Low-Power Dual Digital Isolators

Check for Samples: ISO7420, ISO7420M, ISO7421, ISO7421M

FEATURES

- **Highest Signaling Rate: 1 Mbps**
- **Low Power Consumption, Typical I_{CC} per Channel (3.3V operation):**
  - **ISO7420: 1.1 mA, ISO7421: 1.5 mA**
- **Low Propagation Delay – 9 ns Typ. and Low Skew – 300 ps Typ.**
- **Wide T_A Range Specified: –40°C to 125°C**
- **4-kVpeak Maximum Isolation, 2.5 kVrms per UL 1577, IEC/VDE and CSA Approvals, IEC 60950-1, IEC 61010-1 End Equipment Standards Approvals. All Approvals Pending.**
- **50 kV/μs Transient Immunity, Typical**
- **Over 25-Year Isolation Integrity at Rated Voltage**
- **Operates From 3.3V and 5V Supply and Logic Levels**

APPLICATIONS

- **Optocoupler Replacement in:**
  - **Industrial Fieldbus**
    - **Profibus**
    - **Modbus**
    - **DeviceNet™ Data Buses**
  - **Servo Control Interface**
  - **Motor Control**
  - **Power Supplies**
  - **Battery Packs**

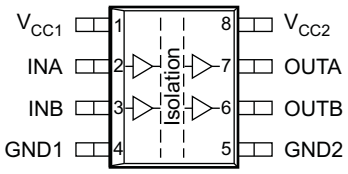
DESCRIPTION

The ISO7420, ISO7420M, ISO7421, and ISO7421M provide galvanic isolation up to 2.5 kVrms for 1 minute per UL. These digital isolators have two isolated channels. Each isolation channel has a logic input and output buffer separated by a silicon dioxide (SiO_2) insulation barrier. Used in conjunction with isolated power supplies, these devices prevent noise currents on a data bus or other circuit from entering the local ground and interfering with or damaging sensitive circuitry. The suffix M indicates wide temperature range (–40°C to 125°C).

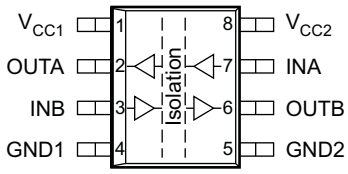
The devices have TTL input thresholds and require two supply voltages, 3.3V or 5V, or any combination. All inputs are 5-V tolerant when supplied from a 3.3V supply.

Note: The ISO7420 and ISO7421 are specified for signaling rates up to 1 Mbps. Due to their fast response time, under most cases, these devices will also transmit data with much shorter pulse widths. Designers should add external filtering to remove spurious signals with input pulse duration < 20ns if desired.

ISO7420
D Package
(Top View)



ISO7421
D Package
(Top View)



P0066-08

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.

DeviceNet is a trademark of Texas Instruments.

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

Copyright © 2009–2010, Texas Instruments Incorporated

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.

PIN FUNCTIONS

PIN		I/O	DESCRIPTION
NAME	NO.		
INA	7	I	Input, channel A
INB	3	I	Input, channel B
GND1	4	–	Ground connection for V_{CC1}
GND2	5	–	Ground connection for V_{CC2}
OUTA	2	O	Output, channel A
OUTB	6	O	Output, channel B
V_{CC1}	1	–	Power supply, V_{CC1}
V_{CC2}	8	–	Power supply, V_{CC2}

Table 1. FUNCTION TABLE(1)

INPUT SIDE VCC	OUTPUT SIDE VCC	INPUT IN	OUTPUT OUT
PU	PU	H	H
		L	L
		Open	H(2)
PD	PU	X	H(2)

(1) PU = Powered up (V_{CC} ≥ 3 V); PD = Powered down (V_{CC} ≤ 2.4 V); X = Irrelevant; H = High level; L = Low level
(2) In fail-safe condition, output is at high level for ISO7420, ISO7420M, ISO7421 and ISO7421M.

AVAILABLE OPTIONS

PRODUCT	RATED ISOLATION	PACKAGE	INPUT THRESHOLD	RATED T_A	CHANNEL DIRECTION	MARKED AS	ORDERING NUMBER
ISO7420	2.5 kVrms	D-8	~1.5 V (TTL) (CMOS compatible)	–40°C to 105°C	Same direction	IS7420	ISO7420D (rail)
							ISO7420DR (reel)
ISO7420M				–40°C to 125°C		I7420M	ISO7420MD (rail)
							ISO7420MDR (reel)
ISO7421				–40°C to 105°C	Opposite directions	IS7421	ISO7421D (rail)
							ISO7421DR (reel)
ISO7421M (PREVIEW)				–40°C to 125°C		I7421M	ISO7421MD (rail)
							ISO7421MDR (reel)

Copyright © 2009–2010, Texas Instruments Incorporated

ABSOLUTE MAXIMUM RATINGS(1)

					VALUE
V_{CC}	Supply voltage(2), V_{CC1}, V_{CC2}				–0.5 V to 6 V
V_I	Voltage at IN, OUT				–0.5 V 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		±1.5 kV
		Machine model	ANSI/ESDS5.2-1996		±200 V
$T_{J(Max)}$	Maximum junction temperature				150°C
T_{stg}	Storage temperature				-65°C to 150°C

(1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) All voltage values except differential I/O bus voltages are with respect to network ground terminal and are peak voltage values.

RECOMMENDED OPERATING CONDITIONS

		MIN	TYP	MAX	UNIT
V_{CC1}, V_{CC2}	Supply voltage - 3.3V operation	3.15	3.3	3.45	V
	Supply voltage - 5V operation	4.75	5	5.25	
I_{OH}	High-level output current	–4			mA
I_{OL}	Low-level output current			4	mA
V_{IH}	High-level input voltage	2		V_{CC}	V
V_{IL}	Low-level input voltage	0		0.8	V
T_J(1)	Junction temperature	–40		136	°C
$1/t_{ui}$	Signaling rate	0		1	Mbps
t_{ui}	Input pulse duration	1			us

(1) To maintain the recommended operating conditions for T_J, see the *Package Thermal Characteristics* table and the I_{CC} limits in this data sheet.

