HIGH SPEED, TRIPLE DIGITAL ISOLATORS

Check for Samples: ISO7230C, ISO7230M, ISO7231C, ISO7231M

FEATURES

- **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 14)**
- **4000-V_{peak} Isolation, 560-V_{peak} V_{IORM}**
  - **UL 1577, IEC 60747-5-2 (VDE 0884, Rev 2), IE 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 Note SLLA181)**
- **–40°C to 125°C Operating Range**

APPLICATIONS

- **Industrial Fieldbus**
- **Computer Peripheral Interface**
- **Servo Control Interface**
- **Data Acquisition**

DESCRIPTION

The ISO7230 and ISO7231 are triple-channel digital isolators each 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 on a data bus or other circuits from entering the local ground and interfering with or damaging sensitive circuitry.

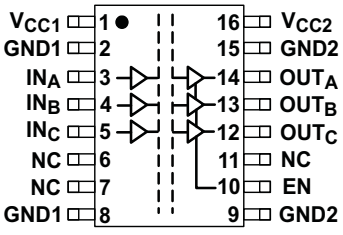
The ISO7230 triple-channel device has all three channels in the same direction while the ISO7231 has two channels in one direction and one channel in opposition. These devices have an active-high output enable that when driven to a low level, places the output in a high-impedance state.

The ISO7230C and ISO7231C have TTL input thresholds and a noise-filter at the input that prevents transient pulses of up to 2 ns in duration from being passed to the output of the device, while the ISO7230M and ISO7231M have CMOS V_{CC}/2 input thresholds and do not have the input noise-filter or the additional propagation delay.

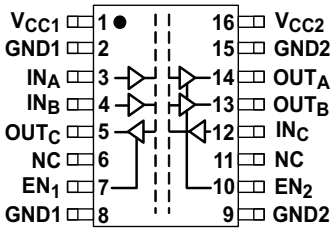
In each device, a periodic update pulse is sent across the isolation barrier to ensure the proper dc level of the output. If this dc-refresh pulse is not received, the input is assumed to be unpowered or not being actively driven, and the failsafe circuit drives the output to a logic high state. (Contact TI for a logic low failsafe option).

These devices require two supply voltages of 3.3-V, 5-V, or any combination. All inputs are 5-V tolerant when supplied from a 3.3-V supply and all outputs are 4-mA CMOS. These devices are characterized for operation over the ambient temperature range of –40°C to 125°C.

ISO7230
DW PACKAGE



ISO7231
DW PACKAGE



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.

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

FUNCTION DIAGRAM

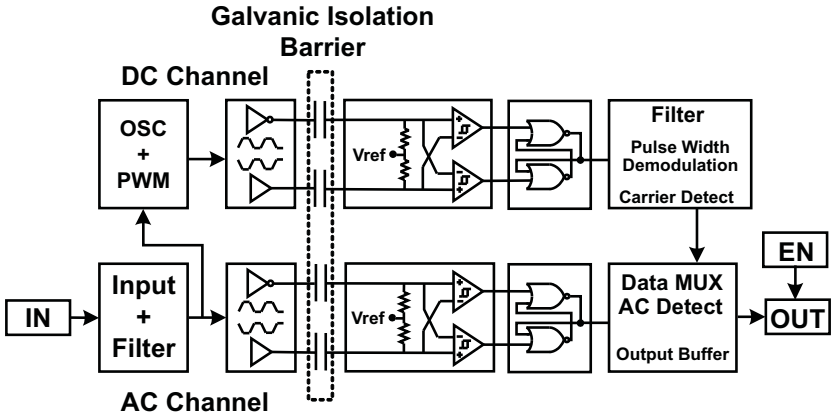


Table 1. Device Function Table ISO723x (1)

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

AVAILABLE OPTIONS

PRODUCT	SIGNALING RATE	INPUT THRESHOLD	CHANNEL CONFIGURATION	MARKED AS	ORDERING NUMBER(1)
ISO7230CDW	25 Mbps	~1.5 V (TTL) (CMOS compatible)	3/0	ISO7230C	ISO7230CDW (rail)
					ISO7230CDWR (reel)
ISO7230MDW	150 Mbps	Vcc/2 (CMOS)		ISO7230M	ISO7230MDW (rail)
					ISO7230MDWR (reel)
ISO7231CDW	25 Mbps	~1.5 V (TTL) (CMOS compatible)	2/1	ISO7231C	ISO7231CDW (rail)
					ISO7231CDWR (reel)
ISO7231MDW	150 Mbps	Vcc/2 (CMOS)		ISO7231M	ISO7231MDW (rail)
					ISO7231MDWR (reel)

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.

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				–0.5 to 6	V
I_O	Output current				±15	mA
ESD	Electrostatic discharge	Human Body Model	JEDEC Standard 22, Test Method A114-C.01	All pins	±4	kV
		Field-Induced-Charged Device Model	JEDEC Standard 22, Test Method C101		±1	
		Machine Model	ANSI/ESDS5.2-1996		±200	V
T_J	Maximum junction temperature				170	°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	ISO723xC	40			ns
		ISO723xM	6.67	5		
$1/t_{ui}$	Signaling rate	ISO723xC	0	30(2)	25	Mbps
		ISO723xM	0	200(2)	150	
V_{IH}	High-level input voltage (IN)	ISO723xM	0.7 V_{CC}		V_{CC}	V
V_{IL}	Low-level input voltage (IN)		0		0.3 V_{CC}	
V_{IH}	High-level input voltage (IN) (EN on all devices)	ISO723xC	2		V_{CC}	V
V_{IL}	Low-level input voltage (IN) (EN on all devices)		0		0.8	
T_J	Junction temperature				150	°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 sigalling rate under ideal conditions at 25°C.

