2 X 2 Crosspoint Switch for Audio Applications

Check for Samples: TS3A26746E

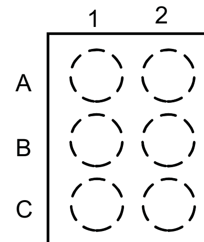
FEATURES

- **Ultra Low R_{ON} for GND Switch (80-mΩ typical)**
- **R_{ON} for MIC Switch <10-Ω**
- **3.0V to 3.6V V+ Operation**
- **Control Input is 1.8-V Logic Compatible**
- **6-bump, 0.5mm pitch CSP Package (1.45mm × 0.95mm × 0.5mm)**
- **Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II**
- **ESD Performance Tested Per JESD 22**
  - **2000-V Human-Body Model (A114-B, Class II)**
  - **500-V Charged-Device Model (C101)**
- **ESD Performance (SLEEVE, RING2)**
  - **±8-kV Contact Discharge (IEC 61000-4-2)**

APPLICATIONS

- **Cellular phones**
- **PDAs**
- **Portable Instrumentation**
- **Digital Still Cameras**
- **Portable Navigation Devices**

PINOUT



DESCRIPTION

The TS3A26746E is a 2 × 2 cross-point switch that is used to interchange the Ground and MIC connections on a headphone connector. The Ground switch has an ultra low R_{ON} of <0.1Ω to minimize voltage drop across it, preventing undesired increases in headphone ground reference voltage. The switch state is controlled via the SEL input. When SEL=High, GND is connected to RING2 and MIC is connected to SLEEVE. When SEL=Low, GND is connected to SLEEVE and MIC is connected to RING2. An internal 100k pull-up resistor on the SEL input sets the default state of the switch.

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.

Copyright © 2011–2013, 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.

TYPICAL APPLICATION BLOCK DIAGRAM

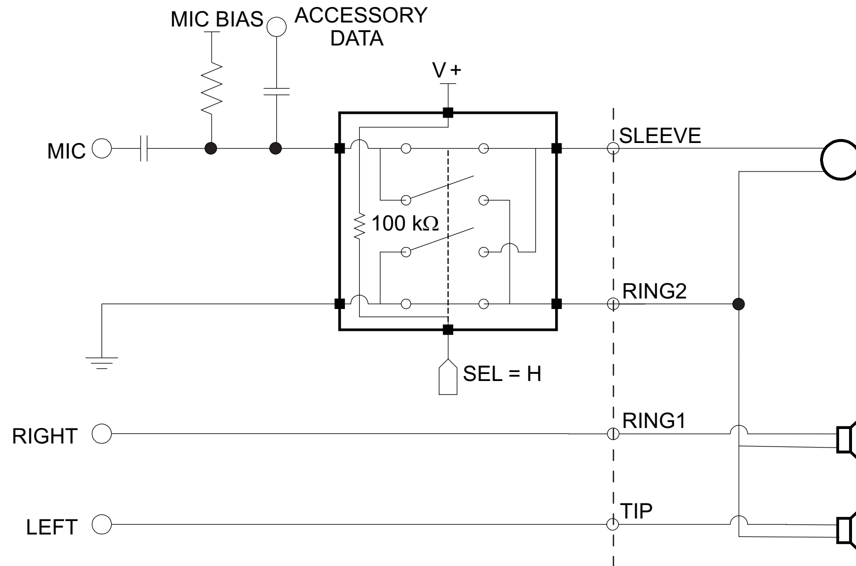


Figure 1. Standard Headphone Configuration (SEL=H)

