

4214846/A 03/2014

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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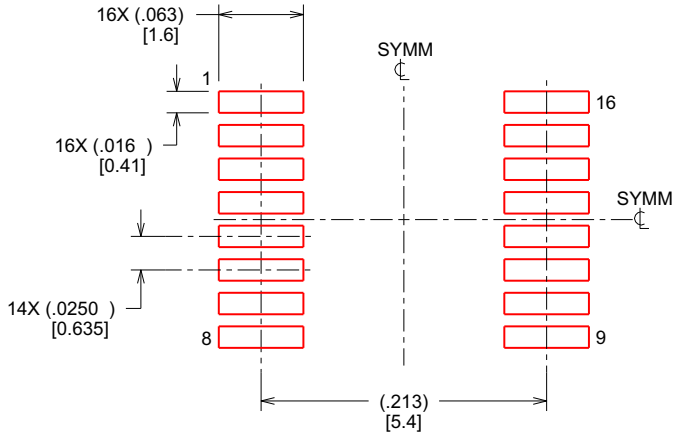
EXAMPLE STENCIL DESIGN

DBQ0016A

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.127 MM] THICK STENCIL
SCALE:8X

4214846/A 03/2014

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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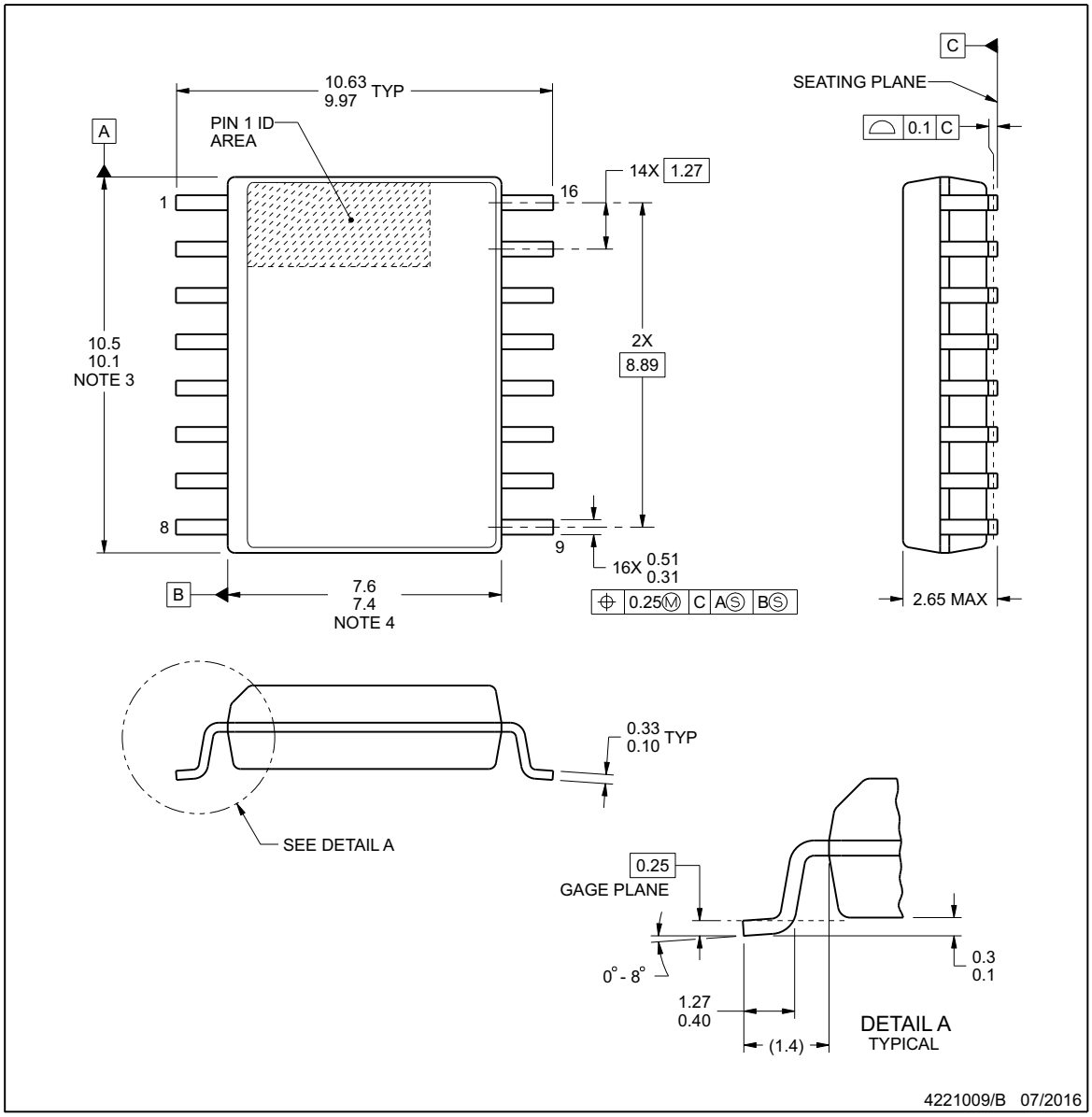
PACKAGE OUTLINE