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}	ISO7230C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V		1	3	mA
		25 Mbps			7	9.5	
	ISO7231C/M	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			11	17	
I_{CC2}	ISO7230C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V		15	22	mA
		25 Mbps			17	24	
	ISO7231C/M	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			17.5	27	
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 4	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.

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	ISO723xC	See Figure 1	18		42	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO723xC	See Figure 1			2.5	ns
t_{PLH}, t_{PHL}	Propagation delay	ISO723xM		10		23	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO723xM			1	2	ns
$t_{sk(pp)}$	Part-to-part skew (2)	ISO723xC				8	ns
		ISO723xM			0	3	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO723xC			0	2	ns
		ISO723xM			0	1	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		15	20	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output		See Figure 2		15	20	ns
t_{PLZ}	Propagation delay, low-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZL}	Propagation delay, high-impedance-to-low-level output		See Figure 2		15	20	ns
t_{fs}	Failsafe output delay time from input power loss		See Figure 3		12		µs
$t_{jit(pp)}$	Peak-to-peak eye-pattern jitter	ISO723xM	150 Mbps PRBS NRZ data input, Same polarity inputon all channels, See Figure 5		1		ns

(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.

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}	ISO7230C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			1	3	mA
		25 Mbps				7	9.5	
	ISO7231C/M	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				11	17	
I_{CC2}	ISO7230C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			9	15	mA
		25 Mbps				10	17	
	ISO7231C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			8	12	mA
		25 Mbps				10.5	16	
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	ISO7230	V_{CC} – 0.4			V
				ISO7231 (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 4		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.

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, low-to-high-level output	ISO723xC	See Figure 1	20		50	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO723xC	See Figure 1			3	ns
t_{PLH}, t_{PHL}	Propagation delay, low-to-high-level output	ISO723xM		12		29	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO723xM			1	2	ns
$t_{sk(pp)}$	Part-to-part skew (2)	ISO723xC				10	ns
		ISO723xM			0	5	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO723xC			0	2.5	ns
		ISO723xM			0	1	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		15	20	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output		See Figure 2		15	20	ns
t_{PLZ}	Propagation delay, low-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZL}	Propagation delay, high-impedance-to-low-level output		See Figure 2		15	20	ns
t_{fs}	Failsafe output delay time from input power loss		See Figure 3		18		µs
$t_{jit(pp)}$	Peak-to-peak eye-pattern jitter	ISO723xM	150 Mbps PRBS NRZ data input, Same polarity input on all channels, See Figure 5		1		ns

(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.

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}	ISO7230C/M	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	
	ISO7231C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_1 at 3 V, EN_2 at 3 V			4.5	7	mA
		25 Mbps				6.5	11	
I_{CC2}	ISO7230C/M	Quiescent	V_I = V_{CC} or 0 V, All channels, no load, EN_2 at 3 V			15	22	mA
		25 Mbps				17	24	
	ISO7231C/M	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				17.5	27	
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	ISO7230	V_{CC} – 0.4			V
				ISO7231 (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 4		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.

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	ISO723xC	See Figure 1	22		51	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO723xC	See Figure 1			3	ns
t_{PLH}, t_{PHL}	Propagation delay	ISO723xM	See Figure 1	12		30	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO723xM	See Figure 1		1	2	ns
$t_{sk(pp)}$	Part-to-part skew (2)	ISO723xC				10	ns
		ISO723xM			0	5	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO723xC			0	2.5	ns
		ISO723xM			0	1	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		15	20	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output		See Figure 2		15	20	ns
t_{PLZ}	Propagation delay, low-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZL}	Propagation delay, high-impedance-to-low-level output		See Figure 2		15	20	ns
t_{fs}	Failsafe output delay time from input power loss		See Figure 3		12		µs
$t_{jit(pp)}$	Peak-to-peak eye-pattern jitter	ISO723xM	150 Mbps PRBS NRZ data input, Same polarity input on all channels, See Figure 5		1		ns

(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.

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}	ISO7230C/M	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	
	ISO7231C/M	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_1 at 3 V, EN_2 at 3 V		4.5	7	mA
		25 Mbps			6.5	11	
I_{CC2}	ISO7230C/M	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_2 at 3 V		9	15	mA
		25 Mbps			10	17	
	ISO7231C/M	Quiescent	V_I = V_{CC} or 0 V, all channels, no load, EN_1 at 3 V, EN_2 at 3 V		8	12	mA
		25 Mbps			10.5	16	
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 4	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.