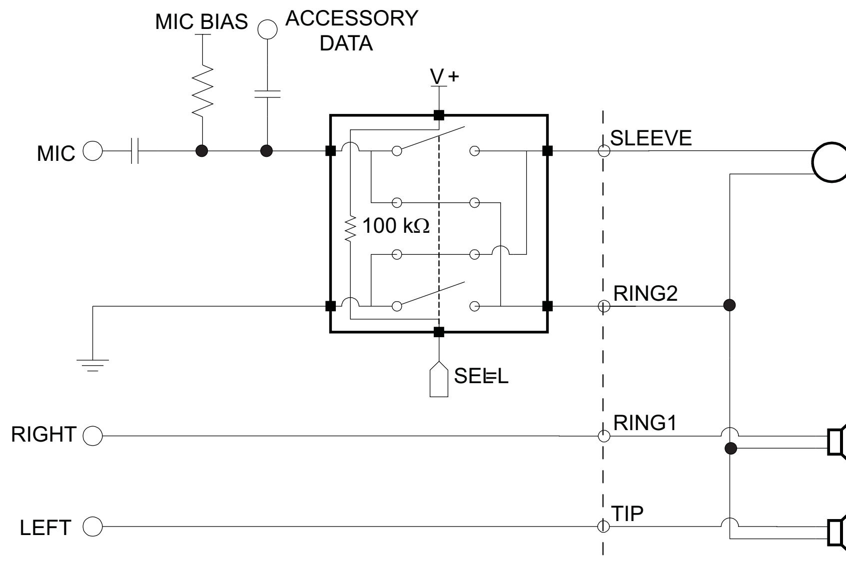
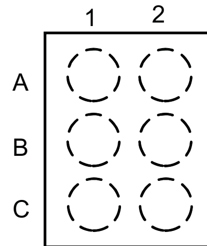


Figure 2. Alternate Headphone Configuration (SEL=L)

Copyright © 2011–2013, Texas Instruments Incorporated

PINOUT



TERMINAL ASSIGNMENTS

	1	2
A	SEL	V+
B	MIC	SLEEVE
C	GND	RING2

PIN FUNCTIONS

BALL #	PIN		DESCRIPTION
	NAME	TYPE	
A1	SEL	Input	Control Input
A2	V+	Power	Supply Voltage
B1	MIC	I/O	MIC
B2	SLEEVE	I/O	Sleeve Connection on Headphone Jack
C1	GND	Ground	Ground
C2	RING2	I/O	2nd Ring Connection on Headphone Jack

Table 1. FUNCTION TABLE

SEL	MIC to SLEEVE, GND to RING2	MIC to RING2, GND to SLEEVE
L	OFF	ON
H	ON	OFF

ABSOLUTE MAXIMUM RATINGS[1][2]

over operating free-air temperature range (unless otherwise noted)

			MIN	MAX	UNIT
V_+	Supply voltage range[3]		–0.3	4.0	V
V_{MIC} V_{SLEEVE} V_{RING2}	Analog voltage range[3]		–0.3	4.0	V
I_K	Analog port diode current	V_{MIC}, V_{SLEEVE}, V_{RING2} < 0 V	–50		mA
V_I	Digital input voltage range		–0.3	4.0	V
I_{IK}	Digital input clamp current[3]	V_I < 0 V	–50		mA
I_+	Continuous current through V_+			100	mA
I_{GND}	Continuous current through GND		–100		mA
θ_{JA}	Package thermal impedance[4]	YZP package		102	°C/W
T_{stg}	Storage temperature range		–65	150	°C

(1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.
(2) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum.
(3) All voltages are with respect to ground, unless otherwise specified.
(4) The package thermal impedance is calculated in accordance with JESD 51-7.

ELECTRICAL CHARACTERISTICS FOR 3.3 V SUPPLY[1]

