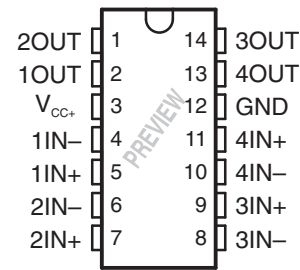


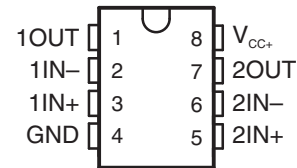
FEATURES

- Qualified for Automotive Applications
- 2.7-V and 5-V Performance
- Low Supply Current
 - LMV331 . . . 60 μ A Typ
 - LMV393 . . . 100 μ A Typ
 - LMV339 . . . 170 μ A Typ
- Input Common-Mode Voltage Range Includes Ground
- Low Output Saturation Voltage . . . 200 mV Typ
- Open-Collector Output for Maximum Flexibility

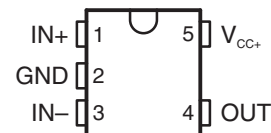
LMV339...D OR PW PACKAGE
(TOP VIEW)



LMV393...D, DGK, OR PW PACKAGE
(TOP VIEW)



LMV331...DBV OR DCK PACKAGE
(TOP VIEW)



DESCRIPTION/ORDERING INFORMATION

The LMV393 and LMV339 devices are low-voltage (2.7 V to 5.5 V) versions of the dual and quad comparators, LM393 and LM339, which operate from 5 V to 30 V. The LMV331 is the single-comparator version.

The LMV331, LMV339, and LMV393 are the most cost-effective solutions for applications where low-voltage operation, low power, space saving, and price are the primary specifications in circuit design for portable consumer products. These devices offer specifications that meet or exceed the familiar LM339 and LM393 devices at a fraction of the supply current.

ORDERING INFORMATION⁽¹⁾

T _A	PACKAGE ⁽²⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING ⁽³⁾	
-40°C to 125°C	Single	SC-70 – DCK	Reel of 3000	LMV331QDCKRQ1	PREVIEW
		SOT23-5 – DBV	Reel of 3000	LMV331QDBVRQ1	LADQ
	Dual	MSOP/VSSOP – DGK	Reel of 2500	LMV393QDGKRQ1	PREVIEW
		SOIC – D	Reel of 2500	LMV393QDRQ1	V393Q1
		TSSOP – PW	Reel of 2000	LMV393QPWRQ1	PREVIEW
	Quad	SOIC – D	Reel of 2500	LMV339QDRQ1	PREVIEW
TSSOP – PW		Reel of 2000	LMV339QPWRQ1	PREVIEW	

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

(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

(3) DBV/DCK: The actual top-side marking has one additional character that designates the wafer fab/assembly site.