DW0016B

SOIC - 2.65 mm max height

SOIC



NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
5. Reference JEDEC registration MS-013.

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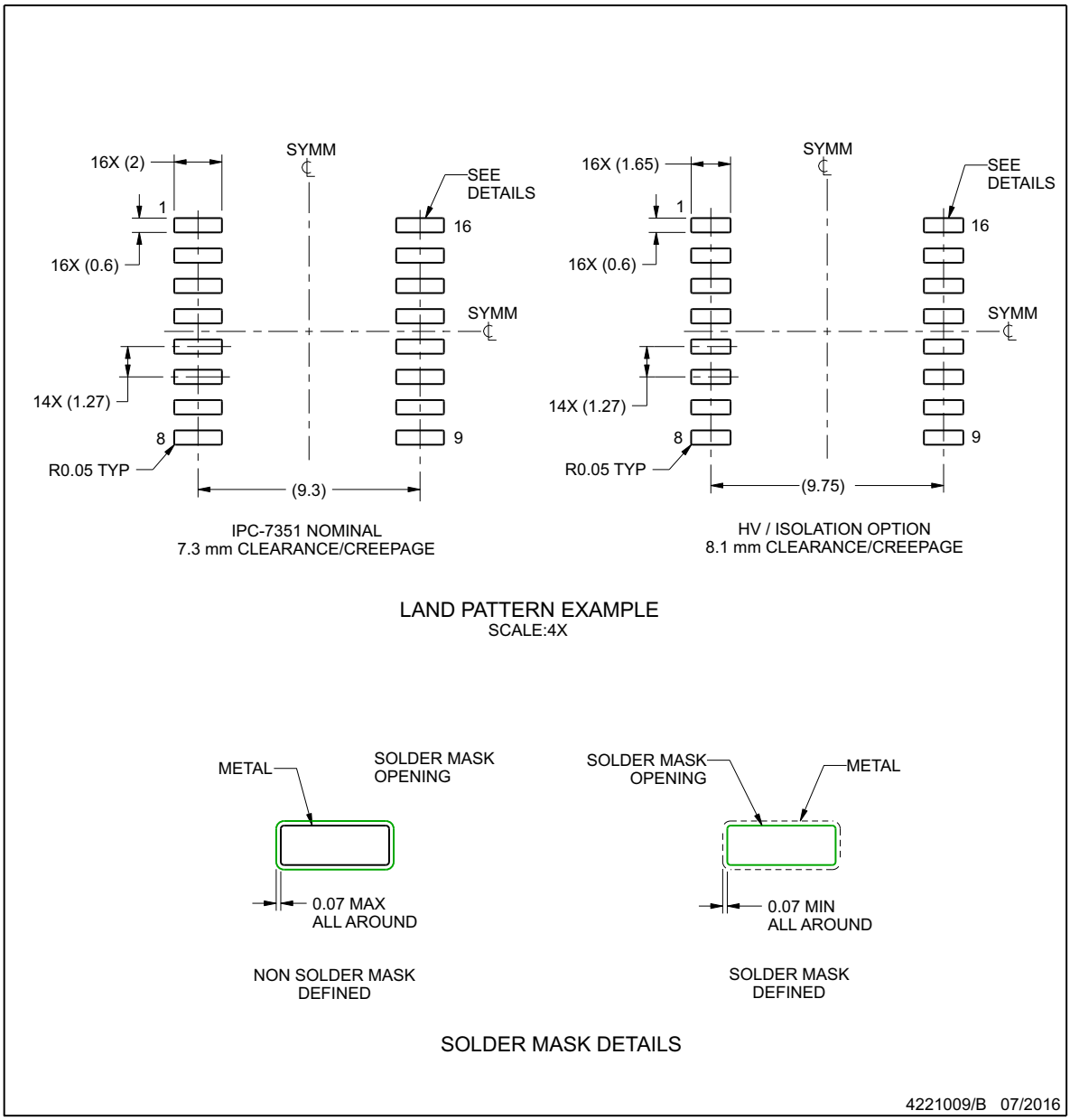
EXAMPLE BOARD LAYOUT

