HIGH-SPEED QUAD DIGITAL ISOLATORS

Check for Samples: ISO7240CF-Q1, ISO7241C-Q1

FEATURES

- **Qualified for Automotive Applications**
- **Selectable Failsafe Output (ISO7240CF)**
- **25 and 150-Mbps Signaling Rate Options**
  - **Low Channel-to-Channel Output Skew; 1 ns Max**
  - **Low Pulse-Width Distortion (PWD); 2 ns Max**
  - **Low Jitter Content; 1 ns Typ at 150 Mbps**
- **Typical 25-Year Life at Rated Working Voltage (see application note SLLA197 and Figure 17)**
- **4000-V_{peak} Isolation, 560-V_{peak} V_{IORM}**
  - **UL 1577 , IEC 60747-5-2 (VDE 0884, Rev 2), IEC 61010-1, IEC 60950-1 and CSA Approved**
- **4 kV ESD Protection**
- **Operate With 3.3-V or 5-V Supplies**
- **High Electromagnetic Immunity (see application report SLLA181)**
- **–40°C to 125°C Operating Range**

DESCRIPTION

The ISO7240, ISO7241 and ISO7242 are quad-channel digital isolators with multiple channel configurations and output enable functions. These devices have logic input and output buffers separated by TI's silicon dioxide (SiO_2) isolation barrier. Used in conjunction with isolated power supplies, these devices block high voltage, isolate grounds, and prevent noise currents from entering the local ground and interfering with or damaging sensitive circuitry.

The ISO7240 has all four channels in the same direction while the ISO7241 has three channels the same direction and one channel in opposition. The ISO7242 has two channels in each direction.

The C option devices have TTL input thresholds and a noise-filter at the input that prevents transient pulses from being passed to the output of the device. The M option devices have CMOS $V_{CC}/2$ input thresholds and do not have the input noise-filter or the additional propagation delay.

The ISO7240CF has an input disable function on pin 7, and a selectable high or low failsafe-output function with the CTRL pin (pin 10). The failsafe-output is a logic high when a logic-high is placed on the CTRL pin or it is left unconnected. If a logic-low signal is applied to the CTRL pin, the failsafe-output becomes a logic-low output state. The ISO7240CF input disable function prevents data from being passed across the isolation barrier to the output. When the inputs are disabled, the outputs are set by the CTRL pin.

These devices may be powered from either 3.3-V or 5-V supplies on either side in any 3.3-V / 3.3-V, 5-V / 5-V, 5-V / 3.3-V, or 3.3-V / 5-V combination. Note that the signal input pins are 5-V tolerant regardless of the voltage supply level being used.

These devices are characterized for operation over the ambient temperature range of –40°C to 125°C.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

ORDERING INFORMATION(1)

T_A	PACKAGE(2)		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 125°C	SOIC – DW	Reel of 2000	ISO7240CFQDWRQ1	ISO7240CFQ
			ISO7240CQDWRQ1	Product Preview
			ISO7241CQDWRQ1	ISO7241CQ
			ISO7242CQDWRQ1	ISO7242CQ

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

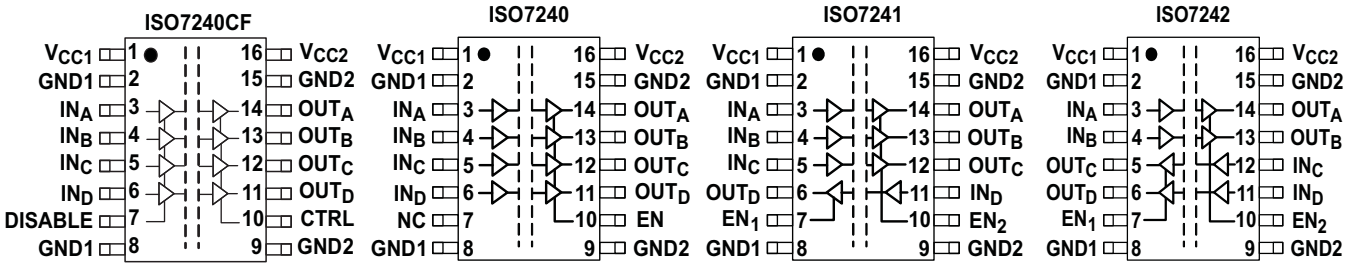


Table 1. ISO724xC Function Table(1)

INPUT V_{CC}	OUTPUT V_{CC}	INPUT (IN)	OUTPUT ENABLE (EN)	OUTPUT (OUT)
PU	PU	H	H or Open	H
		L	H or Open	L
		X	L	Z
		Open	H or Open	H
PD	PU	X	H or Open	H
PD	PU	X	L	Z

(1) PU = Powered Up; PD = Powered Down ; X = Irrelevant; H = High Level; L = Low Level

Table 2. ISO7240CF Function Table

V_{CC1}	V_{CC2}	DATA INPUT (IN)	DISABLE INPUT (DISABLE)	FAILSAFE CONTROL INPUT (CTRL)	DATA OUTPUT (OUT)
PU	PU	H	L or Open	X	H
PU	PU	L	L or Open	X	L
X	PU	X	H	H or Open	H
X	PU	X	H	L	L
PD	PU	X	X	H or Open	H
PD	PU	X	X	L	L

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ABSOLUTE MAXIMUM RATINGS(1)

				VALUE	UNIT
V_{CC}	Supply voltage(2), V_{CC1}, V_{CC2}			–0.5 to 6	V
V_I	Voltage at IN, OUT, EN, DISABLE, CTRL			–0.5 to 6	V
I_O	Output current			±15	mA
ESD	Electrostatic discharge	Human-Body Model	All pins	±4	kV
		Field-Induced-Charged Device Model		±1	
		Machine Model		±200	V
T_J	Maximum junction temperature			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 are with respect to network ground terminal and are peak voltage values.

RECOMMENDED OPERATING CONDITIONS

		MIN	TYP	MAX	UNIT
V_{CC}	Supply voltage(1), V_{CC1}, V_{CC2}	3.15		5.5	V
I_{OH}	High-level output current			4	mA
I_{OL}	Low-level output current	–4			mA
t_{ui}	Input pulse width	40			ns
$1/t_{ui}$	Signaling rate	0	30(2)	25	Mbps
V_{IH}	High-level input voltage (IN, DISABLE, CTRL, EN)	2		V_{CC}	V
V_{IL}	Low-level input voltage (IN, DISABLE, CTRL, EN)	0		0.8	V
T_A	Operating free-air temperature	-40		125	°C
H	External magnetic field-strength immunity per IEC 61000-4-8 and IEC 61000-4-9 certification			1000	A/m

(1) For the 5-V operation, V_{CC1} or V_{CC2} is specified from 4.5 V to 5.5 V.
For the 3-V operation, V_{CC1} or V_{CC2} is specified from 3.15 V to 3.6 V.
(2) Typical value at room temperature and well-regulated power supply.

