

ISO652x 通用双通道功能隔离器

1 特性

- 双通道 CMOS 输出功能隔离器
- 50Mbps 数据速率
- 稳健可靠的 SiO₂ 隔离栅 (CMTI 典型值为 $\pm 150\text{kV}/\mu\text{s}$)
- 功能隔离(8-EEU) :
 - 200V_{RMS}、280V_{DC} 工作电压
 - 570V_{RMS}、800V_{DC} 瞬态电压 (60s)
- 功能隔离(8-D) :
 - 450V_{RMS}、637V_{DC} 工作电压
 - 707V_{RMS}、1000V_{DC} 瞬态电压 (60s)
- 采用爬电距离 >2.2mm 的紧凑型 8-REU 封装
- 宽电源电压范围：1.71V 到 1.89V 和 2.25V 到 5.5V
- 1.71V 至 5.5V 电平转换
- 默认输出高电平 (ISO652x) 和低电平 (ISO652xF) 选项
- 宽温度范围：-40°C 至 125°C
- 3.3V、1Mbps 时每通道电流典型值为 1.8mA
- 低传播延迟：3.3V 时为 11ns (典型值)
- 优异的电磁兼容性 (EMC)
 - 系统级 ESD、EFT 和浪涌抗扰度
 - 超低辐射
- 无引线 DFN (8-REU) 封装和窄体 SOIC (8-D) 封装选项

2 应用

- 电源
- 电网、电表
- 电机驱动器
- 工厂自动化
- 楼宇自动化
- 照明
- 电器

3 说明

ISO652x 器件是高性能双通道功能隔离器，适用于需要与非安全应用隔离的成本敏感、空间受限型应用。该隔离栅支持 200V_{RMS}/280V_{DC} 的工作电压，以及 570V_{RMS}/800V_{DC} 的瞬态过压。

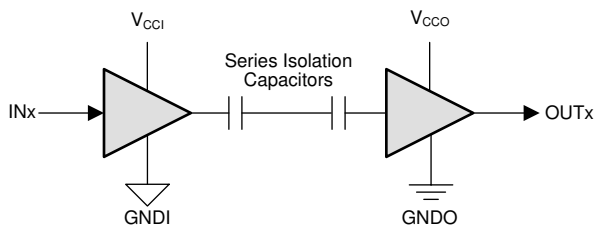
在隔离 CMOS 或 LVCMOS 数字 I/O 的同时，器件可提供高电磁抗扰度、低发射和低功耗特性。每条隔离通道的逻辑输入和输出缓冲器均由 TI 的双电容二氧化硅 (SiO₂) 绝缘栅相隔离。ISO6520 具有 2 个同向隔离通道。ISO6521 具有 2 个隔离通道，每个方向各一个通道。如果输入功率或信号出现损失，不带后缀 F 的器件默认输出高电平，带后缀 F 的器件默认输出低电平。更多详细信息，请参见器件功能模式部分。

这些器件有助于防止 UART、SPI、RS-485、RS-232 和 CAN 等数据总线上的噪声电流损坏敏感电路。得益于芯片设计和布局布线技术，器件的电磁兼容性得到了显著增强，可缓解系统级 ESD 问题并符合辐射标准。

封装信息

器件型号	封装 ⁽¹⁾	封装尺寸 ⁽²⁾
ISO6520、ISO6520F	DFN (8-REU)	3.0mm x 2.0mm
ISO6521、ISO6521F		
ISO6520、ISO6520F	D (8)	4.9mm x 6.0mm
ISO6521、ISO6521F		

- (1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。
- (2) 封装尺寸 (长 × 宽) 为标称值，并包括引脚 (如适用)。



V_{CCI} = 输入电源，V_{CCO} = 输出电源
GNDI = 输入接地，GNDO = 输出接地

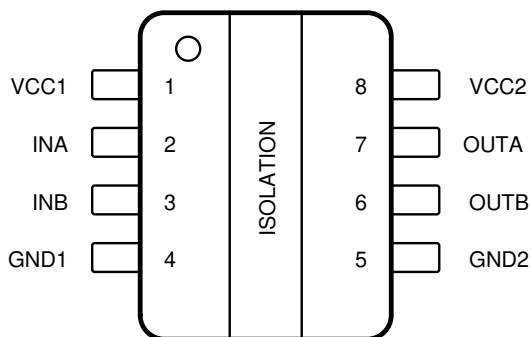
简化原理图



Table of Contents

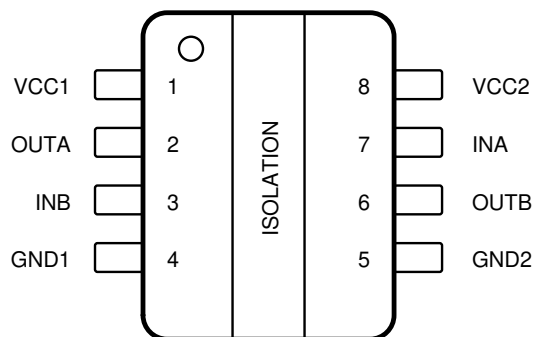
1 特性	1	6 Parameter Measurement Information	14
2 应用	1	7 Detailed Description	15
3 说明	1	7.1 Overview.....	15
4 Pin Configuration and Functions	3	7.2 Functional Block Diagram.....	15
5 Specifications	4	7.3 Feature Description.....	16
5.1 Absolute Maximum Ratings.....	4	7.4 Device Functional Modes.....	16
5.2 ESD Ratings.....	4	8 Application and Implementation	18
5.3 Recommended Operating Conditions.....	4	8.1 Application Information.....	18
5.4 Thermal Information.....	5	8.2 Typical Application.....	18
5.5 Package Characteristics.....	5	9 Power Supply Recommendations	19
5.6 Electrical Characteristics—5-V Supply.....	6	10 Layout	19
5.7 Supply Current Characteristics—5-V Supply.....	6	10.1 Layout Guidelines.....	19
5.8 Electrical Characteristics—3.3-V Supply.....	7	10.2 Layout Example.....	20
5.9 Supply Current Characteristics—3.3-V Supply.....	7	11 Device and Documentation Support	21
5.10 Electrical Characteristics—2.5-V Supply.....	8	11.1 Documentation Support.....	21
5.11 Supply Current Characteristics—2.5-V Supply.....	8	11.2 Receiving Notification of Documentation Updates..	21
5.12 Electrical Characteristics—1.8-V Supply.....	9	11.3 支持资源.....	21
5.13 Supply Current Characteristics—1.8-V Supply.....	9	11.4 Trademarks.....	21
5.14 Switching Characteristics—5-V Supply.....	10	11.5 静电放电警告.....	21
5.15 Switching Characteristics—3.3-V Supply.....	10	11.6 术语表.....	21
5.16 Switching Characteristics—2.5-V Supply.....	11	12 Revision History	21
5.17 Switching Characteristics—1.8-V Supply.....	11	13 Mechanical, Packaging, and Orderable Information	22
5.18 Typical Characteristics.....	12		

4 Pin Configuration and Functions



Not to scale

图 4-1. ISO6520 D Package 8-Pin SOIC Top View



Not to scale

图 4-2. ISO6521 D Package 8-Pin SOIC Top View

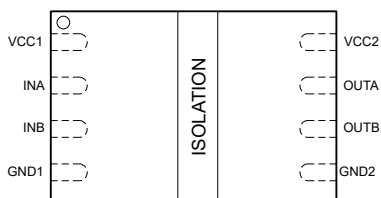


图 4-3. ISO6520 DFN Package 8-Pin REU Top View

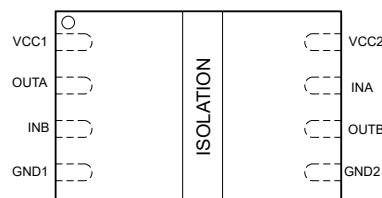


图 4-4. ISO6521 DFN Package 8-Pin REU Top View

表 4-1. Pin Functions

NAME	PIN		TYPE ⁽¹⁾	Description
	ISO6520	ISO6521		
GND1	4	4	-	Ground connection for V _{CC1}
GND2	5	5	-	Ground connection for V _{CC2}
INA	2	7	I	Input, channel A
INB	3	3	I	Input, channel B
OUTA	7	2	O	Output, channel A
OUTB	6	6	O	Output, channel B
V _{CC1}	1	1	P	Power supply, V _{CC1}
V _{CC2}	8	8	P	Power supply, V _{CC2}

(1) I = Input, O = Output, P = Power

5 Specifications

5.1 Absolute Maximum Ratings

See⁽¹⁾

		MIN	MAX	UNIT
Supply Voltage ⁽²⁾	V _{CC1} to GND1	-0.5	6	V
	V _{CC2} to GND2	-0.5	6	
Input/Output Voltage	INx to GNDx	-0.5	V _{CCX} + 0.5 ⁽³⁾	V
	OUTx to GNDx	-0.5	V _{CCX} + 0.5 ⁽³⁾	
Output Current	I _O	-15	15	mA
Temperature	Operating junction temperature, T _J		150	°C
	Storage temperature, T _{stg}	-65	150	°C
Transient Isolation Voltage (REU-8)	AC Voltage, t=60s		570	V _{RMS}
	DC Voltage, t=60s		800	V _{DC}
Transient Isolation Voltage (SOIC-8)	AC Voltage, t=60s		707	V _{RMS}
	DC Voltage, t=60s		1000	V _{DC}

- (1) Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.
- (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.

5.2 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.