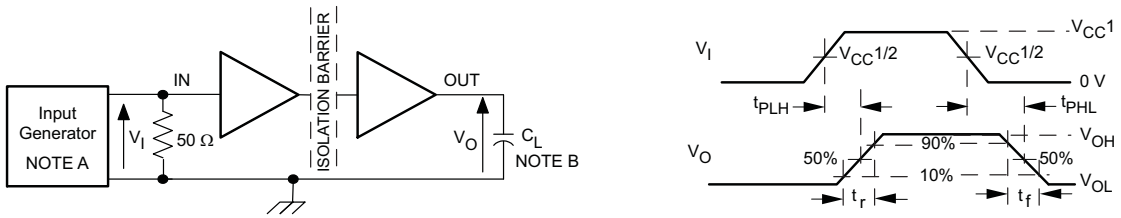
SWITCHING CHARACTERISTICS: V_{CC1} and V_{CC2} at 3.3-V OPERATION

over recommended operating conditions (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay	ISO723xC	See Figure 1	25		56	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO723xC	See Figure 1			4	ns
t_{pLH}, t_{pHL}	Propagation delay	ISO723xM		12		34	ns
PWD	Pulse-width distortion(1) $\lvert t_{PHL} - t_{PLH} \rvert$	ISO723xM			1	2	ns
$t_{sk(pp)}$	Part-to-part skew (2)	ISO723xC				10	ns
		ISO723xM			0	5	ns
$t_{sk(o)}$	Channel-to-channel output skew (3)	ISO723xC			0	3	ns
		ISO723xM			0	1	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		15	20	ns
t_{PZH}	Propagation delay, high-impedance-to-high-level output		See Figure 2		15	20	ns
t_{PLZ}	Propagation delay, low-level-to-high-impedance output		See Figure 2		15	20	ns
t_{PZL}	Propagation delay, high-impedance-to-low-level output		See Figure 2		15	20	ns
t_{fs}	Failsafe output delay time from input power loss		See Figure 3		18		µs
$t_{jit(pp)}$	Peak-to-peak eye-pattern jitter	ISO723xM	150 Mbps PRBS NRZ data input, same polarity input on all channels, See Figure 5		1		ns

(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.

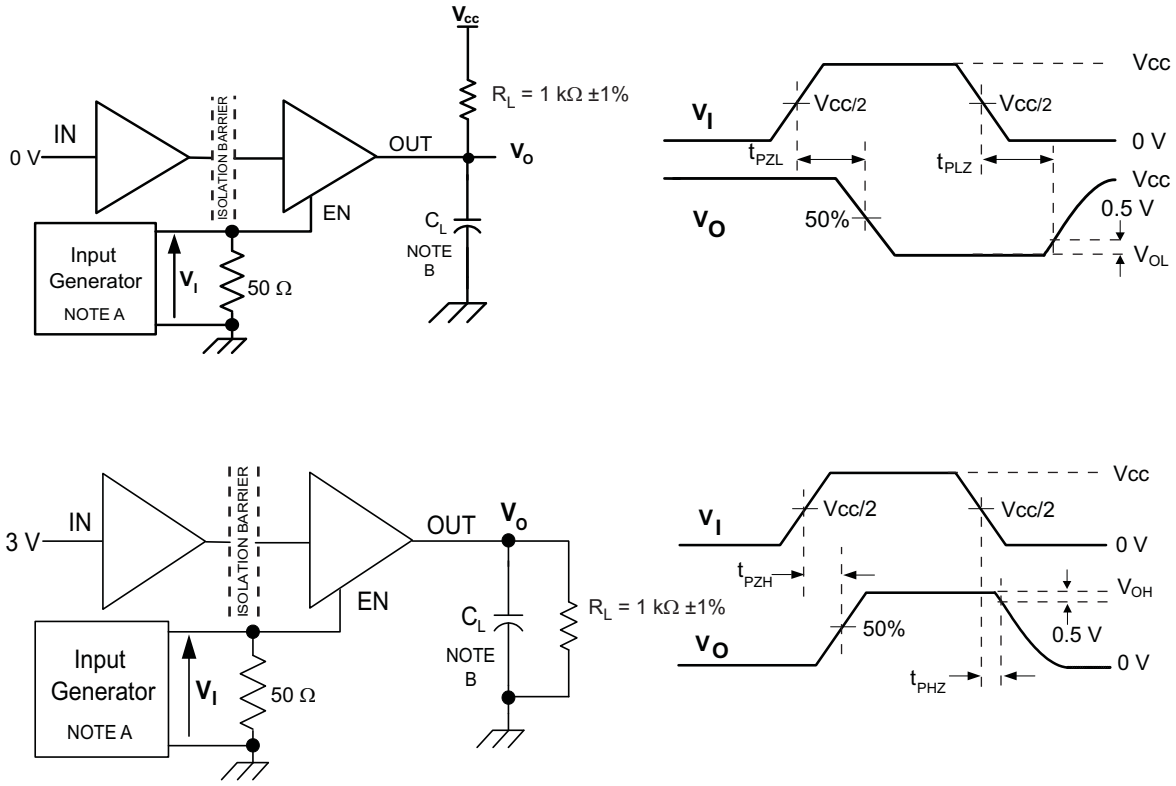
PARAMETER MEASUREMENT INFORMATION



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

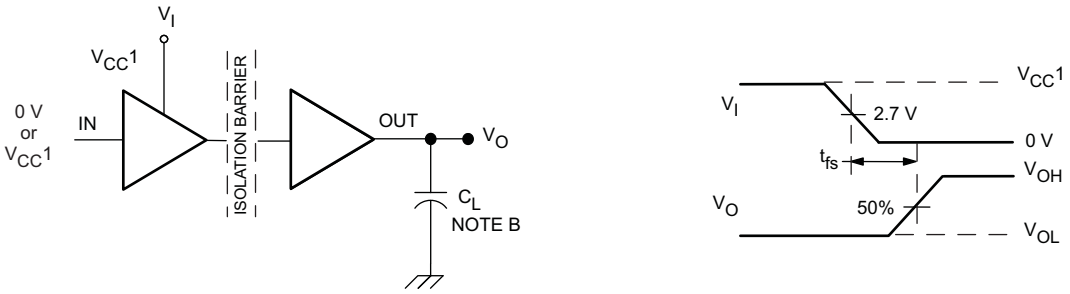


A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 50 kHz, 50% duty cycle, t_r ≤ 3 ns, t_f ≤ 3 ns, Z_O = 50Ω.