Copyright © 2009–2010, Texas Instruments Incorporated

ELECTRICAL CHARACTERISTICS

V_{CC1} and V_{CC2} at 5V ± 5%; T_A = –40°C to 125°C for ISO742xM, T_A = –40°C to 105°C for ISO742x

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	I_{OH} = –4 mA; see Figure 1.		V_{CC} – 0.8	4.6		V
		I_{OH} = –20 μA; see Figure 1.		V_{CC} – 0.1	5		
V_{OL}	Low-level output voltage	I_{OL} = 4 mA; see Figure 1.			0.2	0.4	V
		I_{OL} = 20 μA; see Figure 1.			0	0.1	
$V_{I(HYS)}$	Input threshold voltage hysteresis				400		mV
I_{IH}	High-level input current	INx at 0 V or V_{CC}				10	μA
I_{IL}	Low-level input current			–10			μA
CMTI	Common-mode transient immunity	V_I = V_{CC} or 0 V; see Figure 3.		25	50		kV/μs
SUPPLY CURRENT (All inputs switching with square wave clock signal for dynamic ICC measurement)							
	ISO7420						
I_{CC1}	Supply current for V_{CC1}	DC to 1 Mbps	V_I = V_{CC} or 0 V, 15 pF load		0.4	1	mA
I_{CC2}	Supply current for V_{CC2}				3	6	
	ISO7421						
I_{CC1}	Supply current for V_{CC1}	DC to 1 Mbps	V_I = V_{CC} or 0 V, 15 pF load		2	4	mA
I_{CC2}	Supply current for V_{CC2}				2	4	

SWITCHING CHARACTERISTICS

V_{CC1} and V_{CC2} at 5V ± 5%; T_A = –40°C to 125°C for ISO742xM, T_A = –40°C to 105°C for ISO742X

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay time	See Figure 1.		9	14	ns
PWD(1)	Pulse width distortion $\lvert t_{PHL} - t_{PLH} \rvert$			0.3	3.5	ns
$t_{sk(pp)}$	Part-to-part skew time				4	ns
$t_{sk(o)}$	Channel-to-channel output skew time				3.6	ns
t_r	Output signal rise time	See Figure 1.		1		ns
t_f	Output signal fall time			1		ns
t_{fs}	Fail-safe output delay time from input power loss	See Figure 2.		6		μs

(1) Also known as pulse skew.

Copyright © 2009–2010, Texas Instruments Incorporated

ELECTRICAL CHARACTERISTICS

V_{CC1} at 5V ± 5%, V_{CC2} at 3.3V ± 5%; T_A = –40°C to 125°C for ISO742xM , T_A = –40°C to 105°C for ISO742x

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	I_{OH} = –4 mA; see Figure 1.	ISO7421 (5-V side)	V_{CC} – 0.8	4.6		V
			ISO7420 / 7421 (3.3-V side) .	V_{CC} – 0.4	3		
		I_{OH} = –20 μA; see Figure 1,		V_{CC} – 0.1	V_{CC}		
V_{OL}	Low-level output voltage	I_{OL} = 4 mA; see Figure 1.			0.2	0.4	V
		I_{OL} = 20 μA; see Figure 1.			0	0.1	
$V_{I(HYS)}$	Input threshold voltage hysteresis				400		mV
I_{IH}	High-level input current	INx at 0 V or V_{CC}				10	μA
I_{IL}	Low-level input current			–10			μA
CMTI	Common-mode transient immunity	V_I = V_{CC} or 0 V; see Figure 3.		25	40		kV/μs
SUPPLY CURRENT (All inputs switching with square wave clock signal for dynamic ICC measurement)							
	ISO7420						
I_{CC1}	Supply current for V_{CC1}	DC to 1 Mbps	V_I = V_{CC} or 0 V, 15 pF load		0.4	1	mA
I_{CC2}	Supply current for V_{CC2}				2	4.5	mA
	ISO7421						
I_{CC1}	Supply current for V_{CC1}	DC to 1 Mbps	V_I = V_{CC} or 0 V, 15 pF load		2	4	mA
I_{CC2}	Supply current for V_{CC2}				1.5	3.5	mA

SWITCHING CHARACTERISTICS

V_{CC1} at 5V ± 5%, V_{CC2} at 3.3V ± 5%; T_A = –40°C to 125°C for ISO742xM, T_A = –40°C to 105°C for ISO742x

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay time	See Figure 1.		10	17	ns
PWD(1)	Pulse width distortion $\lvert t_{PHL} - t_{PLH} \rvert$			0.5	4	ns
$t_{sk(pp)}$	Part-to-part skew time				5	ns
$t_{sk(o)}$	Channel-to-channel output skew time				4	ns
t_r	Output signal rise time	See Figure 1.		2		ns
t_f	Output signal fall time			2		ns
t_{fs}	Fail-safe output delay time from input power loss	See Figure 2.		6		μs

(1) Also known as pulse skew.

Copyright © 2009–2010, Texas Instruments Incorporated

ELECTRICAL CHARACTERISTICS

V_{CC1} at 3.3V ± 5%, V_{CC2} at 5V ± 5%; T_A = –40°C to 125°C for ISO742xM, T_A = –40°C to 105°C for ISO742X

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	I_{OH} = –4 mA; see Figure 1.	ISO7420 / 7421 (5-V side).	V_{CC} – 0.8	4.6		V
			ISO7421 (3.3-V side)	V_{CC} – 0.4	3		
		I_{OH} = –20 μA; see Figure 1		V_{CC} – 0.1	V_{CC}		
V_{OL}	Low-level output voltage	I_{OL} = 4 mA; see Figure 1.			0.2	0.4	V
		I_{OL} = 20 μA; see Figure 1.			0	0.1	
$V_{I(HYS)}$	Input threshold voltage hysteresis				400		mV
I_{IH}	High-level input current	INx at 0 V or V_{CC}				10	μA
I_{IL}	Low-level input current			–10			μA
CMTI	Common-mode transient immunity	V_I = V_{CC} or 0 V; see Figure 3.		25	40		kV/μs
SUPPLY CURRENT (All inputs switching with square wave clock signal for dynamic ICC measurement)							
	ISO7420						
I_{CC1}	Supply current for V_{CC1}	DC to 1 Mbps	V_I = V_{CC} or 0 V, 15 pF load		0.2	0.7	mA
I_{CC2}	Supply current for V_{CC2}				3	6	
	ISO7421						
I_{CC1}	Supply current for V_{CC1}	DC to 1 Mbps	V_I = V_{CC} or 0 V, 15 pF load		1.5	3.5	mA
I_{CC2}	Supply current for V_{CC2}				2	4	