V_+ = 3 V to 3.6 V, T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS		T_A	V_+	MIN	TYP	MAX	UNIT
MIC SWITCH									
V_{MIC}, V_{SLEEVE}, V_{RING2}	Analog signal range					0		V+	V
r_{on}	ON-state resistance	0 ≤ V_{SLEEVE} or V_{RING2} ≤ V_+, I_{MIC} = –32 mA	Switch ON	25°C	3 V		5	8	Ω
				Full				10	
$r_{on(flat)}$	ON-state resistance flatness	0 ≤ V_{SLEEVE} or V_{RING2} ≤ V_+, I_{MIC} = –32 mA	Switch ON	25°C	3 V		1	2.3	Ω
				Full				2.5	
$I_{SLEEVE(OFF)}$, $I_{RING2(OFF)}$	SLEEVE, RING2 OFF leakage current	V_{SLEEVE} or V_{RING2} = 1 V, V_{MIC} = 3 V, or V_{SLEEVE} or V_{RING2} = 3 V, V_{MIC} = 1 V	Switch OFF	25°C	3.6 V	–0.5	0.05	0.5	µA
				Full		–2		2	
$I_{MIC(OFF)}$	MIC OFF leakage current	V_{SLEEVE} or V_{RING2} = 3 V, V_{MIC} = 1 V, or V_{SLEEVE} or V_{RING2} = 1 V, V_{MIC} = 3 V	Switch OFF	25°C	3.6 V	–1	0.1	1	µA
				Full		–2		2	
$I_{SLEEVE(ON)}$, $I_{RING2(ON)}$	SLEEVE, RING2 ON leakage current	V_{SLEEVE} or V_{RING2} = 1 V, V_{MIC} = Open, or V_{SLEEVE} or V_{RING2} = 3 V, V_{MIC} = Open	Switch ON	25°C	3.6 V	–2	0.5	2	µA
				Full		–2		2	
$I_{MIC(ON)}$	MIC ON leakage current	V_{SLEEVE} or V_{RING2} = Open V, V_{MIC} = 1 V, or V_{SLEEVE} or V_{RING2} = Open, V_{MIC} = 3 V	Switch ON	25°C	3.6 V	–2	0.5	2	µA
				Full		–2		2	
GND SWITCH									
r_{on}	ON-state resistance	I_{SLEEVE} or I_{RING2} = +32 mA, V_{GND} = 0 V, I_{GND} = –32 mA	Switch ON	25°C	3 V		0.08	0.09	Ω
				Full				0.11	
$I_{SLEEVE(OFF)}$, $I_{RING2(OFF)}$	SLEEVE, RING2 OFF leakage current	V_{SLEEVE} or V_{RING2} = 3V and V_{GND} = 0 V	Switch OFF	25°C	3.6 V	–0.5	0.05	0.5	µA
				Full		–1		1	
$I_{SLEEVE(PWROFF)}$, $I_{RING2(PWROFF)}$		V_{SLEEVE} or V_{RING2} = 0 to 3.6 V and V_{GND} = 0 V	Switch OFF	25°C	0 V	–1	0.5	1	µA
				Full		–10		10	

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

Copyright © 2011–2013, Texas Instruments Incorporated

ELECTRICAL CHARACTERISTICS FOR 3.3 V SUPPLY(1) (continued)

V_+ = 3 V to 3.6 V, T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS		T_A	V_+	MIN	TYP	MAX	UNIT
DIGITAL CONTROL INPUTS (SEL)									
V_{IH}	Input logic high			Full	3.6 V	1.2		3.6	V
V_{IL}	Input logic low			Full	3.6 V	0		0.4	V
I_{IH}	Input logic high leakage current	$V_I = V_+$		25°C	3.6 V	–1	0.05	1	µA
				Full		–2		2	
I_{IL}	Input logic low leakage current	V_I = 0 V		25°C	3.6 V	–38	–36	–34	µA
				Full		–45		–30	
DYNAMIC									
t_{ON}	Turn-on time	$V_{MIC} = V_+$, R_L = 50 Ω	C_L = 35 pF	25°C	3.3 V		150	200	ns
				Full	3 V to 3.6 V			250	
t_{OFF}	Turn-off time	$V_{MIC} = V_+$, R_L = 50 Ω	C_L = 35 pF	25°C	3.3 V		5	10	ns
				Full	3 V to 3.6 V			15	
t_{BBM}	Break-before-make time	$V_{MIC} = V_+$	25°C		3.3 V	70		330	ns
			Full		3 V to 3.6 V			330	
C_{MIC}	MIC capacitance	SEL=High	25°C		3.3 V		100	140	pF
		SEL=Low	25°C		3.3 V		100	140	pF
C_{SLEEVE}	SLEEVE / RING2 capacitance	SEL=High	25°C		3.3 V		100	140	pF
		SEL=Low	25°C		3.3 V		100	140	pF
C_I	Digital input capacitance	$V_I = V_+$ or 0 V	25°C		3.3 V		4.0		pF
THD	Total harmonic distortion	R_L = 1k Ω, V = 30 mVPP	f = 20 Hz to 20 kHz	25°C	3.3 V		0.01%		
SUPPLY									
V+	Power Supply Voltage					3.0	3.3	3.6	V
I_+	Positive supply current	$V_I = V_+$		25°C	3.6 V		0.01	1	µA
				Full				5	
		V_I = 0 V		25°C			40	41	µA
				Full				50	