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

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

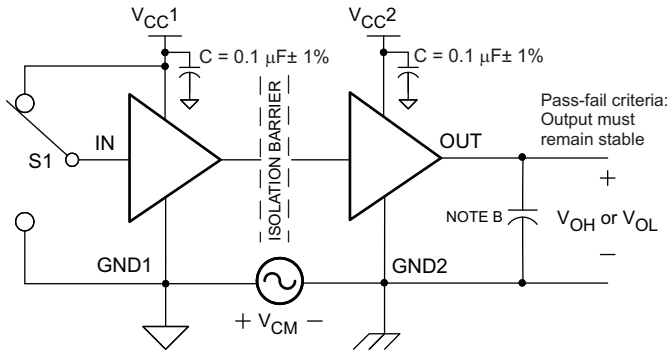
PARAMETER MEASUREMENT INFORMATION (continued)



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%.

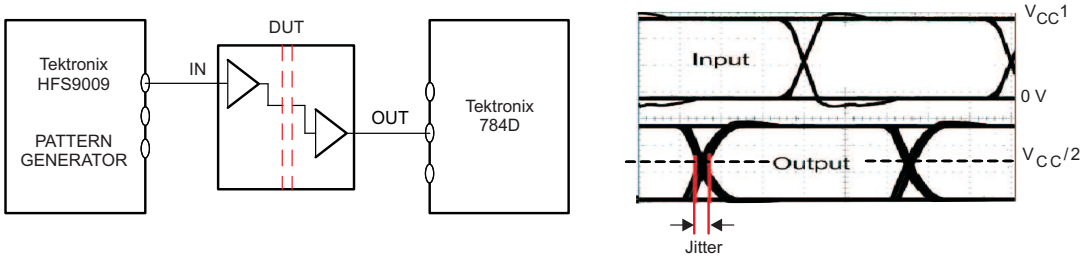
Figure 3. Failsafe Delay Time Test Circuit and Voltage Waveforms



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 4. 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 5. Peak-to-Peak Eye-Pattern Jitter Test Circuit and Voltage Waveform

DEVICE INFORMATION

PACKAGE CHARACTERISTICS

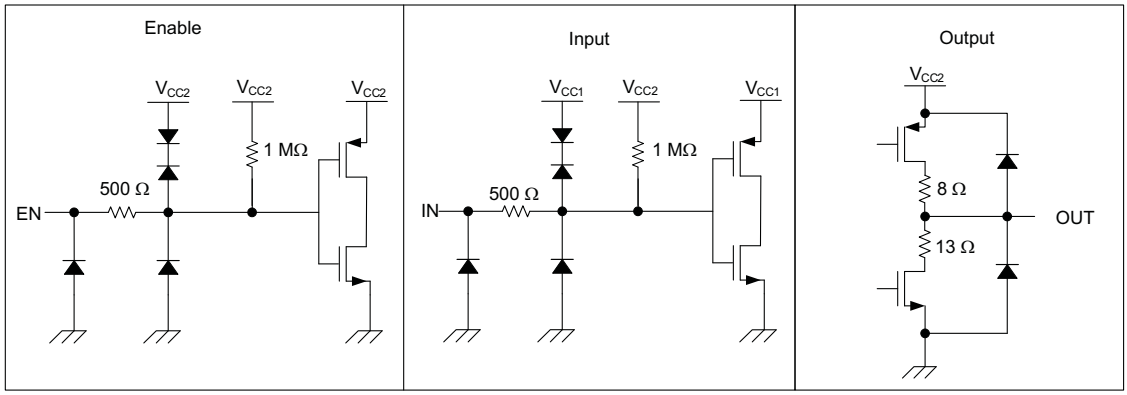
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
L(I01)	Minimum air gap (Clearance)	Shortest terminal-to-terminal distance through air	8.34			mm
L(I02)	Minimum external tracking (Creepage)	Shortest terminal-to-terminal distance across the package surface	8.1			mm
	Minimum Internal Gap (Internal Clearance)	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, T_A < 100°C		$>10^{12}$		Ω
		Input to output, V_{IO} = 500 V, 100°C ≤ T_A ≤ T_A max		$>10^{11}$		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

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.

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.

TYPICAL CHARACTERISTIC CURVES

ISO7230 C/M RMS SUPPLY CURRENT vs SIGNALING RATE

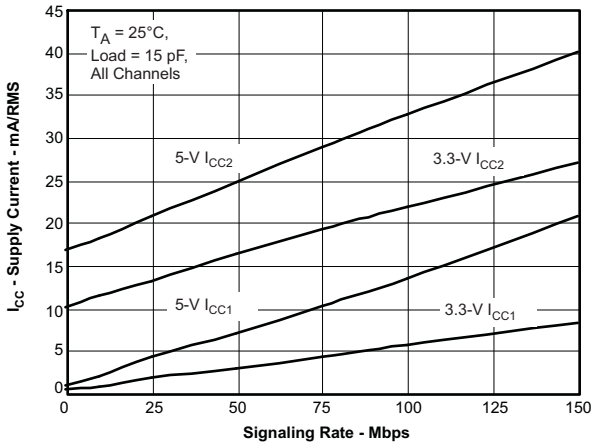


Figure 6.