SWITCHING CHARACTERISTICS

V_{CC1} at 3.3V ± 5%, V_{CC2} at 5V ± 5%, T_A = –40°C to 125°C for ISO742xM, T_A = –40°C to 105°C for ISO742x

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay time	See Figure 1.		10	17	ns
PWD(1)	Pulse width distortion $\lvert t_{PHL} - t_{PLH} \rvert$			0.5	4	ns
$t_{sk(pp)}$	Part-to-part skew time				5	ns
$t_{sk(o)}$	Channel-to-channel output skew time				4	ns
t_r	Output signal rise time	See Figure 1.		2		ns
t_f	Output signal fall time			2		ns
t_{fs}	Fail-safe output delay time from input power loss	See Figure 2.		6		μs

(1) Also known as pulse skew.

Copyright © 2009–2010, Texas Instruments Incorporated

ELECTRICAL CHARACTERISTICS

V_{CC1} and V_{CC2} at 3.3V ± 5%, T_A = –40°C to 125°C for ISO742xM, T_A = –40°C to 105°C for ISO742x

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	I_{OH} = –4 mA; see Figure 1.		V_{CC} – 0.4	3		V
		I_{OH} = –20 μA; see Figure 1.		V_{CC} – 0.1	3.3		
V_{OL}	Low-level output voltage	I_{OL} = 4 mA; see Figure 1.			0.2	0.4	V
		I_{OL} = 20 μA; see Figure 1.			0	0.1	
$V_{I(HYS)}$	Input threshold voltage hysteresis				400		mV
I_{IH}	High-level input current	INx at 0 V or V_{CC}				10	μA
I_{IL}	Low-level input current			–10			μA
CMTI	Common-mode transient immunity	V_I = V_{CC} or 0 V; see Figure 3.		25	40		kV/μs
SUPPLY CURRENT (All inputs switching with square wave clock signal for dynamic ICC measurement)							
	ISO7420						
I_{CC1}	Supply current for V_{CC1}	DC to 1 Mbps	V_I = V_{CC} or 0 V, 15 pF load		0.2	0.7	mA
I_{CC2}	Supply current for V_{CC2}				2	4.5	
	ISO7421						
I_{CC1}	Supply current for V_{CC1}	DC to 1 Mbps	V_I = V_{CC} or 0 V, 15 pF load		1.5	3.5	mA
I_{CC2}	Supply current for V_{CC2}				1.5	3.5	

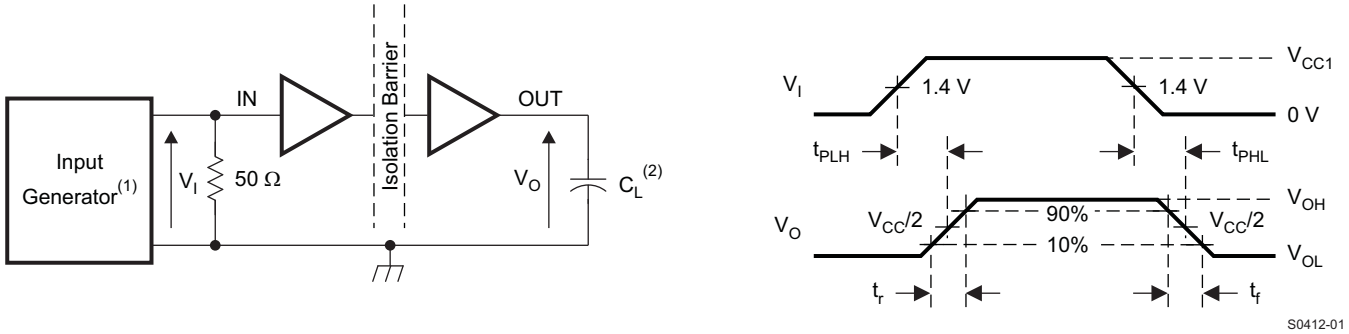
SWITCHING CHARACTERISTICS

V_{CC1} and V_{CC2} at 3.3V ± 5%, T_A = –40°C to 125°C for ISO742xM, T_A = –40°C to 105°C for ISO742x

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay time	See Figure 1.		12	20	ns
PWD (1)	Pulse width distortion $\lvert t_{PHL} - t_{PLH} \rvert$			1	5	ns
$t_{sk(pp)}$	Part-to-part skew time				6	ns
$t_{sk(o)}$	Channel-to-channel output skew time				5.5	ns
t_r	Output signal rise time	See Figure 1.		2		ns
t_f	Output signal fall time			2		ns
t_{fs}	Fail-safe output delay time from input power loss	See Figure 2.		6		μs

(1) Also known as pulse skew.

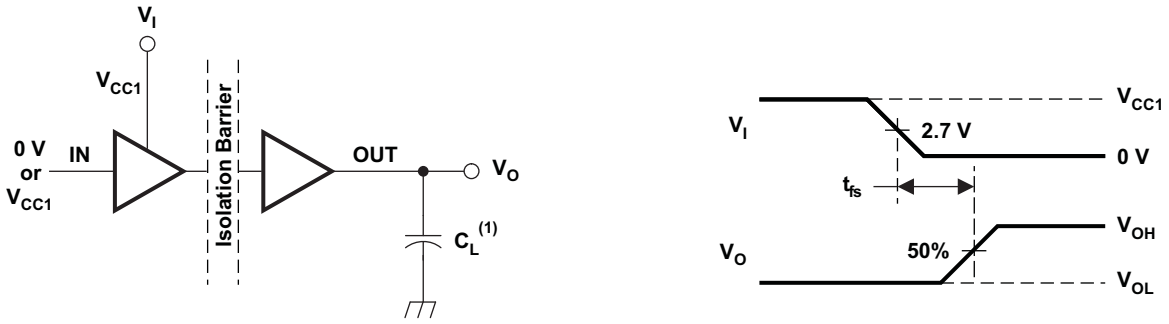
PARAMETER MEASUREMENT INFORMATION



(1) 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 = 50 Ω. At the input, a 50-Ω resistor is required to terminate the Input Generator signal. It is not needed in an actual application.