OPERATIONAL CHARACTERISTICS

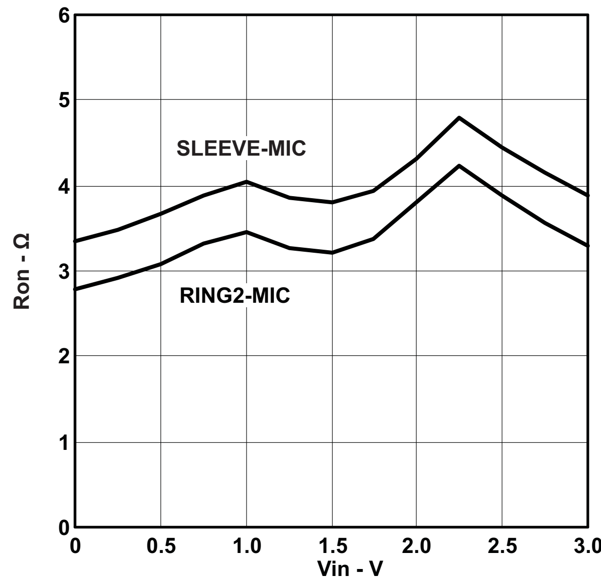
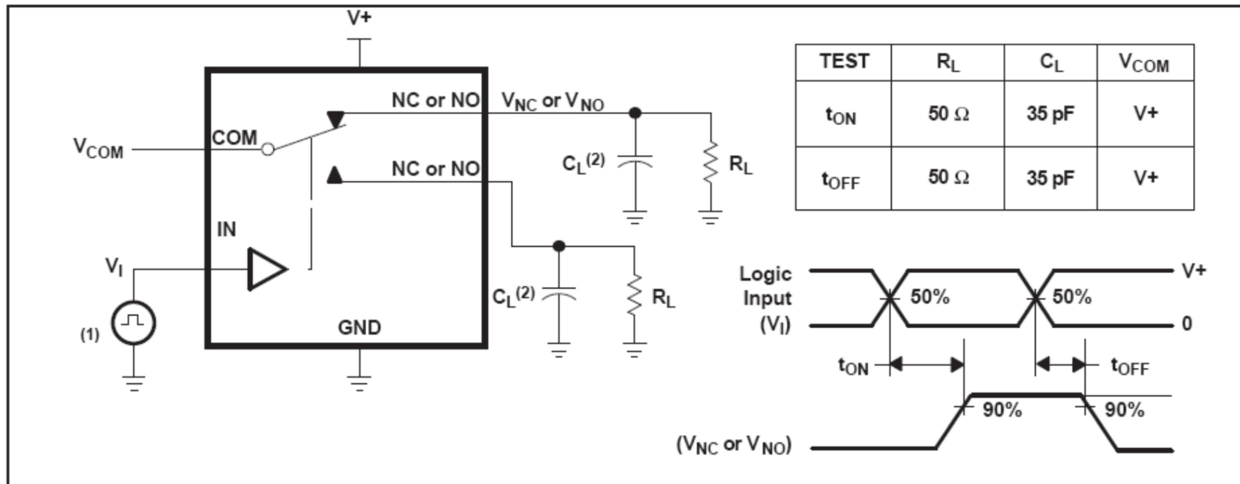


Figure 3. R_{ON} vs V_{IN} (MIC Switch)