DW0016B

SOIC - 2.65 mm max height

SOIC



NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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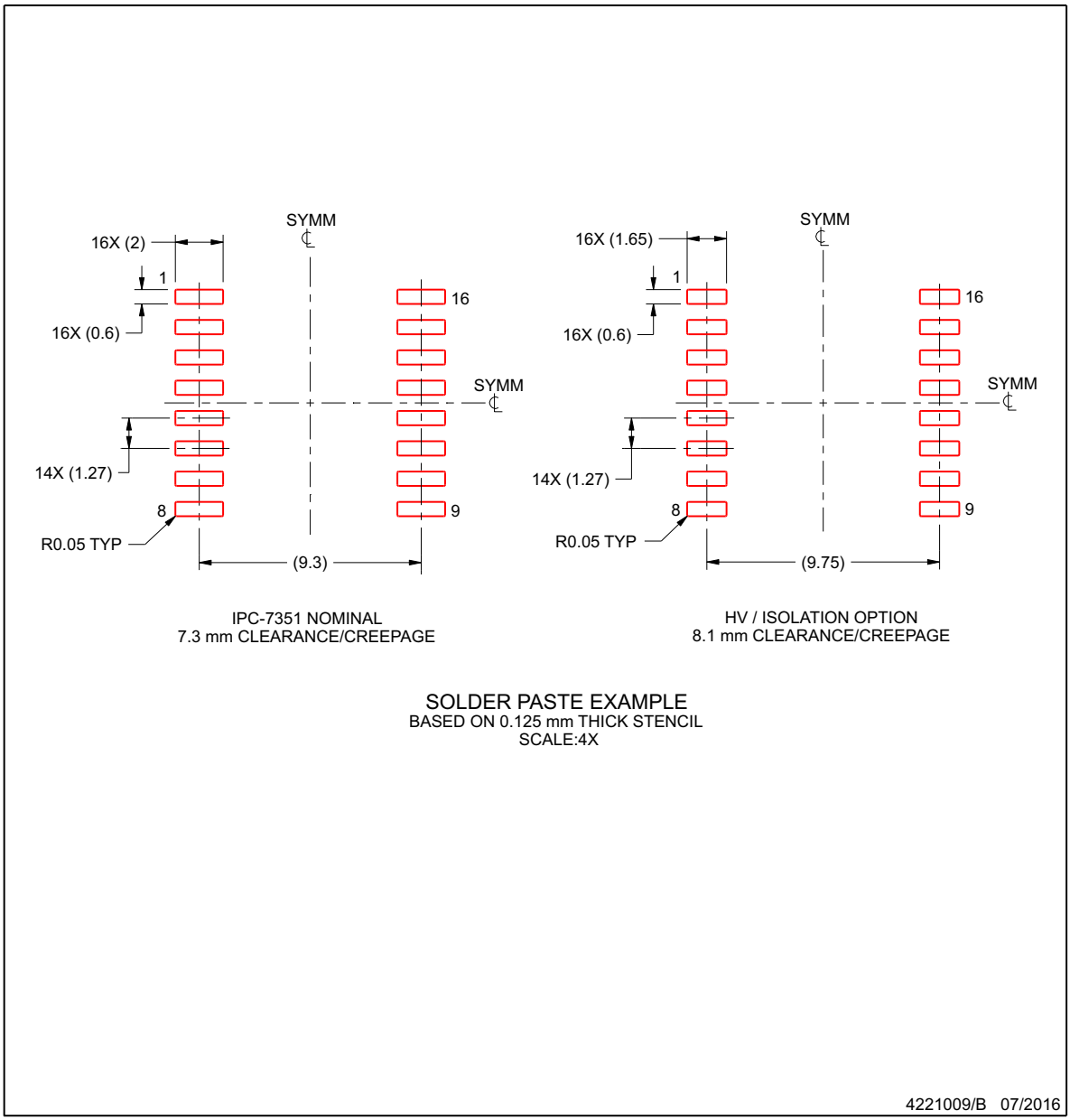
EXAMPLE STENCIL DESIGN