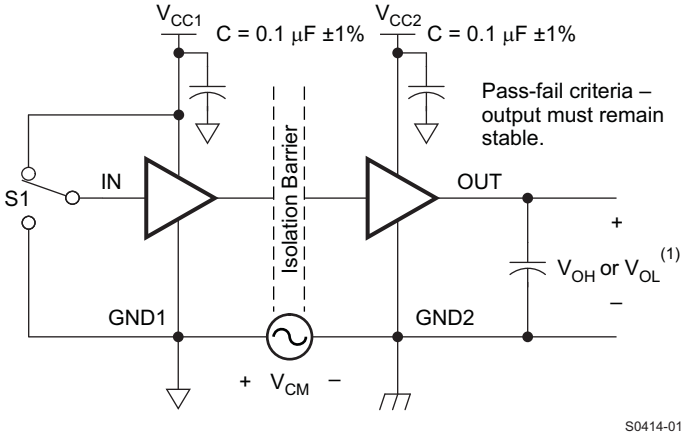
(2) C_L = 15 pF ± 20% includes instrumentation and fixture capacitance.

Figure 1. Switching Characteristic Test Circuit and Voltage Waveforms



(1) C_L = 15 pF ± 20% includes instrumentation and fixture capacitance.

Figure 2. Fail-Safe Output Delay-Time Test Circuit and Voltage Waveforms



(1) C_L = 15 pF ±20% includes instrumentation and fixture capacitance.

Figure 3. Common-Mode Transient Immunity Test Circuit

Copyright © 2009–2010, Texas Instruments Incorporated

DEVICE INFORMATION

PACKAGE CHARACTERISTICS

over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
L(I01)	Minimum air gap (clearance)	Shortest terminal-to-terminal distance through air	4.8			mm
L(I02)	Minimum external tracking (creepage)	Shortest terminal-to-terminal distance across the package surface	4.3			mm
CTI	Tracking resistance (comparative tracking index)	DIN IEC 60112 / VDE 0303 Part 1	>175			V
	Minimum internal gap (internal clearance)	Distance through the insulation	0.014			mm
R_{IO}	Isolation resistance, input to output(1)	V_{IO} = 500 V, T_A < 100°C		$>10^{12}$		Ω
		V_{IO} = 500 V, 100°C ≤ T_A ≤ max		$>10^{11}$		Ω
C_{IO}	Barrier capacitance, input to output(1)	V_{IO} = 0.4 sin (2πft), f = 1 MHz		1		pF
C_I	Input capacitance(2)	$V_I = V_{CC}/2$ + 0.4 sin (2πft), f = 1 MHz, V_{CC} = 5 V		1		pF

(1) All pins on each side of the barrier tied together creating a two-terminal device.
(2) Measured from input pin to ground.

NOTE

Creepage and clearance requirements should be applied according to the specific equipment isolation standards of an application. Care should be taken to maintain the creepage and clearance distance of a board design to ensure that the mounting pads of the isolator on the printed-circuit board do not reduce this distance.

Creepage and clearance on a printed-circuit board become equal according to the measurement techniques shown in the Isolation Glossary. Techniques such as inserting grooves and/or ribs on a printed circuit board are used to help increase these specifications.

INSULATION CHARACTERISTICS(3)

over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	SPECIFICATION	UNIT
V_{IORM}	Maximum working insulation voltage		560	Vpeak
V_{PR}	Input-to-output test voltage	t = 1 s (100% production), partial discharge 5 pC	1050	Vpeak
V_{IOTM}	Transient overvoltage	t = 60 s (qualification)	4000	Vpeak
		t = 1 s (100% production)		
V_{ISO}	Isolation voltage per UL	t = 60 s (qualification)	2500	Vrms
		t = 1 s (100% production)	3000	
R_S	Insulation resistance	V_{IO} = 500 V at T_S	$>10^9$	Ω
	Pollution degree		2	

(3) Climatic Classification 40/125/21

Table 2. IEC 60664-1 RATINGS TABLE

PARAMETER	TEST CONDITIONS	SPECIFICATION
Basic isolation group	Material group	III-a
Installation classification	Rated mains voltage ≤ 150 Vrms	I–IV
	Rated mains voltage ≤ 300 Vrms	I–III
	Rated mains voltage ≤ 400 Vrms	I–II

Copyright © 2009–2010, Texas Instruments Incorporated

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: pending (40016131)	File number: pending (1698195)	File number: pending (E181974)