IEC 60747-5-2 INSULATION CHARACTERISTICS(1)

over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	SPECIFICATIONS	UNIT
V_{IORM}	Maximum working insulation voltage		560	V
V_{PR}	Input to output test voltage	After Input/Output Safety Test Subgroup 2/3 $V_{PR} = V_{IORM} \times 1.2$, t = 10 s, Partial discharge < 5 pC	672	V
		Method a, $V_{PR} = V_{IORM} \times 1.6$, Type and sample test with t = 10 s, Partial discharge < 5 pC	896	V
		Method b1, $V_{PR} = V_{IORM} \times 1.875$, 100 % Production test with t = 1 s, Partial discharge < 5 pC	1050	V
V_{IOTM}	Transient overvoltage	t = 60 s	4000	V
R_S	Insulation resistance	V_{IO} = 500 V at T_S	$>10^9$	Ω
	Pollution degree		2	

(1) Climatic Classification 40/125/21

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ELECTRICAL CHARACTERISTICS: V_{CC1} and V_{CC2} at 5-V[(1)] OPERATION

, over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
SUPPLY CURRENT							
I_{CC1}	ISO7240C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V		1	3	mA
		25 Mbps			7	10.5	
	ISO7241C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V		6.5	11	mA
		25 Mbps			12	18	
	ISO7242C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V		10	16	mA
		25 Mbps			15	24	
I_{CC2}	ISO7240C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V		15	22	mA
		25 Mbps			17	25	
	ISO7241C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V		13	20	mA
		25 Mbps			18	28	
	ISO7242C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V		10	16	mA
		25 Mbps			15	24	
ELECTRICAL CHARACTERISTICS							
I_{OFF}	Sleep mode output current		EN at 0 V, Single channel		0		µA
V_{OH}	High-level output voltage		I_{OH} = –4 mA, See Figure 1	V_{CC} – 0.8			V
			I_{OH} = –20 µA, See Figure 1	V_{CC} – 0.1			
V_{OL}	Low-level output voltage		I_{OL} = 4 mA, See Figure 1			0.4	V
			I_{OL} = 20 µA, See Figure 1			0.1	
$V_{I(HYS)}$	Input voltage hysteresis				150		mV
I_{IH}	High-level input current		IN from 0 V to V_{CC}			10	µA
I_{IL}	Low-level input current			–10			
C_I	Input capacitance to ground		IN at V_{CC}, V_I = 0.4 sin (4E6πt)		2		pF
CMTI	Common-mode transient immunity		V_I = V_{CC} or 0 V, See Figure 5	25	50		kV/µs

(1) For the 5-V operation, V_{CC1} or V_{CC2} is specified from 4.5 V to 5.5 V.
For the 3-V operation, V_{CC1} or V_{CC2} is specified from 3.15 V to 3.6 V.

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SWITCHING CHARACTERISTICS: V_{CC1} and V_{CC2} at 5-V OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay	See Figure 1	18		45	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$				5	
$t_{sk(pp)}$	Part-to-part skew (2)				8	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO7240C, ISO7241C			3	ns
		ISO7242C			4	
t_r	Output signal rise time	See Figure 1		2		ns
t_f	Output signal fall time			2		
t_{PHZ}	Propagation delay, high-level-to-high-impedance output	See Figure 2		15	25	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output			15	25	
t_{PLZ}	Propagation delay, low-level-to-high-impedance output			15	25	
t_{PZL}	Propagation delay, high-impedance-to-low-level output			15	25	
t_{fs}	Failsafe output delay time from input power loss	See Figure 3		12		µs
t_{wake}	Wake time from input disable	See Figure 4		15		µs

(1) Also referred to as pulse skew.
(2) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.
(3) $t_{sk(o)}$ is the skew between specified outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical specified loads.

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ELECTRICAL CHARACTERISTICS: V_{CC1} at 5-V, V_{CC2} at 3.3-V[1] OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
SUPPLY CURRENT								
I_{CC1}	ISO7240C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			1	3	mA
		25 Mbps				7	10.5	
	ISO7241C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			6.5	11	mA
		25 Mbps				12	18	
	ISO7242C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			10	16	mA
		25 Mbps				15	24	
I_{CC2}	ISO7240C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			9.5	15	mA
		25 Mbps				10.5	17	
	ISO7241C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			8	13	mA
		25 Mbps				11.5	18	
	ISO7242C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			6	10	mA
		25 Mbps				9	14	
ELECTRICAL CHARACTERISTICS								
I_{OFF}	Sleep mode output current		EN at 0 V, Single channel			0		µA
V_{OH}	High-level output voltage		I_{OH} = –4 mA, See Figure 1	ISO7240	V_{CC} – 0.4			V
				ISO724x (5-V side)	V_{CC} – 0.8			
			I_{OH} = –20 µA, See Figure 1		V_{CC} – 0.1			
V_{OL}	Low-level output voltage		I_{OL} = 4 mA, See Figure 1				0.4	V
			I_{OL} = 20 µA, See Figure 1				0.1	
$V_{I(HYS)}$	Input voltage hysteresis					150		mV
I_{IH}	High-level input current		IN from 0 V to V_{CC}				10	µA
I_{IL}	Low-level input current				–10			
C_I	Input capacitance to ground		IN at V_{CC}, V_I = 0.4 sin (4E6πt)			2		pF
CMTI	Common-mode transient immunity		V_I = V_{CC} or 0 V, See Figure 5		25	50		kV/µs

(1) For the 5-V operation, V_{CC1} or V_{CC2} is specified from 4.5 V to 5.5 V.
For the 3-V operation, V_{CC1} or V_{CC2} is specified from 3.15 V to 3.6 V.

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SWITCHING CHARACTERISTICS: V_{CC1} at 5-V, V_{CC2} at 3.3-V OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay	See Figure 1	20		50	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO7240C, ISO7241C			3	ns
		ISO7242C			4	
$t_{sk(pp)}$	Part-to-part skew (2)				10	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO7240C, ISO7241C			3	ns
		ISO7242C			4	
t_r	Output signal rise time	See Figure 1		2		ns
t_f	Output signal fall time			2		
t_{PHZ}	Propagation delay, high-level-to-high-impedance output	See Figure 2		15	25	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output			15	25	
t_{PLZ}	Propagation delay, low-level-to-high-impedance output			15	25	
t_{PZL}	Propagation delay, high-impedance-to-low-level output			15	25	
t_{fs}	Failsafe output delay time from input power loss	See Figure 3		18		µs
t_{wake}	Wake time from input disable	See Figure 4		15		µs

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

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ELECTRICAL CHARACTERISTICS: V_{CC1} at 3.3-V, V_{CC2} at 5-V[1] OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
SUPPLY CURRENT								
I_{CC1}	ISO7240C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			0.5	1	mA
		25 Mbps				3	5	
	ISO7241C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			4	7	mA
		25 Mbps				6.5	11	
	ISO7242C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			6	10	mA
		25 Mbps				9	14	
I_{CC2}	ISO7240C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			15	22	mA
		25 Mbps				17	25	
	ISO7241C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			13	20	mA
		25 Mbps				18	28	
	ISO7242C	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			10	16	mA
		25 Mbps				15	24	
ELECTRICAL CHARACTERISTICS								
I_{OFF}	Sleep mode output current		EN at 0 V, Single channel			0		µA
V_{OH}	High-level output voltage		I_{OH} = –4 mA, See Figure 1	ISO7240	V_{CC} – 0.4			V
				ISO724x (5-V side)	V_{CC} – 0.8			
			I_{OH} = –20 µA, See Figure 1		V_{CC} – 0.1			
V_{OL}	Low-level output voltage		I_{OL} = 4 mA, See Figure 1				0.4	V
			I_{OL} = 20 µA, See Figure 1				0.1	
$V_{I(HYS)}$	Input voltage hysteresis					150		mV
I_{IH}	High-level input current		IN from 0 V to V_{CC}				10	µA
I_{IL}	Low-level input current				–10			
C_I	Input capacitance to ground		IN at V_{CC}, V_I = 0.4 sin (4E6πt)			2		pF
CMTI	Common-mode transient immunity		V_I = V_{CC} or 0 V, See Figure 5		25	50		kV/µs

(1) For the 5-V operation, V_{CC1} or V_{CC2} is specified from 4.5 V to 5.5 V.
For the 3-V operation, V_{CC1} or V_{CC2} is specified from 3.15 V to 3.6 V.