DW0016B

SOIC - 2.65 mm max height

SOIC



NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
ISO7740DBQ	ACTIVE	SSOP	DBQ	16	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	7740	Samples
ISO7740DBQR	ACTIVE	SSOP	DBQ	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	7740	Samples
ISO7740DW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7740	Samples
ISO7740DWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7740	Samples
ISO7740FDBQ	ACTIVE	SSOP	DBQ	16	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	7740F	Samples
ISO7740FDBQR	ACTIVE	SSOP	DBQ	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	7740F	Samples
ISO7740FDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7740F	Samples
ISO7740FDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7740F	Samples
ISO7741DBQ	ACTIVE	SSOP	DBQ	16	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	7741	Samples
ISO7741DBQR	ACTIVE	SSOP	DBQ	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	7741	Samples
ISO7741DW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7741	Samples
ISO7741DWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7741	Samples
ISO7741FDBQ	ACTIVE	SSOP	DBQ	16	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	7741F	Samples
ISO7741FDBQR	ACTIVE	SSOP	DBQ	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	7741F	Samples
ISO7741FDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7741F	Samples
ISO7741FDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7741F	Samples
ISO7742DBQ	PREVIEW	SSOP	DBQ	16	75	Green (RoHS & no Sb/Br)	CU NIPDAU | Call TI	Level-2-260C-1 YEAR	-55 to 125	7742	

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
ISO7742DBQR	PREVIEW	SSOP	DBQ	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	7742	
ISO7742DW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7742	Samples
ISO7742DWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7742	Samples
ISO7742FDBQ	PREVIEW	SSOP	DBQ	16	75	Green (RoHS & no Sb/Br)	CU NIPDAU | Call TI	Level-2-260C-1 YEAR	-55 to 125	7742F	
ISO7742FDBQR	PREVIEW	SSOP	DBQ	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	7742F	
ISO7742FDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7742F	Samples
ISO7742FDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-55 to 125	ISO7742F	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

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(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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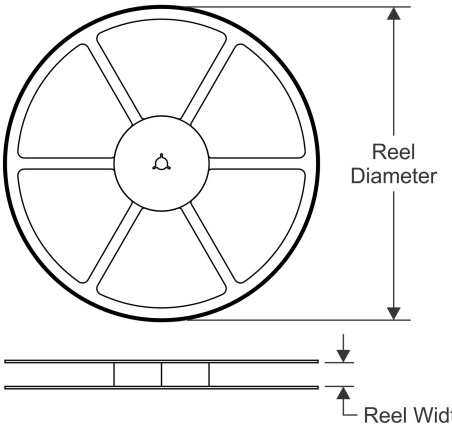
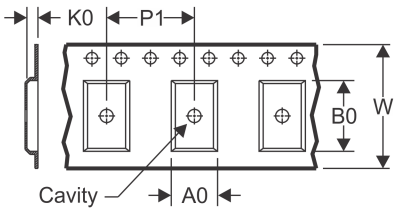
TAPE AND REEL INFORMATION