ISO7231 C/M RMS SUPPLY CURRENT vs SIGNALING RATE

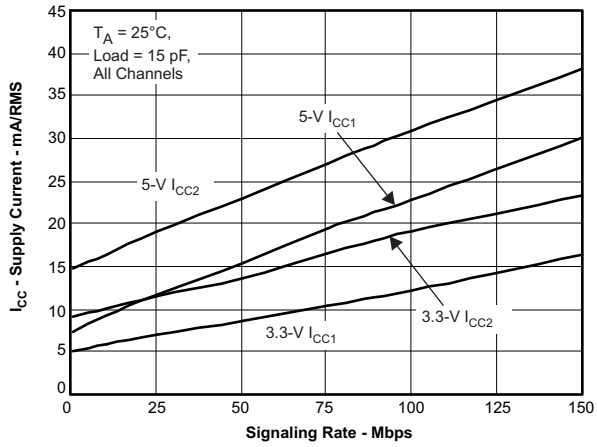


Figure 7.

PROPAGATION DELAY vs FREE-AIR TEMPERATURE

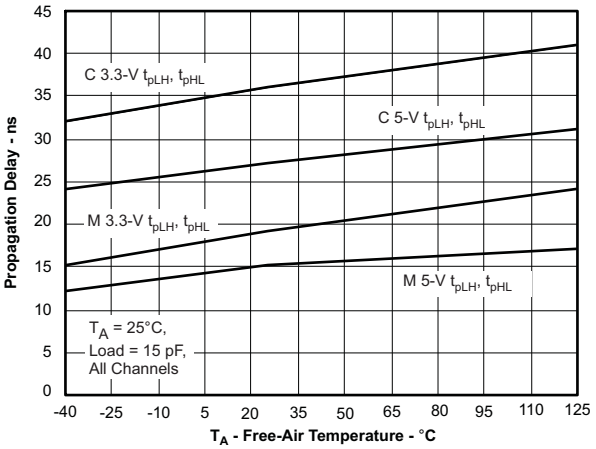


Figure 8.

INPUT THRESHOLD VOLTAGE vs FREE-AIR TEMPERATURE

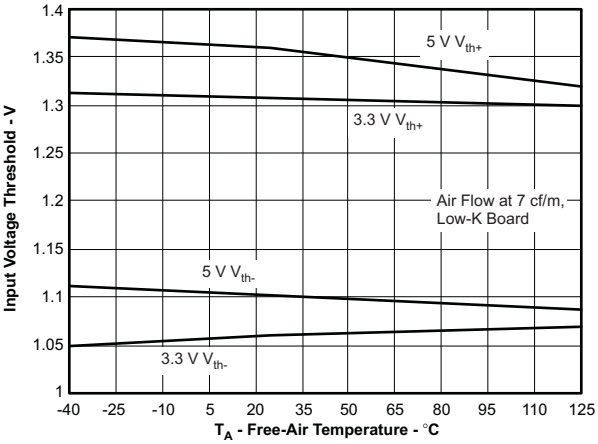


Figure 9.

TYPICAL CHARACTERISTIC CURVES (continued)

V_{CC1} FAILSAFE THRESHOLD vs FREE-AIR TEMPERATURE

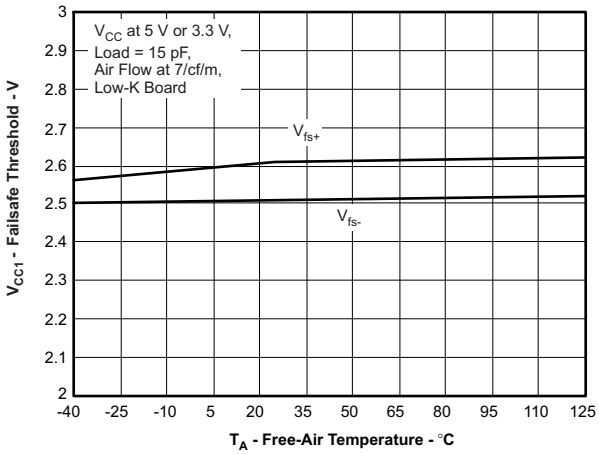


Figure 10.

HIGH-LEVEL OUTPUT CURRENT vs HIGH-LEVEL OUTPUT VOLTAGE

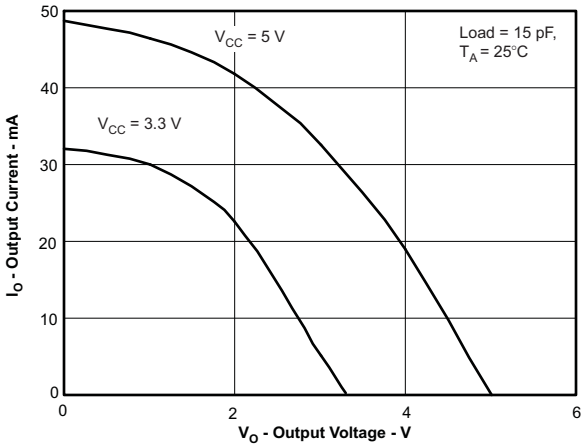


Figure 11.

LOW-LEVEL OUTPUT CURRENT vs LOW-LEVEL OUTPUT VOLTAGE

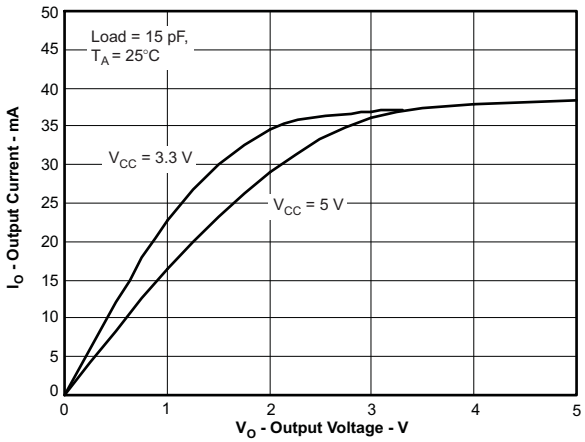


Figure 12.