PARAMETER MEASRUMENT INFORMATION



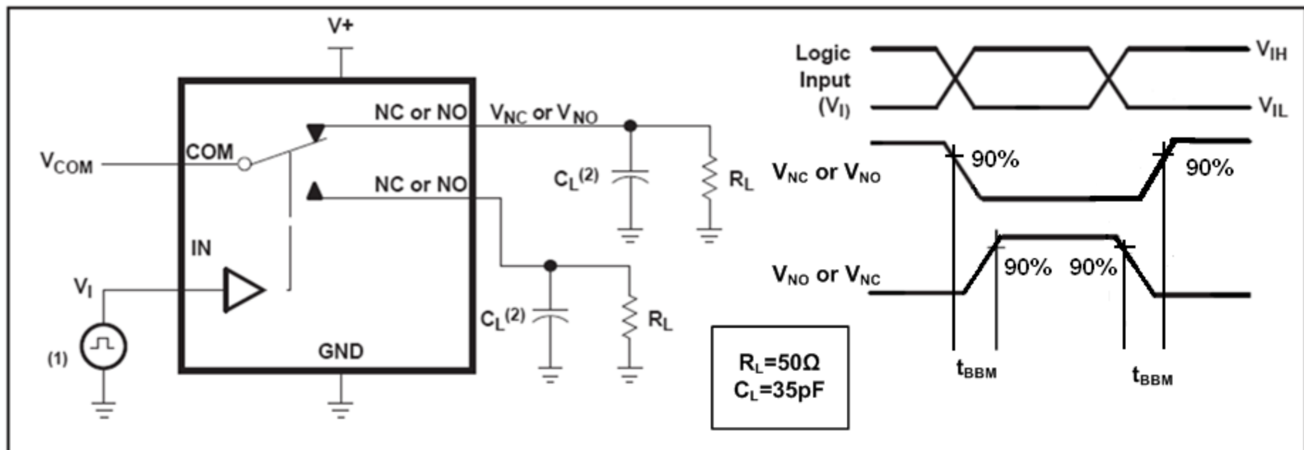
A. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r < 5 ns, t_f < 5 ns.

B. C_L includes probe and jig capacitance.

Figure 4. Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})

Copyright © 2011–2013, Texas Instruments Incorporated

PARAMETER MEASRUMENT INFORMATION (continued)



A. C_L includes probe and jig capacitance.

B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r < 5 ns, t_f < 5 ns.

Figure 5. Break-Before-Make Time (t_{BBM})

REVISION HISTORY

Changes from Revision B (November 2011) to Revision C	Page
• Replaced 1 page preview with full document.	1

Copyright © 2011–2013, 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)	Op Temp (°C)	Device Marking (4/5)	Samples
TS3A26746EYZPR	ACTIVE	DSBGA	YZP	6	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	7N	Samples

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

(2) 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)

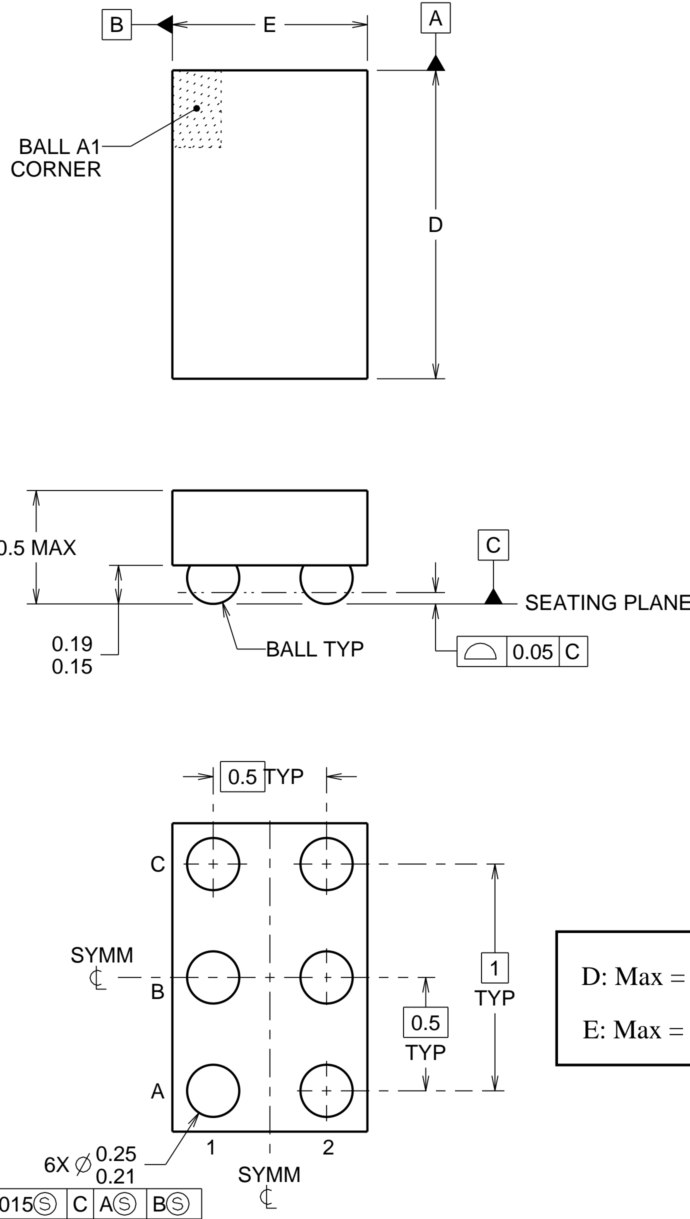
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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

