

## GENERAL-PURPOSE LOW-VOLTAGE COMPARATORS

### FEATURES

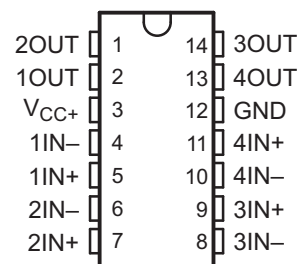
- 2.7-V and 5-V Performance
- Low Supply Current
  - LMV331 . . . 130  $\mu$ A Typ
  - LMV393 . . . 210  $\mu$ A Typ
  - LMV339 . . . 410  $\mu$ A Typ
- Input Common-Mode Voltage Range Includes Ground
- Low Output Saturation Voltage 200 mV Typical
- Open-Collector Output for Maximum Flexibility

### DESCRIPTION/ ORDERING INFORMATION

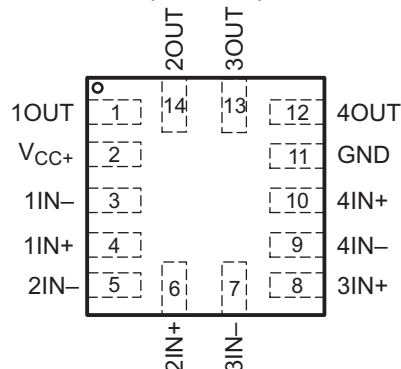
The LMV393 and LMV339 devices are low-voltage (2.7 V to 5.5 V) versions of the dual and quad comparators, LM393 and LM339, which operate from 5 V to 30 V. The LMV331 is the single-comparator version.

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.

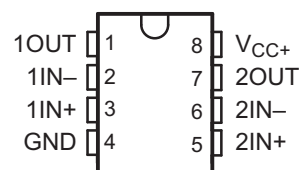
LMV339 . . . D OR PW PACKAGE  
(TOP VIEW)



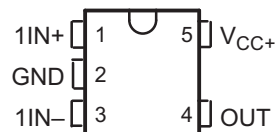
LMV339 . . . RUC PACKAGE  
(TOP VIEW)



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



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



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.

## ORDERING INFORMATION<sup>(1)</sup>

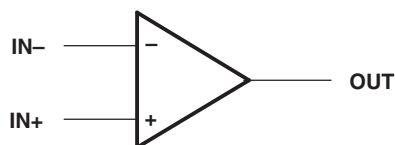
T <sub>A</sub>	PACKAGE <sup>(2)</sup>			ORDERABLE PART NUMBER	TOP-SIDE MARKING <sup>(3)</sup>
–40°C to 125°C	Single	SC-70 – DCK	Reel of 3000	LMV331IDCKR	R2_
			Reel of 250	LMV331IDCKT	
		SOT23-5 – DBV	Reel of 3000	LMV331IDBVR	R1I_
			Reel of 250	LMV331IDBVT	
	Dual	MSOP/VSSOP – DGK	Reel of 2500	LMV393IDGKR	R9_
			Tube of 75	LMV393ID	MV393I
		SOIC – D	Reel of 2500	LMV393IDR	
			Tube of 90	LMV393IPW	MV393I
		TSSOP – PW	Reel of 2000	LMV393IPWR	
			Reel of 3000	LMV393IDDUR	RABR
	Quad	SOIC – D	Tube of 50	LMV339ID	LM339I
			Reel of 2500	LMV339IDR	
		TSSOP – PW	Tube of 150	LMV339IPW	MV339I
			Reel of 2000	LMV339IPWR	
		μQFN – RUC	Reel of 3000	LMV339IRUCR	RT_

(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](http://www.ti.com).

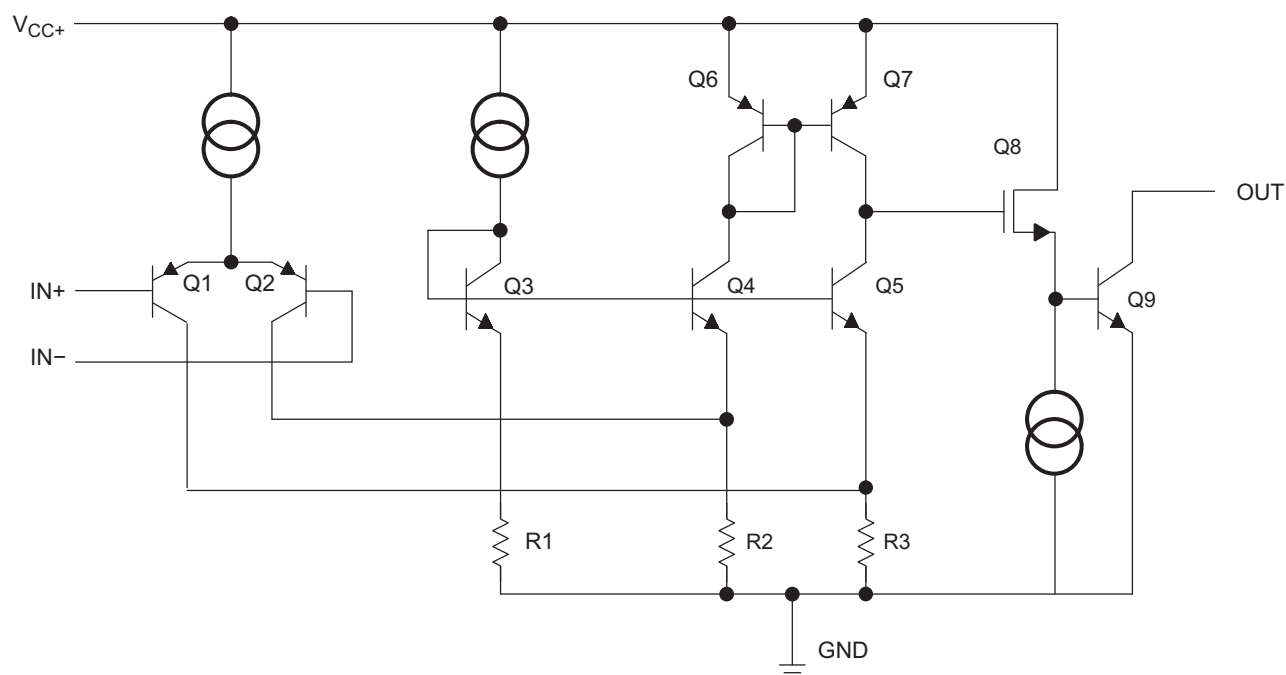
(2) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).

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

## SYMBOL (EACH COMPARATOR)



## SIMPLIFIED SCHEMATIC



## Absolute Maximum Ratings<sup>(1)</sup>

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

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage <sup>(2)</sup>			5.5	V
V <sub>ID</sub>	Differential input voltage <sup>(3)</sup>			±5.5	V
V <sub>I</sub>	Input voltage range (either input)		0	V <sub>CC+</sub>	V
	Duration of output short circuit (one amplifier) to ground <sup>(4)</sup>	At or below T <sub>A</sub> = 25°C, V <sub>CC</sub> ≤ 5.5 V		Unlimited	
θ <sub>JA</sub>	Package thermal impedance <sup>(5) (6)</sup>	D package	8 pin	97	°C/W
			14 pin	86	
		DBV package		206	
		DCK package		252	
		DDU package		210	
		RUC package		216	
		DGK package		172	
		PW package	8 pin	149	
			14 pin	113	
T <sub>J</sub>	Operating virtual junction temperature			150	°C
T <sub>stg</sub>	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<sub>CC</sub> specified for the measurement of I<sub>OS</sub>) are with respect to the network GND.
- (3) Differential voltages are at IN+ with respect to IN–.
- (4) Short circuits from outputs to V<sub>CC</sub> can cause excessive heating and eventual destruction.
- (5) Maximum power dissipation is a function of T<sub>J</sub>(max), θ<sub>JA</sub>, and T<sub>A</sub>. The maximum allowable power dissipation at any allowable ambient temperature is P<sub>D</sub> = (T<sub>J</sub>(max) – T<sub>A</sub>)/θ<sub>JA</sub>. Operating at the absolute maximum T<sub>J</sub> of 150°C can affect reliability.
- (6) The package thermal impedance is calculated in accordance with JESD 51-7.

## Recommended Operating Conditions

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage (single-supply operation)		2.7	5.5	V
V <sub>OUT</sub>	Output voltage			V <sub>CC+</sub> + 0.3	V
T <sub>A</sub>	Operating free-air temperature	I temperature	–40	125	°C

## Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	$T_A$	MIN	TYP	MAX	UNIT
$V_{IO}$ Input offset voltage		25°C		1.7	7	mV
$\alpha_{VIO}$ 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		15	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		$\mu\text{A}$
		–40°C to 125°C			1	
$V_{ICR}$ Common-mode input voltage range		25°C	–0.1 to 2			V
$V_{SAT}$ Saturation voltage	$I_O \leq 1.5\text{ mA}$	25°C		200		mV
$I_{CC}$ Supply current	LMV331	25°C		40	100	$\mu\text{A}$
	LMV393 (both comparators)	25°C		70	140	
	LMV339 (all four comparators)	25°C		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

 $V_{CC+} = 5\text{ V}$ ,  $GND = 0\text{ V}$ , at specified free-air temperature (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	
$\alpha_{VIO}$ 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		$\mu\text{A}$
		–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	$\mu\text{A}$
		–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	