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

LIFE EXPECTANCY vs WORKING VOLTAGE

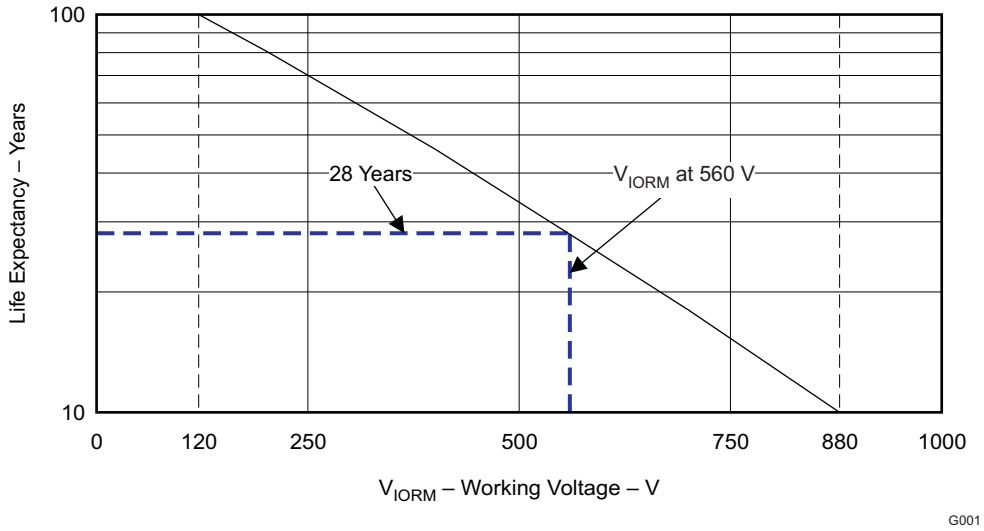


Figure 4. Life Expectancy vs Working Voltage

IEC SAFETY LIMITING VALUES

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
I_S	Safety input, output, or supply current	θ_{JA} = 212°C/W, V_I = 5.25 V, T_J = 150°C, T_A = 25°C			112	mA
		θ_{JA} = 212°C/W, V_I = 3.45 V, T_J = 150°C, T_A = 25°C			171	
T_S	Maximum case temperature				150	°C

The safety-limiting constraint is the absolute-maximum junction temperature specified in the *Absolute Maximum Ratings* table. The power dissipation and junction-to-air thermal impedance of the device installed in the application hardware determines the junction temperature. The assumed junction-to-air thermal resistance in the *Thermal Characteristics* table is that of a device installed in the JESD51-3, Low-Effective-Thermal-Conductivity Test Board for Leaded Surface-Mount Packages and is conservative. The power is the recommended maximum input voltage times the current. The junction temperature is then the ambient temperature plus the power times the junction-to-air thermal resistance.

Copyright © 2009–2010, Texas Instruments Incorporated

PACKAGE THERMAL CHARACTERISTICS

(over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
θ_{JA}	Junction-to-air thermal resistance	Low-K thermal resistance(1)		212		°C/W
		High-K thermal resistance(1)		122		
θ_{JB}	Junction-to-board thermal resistance			37		°C/W
θ_{JC}	Junction-to-case thermal resistance			69.1		°C/W
P_D	Device power dissipation	$V_{CC1} = V_{CC2} = 5.5$ V, $T_J = 150$°C, $C_L = 15$ pF, Input a 150-Mbps 50% duty-cycle square wave			390	mW

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

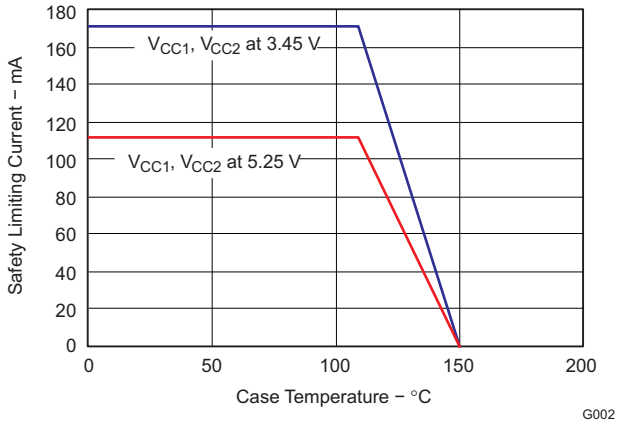


Figure 5. θ_{JC} Thermal Derating Curve per IEC 60747-5-2

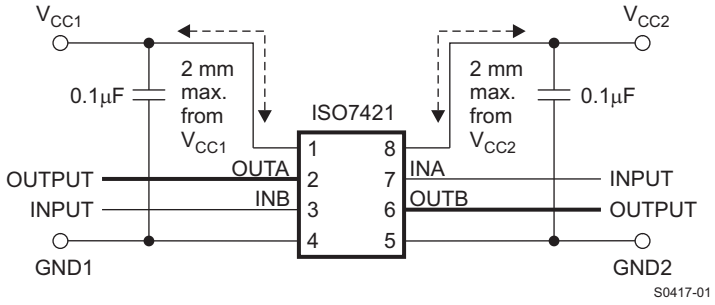


Figure 6. Typical ISO7421 Application Circuit

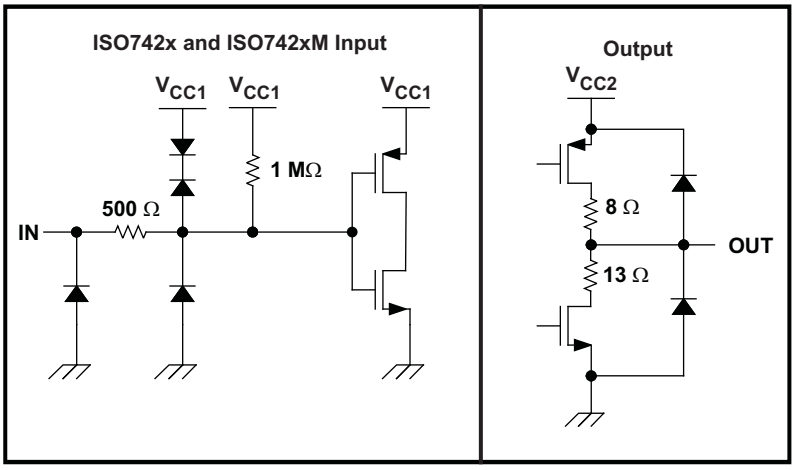


Figure 7. Device I/O Schematics

Copyright © 2009–2010, Texas Instruments Incorporated

TYPICAL CHARACTERISTICS

PROPAGATION DELAY TIME vs FREE-AIR TEMPERATURE

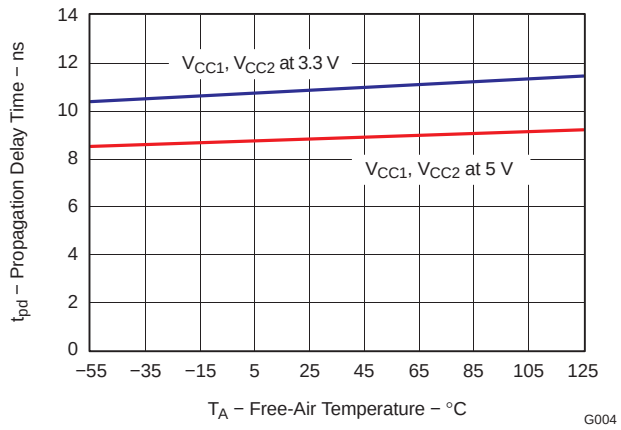


Figure 8.