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

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.



D: Max = 1.338 mm, Min =1.277 mm

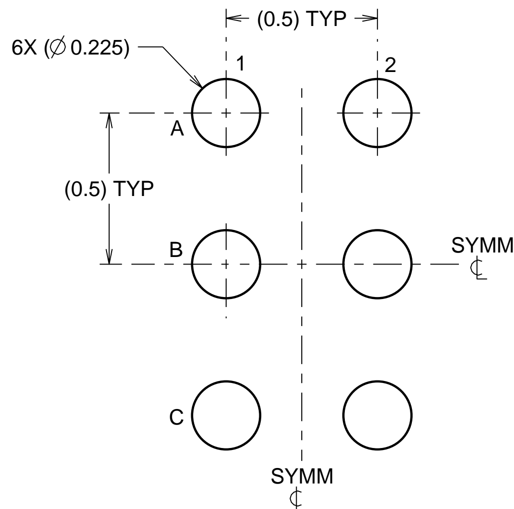
E: Max = 0.838 mm, Min =0.777 mm

4219524/A 06/2014

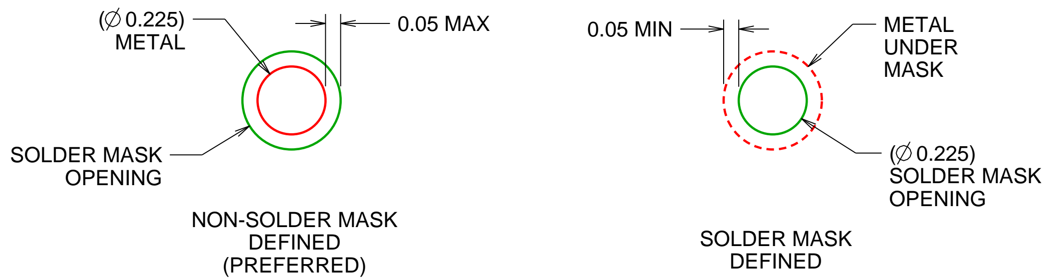
NOTES:

NanoFree Is a trademark of Texas Instruments.

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



LAND PATTERN EXAMPLE
SCALE:40X



NON-SOLDER MASK
DEFINED
(PREFERRED)

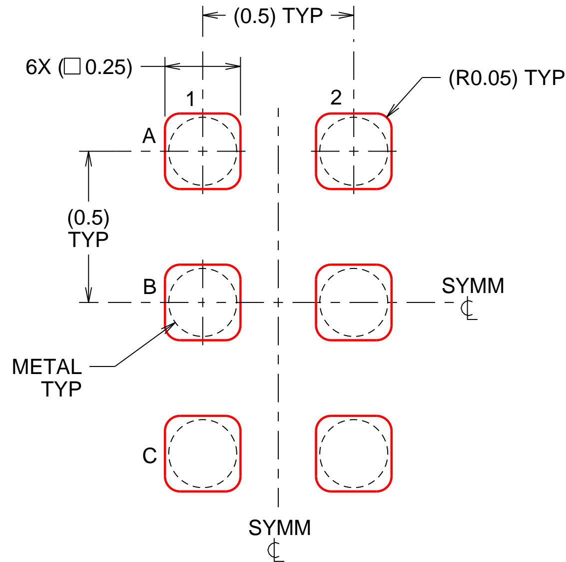
SOLDER MASK
DEFINED

SOLDER MASK DETAILS
NOT TO SCALE

4219524/A 06/2014

NOTES: (continued)

4. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SBVA017 (www.ti.com/lit/sbva017).