APPLICATION INFORMATION

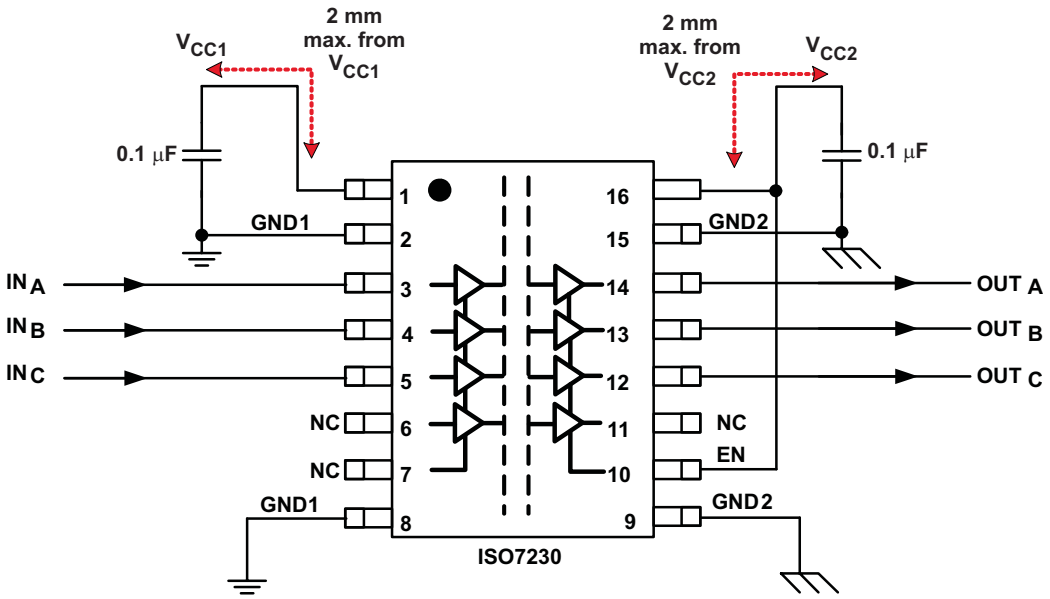


Figure 13. Typical ISO7230 Application Circuit

LIFE EXPECTANCY vs WORKING VOLTAGE

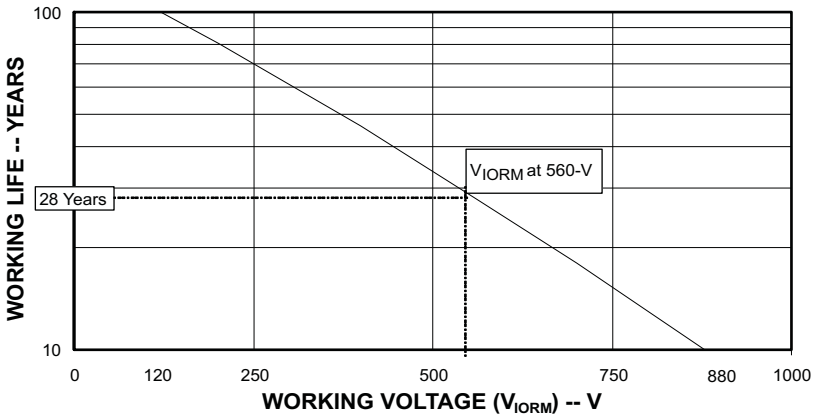


Figure 14. Time Dependant Dielectric Breakdown Testing Results

REVISION HISTORY

Changes from Original (September 2007) to Revision A **Page**

- Deleted Product Preview note 2
- Changed V_{CC} Supply Voltage of the ROC Table From: 3 To: 3.15 3
- Changed From: 3.6 To: 3.45 3
- Changed TBD to actual values 4
- Changed V_{CC} – 0.4 To: V_{CC} – 0.8 4
- Changed C_I - Typical value from 1 To: 2 4
- Changed Propagation delay max From: 22 To: 23 5
- Changed C_I - Typical value from 1 To: 2 6
- Changed Propagation delay max From: 46 To: 50 7
- Changed Propagation delay max From: 28 To: 29 7
- Changed C_I - Typical value from 1 To: 2 8
- Changed Propagation delay max From: 26 To: 30 9
- Changed C_I - Typical value from 1 To: 2 10
- Changed Propagation delay max From: 32 To: 34 11
- Changed C_{IO} - Typical value from 1 To: 2 14
- Changed C_I - Typical value from 1 To: 2 14
- Changed the REGULATORY INFORMATION Table 14
- Changed Figure 6, Figure 7, and Figure 8 15

Changes from Revision A (December 2007) to Revision B **Page**

- Changed Supply Voltage of the ROC Table From: 3.45 To: 3.6 3

Changes from Revision B (April 2008) to Revision C **Page**

- Deleted Min = 4.5 V and max = 5.5 V for Supply Voltage of the ROC Table. 3
- Changed Supply Voltage of the ROC Table From: 3.6 To: 5.5 3

Changes from Revision C (April 2008) to Revision D **Page**

- Changed Features bullet 4000-V_{peak} Isolation to the Features list 1
- Added $t_{sk(pp)}$ Part-to-part skew 5
- Added $t_{sk(pp)}$ Part-to-part skew 7
- Added $t_{sk(pp)}$ Part-to-part skew 9
- Added $t_{sk(pp)}$ Part-to-part skew 11
- Changed Typical ISO723x Application Circuit Figure 13 17