REEL DIMENSIONS

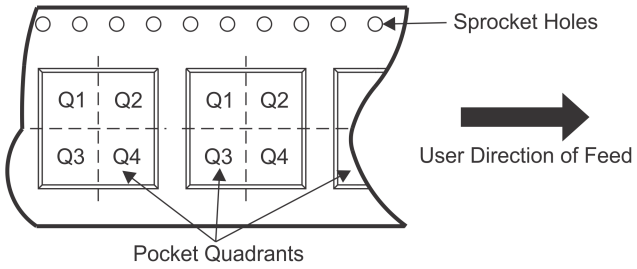


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

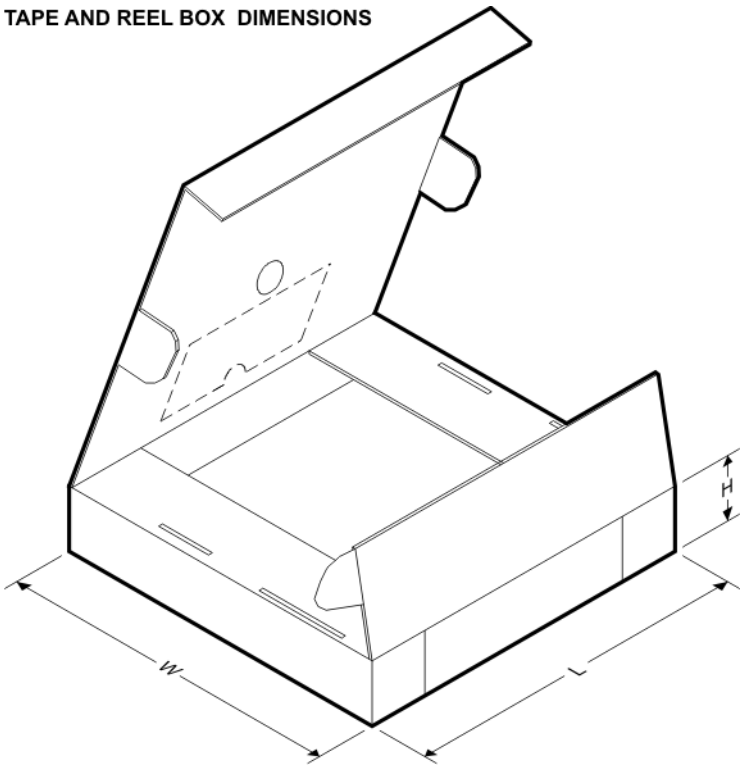
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
ISO7740DBQR	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7740DWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7740FDBQR	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7740FDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7741DBQR	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7741DWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7741FDBQR	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7741FDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7742DWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7742FDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
ISO7740DBQR	SSOP	DBQ	16	2500	367.0	367.0	38.0
ISO7740DWR	SOIC	DW	16	2000	367.0	367.0	38.0
ISO7740FDBQR	SSOP	DBQ	16	2500	367.0	367.0	38.0
ISO7740FDWR	SOIC	DW	16	2000	367.0	367.0	38.0
ISO7741DBQR	SSOP	DBQ	16	2500	367.0	367.0	38.0
ISO7741DWR	SOIC	DW	16	2000	367.0	367.0	38.0
ISO7741FDBQR	SSOP	DBQ	16	2500	367.0	367.0	38.0
ISO7741FDWR	SOIC	DW	16	2000	367.0	367.0	38.0
ISO7742DWR	SOIC	DW	16	2000	367.0	367.0	38.0
ISO7742FDWR	SOIC	DW	16	2000	367.0	367.0	38.0

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