INPUT VOLTAGE SWITCHING THRESHOLD vs FREE-AIR TEMPERATURE

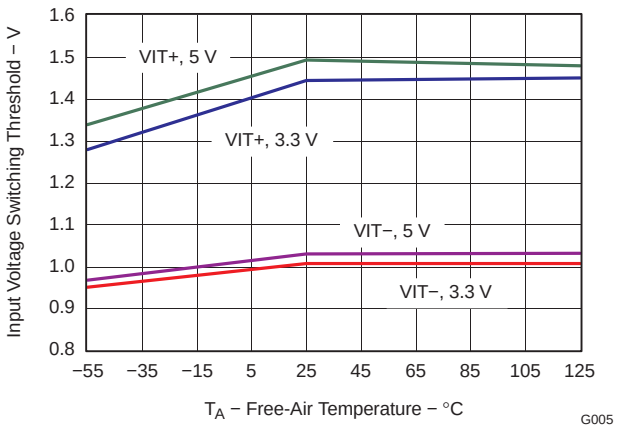


Figure 9.

FAIL-SAFE VOLTAGE THRESHOLD vs FREE-AIR TEMPERATURE

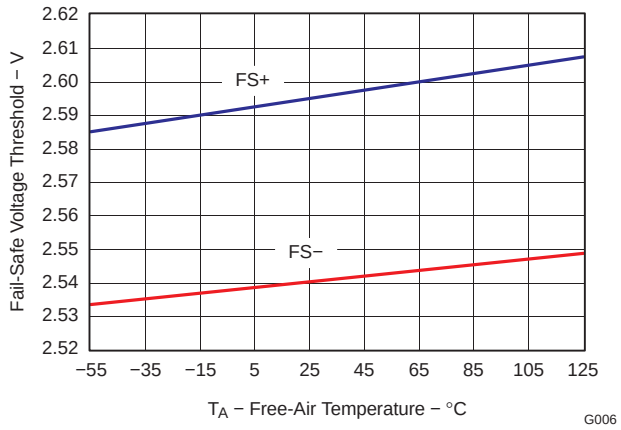


Figure 10.

HIGH-LEVEL OUTPUT CURRENT vs HIGH-LEVEL OUTPUT VOLTAGE

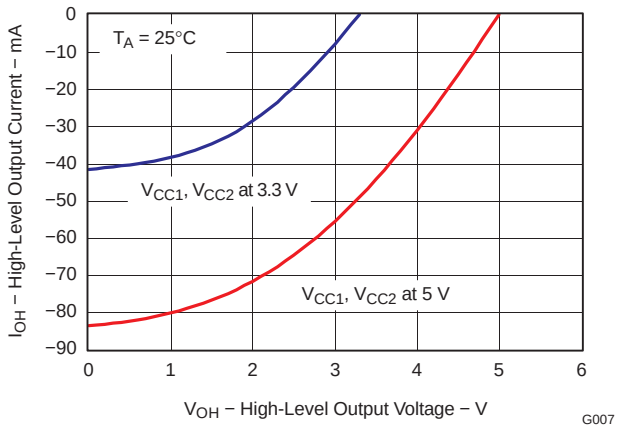


Figure 11.

LOW-LEVEL OUTPUT CURRENT vs LOW-LEVEL OUTPUT VOLTAGE

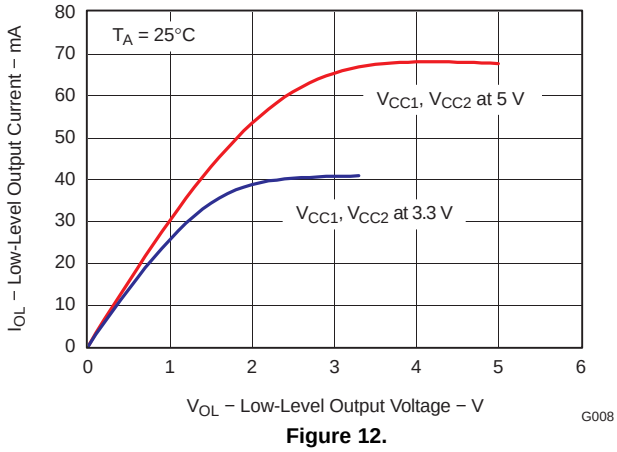


Figure 12.

REVISION HISTORY

Changes from Original (June 2009) to Revision A **Page**

- Added devices ISO7420 and ISO7420M to the data sheet 1
- Added the I_{CC} EQUATIONS section 11

Changes from Revision A (December 2009) to Revision B **Page**

- Switching Characteristics Table, Added Note (2) - Typical specifications are measured at ideal conditions of 25°C. Max or Min specifications are measured at worst case conditions for V_{CC} and temperature. 4