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL
SCALE:40X

4219524/A 06/2014

NOTES: (continued)

5. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

IMPORTANT NOTICE

Texas Instruments Incorporated (TI) reserves the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

TI's published terms of sale for semiconductor products (http://www.ti.com/sc/docs/stdterms.htm) apply to the sale of packaged integrated circuit products that TI has qualified and released to market. Additional terms may apply to the use or sale of other types of TI products and services.

Reproduction of significant portions of TI information in TI data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such reproduced 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.

Buyers and others who are developing systems that incorporate TI products (collectively, "Designers") understand and agree that Designers remain responsible for using their independent analysis, evaluation and judgment in designing their applications and that Designers have full and exclusive responsibility to assure the safety of Designers' applications and compliance of their applications (and of all TI products used in or for Designers' applications) with all applicable regulations, laws and other applicable requirements. Designer represents that, with respect to their applications, Designer has all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. Designer agrees that prior to using or distributing any applications that include TI products, Designer will thoroughly test such applications and the functionality of such TI products as used in such applications.

TI's provision of technical, application or other design advice, quality characterization, reliability data or other services or information, including, but not limited to, reference designs and materials relating to evaluation modules, (collectively, "TI Resources") are intended to assist designers who are developing applications that incorporate TI products; by downloading, accessing or using TI Resources in any way, Designer (individually or, if Designer is acting on behalf of a company, Designer's company) agrees to use any particular TI Resource solely for this purpose and subject to the terms of this Notice.

TI's provision of TI Resources does not expand or otherwise alter TI's applicable published warranties or warranty disclaimers for TI products, and no additional obligations or liabilities arise from TI providing such TI Resources. TI reserves the right to make corrections, enhancements, improvements and other changes to its TI Resources. TI has not conducted any testing other than that specifically described in the published documentation for a particular TI Resource.

Designer is authorized to use, copy and modify any individual TI Resource only in connection with the development of applications that include the TI product(s) identified in such TI Resource. NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT OF TI OR ANY THIRD PARTY IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of TI Resources 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.

TI RESOURCES ARE PROVIDED "AS IS" AND WITH ALL FAULTS. TI DISCLAIMS ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING RESOURCES OR USE THEREOF, INCLUDING BUT NOT LIMITED TO ACCURACY OR COMPLETENESS, TITLE, ANY EPIDEMIC FAILURE WARRANTY AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS. TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY DESIGNER AGAINST ANY CLAIM, INCLUDING BUT NOT LIMITED TO ANY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON ANY COMBINATION OF PRODUCTS EVEN IF DESCRIBED IN TI RESOURCES OR OTHERWISE. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, DIRECT, SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF TI RESOURCES OR USE THEREOF, AND REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Unless TI has explicitly designated an individual product as meeting the requirements of a particular industry standard (e.g., ISO/TS 16949 and ISO 26262), TI is not responsible for any failure to meet such industry standard requirements.

Where TI specifically promotes products as facilitating functional safety or as compliant with industry functional safety standards, such products are intended to help enable customers to design and create their own applications that meet applicable functional safety standards and requirements. Using products in an application does not by itself establish any safety features in the application. Designers must ensure compliance with safety-related requirements and standards applicable to their applications. Designer may not use any TI products in life-critical medical equipment unless authorized officers of the parties have executed a special contract specifically governing such use. Life-critical medical equipment is medical equipment where failure of such equipment would cause serious bodily injury or death (e.g., life support, pacemakers, defibrillators, heart pumps, neurostimulators, and implantables). Such equipment includes, without limitation, all medical devices identified by the U.S. Food and Drug Administration as Class III devices and equivalent classifications outside the U.S.

TI may expressly designate certain products as completing a particular qualification (e.g., Q100, Military Grade, or Enhanced Product). Designers agree that it has the necessary expertise to select the product with the appropriate qualification designation for their applications and that proper product selection is at Designers' own risk. Designers are solely responsible for compliance with all legal and regulatory requirements in connection with such selection.

Designer will fully indemnify TI and its representatives against any damages, costs, losses, and/or liabilities arising out of Designer's non-compliance with the terms and provisions of this Notice.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2017, Texas Instruments Incorporated