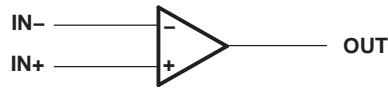


Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

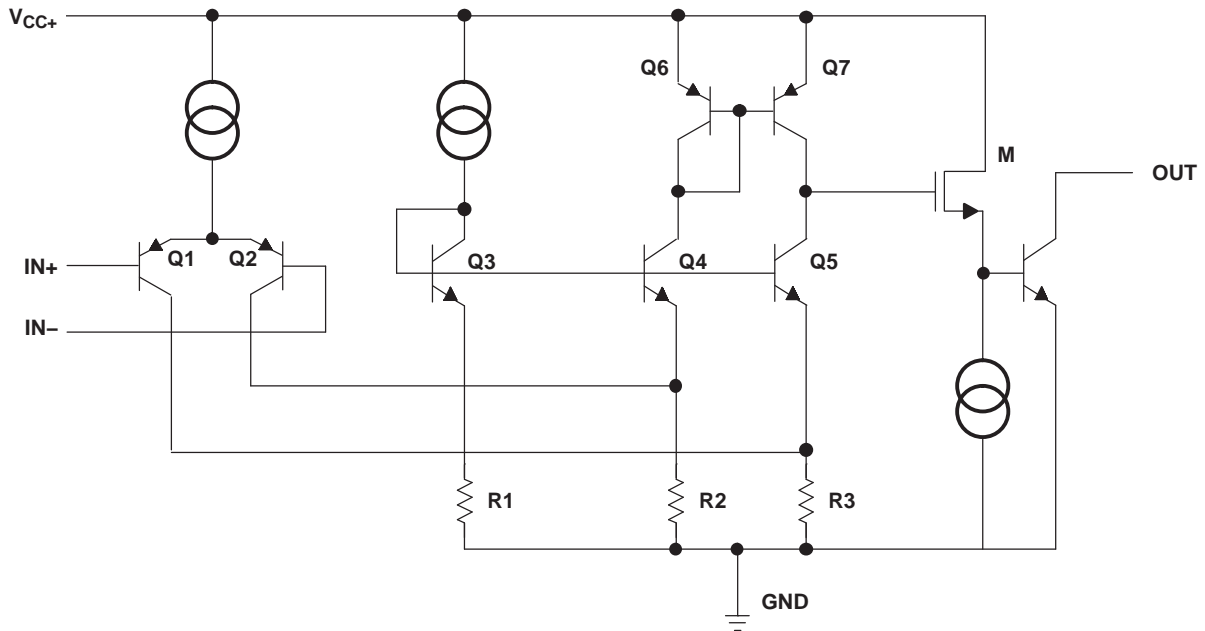
LMV331-Q1 SINGLE, LMV393-Q1 DUAL, LMV339-Q1 QUAD GENERAL-PURPOSE LOW-VOLTAGE COMPARATORS

SLOS468C—MAY 2005—REVISED OCTOBER 2007

SYMBOL (EACH COMPARATOR)



SIMPLIFIED SCHEMATIC



Absolute Maximum Ratings⁽¹⁾

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

		MIN	MAX	UNIT
V _{CC+}	Supply voltage ⁽²⁾		5.5	V
V _{ID}	Differential input voltage ⁽³⁾		±5.5	V
V _I	Input voltage range (either input)	0	5.5	V
θ _{JA}	Package thermal impedance ⁽⁴⁾⁽⁵⁾	D (8-pin) package		°C/W
		D (14-pin) package		
		DBV package		
		DCK package		
		DGK package		
		PW (8-pin) package		
PW (14-pin) package		113		
T _J	Operating virtual junction temperature		150	°C
T _{stg}	Storage temperature range	–65	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 voltages and V_{CC+} specified for the measurement of I_{OS}) are with respect to the network GND.
- (3) Differential voltages are at IN+ with respect to IN–.
- (4) Maximum power dissipation is a function of T_{J(max)}, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is P_D = (T_{J(max)} – T_A)/θ_{JA}. Selecting the maximum of 150°C can affect reliability.
- (5) The package thermal impedance is calculated in accordance with JESD 51-7.

Recommended Operating Conditions

		MIN	MAX	UNIT
V _{CC+}	Supply voltage (single-supply operation)	2.7	5.5	V
V _{OUT}	Output voltage		V _{CC+} + 0.3	V
T _A	Operating free-air temperature	–40	125	°C