Changes from Revision B (February 2010) to Revision C **Page**

- Added devices ISO7420F and ISO7420FM to the data sheet 1
- Added The suffix M indicates wide temperature range (–55°C to 125°C) and the suffix F indicates output-low option in fail-safe condition. All other devices without the F suffix default to output-high in fail-safe state. 1
- Changed the Function Table Output values for PU (Open) From: H To: H/L 2
- Changed the Function Table Output values for PU (X) From: H To: H/L 2
- Changed the Function Table Output values for PU (X) From: H/L To: H 2
- Added Note (2) in the Function Table 2
- Added ISO7420F and ISO7420FM tothe Available Options Table 2
- Changed value from a max of 4 mA to a min of -4 mA 3
- Changed value from a min of -4 mA to a max of 4 mA 3
- Changed Electrical Characteristics Conditions 4
- Deleted C_i from the ELECTRICAL CHARACTERISTICS 4
- Added (All inputs switching with square wave clock signal for dynamic ICC measurement) 4
- Changed SWITCHING CHARACTERISTICS conditions 4
- Changed PWD parameter from duration to width 4
- Changed ELECTRICAL CHARACTERISTICS conditions 5
- Added High-level output voltage ISO7420 / 7421 (3.3-V side) test condition 5
- Changed High-level output voltage min value 5
- Deleted C_i specification 5
- Added (All inputs switching with square wave clock signal for dynamic ICC measurement) 5
- Changed SWITCHING CHARACTERISTICS conditions 5
- Changed Pulse duration distortion to Pulse width distortion 5
- Changed ELECTRICAL CHARACTERISTICS conditions 6
- Added High-level output voltage ISO7420 / 7421 (5-V side) test condition 6
- Changed High-level output voltage min value 6
- Deleted C_i specification 6
- Added (All inputs switching with square wave clock signal for dynamic ICC measurement) 6
- Changed SWITCHING CHARACTERISTICS conditions 6
- Changed Pulse duration distortion to Pulse width distortion 6
- Changed ELECTRICAL CHARACTERISTICS conditions 7
- Deleted C_i specification 7
- Added (All inputs switching with square wave clock signal for dynamic ICC measurement) 7
- Changed SWITCHING CHARACTERISTICS conditions 7
- Changed Pulse duration distortion to Pulse width distortion 7
- Changed Note 1 Figure 1 8

Copyright © 2009–2010, Texas Instruments Incorporated

- Changed Figure 2 8
- Added input to output and note 1 to Isolation resistance, input to output 9
- Changed the Isolation resistance test conditions 9
- Changed the Isolation resistance test conditions 9
- Added note 1 to Barrier capacitance, input to output 9
- Added Input capacitance 9
- Changed T_J = 170°C to T_J = 150°C 10
- Changed From: 124mA To: 107mA 10
- Changed T_J = 170°C to T_J = 150°C 10
- Changed From: 190mA To: 164mA 10
- Changed Figure 5 11
- Changed Figure 7 12

Changes from Revision C (March 2010) to Revision D **Page**

- Deleted devices ISO7420F and ISO7420FM from the data sheet 1
- Updated the Features List 1
- Updated the device Description. Add paragraph - Note: The ISO7420 and ISO7421 1
- Changed the Function Table Output values for PU (Open) From: H/L To: H 2
- Changed ISO7420M T_A temp From: -55 to 125 To: 40 to 125 in the Available Options Table 2
- Added Tstg to the Absolute Maximum Ratings Table 3
- Updated the Recommended Opetating Conditions Table 3
- Updates throughout the Electrical Characteristics and Switching Characteristics tables 4
- Updated the Supply Current test conditions 4
- Changed Figure 2 8
- Changed Note 1 in Figure 3 8
- Changed Minimum internal gap MIN value From: 0.008 To: 0.014mm 9
- Changed the Barrier capacitance, input to output test conditions 9
- Changed the Input capacitance test conditions 9
- Changed the V_{IORM}, V_{PR}, and V_{IOTM} unit values From: V To: Vpeak 9
- Changed V_I From: 5.5V To: 5.25V 10
- Changed From: 107mA To: 112mA 10
- Changed V_I From: 3.6V To: 3.45V 10
- Changed From: 164mA To: 171mA 10
- Changed Figure 5 11
- Deleted the I_{CC} EQUATIONS section 11
- Changed Figure 7 12
- Deleted the SUPPLY CURRENT vs SIGNAL RATE (ALL CHANNELS) graphs and the EYE DIAGRAM plots 13

Copyright © 2009–2010, Texas Instruments Incorporated

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
ISO7420D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
ISO7420DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
ISO7420MD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
ISO7420MDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
ISO7421D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
ISO7421DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
ISO7421MD	PREVIEW	SOIC	D	8	75	TBD	Call TI	Call TI
ISO7421MDR	PREVIEW	SOIC	D	8	2500	TBD	Call TI	Call TI

(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)

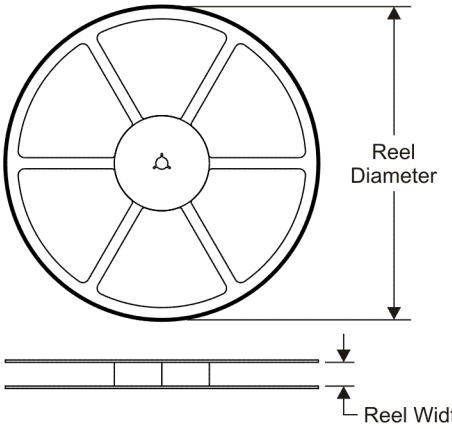
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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.

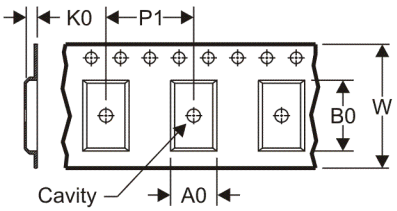
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