## REVISION HISTORY

Changes from Revision M (November 2005) to Revision N	Page
<ul style="list-style-type: none"> <li>Changed document format from Quicksilver to DocZone. ....</li> <li>Added RUC package pin out and RUC package ordering information. ....</li> </ul>	<p>1</p> <p>1</p>
Changes from Revision N (April 2011) to Revision O	Page
<ul style="list-style-type: none"> <li>Changed <math>V_I</math> in the Absolute Maximum Ratings from 5.5 V to <math>V_{CC+}</math> .....</li> </ul>	3
Changes from Revision O (February 2012) to Revision P	Page
<ul style="list-style-type: none"> <li>Updated Ordering Information Table for Top Side Marking, R9_. ....</li> </ul>	2
Changes from Revision P (March 2012) to Revision Q	Page
<ul style="list-style-type: none"> <li>Updated the Top Side Marking for RUC package, RT_. ....</li> </ul>	2
Changes from Revision Q (April 2012) to Revision R	Page
<ul style="list-style-type: none"> <li>Added RUC to marking list .....</li> </ul>	2
Changes from Revision R (May 2012) to Revision S	Page
<ul style="list-style-type: none"> <li>Updated Operating Temperature Range .....</li> <li>Added thermal impedance data .....</li> </ul>	<p>2</p> <p>3</p>

**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)	Top-Side Markings (4)	Samples
LMV331IDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R1I2 ~ R1IC ~ R1II)	<a href="#">Samples</a>
LMV331IDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R1I2 ~ R1IC ~ R1II)	<a href="#">Samples</a>
LMV331IDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R1I2 ~ R1IC ~ R1II)	<a href="#">Samples</a>
LMV331IDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R1I2 ~ R1IC ~ R1II)	<a href="#">Samples</a>
LMV331IDBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R1I2 ~ R1IC ~ R1II)	<a href="#">Samples</a>
LMV331IDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R1I2 ~ R1IC ~ R1II)	<a href="#">Samples</a>
LMV331IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R2C ~ R2I ~ R2R)	<a href="#">Samples</a>
LMV331IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R2C ~ R2I ~ R2R)	<a href="#">Samples</a>
LMV331IDCKRG4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R2C ~ R2I ~ R2R)	<a href="#">Samples</a>
LMV331IDCKT	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R2C ~ R2I ~ R2R)	<a href="#">Samples</a>
LMV331IDCKTE4	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R2C ~ R2I ~ R2R)	<a href="#">Samples</a>
LMV331IDCKTG4	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R2C ~ R2I ~ R2R)	<a href="#">Samples</a>
LMV339ID	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LMV339I	<a href="#">Samples</a>
LMV339IDE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LMV339I	<a href="#">Samples</a>
LMV339IDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LMV339I	<a href="#">Samples</a>
LMV339IDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LMV339I	<a href="#">Samples</a>
LMV339IDRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LMV339I	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LMV339IDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	LMV339I	<a href="#">Samples</a>
LMV339IPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV339I	<a href="#">Samples</a>
LMV339IPWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV339I	<a href="#">Samples</a>
LMV339IPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV339I	<a href="#">Samples</a>
LMV339IPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV339I	<a href="#">Samples</a>
LMV339IPWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV339I	<a href="#">Samples</a>
LMV339IPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV339I	<a href="#">Samples</a>
LMV339IRUCR	ACTIVE	QFN	RUC	14	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	RT	<a href="#">Samples</a>
LMV393ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>
LMV393IDDUR	ACTIVE	VSSOP	DDU	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	RABR	<a href="#">Samples</a>
LMV393IDDURE4	ACTIVE	VSSOP	DDU	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	RABR	<a href="#">Samples</a>
LMV393IDDURG4	ACTIVE	VSSOP	DDU	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	RABR	<a href="#">Samples</a>
LMV393IDE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>
LMV393IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>
LMV393IDGKR	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R9B ~ R9Q ~ R9R)	<a href="#">Samples</a>
LMV393IDGKRG4	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(R9B ~ R9Q ~ R9R)	<a href="#">Samples</a>
LMV393IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>
LMV393IDRE4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>



Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LMV393IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>
LMV393IPW	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>
LMV393IPWE4	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>
LMV393IPWG4	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>
LMV393IPWR	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>
LMV393IPWRE4	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>
LMV393IPWRG4	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	MV393I	<a href="#">Samples</a>

(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) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side 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 Top-Side Marking for that device.

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**OTHER QUALIFIED VERSIONS OF LMV331, LMV393 :**

- Automotive: [LMV331-Q1](#), [LMV393-Q1](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LMV331IDBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
LMV331IDBVR	SOT-23	DBV	5	3000	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3
LMV331IDBVT	SOT-23	DBV	5	250	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3
LMV331IDBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
LMV331IDCKR	SC70	DCK	5	3000	180.0	9.2	2.3	2.55	1.2	4.0	8.0	Q3
LMV331IDCKR	SC70	DCK	5	3000	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
LMV331IDCKT	SC70	DCK	5	250	180.0	9.2	2.3	2.55	1.2	4.0	8.0	Q3
LMV331IDCKT	SC70	DCK	5	250	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
LMV339IDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LMV339IPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LMV339IRUCR	QFN	RUC	14	3000	180.0	8.4	2.3	2.3	0.55	4.0	8.0	Q2
LMV393IDDUR	VSSOP	DDU	8	3000	180.0	8.4	2.25	3.35	1.05	4.0	8.0	Q3
LMV393IDGKR	VSSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
LMV393IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
LMV393IDRG4	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
LMV393IPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	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)
LMV331IDBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
LMV331IDBVR	SOT-23	DBV	5	3000	205.0	200.0	33.0
LMV331IDBVT	SOT-23	DBV	5	250	205.0	200.0	33.0
LMV331IDBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
LMV331IDCKR	SC70	DCK	5	3000	205.0	200.0	33.0
LMV331IDCKR	SC70	DCK	5	3000	180.0	180.0	18.0
LMV331IDCKT	SC70	DCK	5	250	205.0	200.0	33.0
LMV331IDCKT	SC70	DCK	5	250	180.0	180.0	18.0
LMV339IDR	SOIC	D	14	2500	367.0	367.0	38.0
LMV339IPWR	TSSOP	PW	14	2000	367.0	367.0	35.0
LMV339IRUCR	QFN	RUC	14	3000	202.0	201.0	28.0
LMV393IDDUR	VSSOP	DDU	8	3000	202.0	201.0	28.0
LMV393IDGKR	VSSOP	DGK	8	2500	364.0	364.0	27.0
LMV393IDR	SOIC	D	8	2500	340.5	338.1	20.6
LMV393IDRG4	SOIC	D	8	2500	340.5	338.1	20.6
LMV393IPWR	TSSOP	PW	8	2000	367.0	367.0	35.0

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)

PLASTIC SMALL OUTLINE



- 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.

## DCK (R-PDSO-G5)

## PLASTIC SMALL-OUTLINE PACKAGE



4093553-3/G 01/2007

- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
  - Falls within JEDEC MO-203 variation AA.

DCK (R-PDSO-G5)

PLASTIC SMALL OUTLINE



- 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.



## DGK (S-PDSO-G8)

## PLASTIC SMALL-OUTLINE PACKAGE

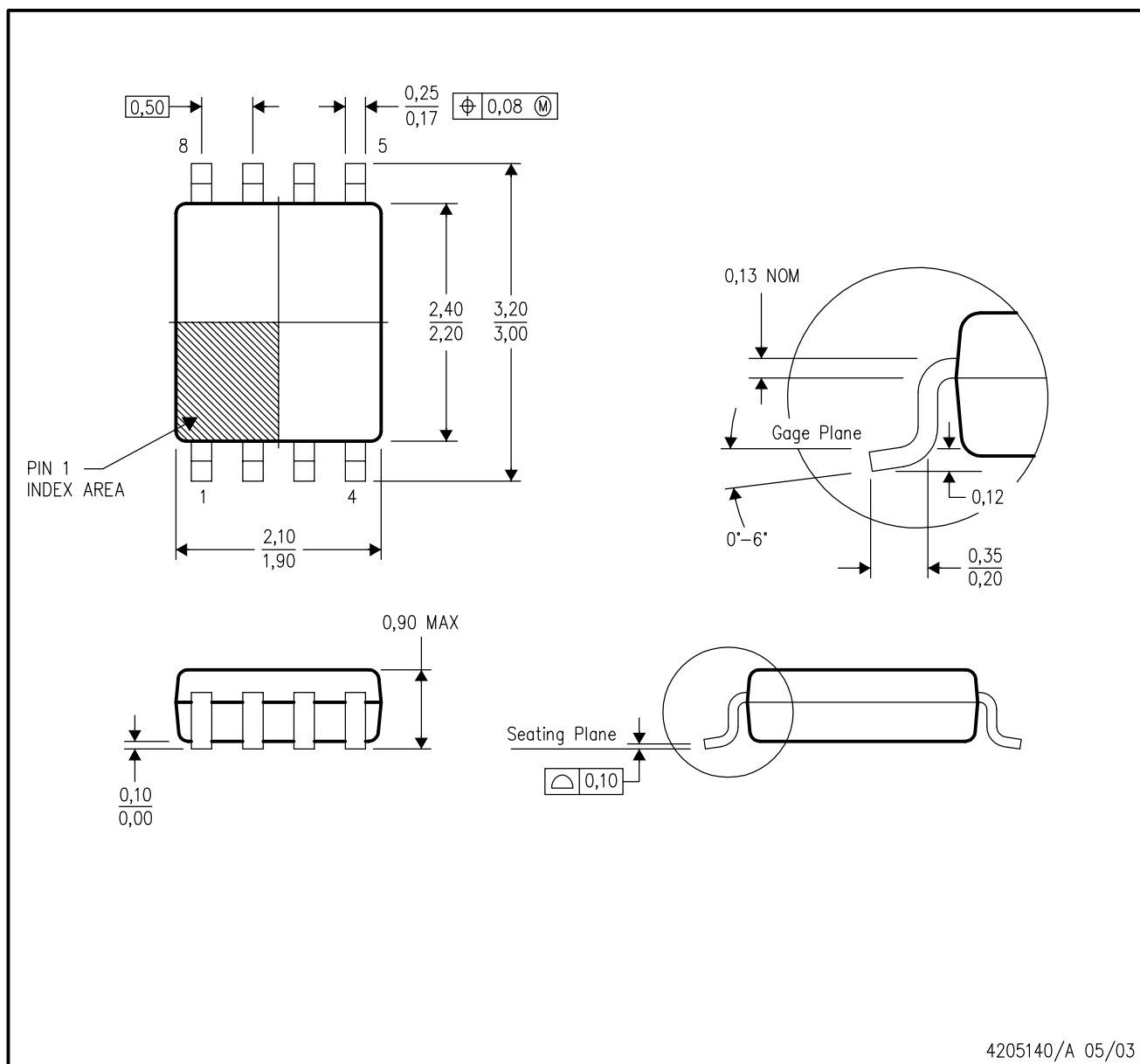


## NOTES:

- A. All linear dimensions are in 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 0.15 per end.
- D. Body width does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
- E. Falls within JEDEC MO-187 variation AA, except interlead flash.

## DDU (R-PDSO-G8)

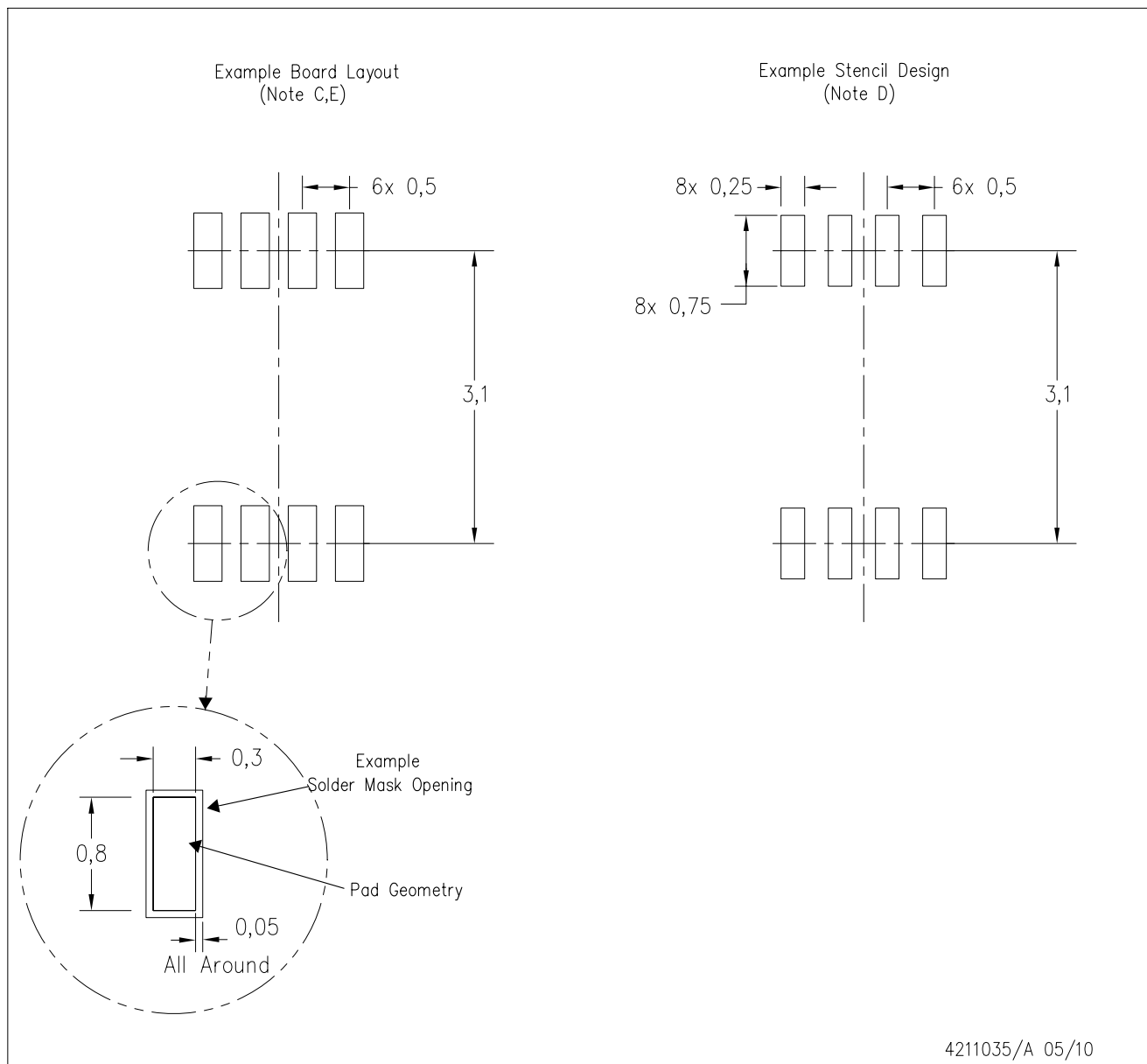
## PLASTIC SMALL-OUTLINE PACKAGE



- 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.
  - D. Falls within JEDEC MO-187 variation CA.

DDU (S-PDSO-G8)

PLASTIC SMALL OUTLINE PACKAGE (DIE UP)



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

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040047-5/M 06/11

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 0.006 (0,15) each side.
- 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 AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



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

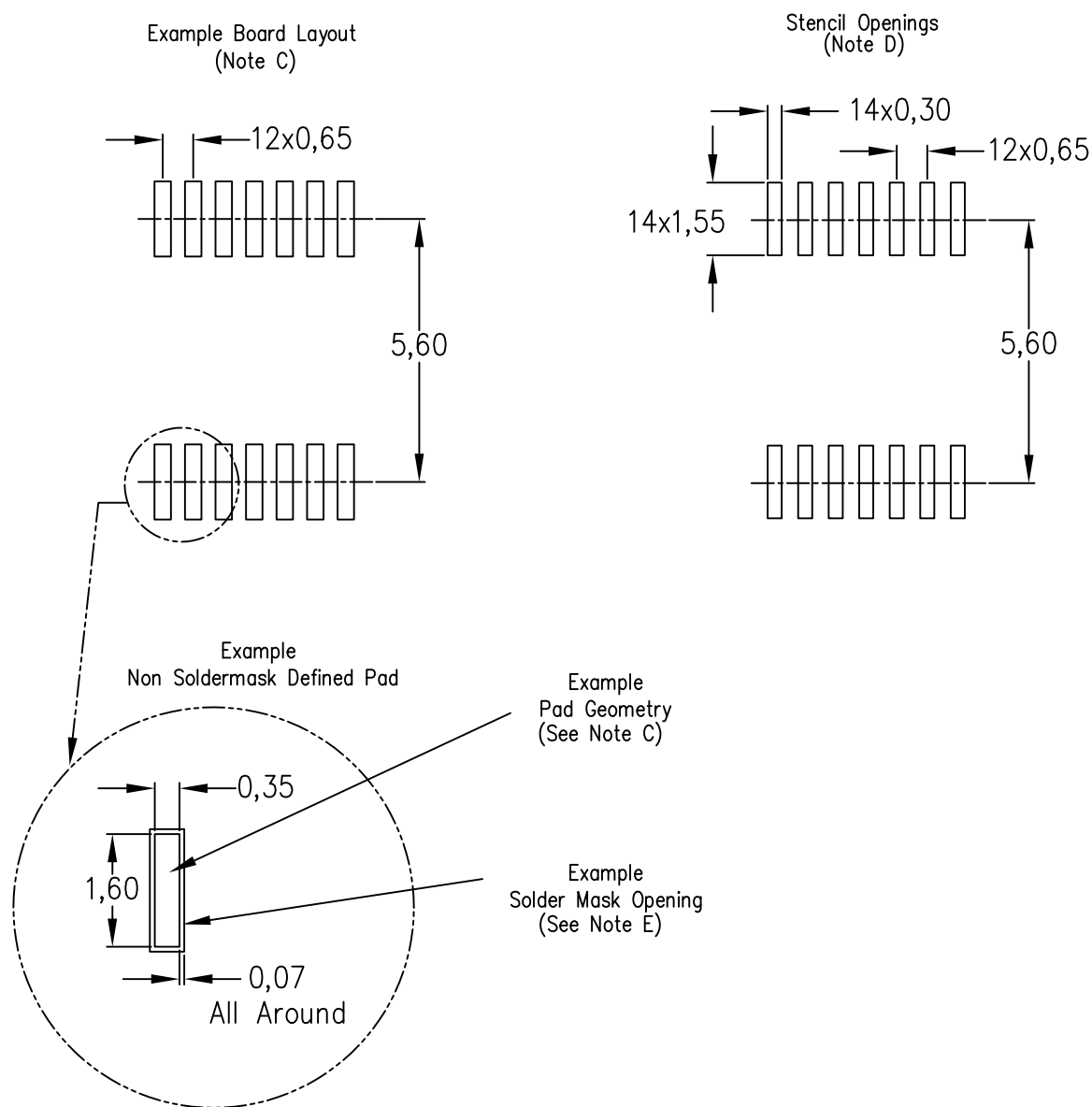
PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE

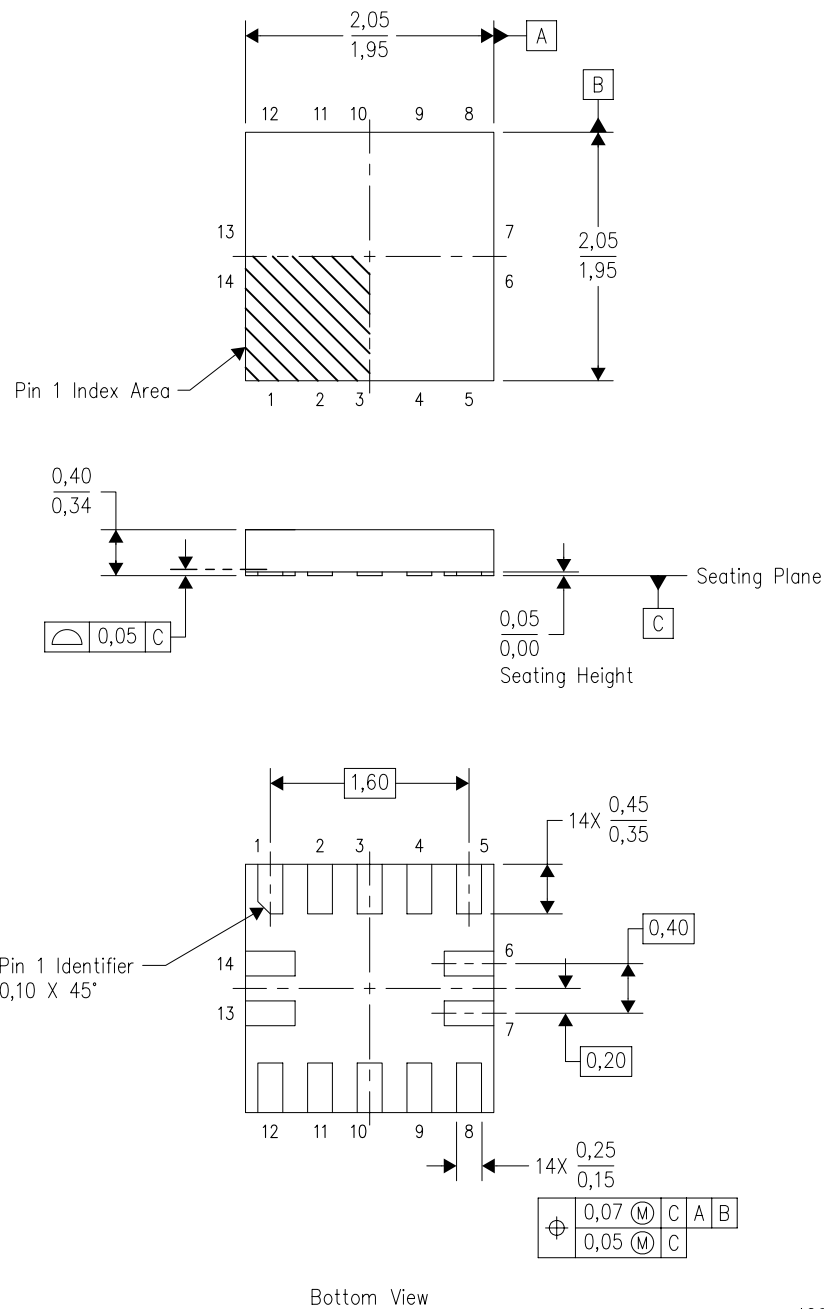


4211284-2/F 12/12

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

RUC (S-PX2QFN-N14)

PLASTIC QUAD FLATPACK NO-LEAD



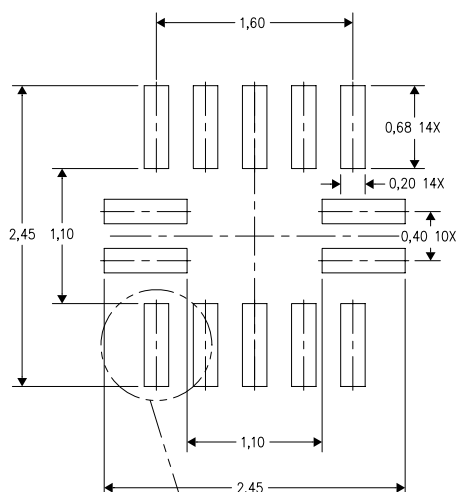
- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. QFN (Quad Flatpack No-lead) package configuration.
  - D. This package complies to JEDEC MO-288 variation X2GFE.



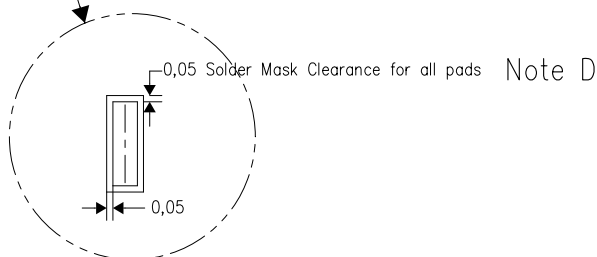
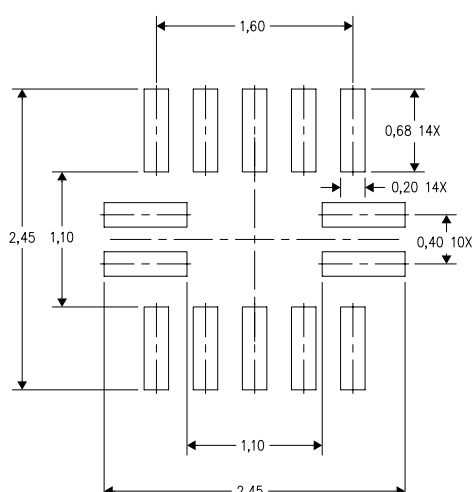
RUC (S-PX2QFN-N14)

PLASTIC QUAD FLATPACK NO-LEAD

Example Board Layout



Example Stencil Design  
(Note E)



4211124/A 06/10

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
  - E. Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
  - F. 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 stencil design considerations.
  - G. Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

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)

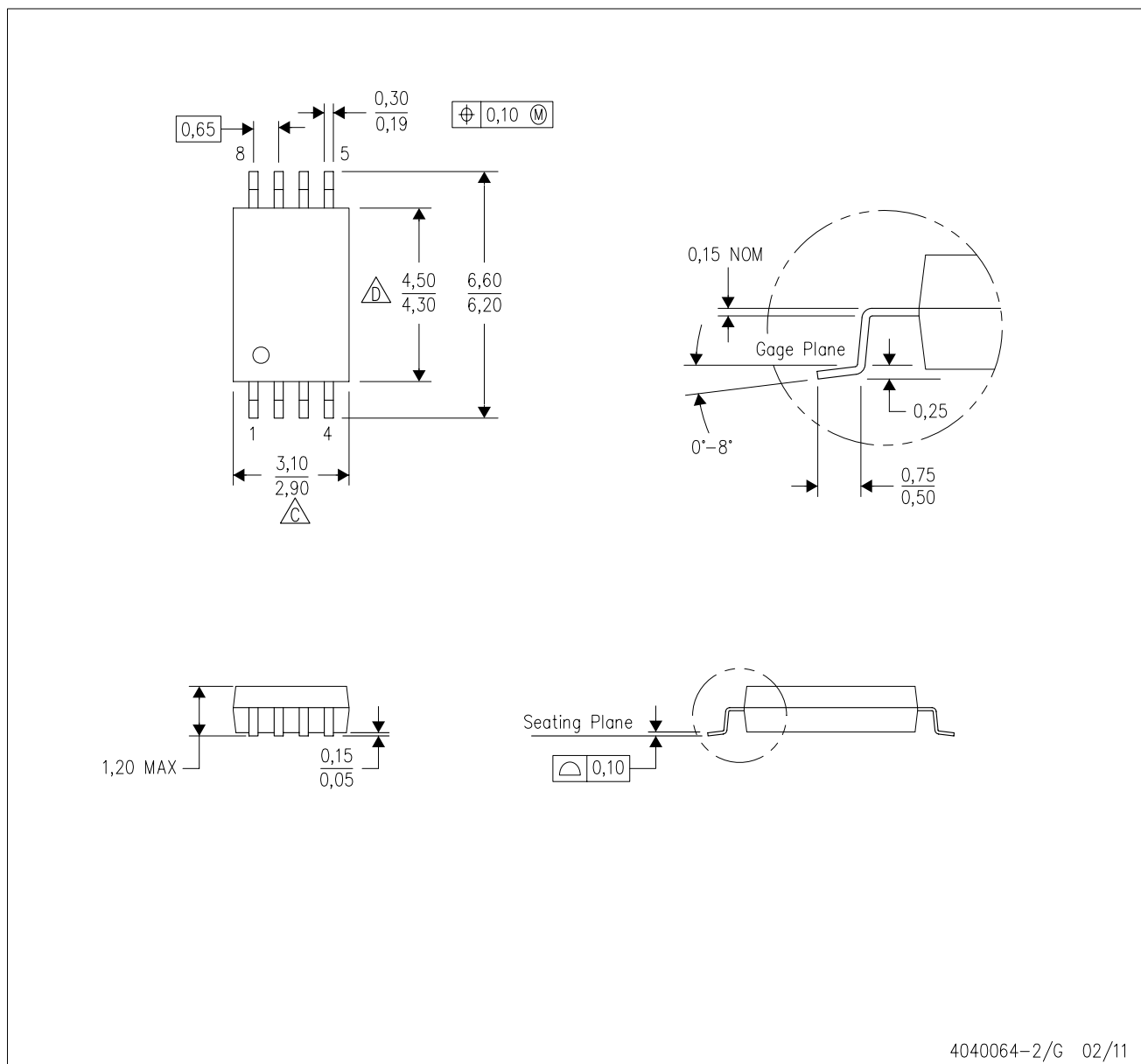
PLASTIC SMALL OUTLINE



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

PW (R-PDSO-G8)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - 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 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

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