LMV331-Q1 SINGLE, LMV393-Q1 DUAL, LMV339-Q1 QUAD GENERAL-PURPOSE LOW-VOLTAGE COMPARATORS

SLOS468C—MAY 2005—REVISED OCTOBER 2007

Electrical Characteristics

at specified free-air temperature, $V_{CC+} = 2.7\text{ V}$, $GND = 0\text{ V}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage		25°C		1.7	7	mV
αV_{IO}	Average temperature coefficient of input offset voltage		-40°C to 125°C		5		$\mu\text{V}/^\circ\text{C}$
I_{IB}	Input bias current		25°C		10	250	nA
			-40°C to 125°C			400	
I_{IO}	Input offset current		25°C		5	50	nA
			-40°C to 125°C			150	
I_O	Output current (sinking)	$V_O \leq 1.5\text{ V}$	25°C	5	23		mA
	Output leakage current		25°C		0.003		μA
			-40°C to 125°C			1	
V_{ICR}	Common-mode input voltage range		25°C		-0.1 to 2		V
V_{SAT}	Saturation voltage	$I_O \leq 1\text{ mA}$	25°C		200		mV
I_{CC}	Supply current	LMV331	25°C		40	100	μA
		LMV393 (both comparators)			70	140	
		LMV339 (all four comparators)			140	200	

Switching Characteristics

$T_A = 25^\circ\text{C}$, $V_{CC+} = 2.7\text{ V}$, $R_L = 5.1\text{ k}\Omega$, $GND = 0\text{ V}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	TYP	UNIT
t_{PHL}	Propagation delay, high- to low-level output switching	Input overdrive = 10 mV	1000	ns
		Input overdrive = 100 mV	350	
t_{PLH}	Propagation delay, low- to high-level output switching	Input overdrive = 10 mV	500	ns
		Input overdrive = 100 mV	400	

Electrical Characteristics

 at specified free-air temperature, $V_{CC+} = 5\text{ V}$, $GND = 0\text{ V}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage		25°C		1.7	7	mV
			–40°C to 125°C			9	
αV_{IO}	Average temperature coefficient of input offset voltage		25°C		5		$\mu\text{V}/^\circ\text{C}$
I_{IB}	Input bias current		25°C		25	250	nA
			–40°C to 125°C			400	
I_{IO}	Input offset current		25°C		2	50	nA
			–40°C to 125°C			150	
I_O	Output current (sinking)	$V_O \leq 1.5\text{ V}$	25°C	10	84		mA
	Output leakage current		25°C		0.003		μA
			–40°C to 125°C			1	
V_{ICR}	Common-mode input voltage range		25°C		–0.1 to 4.2		V
A_{VD}	Large-signal differential voltage gain		25°C	20	50		V/mV
V_{SAT}	Saturation voltage	$I_O \leq 4\text{ mA}$	25°C		200	400	mV
			–40°C to 125°C			700	
I_{CC}	Supply current	LMV331	25°C		60	120	μA
			–40°C to 125°C			150	
		LMV393 (both comparators)	25°C		100	200	
			–40°C to 125°C			250	
		LMV339 (all four comparators)	25°C		170	300	
			–40°C to 125°C			350	

Switching Characteristics

 $T_A = 25^\circ\text{C}$, $V_{CC+} = 5\text{ V}$, $R_L = 5.1\text{ k}\Omega$, $GND = 0\text{ V}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	TYP	UNIT
t_{PHL}	Propagation delay, high- to low-level output switching	Input overdrive = 10 mV	600	ns
		Input overdrive = 100 mV	200	
t_{PLH}	Propagation delay, low- to high-level output switching	Input overdrive = 10 mV	450	ns
		Input overdrive = 100 mV	300	

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
LMV331QDBVRQ1	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV393QDRG4Q1	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV393QDRQ1	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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.

OTHER QUALIFIED VERSIONS OF LMV331-Q1, LMV393-Q1 :

- Catalog: [LMV331](#), [LMV393](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