5.3 Recommended Operating Conditions

		TEST CONDITIONS	MIN	NOM	MAX	UNIT
V _{CC1} ⁽¹⁾	Supply Voltage Side 1	V _{CC} = 1.8 V ⁽³⁾	1.71		1.89	V
V _{CC1} ⁽¹⁾	Supply Voltage Side 1	V _{CC} = 2.5 V to 5 V ⁽³⁾	2.25		5.5	V
V _{CC2} ⁽¹⁾	Supply Voltage Side 2	V _{CC} = 1.8 V ⁽³⁾	1.71		1.89	V
V _{CC2} ⁽¹⁾	Supply Voltage Side 2	V _{CC} = 2.5 V to 5 V ⁽³⁾	2.25		5.5	V
V _{CC} (UVLO+)	UVLO threshold when supply voltage is rising			1.53	1.71	V
V _{CC} (UVLO-)	UVLO threshold when supply voltage is falling		1.1	1.41		V
V _{hys} (UVLO)	Supply voltage UVLO hysteresis		0.08	0.13		V
V _{IH}	High level Input voltage		0.7 × V _{CCI} ⁽²⁾		V _{CCI}	V
V _{IL}	Low level Input voltage		0		0.3 × V _{CCI}	V

		TEST CONDITIONS	MIN	NOM	MAX	UNIT
I _{OH}	High level output current	V _{CCO} ⁽²⁾ = 5 V	-4			mA
		V _{CCO} = 3.3 V	-2			mA
		V _{CCO} = 2.5 V	-1			mA
		V _{CCO} = 1.8 V	-1			mA
I _{OL}	Low level output current	V _{CCO} = 5 V			4	mA
		V _{CCO} = 3.3 V			2	mA
		V _{CCO} = 2.5 V			1	mA
		V _{CCO} = 1.8 V			1	mA
DR	Data Rate		0		50	Mbps
T _A	Ambient temperature		-40	25	125	°C
V _{IOWM}	Functional Isolation Working Voltage (REU-8)	AC Voltage (sine wave)			200	V _{RMS}
		DC Voltage			280	V _{DC}
V _{IOWM}	Functional Isolation Working Voltage (SOIC-8)	AC Voltage (sine wave)			450	V _{RMS}
		DC Voltage			637	V _{DC}

- (1) V_{CC1} and V_{CC2} can be set independent of one another
(2) V_{CC1} = Input-side V_{CC}; V_{CCO} = Output-side V_{CC}
(3) The channel outputs are in undetermined state when 1.89 V < V_{CC1}, V_{CC2} < 2.25 V and 1.05 V < V_{CC1}, V_{CC2} < 1.71 V

5.4 Thermal Information

THERMAL METRIC ⁽¹⁾		ISO652x		UNIT
		DFN (REU-8)	D (SOIC-8)	
		8 PINS	8 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	143.4	104.6	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	70.0	48.9	°C/W
R _{θJB}	Junction-to-board thermal resistance	78.3	52.9	°C/W
ψ _{JT}	Junction-to-top characterization parameter	4.2	7.9	°C/W
ψ _{JB}	Junction-to-board characterization parameter	77.7	52.1	°C/W

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application note.

5.5 Package Characteristics

PARAMETER		TEST CONDITIONS	VALUE	VALUE	UNIT
			8-REU	8-D	
CLR	External clearance ⁽¹⁾	Shortest pin to pin distance through air	>2.2	>4	mm
CPG	External creepage ⁽¹⁾	Shortest pin to pin distance across the package surface	>2.2	>4	mm
CTI	Comparative tracking index	IEC 60112; UL 746A	>400	>400	V
	Material Group	According to IEC 60664-1	II	II	
C _{IO}	Capacitance, input to output ⁽²⁾	V _{IO} = 0.4 × sin (2 π ft), f = 1 MHz	≅0.5	≅0.5	pF
R _{IO}	Resistance, input to output ⁽²⁾	T _A = 25°C	>10 ¹²	>10 ¹²	Ω

- (1) Creepage and clearance requirements must be applied according to the specific equipment isolation standards of an application. Care must be taken to maintain the creepage and clearance distance of a board design to verify 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, ribs, or both on a printed circuit board are used to help increase these specifications.
(2) All pins on each side of the barrier tied together creating a two-pin device.

5.6 Electrical Characteristics—5-V Supply

$V_{CC1} = V_{CC2} = 5\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	$I_{OH} = -4\text{ mA}$; See 图 6-1	$V_{CCO} - 0.4$		V
V_{OL}	Low-level output voltage	$I_{OL} = 4\text{ mA}$; See 图 6-1		0.4	V
$V_{IT+(IN)}$	Rising input switching threshold		$0.7 \times V_{CCI}^{(1)}$		V
$V_{IT-(IN)}$	Falling input switching threshold	$0.3 \times V_{CCI}$			V
$V_{I(HYS)}$	Input threshold voltage hysteresis	$0.1 \times V_{CCI}$			V
I_{IH}	High-level input current	$V_{IH} = V_{CCI}^{(1)}$ at INx		10	μA
I_{IL}	Low-level input current	$V_{IL} = 0\text{ V}$ at INx	-10		μA
CMTI	Common mode transient immunity	$V_I = V_{CC}$ or 0 V , $V_{CM} = 700\text{ V}$; See 图 6-3	100	150	$\text{kV}/\mu\text{s}$
C_i	Input Capacitance ⁽²⁾	$V_I = V_{CC}/2 + 0.4 \times \sin(2\pi ft)$, $f = 2\text{ MHz}$, $V_{CC} = 5\text{ V}$	2.8		pF

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

(2) Measured from input pin to same side ground.

5.7 Supply Current Characteristics—5-V Supply

$V_{CC1} = V_{CC2} = 5\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS		SUPPLY CURRENT	MIN	TYP	MAX	UNIT
ISO6520							
Supply current - DC signal ⁽²⁾	$V_I = V_{CCI}$ ⁽¹⁾ (ISO6520), $V_I = 0$ V (ISO6520 with F suffix)		I_{CC1}		1.1	1.7	mA
			I_{CC2}		1.3	2.2	
	$V_I = 0$ V (ISO6520), $V_I = V_{CC1}$ (ISO6520 with F suffix)		I_{CC1}		3.2	4.6	
			I_{CC2}		1.4	2.3	
Supply current - AC signal ⁽³⁾	All channels switching with square wave clock input; $C_L = 15$ pF	1 Mbps	I_{CC1}		2.1	3.1	
			I_{CC2}		1.5	2.4	
		10 Mbps	I_{CC1}		2.2	3.2	
			I_{CC2}		2.7	3.6	
		50 Mbps	I_{CC1}		2.5	3.6	
			I_{CC2}		7.9	9.5	
ISO6521							
Supply current - DC signal ⁽²⁾	$V_I = V_{CCI}$ ⁽¹⁾ (ISO6521); $V_I = 0$ V (ISO6521 with F suffix)		I_{CC1}, I_{CC2}		1.2	2.2	mA
			I_{CC1}, I_{CC2}		2.3	3.5	
Supply current - AC signal ⁽³⁾	All channels switching with square wave clock input; $C_L = 15$ pF	1 Mbps	I_{CC1}, I_{CC2}		1.9	2.9	
		10 Mbps	I_{CC1}, I_{CC2}		2.5	3.6	
		50 Mbps	I_{CC1}, I_{CC2}		5.2	6.7	

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

(2) Supply current valid for $ENx = V_{CCx}$ and $ENx = 0\text{ V}$

(3) Supply current valid for $ENx = V_{CCx}$

5.8 Electrical Characteristics—3.3-V Supply

$V_{CC1} = V_{CC2} = 3.3 \text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage $I_{OH} = -2\text{mA}$; See 图 6-1	$V_{CCO} - 0.2$			V
V_{OL}	Low-level output voltage $I_{OL} = 2\text{mA}$; See 图 6-1			0.2	V
$V_{IT+(IN)}$	Rising input switching threshold		$0.7 \times V_{CCI}^{(1)}$		V
$V_{IT-(IN)}$	Falling input switching threshold	$0.3 \times V_{CCI}$			V
$V_{I(HYS)}$	Input threshold voltage hysteresis	$0.1 \times V_{CCI}$			V
I_{IH}	High-level input current $V_{IH} = V_{CCI}^{(1)}$ at INx			10	μA
I_{IL}	Low-level input current $V_{IL} = 0 \text{ V}$ at INx	-10			μA
CMTI	Common mode transient immunity $V_I = V_{CC}$ or 0 V , $V_{CM} = 700\text{V}$; See 图 6-3	100	150		$\text{kV}/\mu\text{s}$
C_i	Input Capacitance ⁽²⁾ $V_I = V_{CC}/2 + 0.4 \times \sin(2\pi ft)$, $f = 2 \text{ MHz}$, $V_{CC} = 3.3 \text{ V}$		2.8		pF

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

(2) Measured from input pin to same side ground.

5.9 Supply Current Characteristics—3.3-V Supply

$V_{CC1} = V_{CC2} = 3.3 \text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS		SUPPLY CURRENT	MIN	TYP	MAX	UNIT
ISO6520							
Supply current - DC signal ⁽²⁾	$V_I = V_{CCI}$ ⁽¹⁾ (ISO6520), $V_I = 0$ V (ISO6520 with F suffix)		I_{CC1}		1.1	1.6	mA
			I_{CC2}		1.3	2.2	
	$V_I = 0$ V (ISO6520), $V_I = V_{CC1}$ (ISO6520 with F suffix)		I_{CC1}		3.2	4.5	
			I_{CC2}		1.4	2.3	
Supply current - AC signal ⁽³⁾	All channels switching with square wave clock input; $C_L = 15$ pF	1 Mbps	I_{CC1}		2.1	3.1	
			I_{CC2}		1.4	2.3	
		10 Mbps	I_{CC1}		2.2	3.1	
			I_{CC2}		2.3	3.2	
		50 Mbps	I_{CC1}		2.4	3.4	
			I_{CC2}		6	7.3	
ISO6521							
Supply current - DC signal ⁽²⁾	$V_I = V_{CCI}$ ⁽¹⁾ (ISO6521); $V_I = 0$ V (ISO6521 with F suffix)		I_{CC1}, I_{CC2}		1.2	2.2	mA
	$V_I = 0$ V (ISO6521); $V_I = V_{CCI}$ (ISO6521 with F suffix)		I_{CC1}, I_{CC2}		2.3	3.5	
Supply current - AC signal ⁽³⁾	All channels switching with square wave clock input; $C_L = 15$ pF	1 Mbps	I_{CC1}, I_{CC2}		1.8	2.9	
		10 Mbps	I_{CC1}, I_{CC2}		2.3	3.4	
		50 Mbps	I_{CC1}, I_{CC2}		4.2	5.5	

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

(2) Supply current valid for $ENx = V_{CCx}$ and $ENx = 0 \text{ V}$

(3) Supply current valid for $ENx = V_{CCx}$

5.10 Electrical Characteristics—2.5-V Supply

$V_{CC1} = V_{CC2} = 2.5 \text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	$I_{OH} = -1\text{mA}$; See 图 6-1		$V_{CCO} - 0.1$	V
V_{OL}	Low-level output voltage	$I_{OL} = 1\text{mA}$; See 图 6-1		0.1	V
$V_{IT+(IN)}$	Rising input switching threshold		$0.7 \times V_{CCI}^{(1)}$		V
$V_{IT-(IN)}$	Falling input switching threshold	$0.3 \times V_{CCI}$			V
$V_{I(HYS)}$	Input threshold voltage hysteresis	$0.1 \times V_{CCI}$			V
I_{IH}	High-level input current	$V_{IH} = V_{CCI}^{(1)}$ at INx		10	μA
I_{IL}	Low-level input current	$V_{IL} = 0 \text{ V}$ at INx	-10		μA
CMTI	Common mode transient immunity	$V_I = V_{CC}$ or 0 V , $V_{CM} = 700\text{V}$; See 图 6-3	100	150	$\text{kV}/\mu\text{s}$
C_i	Input Capacitance ⁽²⁾	$V_I = V_{CC}/2 + 0.4 \times \sin(2\pi ft)$, $f = 2 \text{ MHz}$, $V_{CC} = 2.5 \text{ V}$	2.8		pF

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

(2) Measured from input pin to same side ground.

5.11 Supply Current Characteristics—2.5-V Supply

$V_{CC1} = V_{CC2} = 2.5 \text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS		SUPPLY CURRENT	MIN	TYP	MAX	UNIT
ISO6520							
Supply current - DC signal ⁽²⁾	V _I = V _{CCI} ⁽¹⁾ (ISO6520), V _I = 0 V (ISO6520 with F suffix)		I _{CC1}		1.1	1.6	mA
			I _{CC2}		1.3	2.1	
	V _I = 0V (ISO6520), V _I = V _{CC1} (ISO6520 with F suffix)		I _{CC1}		3.1	4.5	
			I _{CC2}		1.4	2.3	
Supply current - AC signal ⁽³⁾	All channels switching with square wave clock input; C _L = 15 pF	1 Mbps	I _{CC1}		2.1	3.1	
			I _{CC2}		1.4	2.3	
		10 Mbps	I _{CC1}		2.1	3.1	
			I _{CC2}		2	2.9	
		50 Mbps	I _{CC1}		2.3	3.3	
			I _{CC2}		4.8	6	
ISO6521							
Supply current - DC signal ⁽²⁾	V _I = V _{CCI} ⁽¹⁾ (ISO6521); V _I = 0 V (ISO6521 with F suffix)		I _{CC1} , I _{CC2}		1.2	2.2	mA
	V _I = 0 V (ISO6521); V _I = V _{CCI} (ISO6521 with F suffix)		I _{CC1} , I _{CC2}		2.3	3.5	
Supply current - AC signal ⁽³⁾	All channels switching with square wave clock input; C _L = 15 pF	1 Mbps	I _{CC1} , I _{CC2}		1.8	2.9	
		10 Mbps	I _{CC1} , I _{CC2}		2.1	3.2	
		50 Mbps	I _{CC1} , I _{CC2}		3.6	4.9	

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

(2) Supply current valid for $ENx = V_{CCx}$ and $ENx = 0 \text{ V}$

(3) Supply current valid for $ENx = V_{CCx}$

5.12 Electrical Characteristics—1.8-V Supply

$V_{CC1} = V_{CC2} = 1.8 \text{ V} \pm 5\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	$I_{OH} = -1\text{mA}$; See 图 6-1	$V_{CCO} - 0.1$		V
V_{OL}	Low-level output voltage	$I_{OL} = 1\text{mA}$; See 图 6-1		0.1	V
$V_{IT+(IN)}$	Rising input switching threshold		$0.7 \times V_{CCI}^{(1)}$		V
$V_{IT-(IN)}$	Falling input switching threshold		$0.3 \times V_{CCI}$		V
$V_{I(HYS)}$	Input threshold voltage hysteresis		$0.1 \times V_{CCI}$		V
I_{IH}	High-level input current	$V_{IH} = V_{CCI}^{(1)}$ at INx		10	μA
I_{IL}	Low-level input current	$V_{IL} = 0 \text{ V}$ at INx	-10		μA
CMTI	Common mode transient immunity	$V_I = V_{CC}$ or 0 V , $V_{CM} = 700\text{V}$; See 图 6-3	100	150	$\text{kV}/\mu\text{s}$
C_i	Input Capacitance ⁽²⁾	$V_I = V_{CC}/2 + 0.4 \times \sin(2\pi ft)$, $f = 2 \text{ MHz}$, $V_{CC} = 1.8 \text{ V}$	2.8		pF

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

(2) Measured from input pin to same side ground.

5.13 Supply Current Characteristics—1.8-V Supply

$V_{CC1} = V_{CC2} = 1.8 \text{ V} \pm 5\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS		SUPPLY CURRENT	MIN	TYP	MAX	UNIT
ISO6520							
Supply current - DC signal ⁽²⁾	$V_I = V_{CCI}$ ⁽¹⁾ (ISO6520), $V_I = 0$ V (ISO6520 with F suffix)		I_{CC1}		0.8	1.5	mA
			I_{CC2}		1.2	2.1	
	$V_I = 0$ V (ISO6520), $V_I = V_{CC1}$ (ISO6520 with F suffix)		I_{CC1}		2.8	4.3	
			I_{CC2}		1.3	2.3	
Supply current - AC signal ⁽³⁾	All channels switching with square wave clock input; $C_L = 15$ pF	1 Mbps	I_{CC1}		1.8	2.9	
			I_{CC2}		1.3	2.3	
		10 Mbps	I_{CC1}		1.8	2.9	
			I_{CC2}		1.8	2.7	
		50 Mbps	I_{CC1}		2	3.1	
			I_{CC2}		3.8	4.9	
ISO6521							
Supply current - DC signal ⁽²⁾	$V_I = V_{CCI}$ ⁽¹⁾ (ISO6521); $V_I = 0$ V (ISO6521 with F suffix)		I_{CC1}, I_{CC2}		1.1	2.1	mA
	$V_I = 0$ V (ISO6521); $V_I = V_{CC1}$ (ISO6521 with F suffix)		I_{CC1}, I_{CC2}		2.1	3.4	
Supply current - AC signal ⁽³⁾	All channels switching with square wave clock input; $C_L = 15$ pF	1 Mbps	I_{CC1}, I_{CC2}		1.6	2.7	
		10 Mbps	I_{CC1}, I_{CC2}		1.9	3	
		50 Mbps	I_{CC1}, I_{CC2}		3	4.2	

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

(2) Supply current valid for ENx = V_{CCx} and ENx = 0V

(3) Supply current valid for ENx = V_{CCx}

5.14 Switching Characteristics—5-V Supply

$V_{CC1} = V_{CC2} = 5\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} , t_{PHL}	Propagation delay time	See 图 6-1	11	18	ns
$t_{P(dft)}$	Propagation delay drift		8		ps/°C
t_{UI}	Minimum pulse width	See 图 6-1	20		ns
PWD	Pulse width distortion ⁽¹⁾ $ t_{PHL} - t_{PLH} $	See 图 6-1	0.2	7	ns
$t_{sk(o)}$	Channel-to-channel output skew time ⁽²⁾	Same direction channels		6	ns
$t_{sk(p-p)}$	Part-to-part skew time ⁽³⁾			6	ns
t_r	Output signal rise time	See 图 6-1	2.6	4.5	ns
t_f	Output signal fall time		2.6	4.5	ns
t_{PU}	Time from UVLO to valid output data			300	μs
t_{DO}	Default output delay time from input power loss	Measured from the time V_{CC} goes below 1.2V. See 图 6-2	0.1	0.3	μs
t_{ie}	Time interval error	$2^{16} - 1$ PRBS data at 50 Mbps	1		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.

5.15 Switching Characteristics—3.3-V Supply

$V_{CC1} = V_{CC2} = 3.3\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} , t_{PHL}	Propagation delay time	See 图 6-1	11	18	ns
$t_{P(dft)}$	Propagation delay drift		9.2		ps/°C
t_{UI}	Minimum pulse width	See 图 6-1	20		ns
PWD	Pulse width distortion ⁽¹⁾ $ t_{PHL} - t_{PLH} $	See 图 6-1	0.5	7	ns
$t_{sk(o)}$	Channel-to-channel output skew time ⁽²⁾	Same direction channels		6	ns
$t_{sk(p-p)}$	Part-to-part skew time ⁽³⁾			6	ns
t_r	Output signal rise time	See 图 6-1	1.6	3.2	ns
t_f	Output signal fall time		1.6	3.2	ns
t_{PU}	Time from UVLO to valid output data			300	μs
t_{DO}	Default output delay time from input power loss	Measured from the time V_{CC} goes below 1.2V. See 图 6-2	0.1	0.3	μs
t_{ie}	Time interval error	$2^{16} - 1$ PRBS data at 50 Mbps	1		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.

5.16 Switching Characteristics—2.5-V Supply

$V_{CC1} = V_{CC2} = 2.5 \text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} , t_{PHL}	Propagation delay time	See 图 6-1	12	20.5	ns
$t_{P(dft)}$	Propagation delay drift		14.3		ps/°C
t_{UI}	Minimum pulse width	See 图 6-1	20		ns
PWD	Pulse width distortion ⁽¹⁾ $ t_{PHL} - t_{PLH} $	See 图 6-1	0.6	7.1	ns
$t_{sk(o)}$	Channel-to-channel output skew time ⁽²⁾	Same direction channels		6	ns
$t_{sk(p-p)}$	Part-to-part skew time ⁽³⁾			6.1	ns
t_r	Output signal rise time	See 图 6-1	2	4	ns
t_f	Output signal fall time		2	4	ns
t_{PU}	Time from UVLO to valid output data			300	μs
t_{DO}	Default output delay time from input power loss	Measured from the time V_{CC} goes below 1.2V. See 图 6-2	0.1	0.3	μs
t_{ie}	Time interval error	$2^{16} - 1$ PRBS data at 50 Mbps	1		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.

5.17 Switching Characteristics—1.8-V Supply

$V_{CC1} = V_{CC2} = 1.8 \text{ V} \pm 5\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} , t_{PHL}	Propagation delay time	See Figure 7-1	15	25.1	ns
$t_{P(dft)}$	Propagation delay drift		15.2		ps/°C
t_{UI}	Minimum pulse width	See Figure 7-1	20		ns
PWD	Pulse width distortion ⁽¹⁾ $ t_{PHL} - t_{PLH} $	See Figure 7-1	0.7	8.2	ns
$t_{sk(o)}$	Channel-to-channel output skew time ⁽²⁾	Same direction channels		6	ns
$t_{sk(p-p)}$	Part-to-part skew time ⁽³⁾			8.8	ns
t_r	Output signal rise time	See Figure 7-1	2.7	5.3	ns
t_f	Output signal fall time		2.7	5.3	ns
t_{PU}	Time from UVLO to valid output data			300	μs
t_{DO}	Default output delay time from input power loss	Measured from the time V_{CC} goes below 1.2V. See 图 6-2	0.1	0.3	μs
t_{ie}	Time interval error	$2^{16} - 1$ PRBS data at 50 Mbps	1		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.

5.18 Typical Characteristics

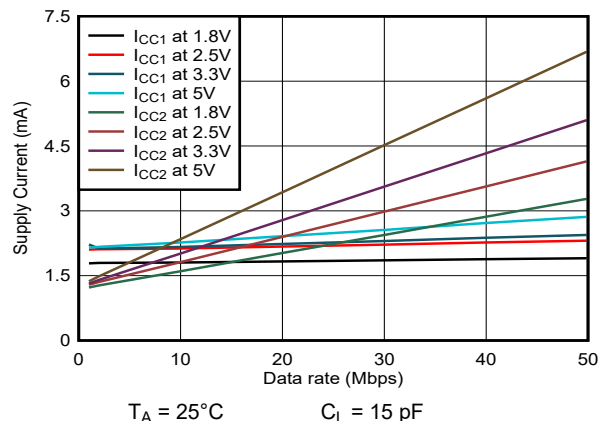


图 5-1. ISO6520 Supply Current vs Data Rate (With 15-pF Load)

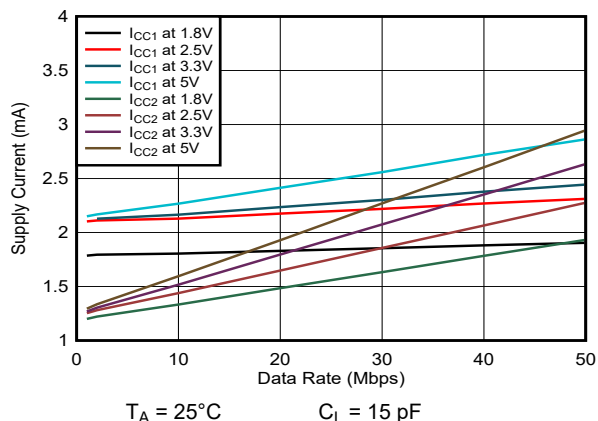


图 5-2. ISO6520 Supply Current vs Data Rate (With No Load)

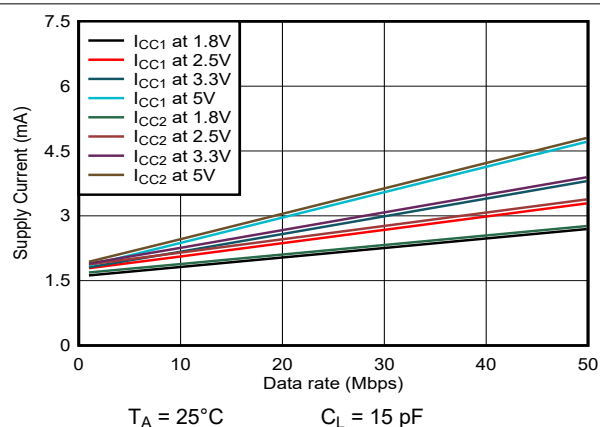


图 5-3. ISO6521 Supply Current vs Data Rate (With 15-pF Load)

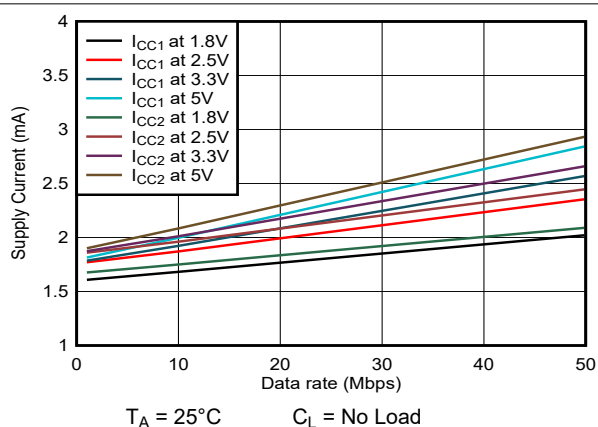


图 5-4. ISO6521 Supply Current vs Data Rate (With No Load)

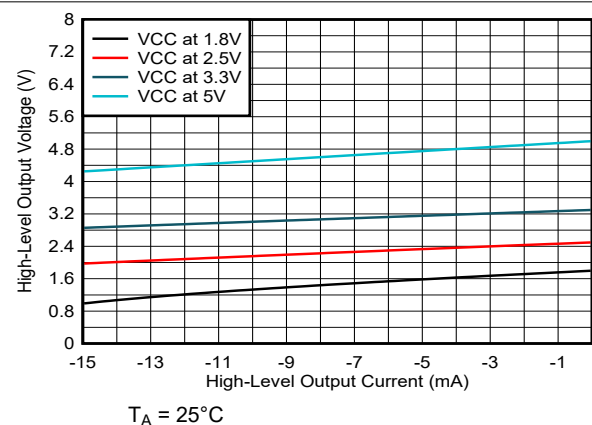


图 5-5. High-Level Output Voltage vs High-level Output Current

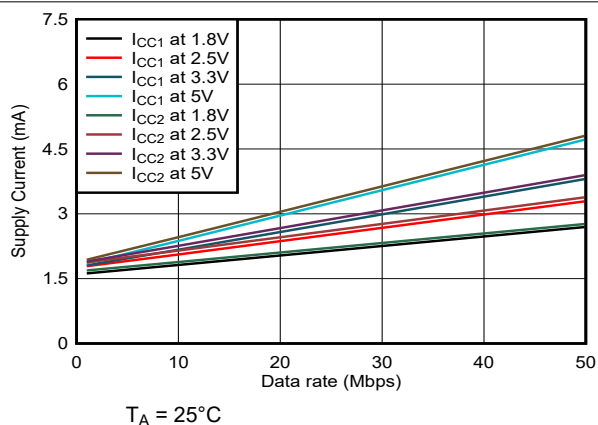


图 5-6. Low-Level Output Voltage vs Low-Level Output Current

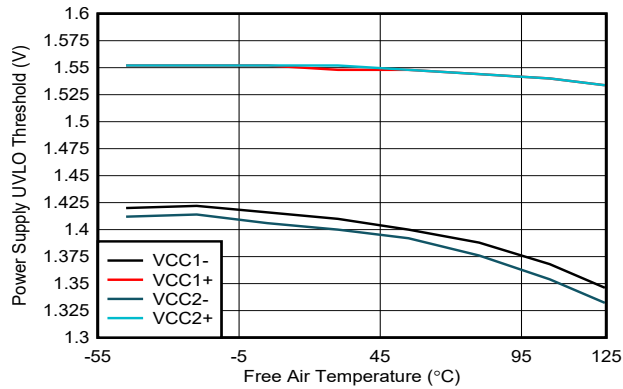


图 5-7. Power Supply Undervoltage Threshold vs Free-Air Temperature

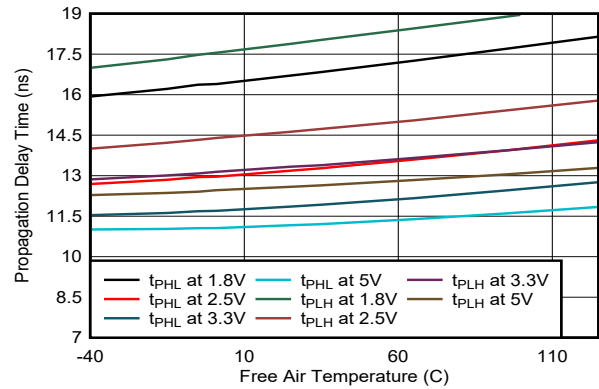
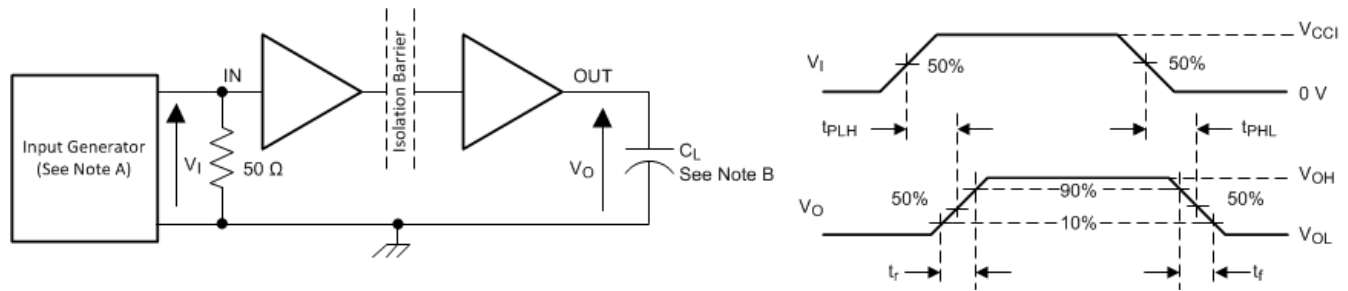


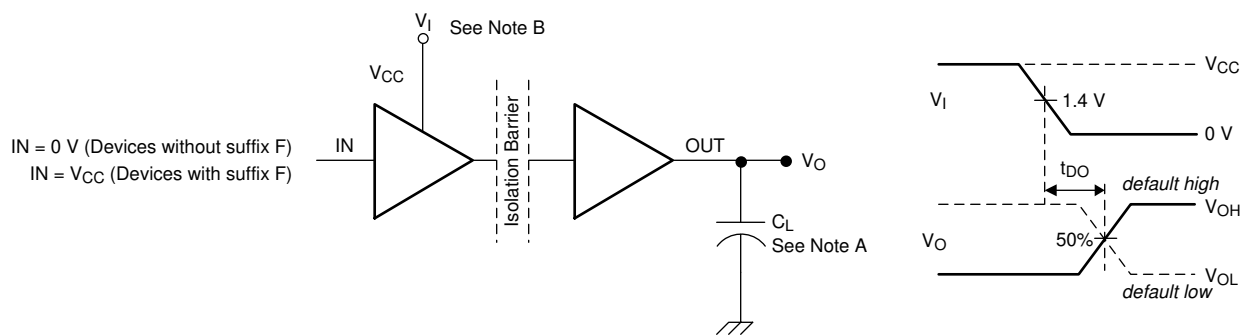
图 5-8. Propagation Delay Time vs Free-Air Temperature

6 Parameter Measurement Information



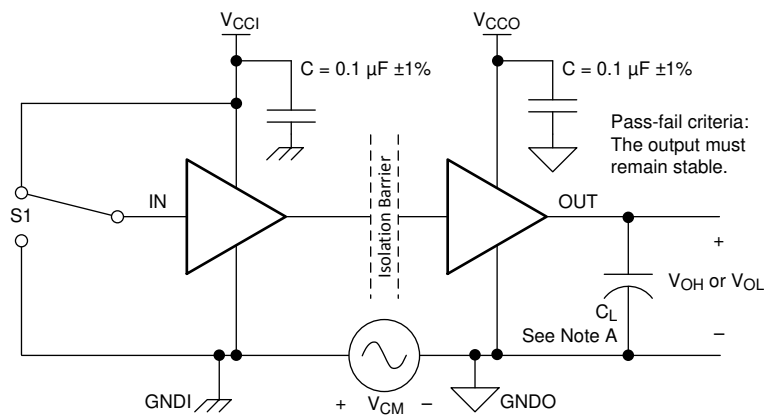
- A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 50 \text{ kHz}$, 50% duty cycle, $t_r \leq 3 \text{ ns}$, $t_f \leq 3 \text{ ns}$, $Z_O = 50 \Omega$. At the input, 50Ω resistor is required to terminate Input Generator signal. The 50Ω resistor is not needed in the actual application.
- B. $C_L = 15 \text{ pF}$ and includes instrumentation and fixture capacitance within $\pm 20\%$.

图 6-1. Switching Characteristics Test Circuit and Voltage Waveforms



- A. $C_L = 15 \text{ pF}$ and includes instrumentation and fixture capacitance within $\pm 20\%$.
- B. Power Supply Ramp Rate = 10 mV/ns

图 6-2. Default Output Delay Time Test Circuit and Voltage Waveforms



- A. $C_L = 15 \text{ pF}$ and includes instrumentation and fixture capacitance within $\pm 20\%$.

图 6-3. Common-Mode Transient Immunity Test Circuit

7 Detailed Description

7.1 Overview

The ISO652x family of devices has 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. These 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, 图 7-1, shows a functional block diagram of a typical channel.

7.2 Functional Block Diagram

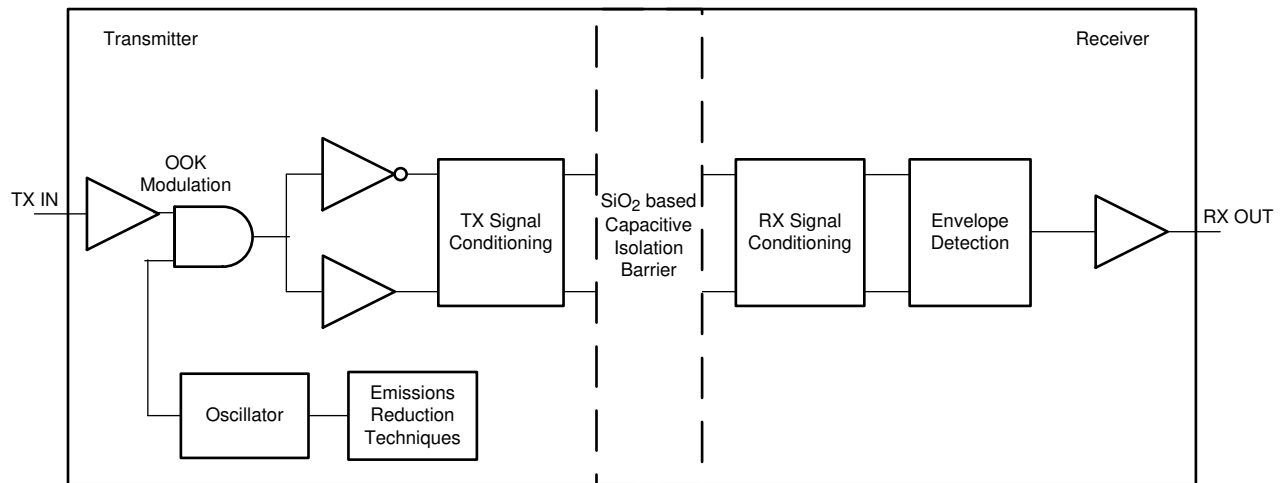


图 7-1. Conceptual Block Diagram of a Digital Capacitive Isolator

图 7-2 shows a conceptual detail of how the OOK scheme works.

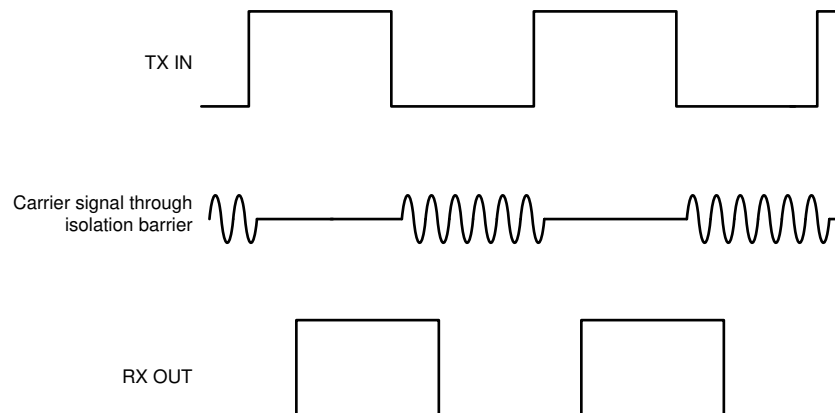


图 7-2. On-Off Keying (OOK) Based Modulation Scheme

7.3 Feature Description

family of devices is available in two channel configurations and default output state options to enable a variety of application uses. lists the device features of the devices.

表 7-1. Device Features

PART NUMBER	MAXIMUM DATA RATE	CHANNEL DIRECTION	DEFAULT OUTPUT STATE	PACKAGE
ISO6520	50 Mbps	2 Forward, 0 Reverse	High	REU-8
ISO6520F	50 Mbps	2 Forward, 0 Reverse	Low	REU-8
ISO6521	50 Mbps	1 Forward, 1 Reverse	High	REU-8
ISO6521F	50 Mbps	1 Forward, 1 Reverse	Low	REU-8

7.4 Device Functional Modes

表 7-2 lists the functional modes for the devices.

表 7-2. Function Table

$V_{CCI}^{(1)}$	V_{CCO}	INPUT (INx) ⁽²⁾	OUTPUT (OUTx)	COMMENTS
PU	PU	H	H	Normal Operation: A channel output assumes the logic state of the input.
		L	L	
		Open	Default	Default mode: When INx is open, the corresponding channel output goes to the default logic state. The default is <i>High</i> for and <i>Low</i> for with F suffix.
PD	PU	X	Default	Default mode: When V_{CCI} is unpowered, a channel output assumes the logic state based on the selected default option. The default is <i>High</i> for and <i>Low</i> for 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	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 ($V_{CC} \geq 1.71V$); PD = Powered down ($V_{CC} \leq 1.05V$); X = Irrelevant; H = High level; L = Low level

(2) A strongly driven input signal can weakly power the floating V_{CC} via an internal protection diode and cause undetermined output.

(3) The outputs are in undetermined state when $1.89V < V_{CCI}$, $V_{CCO} < 2.25V$ and $1.05V < V_{CCI}$, $V_{CCO} < 1.71V$

7.4.1 Device I/O Schematics

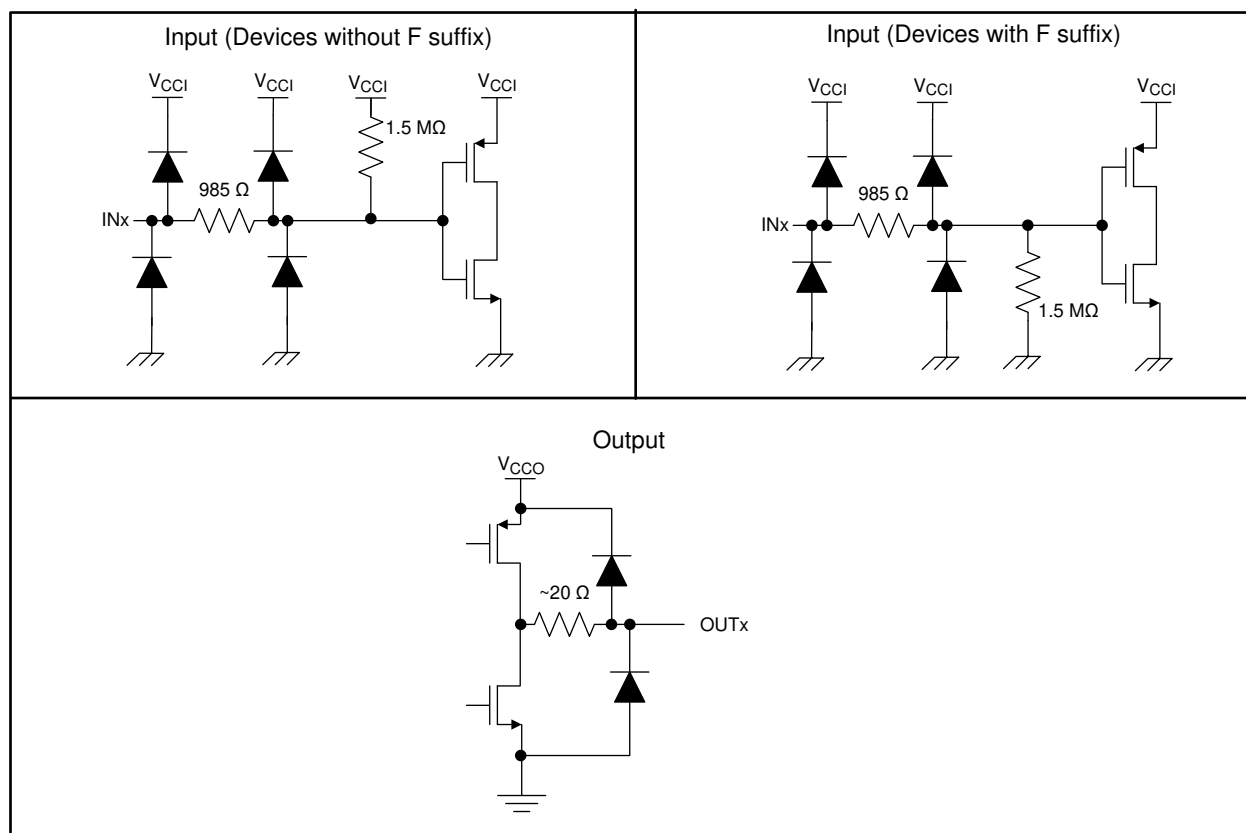


图 7-3. Device I/O Schematics

8 Application and Implementation

备注

Information in the following applications sections is not part of the TI component specification, and TI does not warrant the 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.

8.1 Application Information

The ISO652x devices are high-performance, dual-channel digital isolators. The devices use single-ended CMOS-logic switching technology. The supply voltage range is from 1.71 V to 5.5 V for both supplies, V_{CC1} and V_{CC2} . Since an isolation barrier separates the two sides, each side can be sourced independently with any voltage within the recommended operating conditions. As an example, supplying V_{CC1} with 3.3 V (which is within 1.71 V to 1.89 V and 2.25 V to 5 V) and V_{CC2} with 5 V (which is also within 1.71 V to 1.89 V and 2.25 V to 5 V) is possible. The digital isolator can be used as a logic-level translator in addition to providing isolation. 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, MCU or FPGA), and a data converter or a line transceiver, regardless of the interface type or standard.

备注

ISO652x is a functional isolator, and is not certified for isolation by standard bodies. For applications that require certified isolation by standard bodies, customers must choose [ISO672x](#), [ISO772x](#) or [ISO782x](#) families of digital isolators.

8.2 Typical Application

ISO652x can be used with Texas Instruments' mixed signal microcontroller, voltage regulator and GaN with integrated drivers in several power supply designs. ISO652x helps isolate high voltage power MOSFETs from sensitive logic control circuitry.

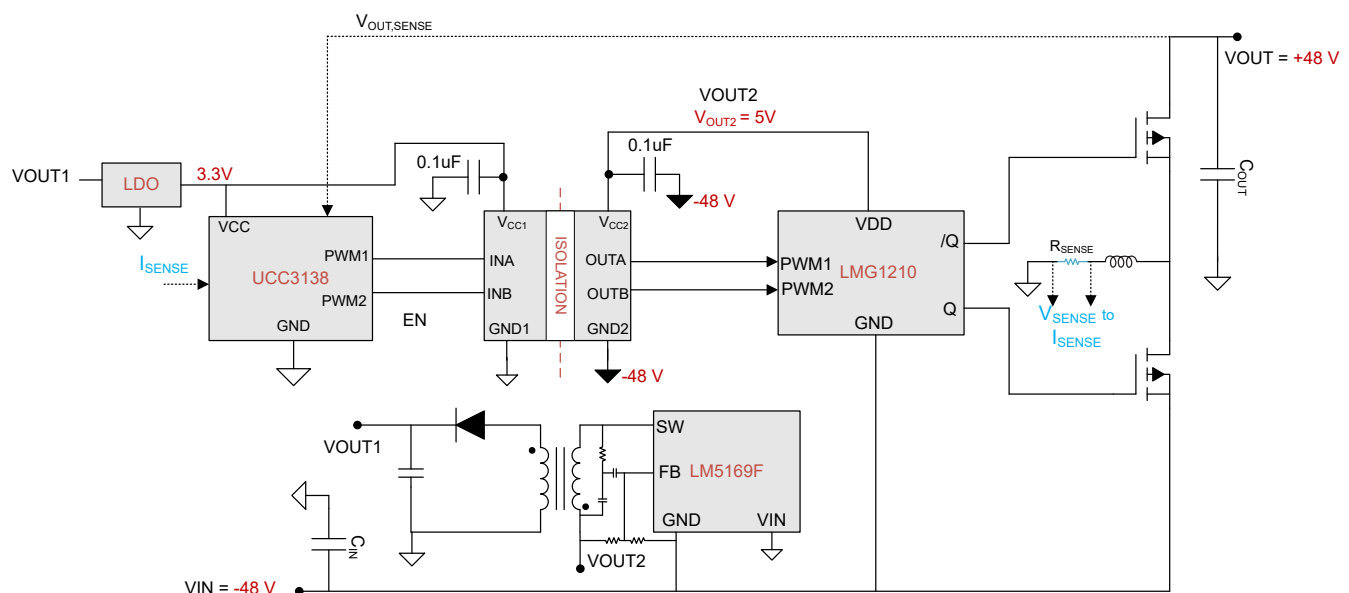


图 8-1. ISO6520 for Level shifting PWM signals from controller referenced to Ground to the FET driver in an Inverted Buck Boost Topology

8.2.1 Design Requirements

To design with these devices, use the parameters listed in [表 8-1](#).

表 8-1. Design Parameters

PARAMETER	VALUE
Supply voltage, V_{CC1} and V_{CC2}	1.71 V to 1.89 V and 2.25 V to 5.5 V
Decoupling capacitor between V_{CC1} and GND1	0.1 μ F
Decoupling capacitor from V_{CC2} and GND2	0.1 μ F

9 Power Supply Recommendations

To provide reliable operation at data rates and supply voltages, a 0.1- μ F bypass capacitor is recommended at the input and output supply pins (V_{CC1} and V_{CC2}). The capacitors must 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. For industrial applications, please use Texas Instruments' [SN6501](#) or [SN6505B](#). For such applications, detailed power supply design and transformer selection recommendations are available in [SN6501 Transformer Drivers for Isolated Power Supplies](#) or [SN6505B-Q1 Low-noise, 1-A Transformer Drivers for Isolated Power Supplies](#).

10 Layout

10.1 Layout Guidelines

A minimum of two layers is required to accomplish a cost optimized and low EMI PCB design. To further improve EMI, a four layer board can be used. Layer stacking for a four layer board must 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 the 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/in².
- 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.
- Bypass the VCC pin to ground with a low-ESR ceramic bypass capacitor. The typical recommended bypass capacitance is 0.1 μ F when using a ceramic capacitor with an X5R- or X7R-rated dielectric. The capacitor must be placed as close to the VCC pin as possible in the PCB layout and on the same layer. The capacitor must have a voltage rating greater than the VCC voltage level.

If an additional supply voltage plane or signal layer is needed, add a second power or ground plane system to the stack to keep the planes symmetrical. This design makes the stack mechanically stable and prevents 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](#).

10.1.1 PCB Material

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

10.2 Layout Example

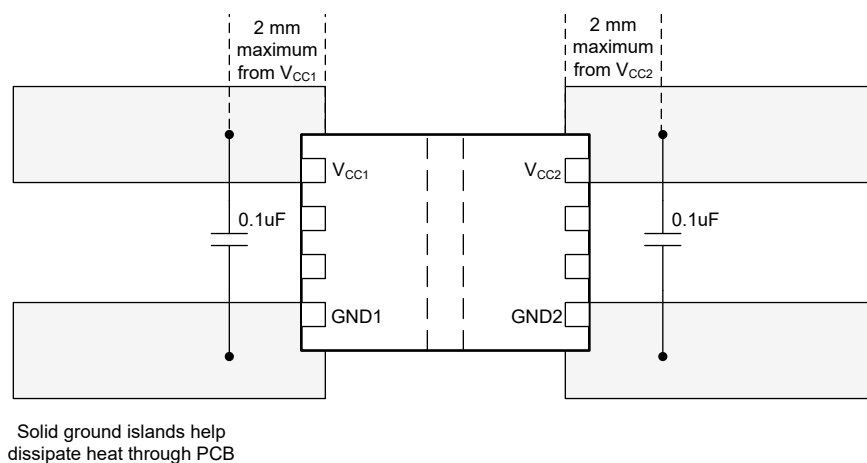


图 10-1. Layout Example

11 Device and Documentation Support

11.1 Documentation Support

11.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, [Isolation Glossary](#), application note
- Texas Instruments, [SN6501 Transformer Driver for Isolated Power Supplies](#), data sheet
- Texas Instruments, [SN6505x Low-Noise 1-A Transformer Drivers for Isolated Power Supplies](#), data sheet
- Texas Instruments, [SN6507 Low-Emissions, 36-V Push-Pull Transformer Driver with Duty Cycle Control for Isolated Power Supplies](#), data sheet
- Texas Instruments, [LMG341xR070 600-V 70-mΩ GaN with Integrated Driver and Protection](#), data sheet

11.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

11.3 支持资源

TI E2E™ 中文支持论坛是工程师的重要参考资料，可直接从专家处获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题，获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的[使用条款](#)。

11.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

11.5 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。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。

11.6 术语表

TI 术语表 本术语表列出并解释了术语、首字母缩略词和定义。

12 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision A (December 2023) to Revision B (April 2024)	Page
• 更新了整个文档中的表格、图和交叉参考的编号格式.....	1
• 在整个文档中添加了有关 ISO6521F 型号的信息.....	1

Changes from Revision * (August 2023) to Revision A (December 2023)	Page
• 将器件状态更新为“量产数据”	1
• Updated Typical Application Diagram.....	18

13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical packaging and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
ISO6520DR	ACTIVE	SOIC	D	8	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	6520	Samples
ISO6520FDR	ACTIVE	SOIC	D	8	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	6520F	Samples
ISO6520FREUR	ACTIVE	VSON	REU	8	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	6520F	Samples
ISO6520REUR	ACTIVE	VSON	REU	8	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	6520	Samples
ISO6521DR	ACTIVE	SOIC	D	8	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	6521	Samples
ISO6521FDR	ACTIVE	SOIC	D	8	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	6521F	Samples
ISO6521FREUR	ACTIVE	VSON	REU	8	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	6521F	Samples
ISO6521REUR	ACTIVE	VSON	REU	8	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	6521	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.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(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.

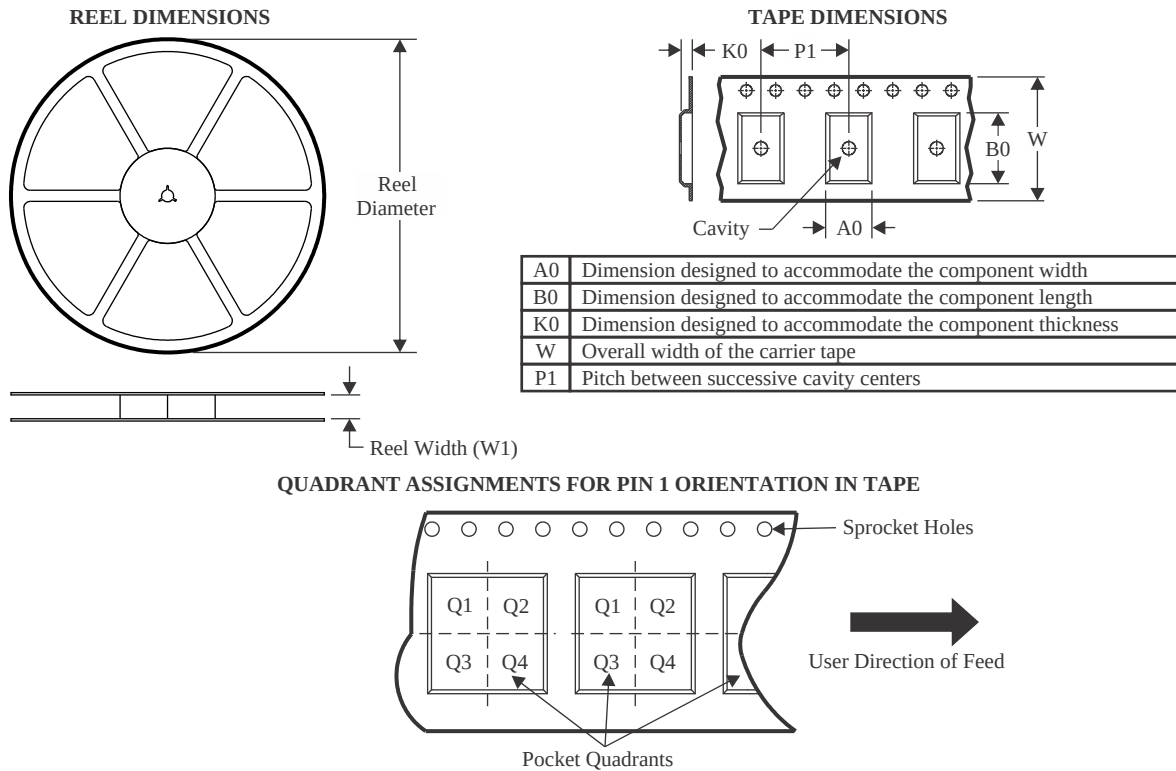
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

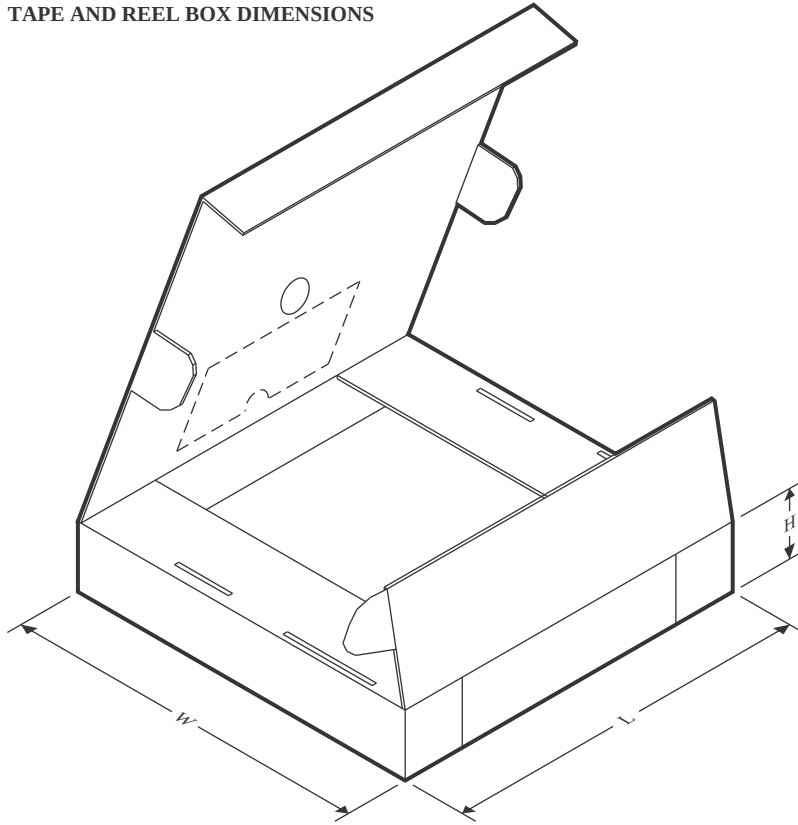
TAPE AND REEL INFORMATION



*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
ISO6520DR	SOIC	D	8	3000	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO6520FDR	SOIC	D	8	3000	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO6521DR	SOIC	D	8	3000	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO6521FDR	SOIC	D	8	3000	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO6521FREUR	VSON	REU	8	3000	180.0	12.4	2.3	3.3	1.2	4.0	12.0	Q2

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

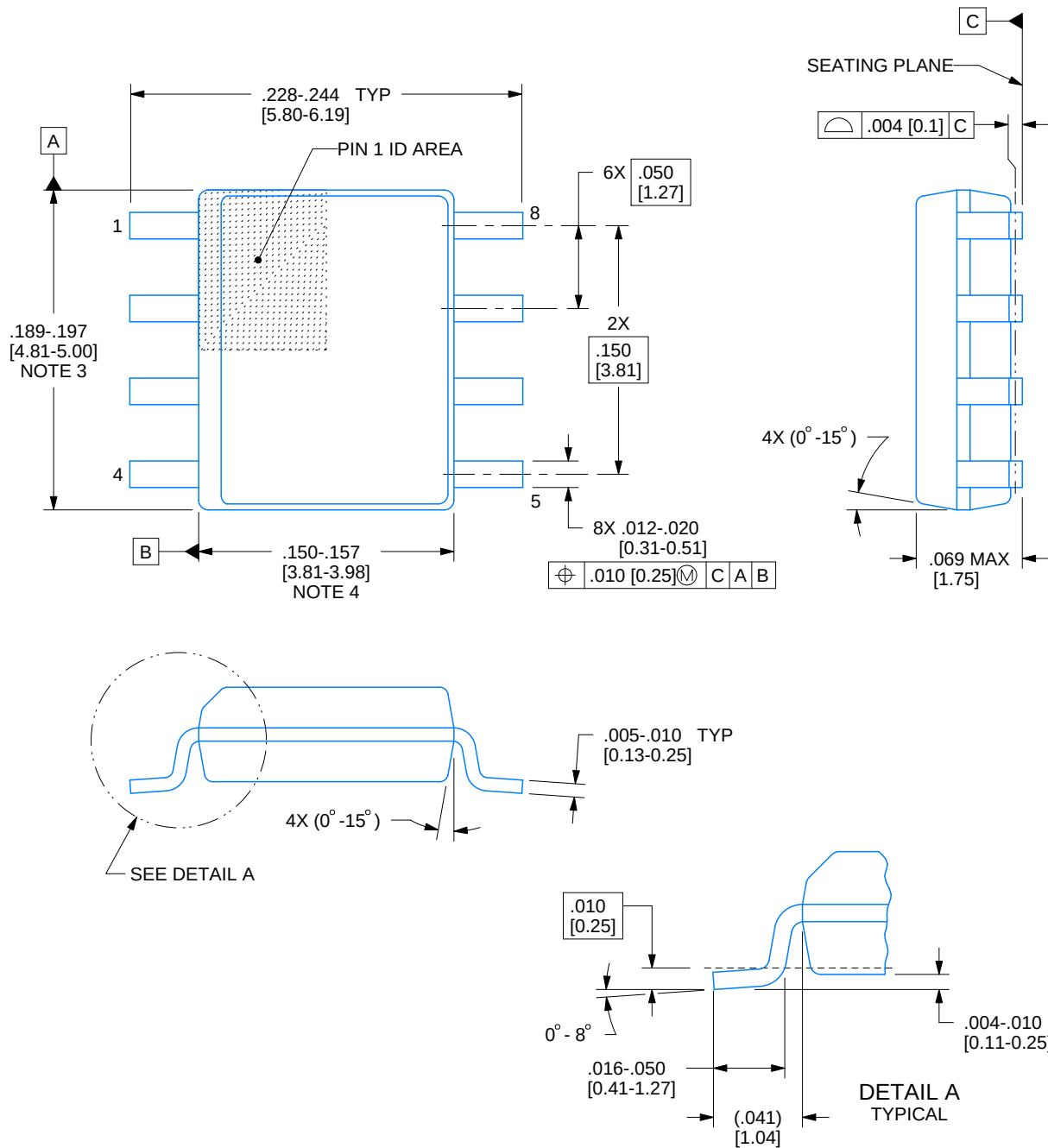
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
ISO6520DR	SOIC	D	8	3000	353.0	353.0	32.0
ISO6520FDR	SOIC	D	8	3000	353.0	353.0	32.0
ISO6521DR	SOIC	D	8	3000	353.0	353.0	32.0
ISO6521FDR	SOIC	D	8	3000	353.0	353.0	32.0
ISO6521FREUR	VSON	REU	8	3000	210.0	185.0	35.0

D0008A

PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4214825/C 02/2019

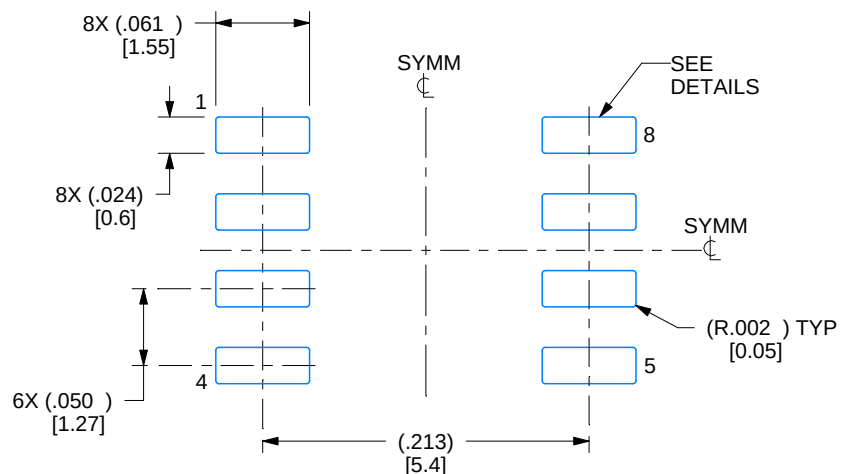
NOTES:

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 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.

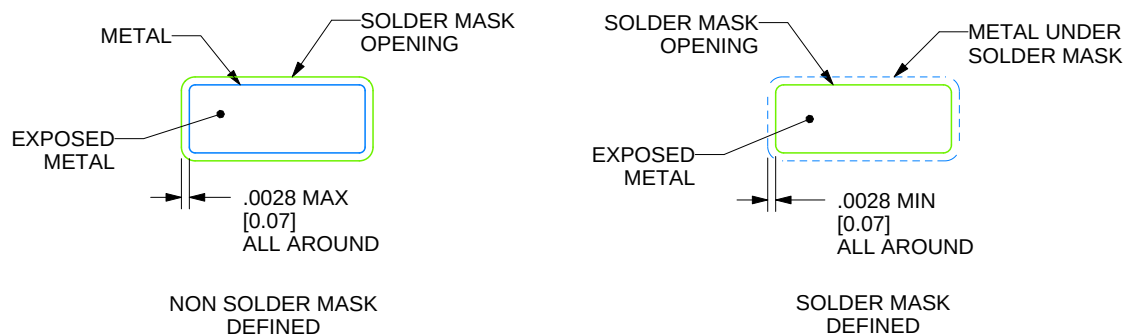
D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

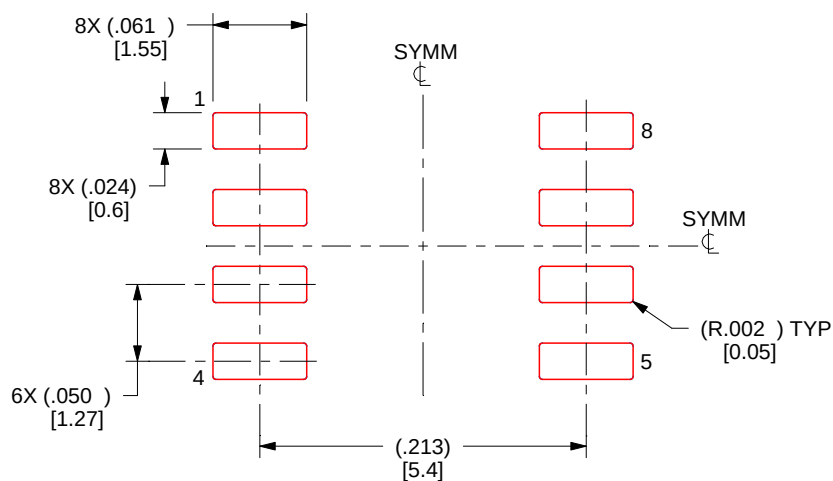
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



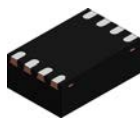
SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

4214825/C 02/2019

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.

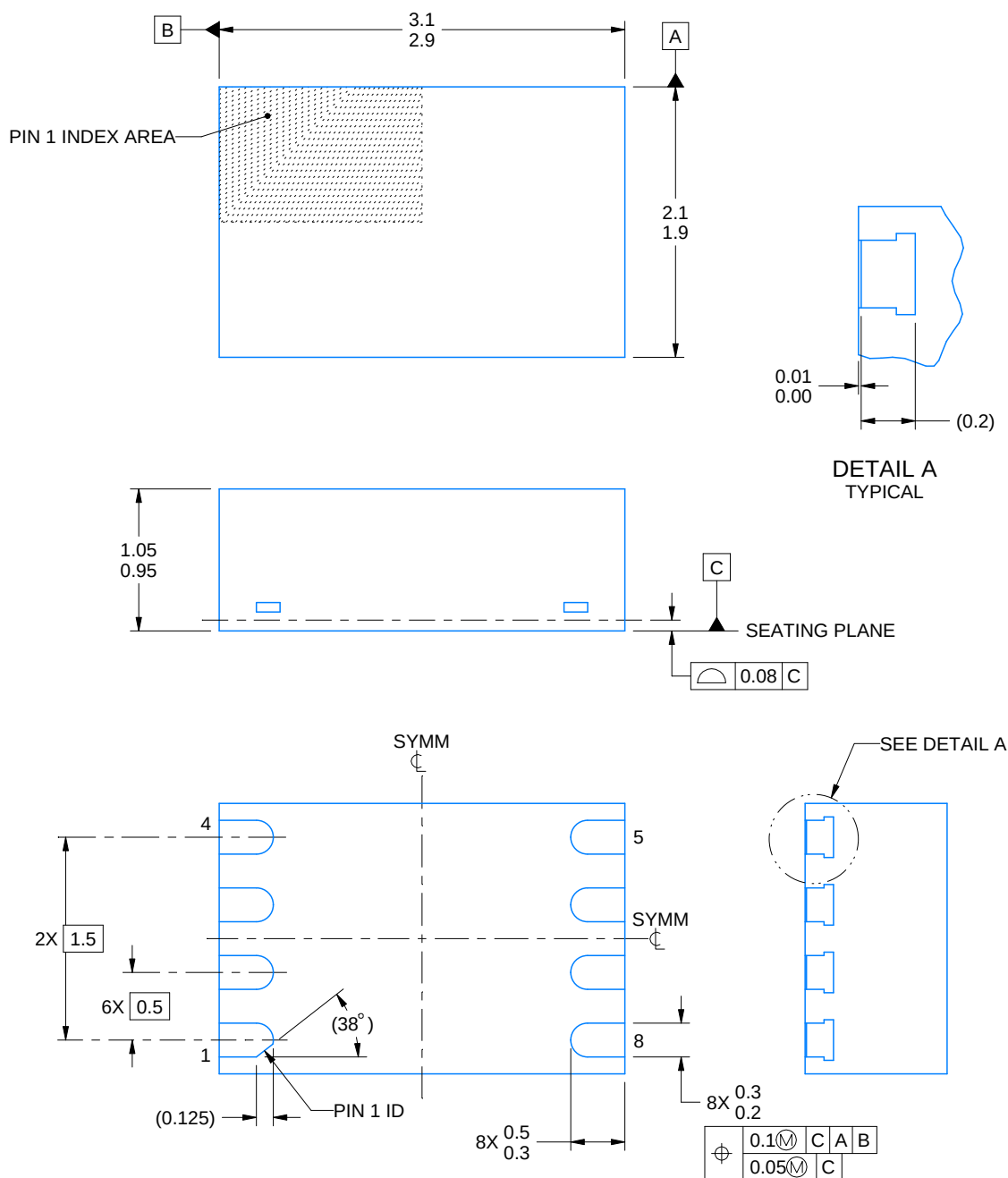
REU0008A



PACKAGE OUTLINE

VSON - 1.05 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



4229400/A 02/2023

NOTES:

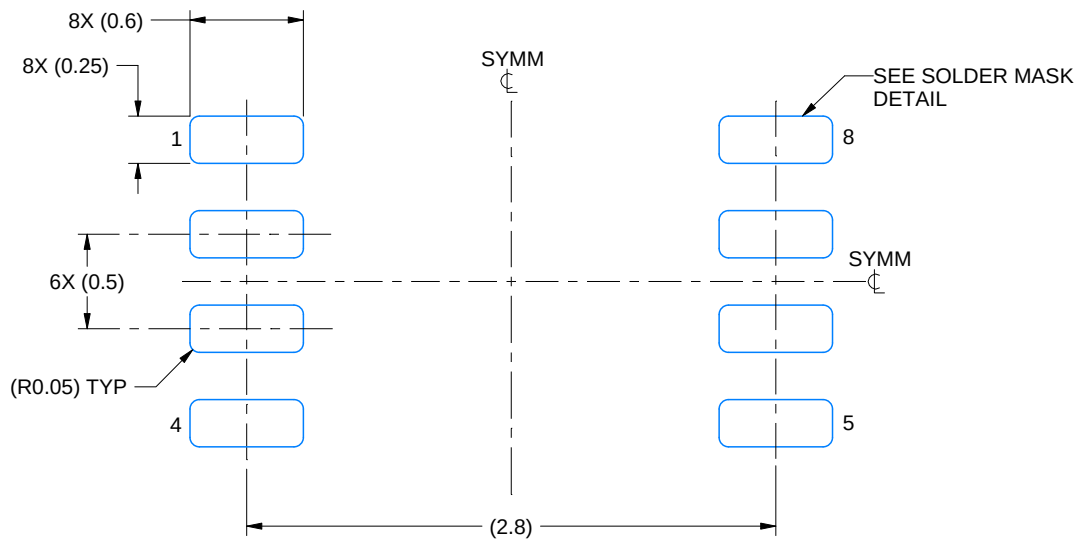
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

EXAMPLE BOARD LAYOUT

REU0008A

VSON - 1.05 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 25X



SOLDER MASK DETAILS

4229400/A 02/2023

NOTES: (continued)

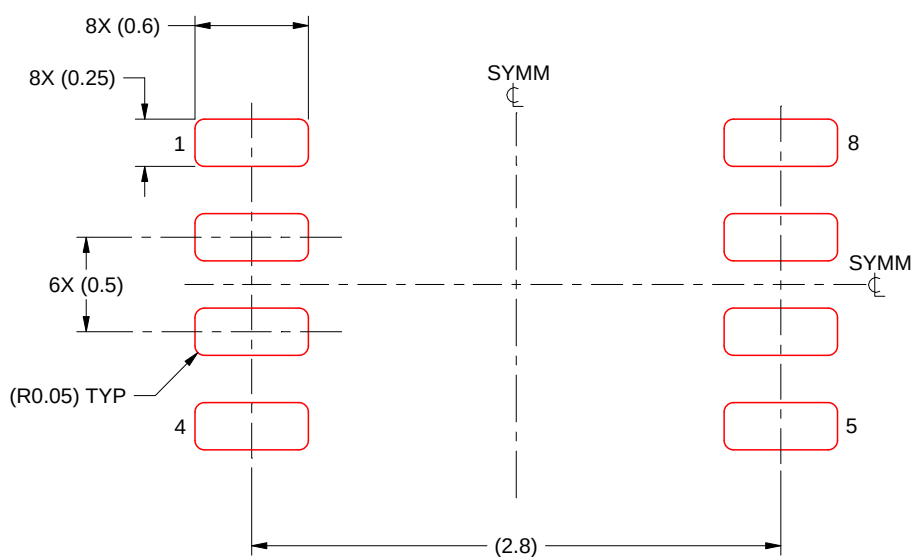
3. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/sluea271).

EXAMPLE STENCIL DESIGN

REU0008A

VSON - 1.05 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 MM THICK STENCIL
SCALE: 25X

4229400/A 02/2023

NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

重要声明和免责声明

TI“按原样”提供技术和可靠性数据（包括数据表）、设计资源（包括参考设计）、应用或其他设计建议、网络工具、安全信息和其他资源，不保证没有瑕疵且不做任何明示或暗示的担保，包括但不限于对适销性、某特定用途方面的适用性或不侵犯任何第三方知识产权的暗示担保。

这些资源可供使用 TI 产品进行设计的熟练开发人员使用。您将自行承担以下全部责任：(1) 针对您的应用选择合适的 TI 产品，(2) 设计、验证并测试您的应用，(3) 确保您的应用满足相应标准以及任何其他功能安全、信息安全、监管或其他要求。

这些资源如有变更，恕不另行通知。TI 授权您仅可将这些资源用于研发本资源所述的 TI 产品的应用。严禁对这些资源进行其他复制或展示。您无权使用任何其他 TI 知识产权或任何第三方知识产权。您应全额赔偿因在这些资源的使用中对 TI 及其代表造成的任何索赔、损害、成本、损失和债务，TI 对此概不负责。

TI 提供的产品受 [TI 的销售条款](#) 或 [ti.com](#) 上其他适用条款/TI 产品随附的其他适用条款的约束。TI 提供这些资源并不会扩展或以其他方式更改 TI 针对 TI 产品发布的适用的担保或担保免责声明。

TI 反对并拒绝您可能提出的任何其他或不同的条款。

邮寄地址：Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2024，德州仪器 (TI) 公司