Changes from Revision D (May 2008) to Revision E **Page**

- Added Note: For the 5-V operation, VCC1 or VCC2 is specified from 4.5 V to 5.5 V. For the 3-V operation, VCC1 or VCC2 is specified from 3.15 V to 3.6 V. 3
- Added Note: For the 5-V operation, VCC1 or VCC2 is specified from 4.5 V to 5.5 V. For the 3-V operation, VCC1 or VCC2 is specified from 3.15 V to 3.6 V. 4
- Added Note: For the 5-V operation, VCC1 or VCC2 is specified from 4.5 V to 5.5 V. For the 3-V operation, VCC1 or VCC2 is specified from 3.15 V to 3.6 V. 6
- Added Note: For the 5-V operation, VCC1 or VCC2 is specified from 4.5 V to 5.5 V. For the 3-V operation, VCC1 or VCC2 is specified from 3.15 V to 3.6 V. 8
- Added Note: For the 5-V operation, VCC1 or VCC2 is specified from 4.5 V to 5.5 V. For the 3-V operation, VCC1 or VCC2 is specified from 3.15 V to 3.6 V. 10

Changes from Revision E (June 2008) to Revision F **Page**

- Deleted device numbers ISO7230A and ISO7231A from the data sheet. 1
- Deleted text from the Description "and turns off internal bias circuitry to conserve power" 1
- Added $t_{sk(pp)}$ footnote. 5
- Added $t_{sk(o)}$ footnote. 5
- Added $t_{sk(pp)}$ footnote. 11
- Added $t_{sk(o)}$ footnote. 11
- Changed the PACKAGE CHARACTERISTICS table, line 1, $L_{(IO1)}$ MIN from 7.7 to 8.34 14

Changes from Revision F (December 2008) to Revision G **Page**

- Added IEC 60950-1 and CSA Approved to the Features list 1

Changes from Revision G (September 2009) to Revision H **Page**

- Changed The Input circuit in the DEVICE I/O SCHEMATICS illustration 14

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
ISO7230CDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7230CDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7230CDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7230CDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7230MDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7230MDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7230MDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7230MDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7231CDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7231CDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7231CDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7231CDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7231MDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7231MDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7231MDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
ISO7231MDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR

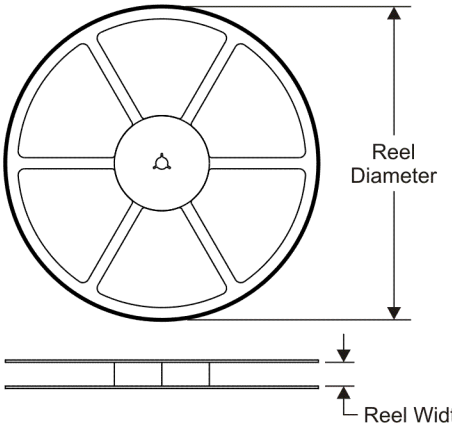
(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, 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)

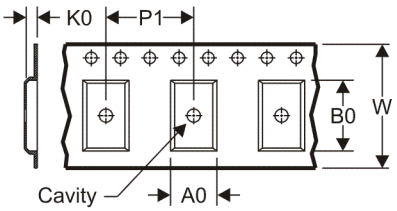
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

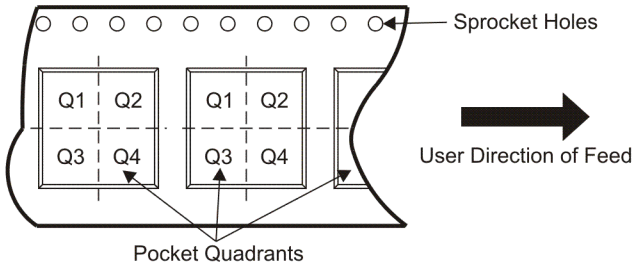


TAPE DIMENSIONS



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

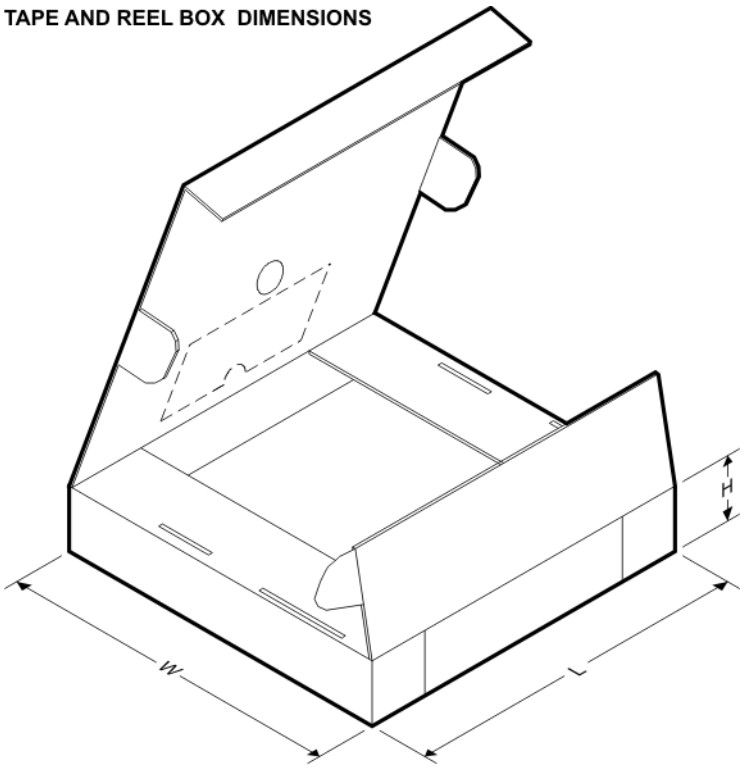
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
ISO7230CDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7230MDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7231CDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7231MDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1

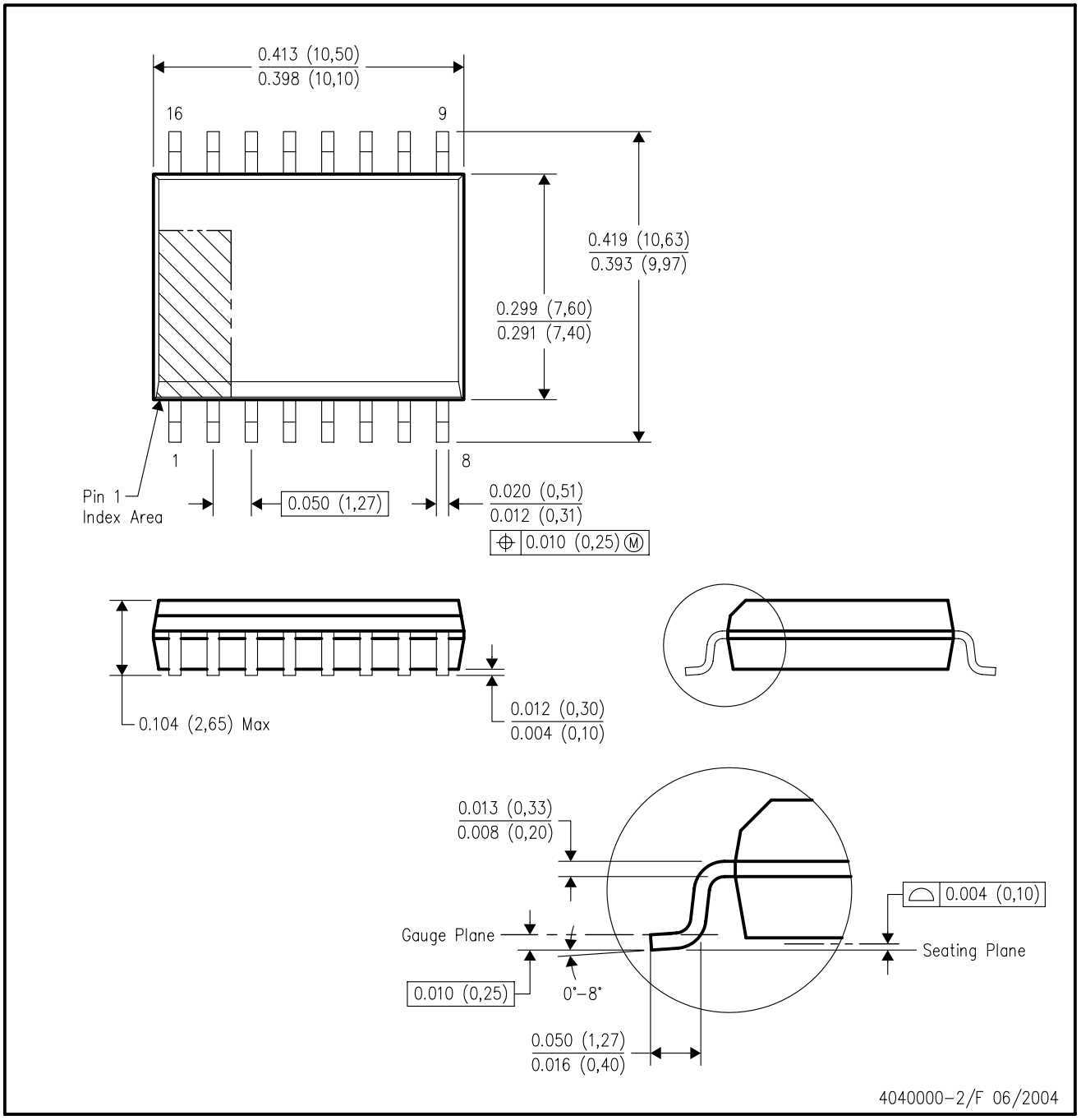
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
ISO7230CDWR	SOIC	DW	16	2000	358.0	335.0	35.0
ISO7230MDWR	SOIC	DW	16	2000	358.0	335.0	35.0
ISO7231CDWR	SOIC	DW	16	2000	358.0	335.0	35.0
ISO7231MDWR	SOIC	DW	16	2000	358.0	335.0	35.0

DW (R–PDSO–G16) PLASTIC SMALL–OUTLINE PACKAGE



NOTES:
A. All linear dimensions are in inches (millimeters).
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.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DLP® Products	www.dlp.com	Communications and Telecom	www.ti.com/communications
DSP	dsp.ti.com	Computers and Peripherals	www.ti.com/computers
Clocks and Timers	www.ti.com/clocks	Consumer Electronics	www.ti.com/consumer-apps
Interface	interface.ti.com	Energy	www.ti.com/energy
Logic	logic.ti.com	Industrial	www.ti.com/industrial
Power Mgmt	power.ti.com	Medical	www.ti.com/medical
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
RFID	www.ti-rfid.com	Space, Avionics & Defense	www.ti.com/space-avionics-defense
RF/IF and ZigBee® Solutions	www.ti.com/lprf	Video and Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless-apps

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265