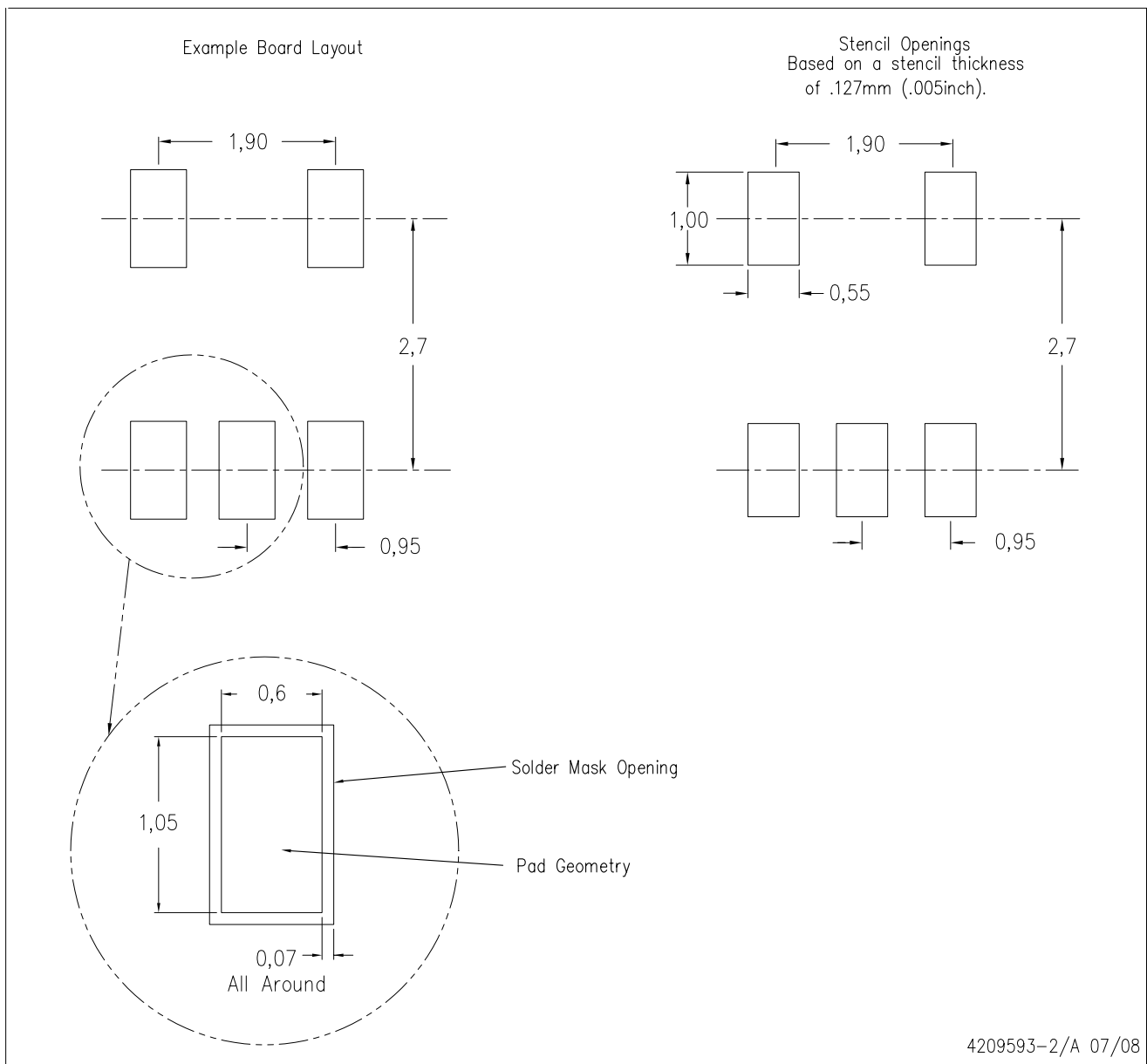
DBV (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Falls within JEDEC MO-178 Variation AA.