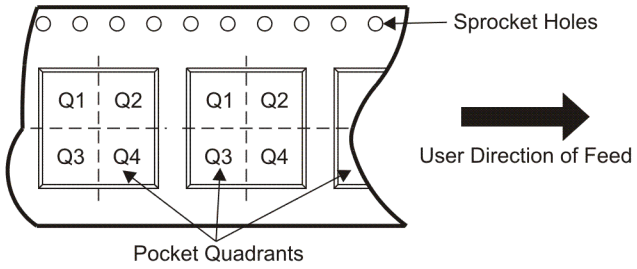


TAPE DIMENSIONS



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

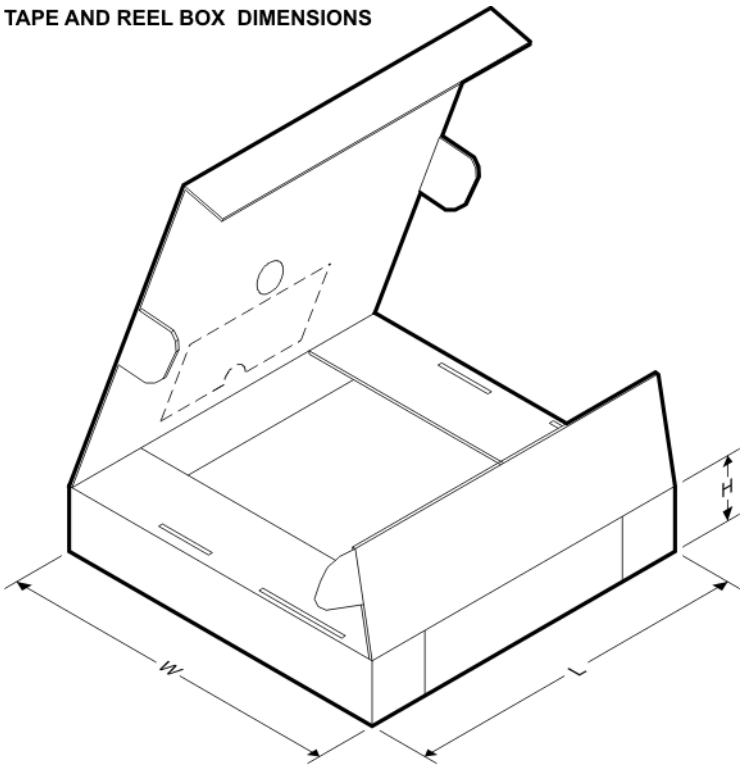
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
ISO7420DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7420MDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7421DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1

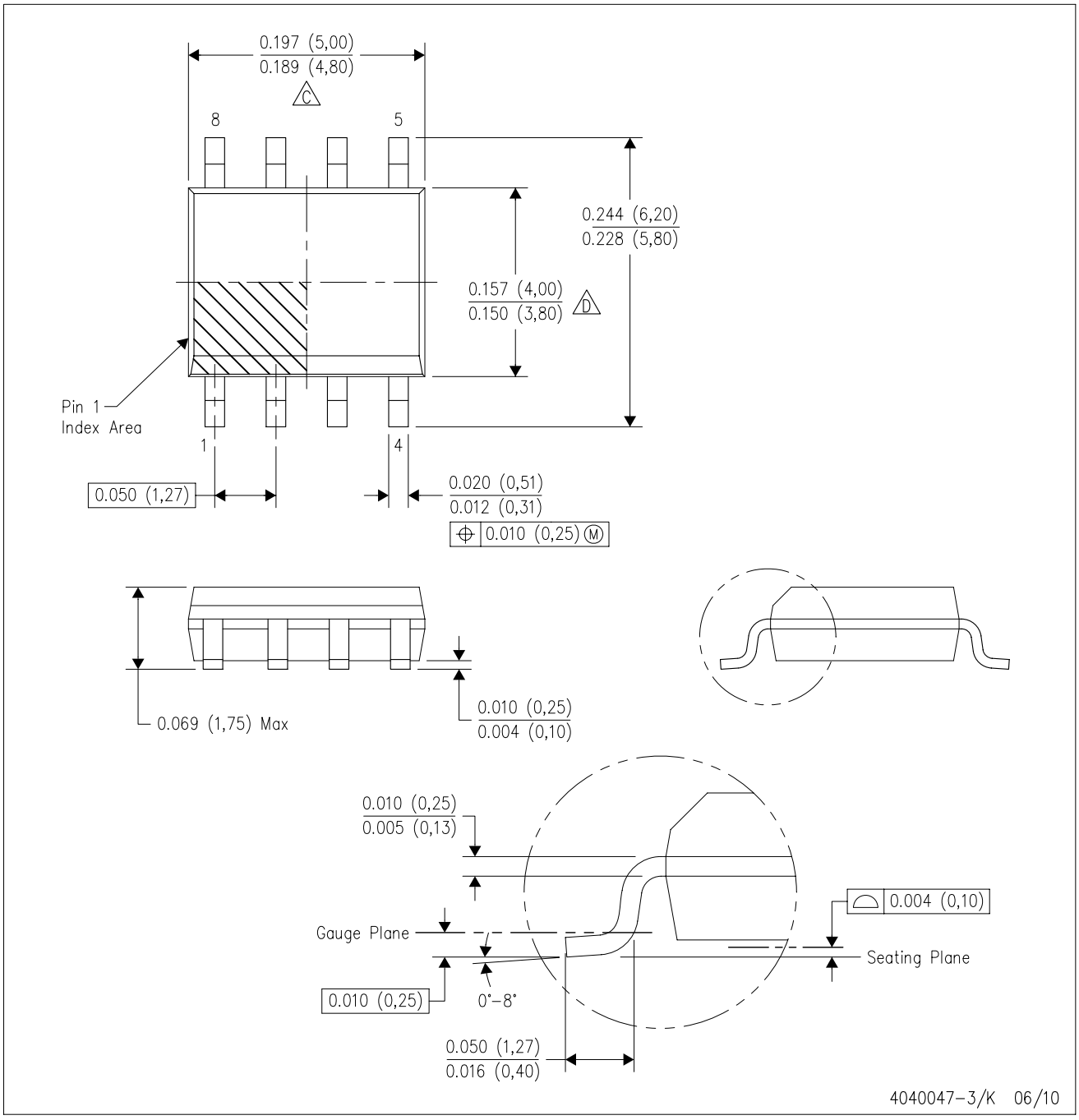
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
ISO7420DR	SOIC	D	8	2500	358.0	335.0	35.0
ISO7420MDR	SOIC	D	8	2500	358.0	335.0	35.0
ISO7421DR	SOIC	D	8	2500	358.0	335.0	35.0

D (R–PDSO–G8) PLASTIC SMALL–OUTLINE PACKAGE



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
E. Reference JEDEC MS–012 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
Copyright © 2010, Texas Instruments Incorporated