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SWITCHING CHARACTERISTICS: V_{CC1} at 3.3-V and V_{CC2} at 5-V OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay	See Figure 1		20		51	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	See Figure 1	ISO7240C, ISO7241C			3	ns
			ISO7242C			4	
$t_{sk(pp)}$	Part-to-part skew (2)					10	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO7240C, ISO7241C				3	ns
		ISO7242C				4	
t_r	Output signal rise time	See Figure 1			2		ns
t_f	Output signal fall time				2		
t_{PHZ}	Propagation delay, high-level-to-high-impedance output	See Figure 2			15	25	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output				15	25	
t_{PLZ}	Propagation delay, low-level-to-high-impedance output				15	25	
t_{PZL}	Propagation delay, high-impedance-to-low-level output				15	25	
t_{fs}	Failsafe output delay time from input power loss	See Figure 3			12		µs
t_{wake}	Wake time from input disable	See Figure 4			15		µs

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

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ELECTRICAL CHARACTERISTICS: V_{CC1} and V_{CC2} at 3.3 V[(1)] OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
SUPPLY CURRENT							
I_{CC1}	ISO7240C	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_2 at 3 V		0.5	1	mA
		25 Mbps			3	5	
	ISO7241C	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_1 at 3 V, EN_2 at 3 V		4	7	mA
		25 Mbps			6.5	11	
	ISO7242C	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_1 at 3 V, EN_2 at 3 V		6	10	
		25 Mbps			9	14	
I_{CC2}	ISO7240C	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_2 at 3 V		9.5	15	mA
		25 Mbps			10.5	17	
	ISO7241C	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_1 at 3 V, EN_2 at 3 V		8	13	mA
		25 Mbps			11.5	18	
	ISO7242C	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_1 at 3 V, EN_2 at 3 V		6	10	
		25 Mbps			9	14	
ELECTRICAL CHARACTERISTICS							
I_{OFF}	Sleep mode output current		EN at 0 V, single channel		0		µA
V_{OH}	High-level output voltage		I_{OH} = –4 mA, See Figure 1	V_{CC} – 0.4			V
			I_{OH} = –20 µA, See Figure 1	V_{CC} – 0.1			
V_{OL}	Low-level output voltage		I_{OL} = 4 mA, See Figure 1			0.4	V
			I_{OL} = 20 µA, See Figure 1			0.1	
$V_{I(HYS)}$	Input voltage hysteresis				150		mV
I_{IH}	High-level input current		IN from 0 V or V_{CC}			10	µA
I_{IL}	Low-level input current			–10			
C_I	Input capacitance to ground		IN at V_{CC}, V_I = 0.4 sin (4E6πt)		2		pF
CMTI	Common-mode transient immunity		V_I = V_{CC} or 0 V, See Figure 5	25	50		kV/µs

(1) For the 5-V operation, V_{CC1} or V_{CC2} is specified from 4.5 V to 5.5 V.
For the 3-V operation, V_{CC1} or V_{CC2} is specified from 3.15 V to 3.6 V.

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SWITCHING CHARACTERISTICS: V_{CC1} and V_{CC2} at 3.3-V OPERATION

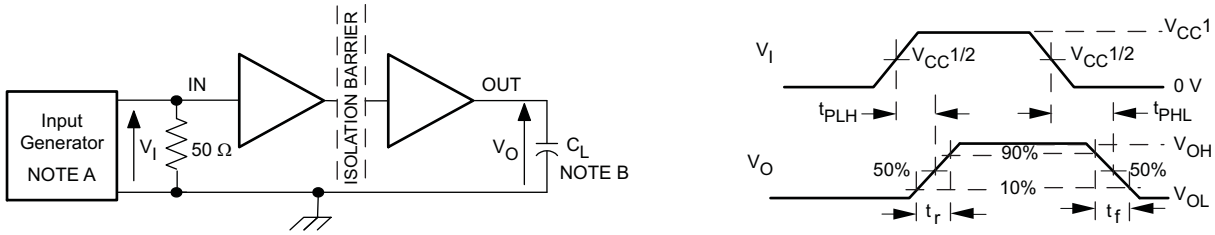
over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay	See Figure 1		25		56	ns
PWD	Pulse-width distortion $\lvert t_{PHL} - t_{PLH} \rvert$ (1)	See Figure 1				4	ns
$t_{sk(pp)}$	Part-to-part skew (2)					10	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO7240C, ISO7241C				3.5	ns
		ISO7242C				4	ns
t_r	Output signal rise time	See Figure 1			2		ns
t_f	Output signal fall time	See Figure 1			2		ns
t_{PHZ}	Propagation delay, high-level-to-high-impedance output	See Figure 2	ISO7240C, ISO7241C		15	20	ns
			ISO7242C		15	25	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output	See Figure 2	ISO7240C, ISO7241C		15	20	ns
			ISO7242C		15	25	ns
t_{PLZ}	Propagation delay, low-level-to-high-impedance output	See Figure 2	ISO7240C, ISO7241C		15	20	ns
			ISO7242C		15	25	ns
t_{PZL}	Propagation delay, high-impedance-to-low-level output	See Figure 2	ISO7240C, ISO7241C		15	20	ns
			ISO7242C		15	25	ns
t_{fs}	Failsafe output delay time from input power loss	See Figure 3			18		µs
t_{wake}	Wake time from input disable	See Figure 4			15		µs

(1) Also referred to as pulse skew.
(2) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.
(3) $t_{sk(o)}$ is the skew between specified outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical specified loads.

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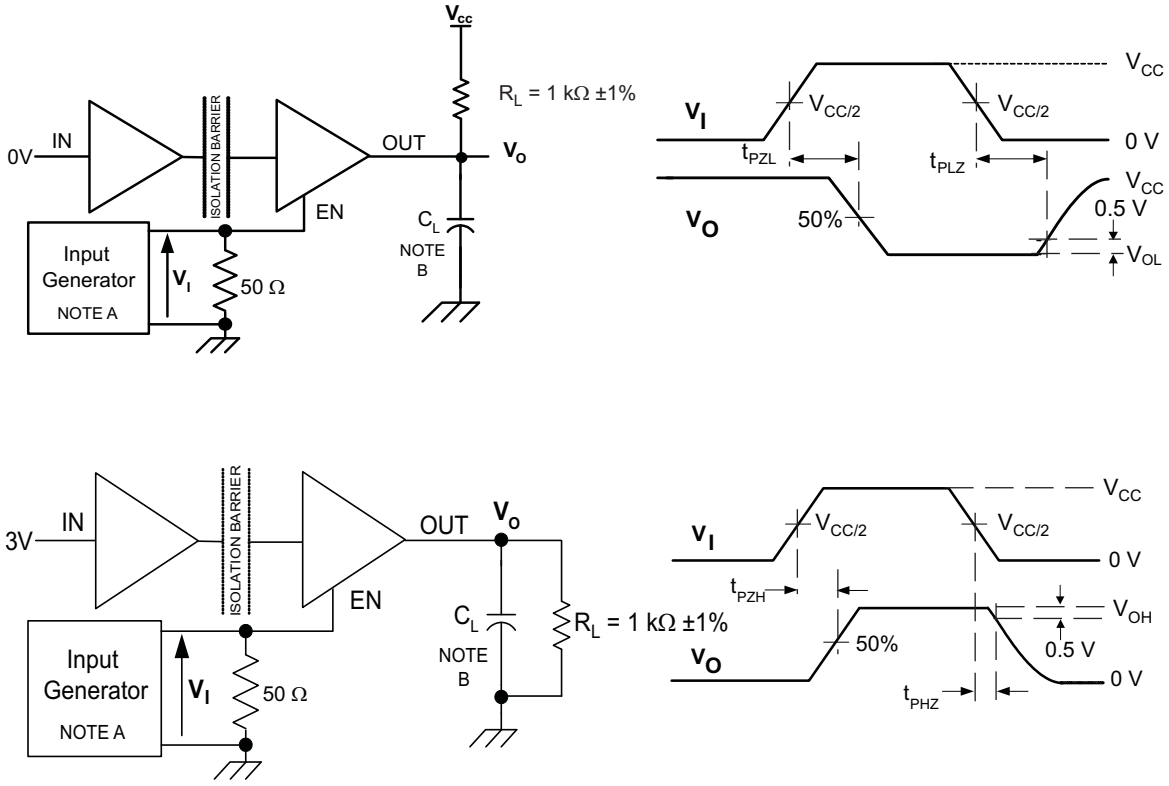
PARAMETER MEASUREMENT INFORMATION



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 ≤ 3 ns, Z_O = 50Ω.

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

Figure 1. Switching Characteristic Test Circuit and Voltage Waveforms



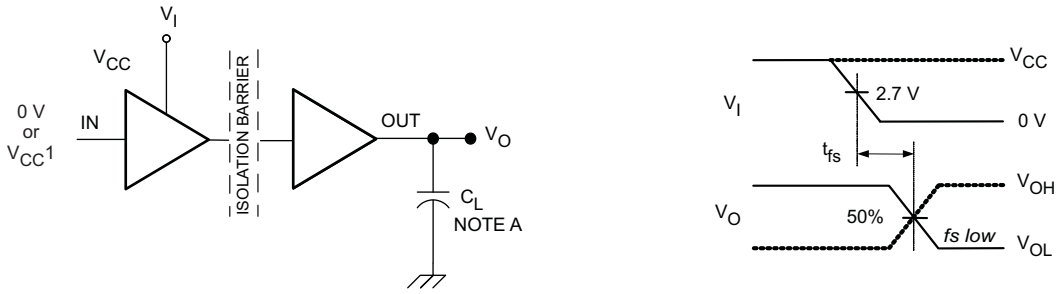
A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 50 kHz, 50% duty cycle, t_r ≤ 3 ns, t_f ≤ 3 ns, Z_O = 50Ω.

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

Figure 2. Enable/Disable Propagation Delay Time Test Circuit and Waveform

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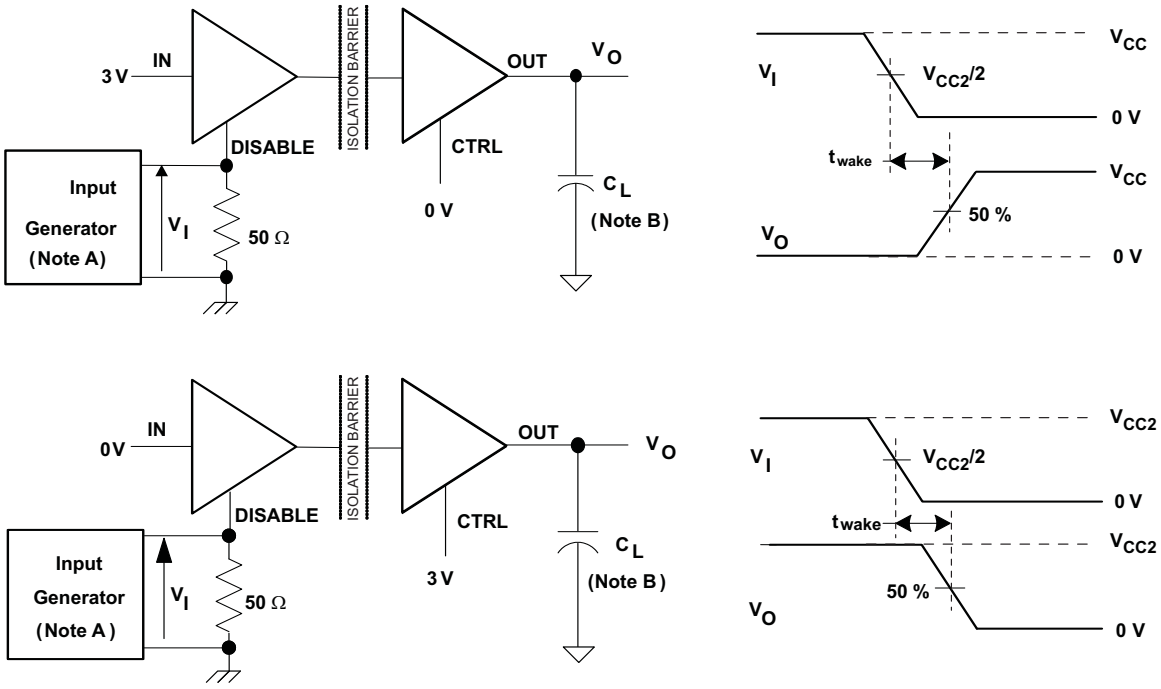
PARAMETER MEASUREMENT INFORMATION (continued)



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

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

Figure 3. Failsafe Delay Time Test Circuit and Voltage Waveforms

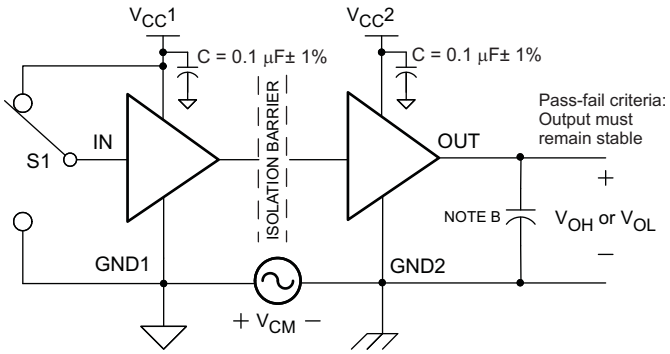


NOTE: Which ever test yields the longest time is used in this data sheet

A. Whichever test yields the longest time is used in this data sheet.

Figure 4. Wake Time From Input Disable Test Circuit and Voltage Waveforms

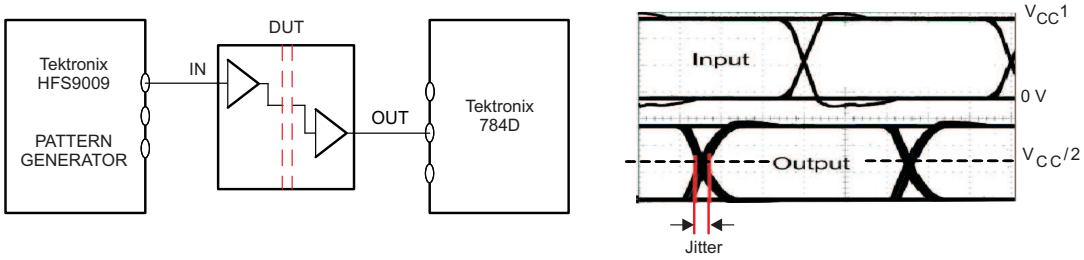
PARAMETER MEASUREMENT INFORMATION (continued)



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

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

Figure 5. Common-Mode Transient Immunity Test Circuit and Voltage Waveform



NOTE: PRBS bit pattern run length is 2^{16} – 1. Transition time is 800 ps. NRZ data input has no more than five consecutive 1s or 0s.

Figure 6. Peak-to-Peak Eye-Pattern Jitter Test Circuit and Voltage Waveform

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DEVICE INFORMATION

PACKAGE CHARACTERISTICS

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
L(I01)	Minimum air gap (Clearance)	Shortest terminal-to-terminal distance through air	8.34			mm
L(I02)	Minimum external tracking (Creepage)	Shortest terminal-to-terminal distance across the package surface	8.1			mm
C_{TI}	Tracking resistance (comparative tracking index)	DIN IEC 60112/VDE 0303 Part 1	≥ 175			V
	Minimum Internal Gap (Internal Clearance)	Distance through the insulation	0.008			mm
R_{IO}	Isolation resistance	Input to output, V_{IO} = 500 V, all pins on each side of the barrier tied together creating a two-terminal device		$>10^{12}$		Ω
C_{IO}	Barrier capacitance Input to output	V_I = 0.4 sin (4E6πt)		2		pF
C_I	Input capacitance to ground	V_I = 0.4 sin (4E6πt)		2		pF

IEC 60664-1 RATINGS TABLE

PARAMETER	TEST CONDITIONS	SPECIFICATION
Basic isolation group	Material group	IIIa
Installation classification	Rated mains voltage ≤150 VRMS	I-IV
	Rated mains voltage ≤300 VRMS	I-III

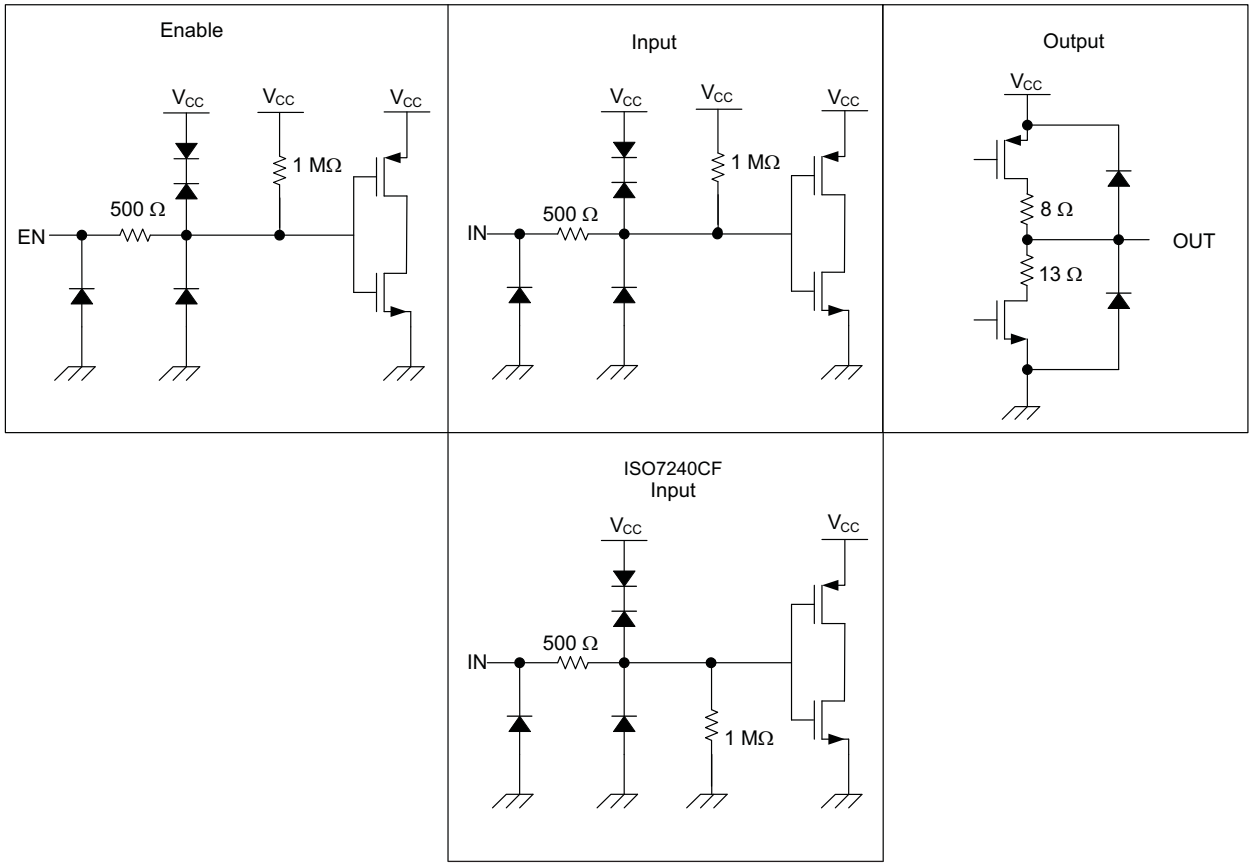
REGULATORY INFORMATION

VDE	CSA	UL
Certified according to IEC 60747-5-2	Approved under CSA Component Acceptance Notice	Recognized under 1577 Component Recognition Program(1)
File Number: 40016131	File Number: 1698195	File Number: E181974

(1) Production tested ≥ 3000 Vrms for 1 second in accordance with UL 1577.

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DEVICE I/O SCHEMATICS



THERMAL CHARACTERISTICS

over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
θ_{JA}	Junction-to-air	Low-K Thermal Resistance(1)		168		°C/W
		High-K Thermal Resistance		96.1		
θ_{JB}	Junction-to-Board Thermal Resistance			61		°C/W
θ_{JC}	Junction-to-Case Thermal Resistance			48		°C/W
P_D	Device Power Dissipation	$V_{CC1} = V_{CC2} = 5.5$ V, $T_J = 150°C$, $C_L = 15$ pF, Input a 50% duty cycle square wave			220	mW

(1) Tested in accordance with the Low-K or High-K thermal metric definitions of EIA/JESD51-3 for leaded surface mount packages.

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TYPICAL CHARACTERISTIC CURVES

ISO7240C RMS SUPPLY CURRENT vs SIGNALING RATE

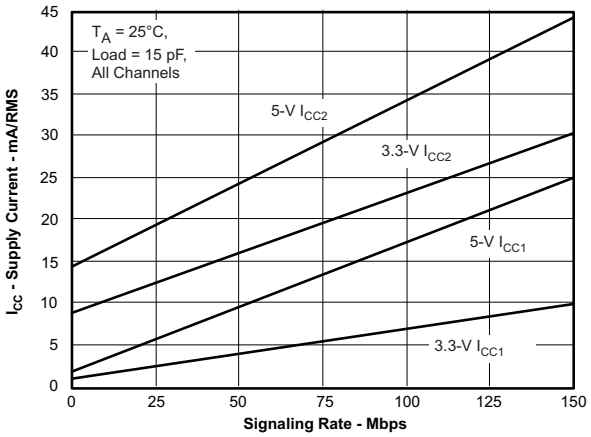


Figure 7.

ISO7241C RMS SUPPLY CURRENT vs SIGNALING RATE

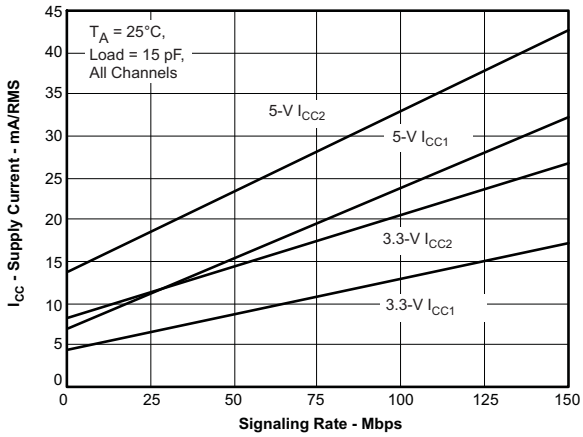


Figure 8.

ISO7242C RMS SUPPLY CURRENT vs SIGNALING RATE

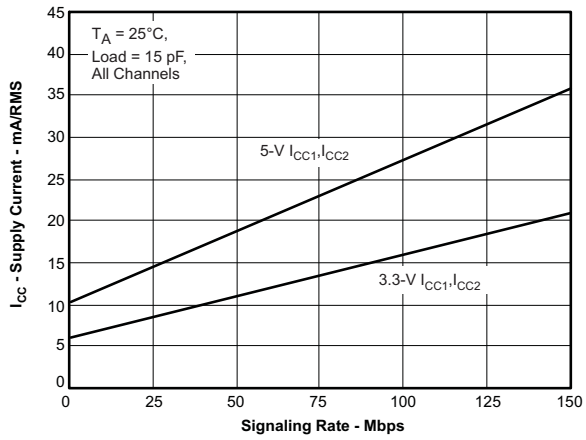


Figure 9.

PROPAGATION DELAY vs FREE-AIR TEMPERATURE

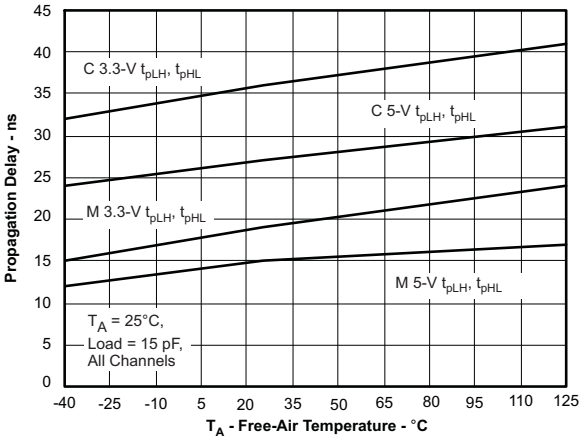


Figure 10.

TYPICAL CHARACTERISTIC CURVES (continued)

INPUT VOLTAGE THRESHOLD vs FREE-AIR TEMPERATURE

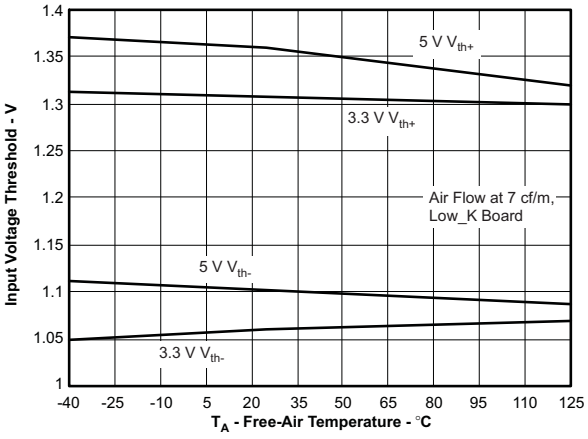


Figure 11.

V_{CC1} FAILSAFE THRESHOLD vs FREE-AIR TEMPERATURE

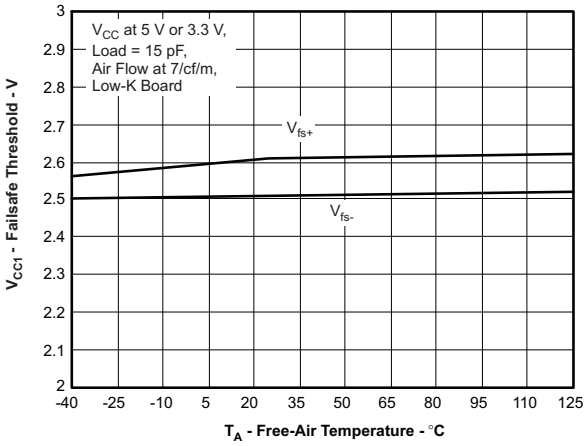


Figure 12.

HIGH-LEVEL OUTPUT CURRENT vs HIGH-LEVEL OUTPUT VOLTAGE

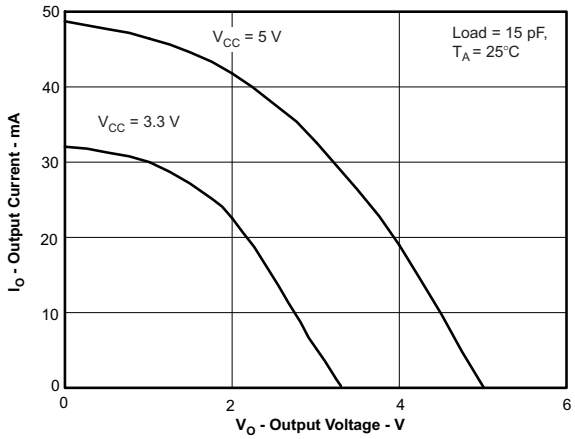


Figure 13.

LOW-LEVEL OUTPUT CURRENT vs LOW-LEVEL OUTPUT VOLTAGE

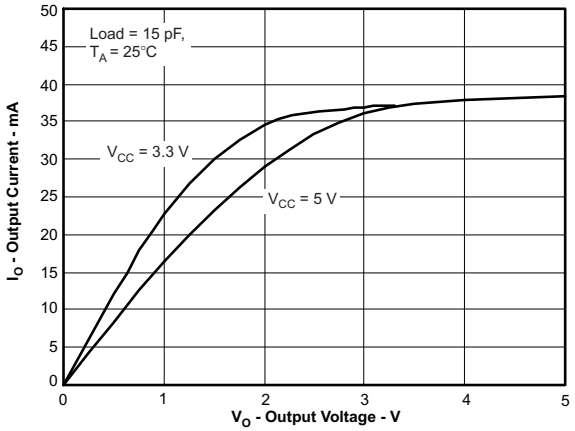


Figure 14.

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APPLICATION INFORMATION

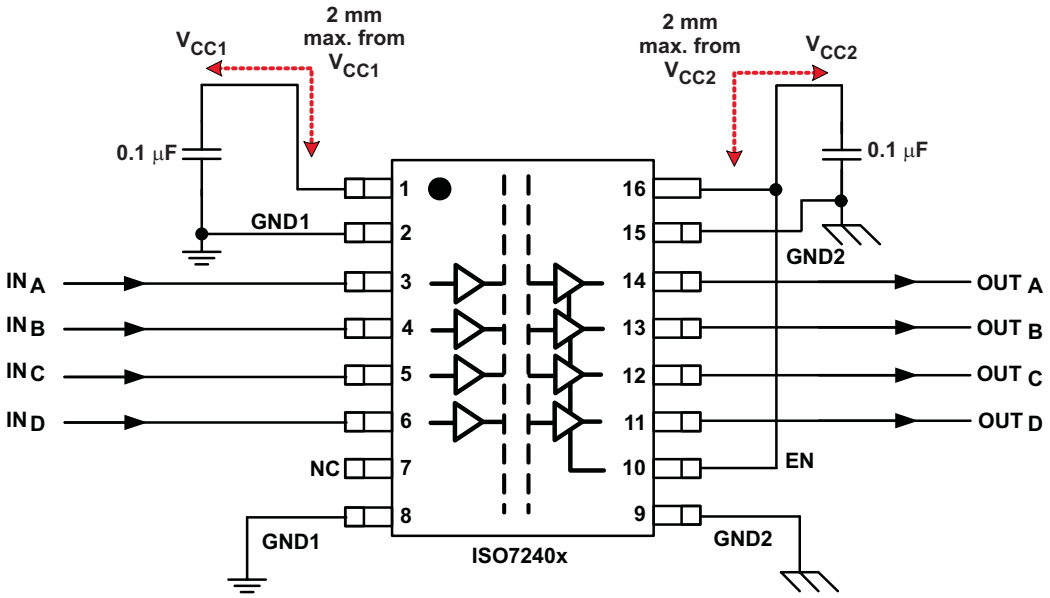


Figure 15. Typical ISO7240x Application Circuit

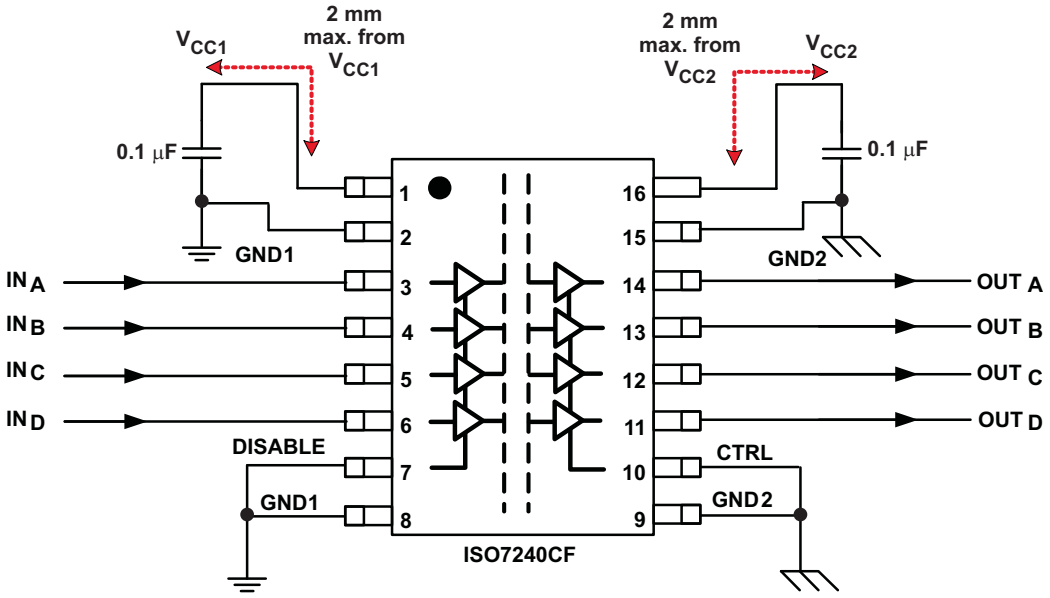


Figure 16. Typical ISO7240CF Failsafe-Low Application Circuit

LIFE EXPECTANCY vs WORKING VOLTAGE

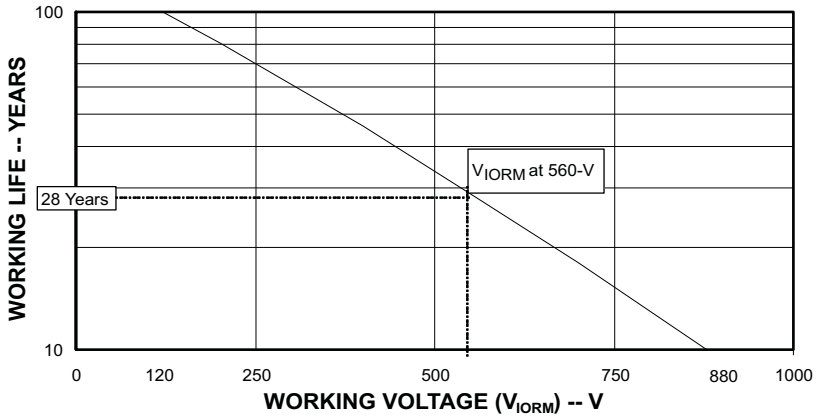


Figure 17. Time-Dependant Dielectric Breakdown Testing Results

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/ Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
ISO7240CFQDWRQ1	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	
ISO7241CQDWRQ1	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	
ISO7242CQDWRQ1	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	

(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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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OTHER QUALIFIED VERSIONS OF ISO7240CF-Q1, ISO7241C-Q1, ISO7242C-Q1 :

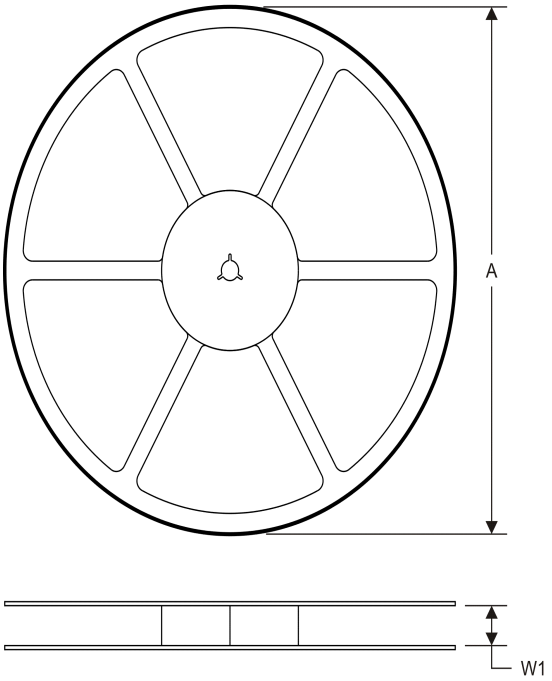
- Catalog: ISO7240CF, ISO7241C, ISO7242C

NOTE: Qualified Version Definitions:

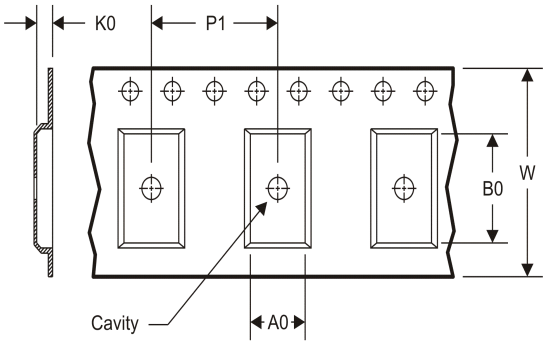
- Catalog - TI's standard catalog product

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



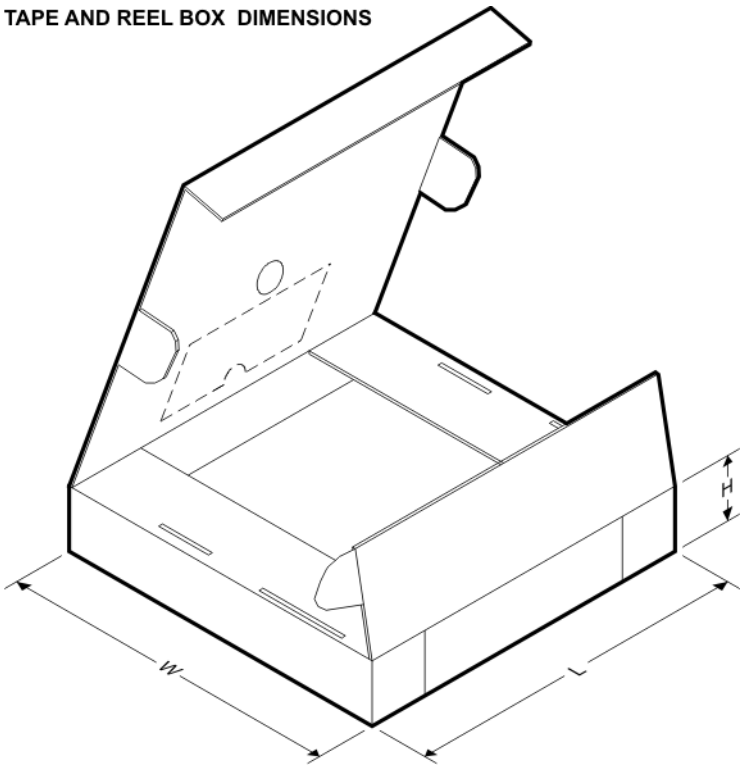
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

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
ISO7240CFQDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1

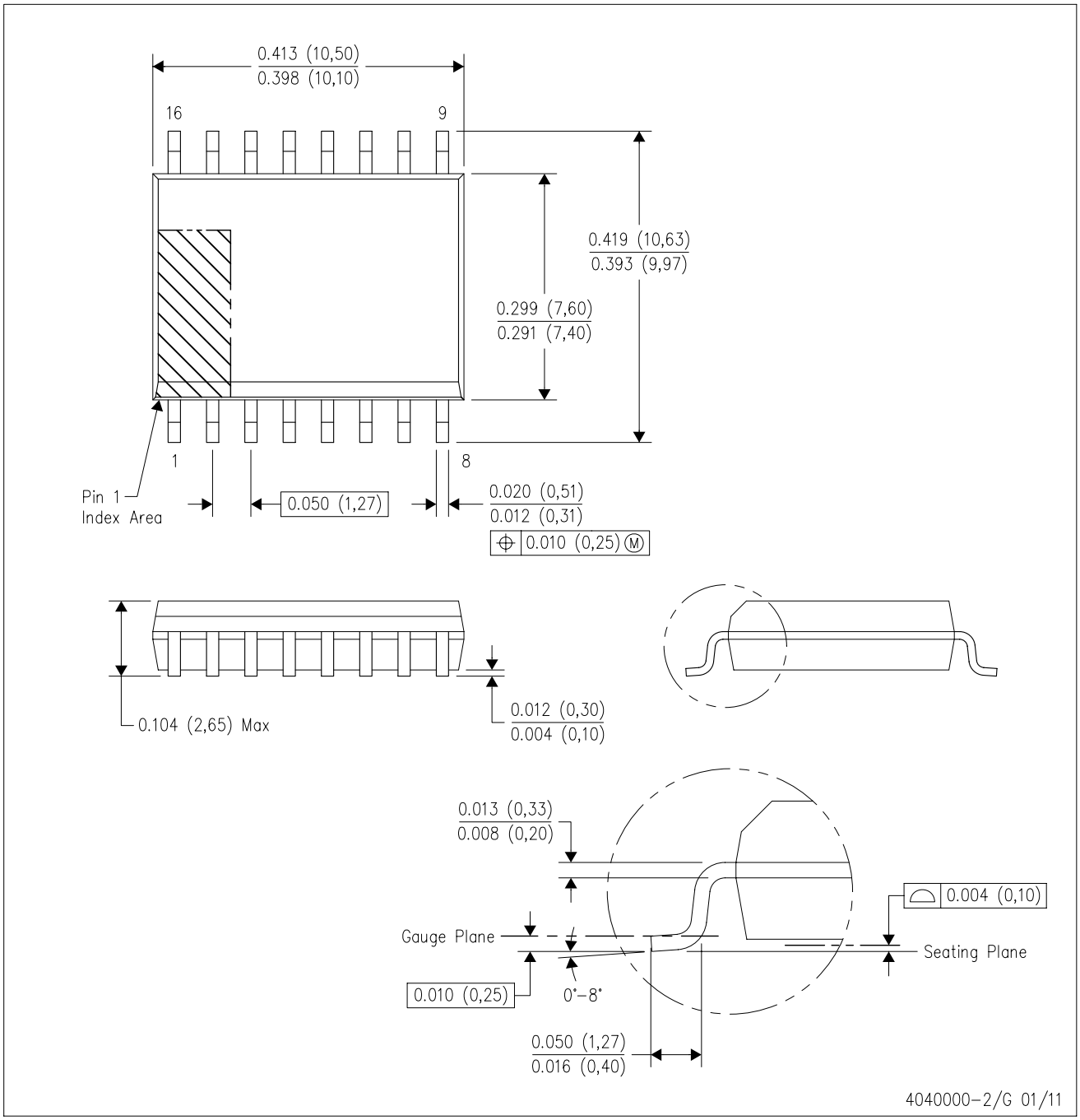
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

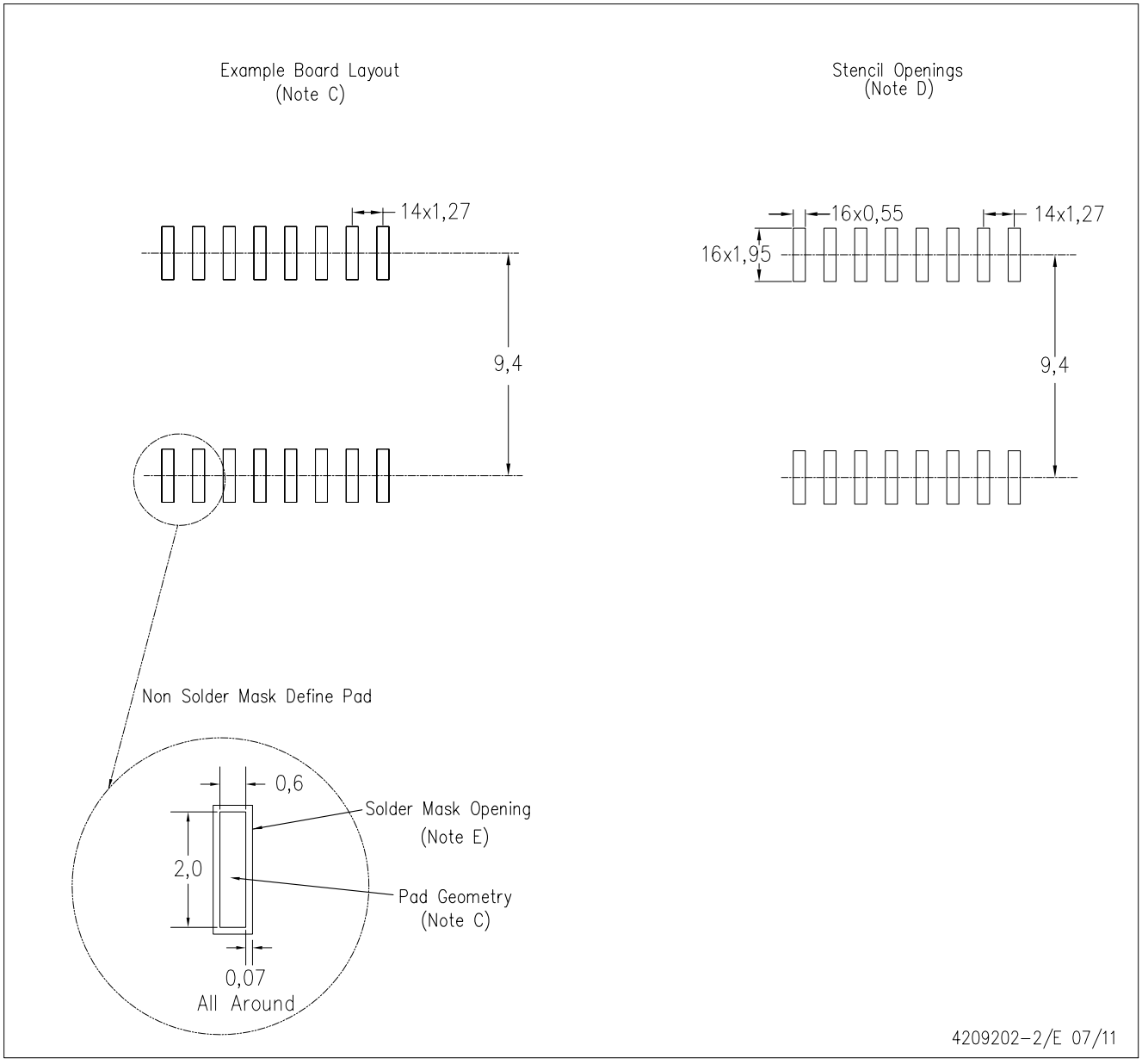
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
ISO7240CFQDWRQ1	SOIC	DW	16	2000	367.0	367.0	38.0

DW (R–PDSO–G16) PLASTIC SMALL OUTLINE



NOTES:
A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
D. Falls within JEDEC MS–013 variation AA.

DW (R–PDSO–G16) PLASTIC SMALL OUTLINE



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Refer to IPC7351 for alternate board design.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC–7525
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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