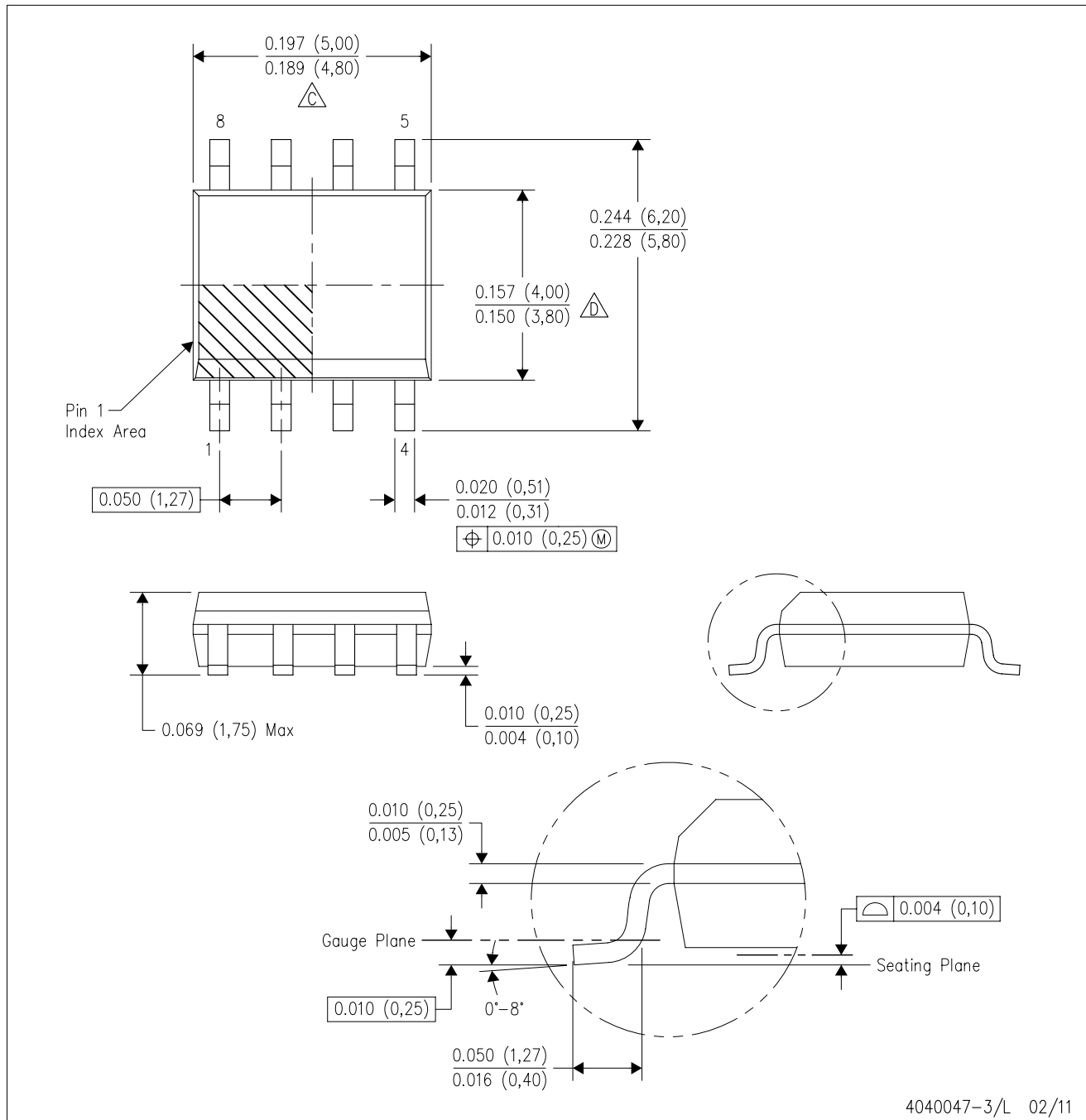
DBV (R-PDSO-G5)



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

D (R-PDSO-G8)

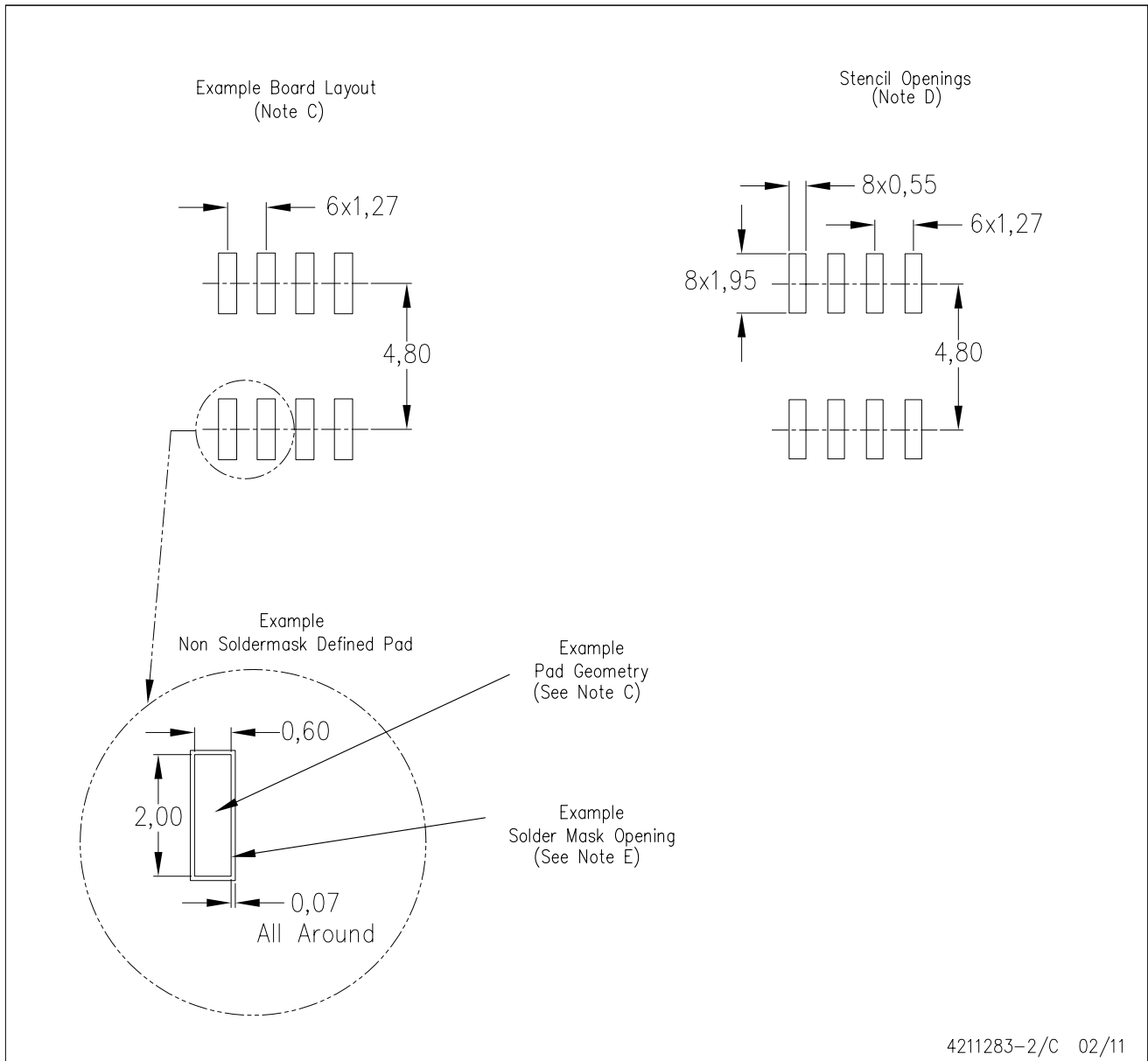
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - $\triangle D$ Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AA.

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Transportation and Automotive	www.ti.com/automotive
Video and Imaging	www.ti.com/video
Wireless	www.ti.com/wireless-apps

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated