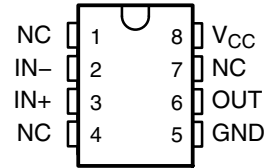


# TL714C HIGH-SPEED DIFFERENTIAL COMPARATOR

SLCS015A – DECEMBER 1988 – REVISED AUGUST 2003

- Operates From a 5-V Supply
- Self-Biasing Inputs
- Hysteresis . . . 10 mV Typ
- Response Time . . . 6 ns Typ
- Maximum Operating Frequency . . . 50 MHz Typ

D OR P PACKAGE  
(TOP VIEW)



NC – No internal connection

## description/ordering information

The TL714C is a high-speed differential comparator fabricated with bipolar Schottky process technology. The circuit has differential inputs and a TTL-compatible logic output with symmetrical switching characteristics.

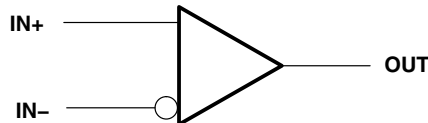
The device operates from a single 5-V supply and is useful as a disk-memory read-chain data comparator.

## ORDERING INFORMATION

T <sub>A</sub>	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP (P)	Tube of 50	TL714CP	TL714CP
	SOIC (D)	Tube of 75	TL714CD	TL714C
		Reel of 2500	TL714CDR	

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

## symbol



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PRODUCTION DATA information is 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.

 **TEXAS  
INSTRUMENTS**

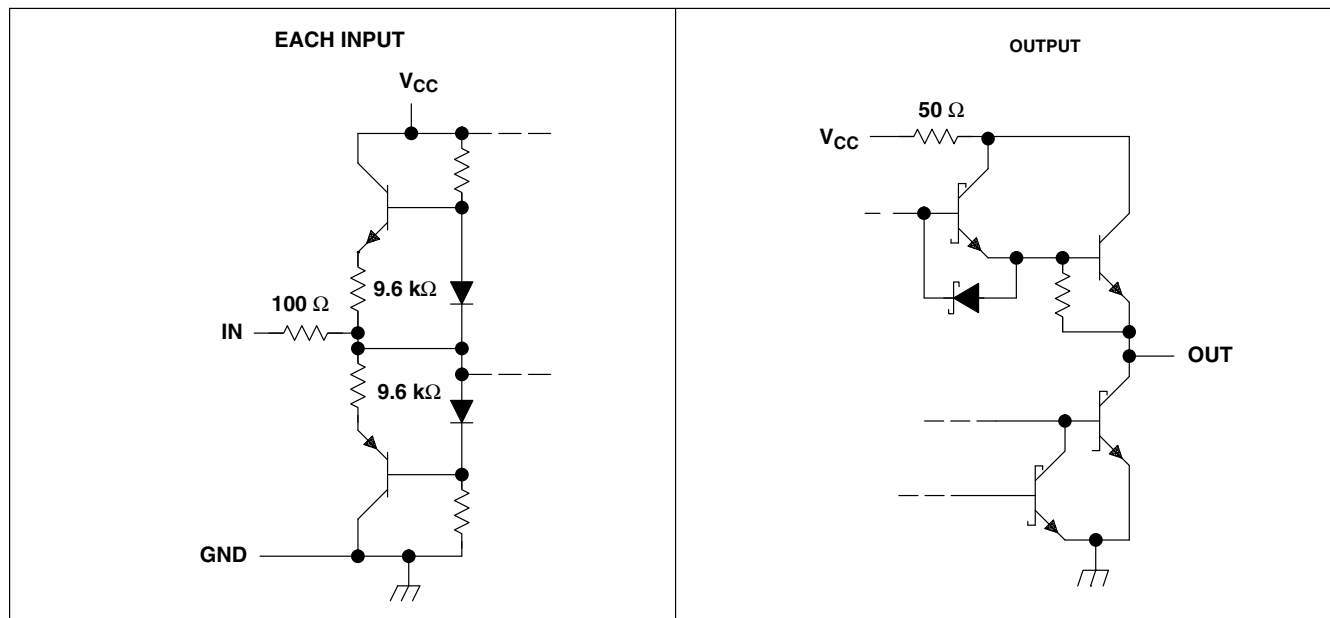
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# TL714C HIGH-SPEED DIFFERENTIAL COMPARATOR

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## schematic of inputs and outputs



All resistor values shown are nominal.

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Differential input voltage, $V_{ID}$ (see Note 2)	$\pm 5$ V
Input voltage range, $V_I$	$V_{CC}$ to GND
Low-level output current, $I_{OL}$	40 mA
Package thermal impedance, $\theta_{JA}$ (see Notes 3 and 4):	
D package	97°C/W
P package	85°C/W
Operating virtual junction temperature, $T_J$	150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C
Storage temperature range, $T_{stg}$	-65°C to 150°C

† 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.

- NOTES:
1. All voltage values, except differential voltage, are with respect to the network ground.
  2. Differential voltage values are at  $IN+$  with respect to  $IN-$ .
  3. Maximum power dissipation is a function of  $T_J(\max)$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J(\max) - T_A) / \theta_{JA}$ . Operating at the absolute maximum  $T_J$  of 150°C can affect reliability.
  4. The package thermal impedance is calculated in accordance with JESD 51-7.

## recommended operating conditions

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	4.75	5.25	V
$V_{IC}$	Common-mode input voltage	1.4 to $V_{CC}-1.4$		V
$I_{OH}$	High-level output current		-1	mA
$I_{OL}$	Low-level output current		16	mA
$T_A$	Operating free-air temperature	0	70	°C



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# TL714C HIGH-SPEED DIFFERENTIAL COMPARATOR

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electrical characteristics over free-air operating temperature range,  $V_{CC} = 5\text{ V}$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
$V_T$	Threshold voltage ( $V_{T+}$ and $V_{T-}$ )	$V_{IC} = 1.4\text{ V to } 3.6\text{ V}$	-75‡		75	mV
$V_{hys}$	Hysteresis ( $V_{T+} - V_{T-}$ )		2	10	30	mV
$V_{OH}$	High-level output voltage	$V_{ID} = 100\text{ mV}, I_{OH} = -1\text{ mA}$	2.7	3.4		V
$V_{OL}$	Low-level output voltage	$V_{ID} = -100\text{ mV}, I_{OL} = 16\text{ mA}$		0.4	0.5	V
$I_{OS}$	Short-circuit output current		-30		-110	mA
$r_i$	Differential input resistance		2.9			k $\Omega$
$I_{CC}$	Supply current	$V_{ID} = -100\text{ mV}, I_O = 0$		7	12	mA

† All typical values are at  $T_A = 25^\circ\text{C}$ .

‡ The algebraic convention, where the more-negative limit is designated as minimum, is used in this data sheet for input threshold voltage levels only.

switching characteristics,  $V_{CC} = 5\text{ V}, T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
$f_{max}$	Maximum operating frequency	$V_{ID} = \pm 250\text{ mV}, C_L = 25\text{ pF}, t_r = t_f = 4\text{ ns},$ Input duty cycle = 50%		50		MHz
$t_{PLH}$	Propagation delay time, low-to-high-level output	$V_{ID} = \pm 100\text{ mV}, C_L = 25\text{ pF},$ See Figures 1 and 2		6	12	ns
$t_{PHL}$	Propagation delay time, high-to-low-level output			6	12	ns
$t_r$	Rise time	$V_{ID} = \pm 100\text{ mV}, C_L = 25\text{ pF},$ See Figure 3		4	8	ns
$t_f$	Fall time			4	8	ns

† All typical values are at  $T_A = 25^\circ\text{C}$ .

## PARAMETER MEASUREMENT INFORMATION

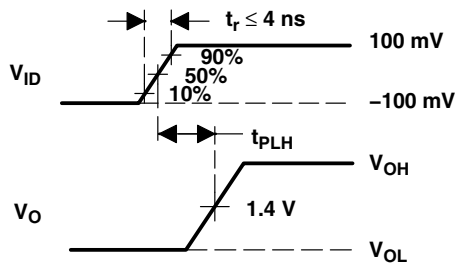


Figure 1. Propagation Delay Time, Low to High ( $t_{PLH}$ )

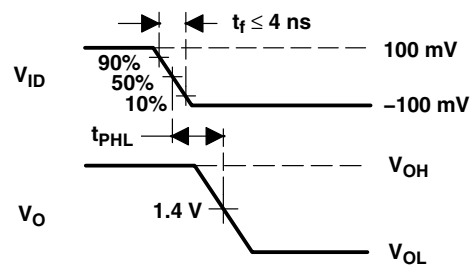


Figure 2. Propagation Delay Time, High to Low ( $t_{PHL}$ )

# TL714C HIGH-SPEED DIFFERENTIAL COMPARATOR

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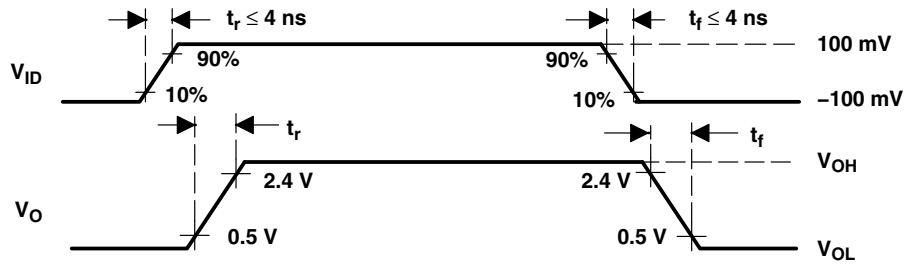


Figure 3. Rise and Fall Times ( $t_r$ ,  $t_f$ )

**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
TL714CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	TL714C	<a href="#">Samples</a>
TL714CDE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	TL714C	<a href="#">Samples</a>
TL714CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	TL714C	<a href="#">Samples</a>
TL714CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	TL714C	<a href="#">Samples</a>
TL714CDRE4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	TL714C	<a href="#">Samples</a>
TL714CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	TL714C	<a href="#">Samples</a>
TL714CP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	TL714CP	<a href="#">Samples</a>
TL714CPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	TL714CP	<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.

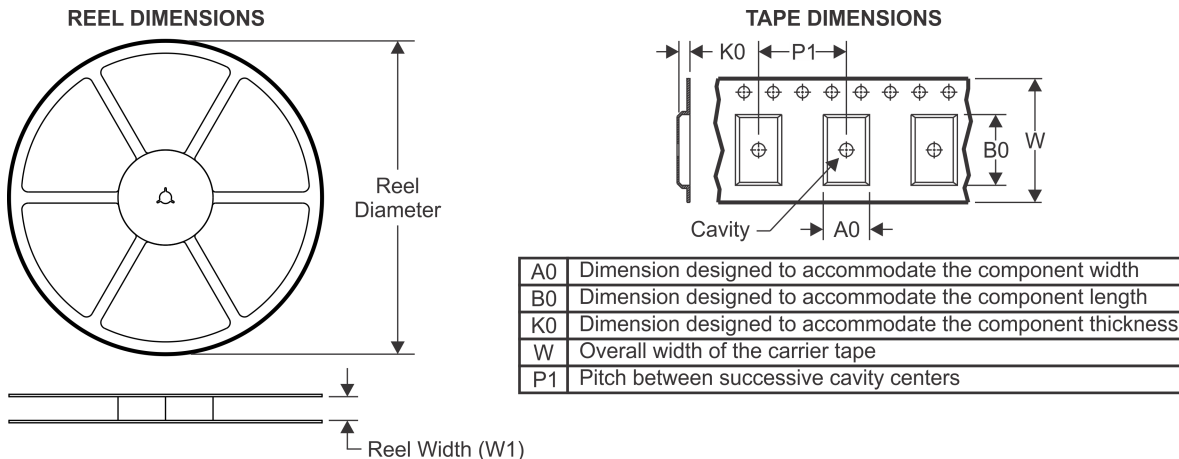
**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

<sup>(4)</sup> Only one of markings shown within the brackets will appear on the physical device.

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**TAPE AND REEL INFORMATION**

**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
TL714CDR	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)
TL714CDR	SOIC	D	8	2500	340.5	338.1	20.6



P (R-PDIP-T8)

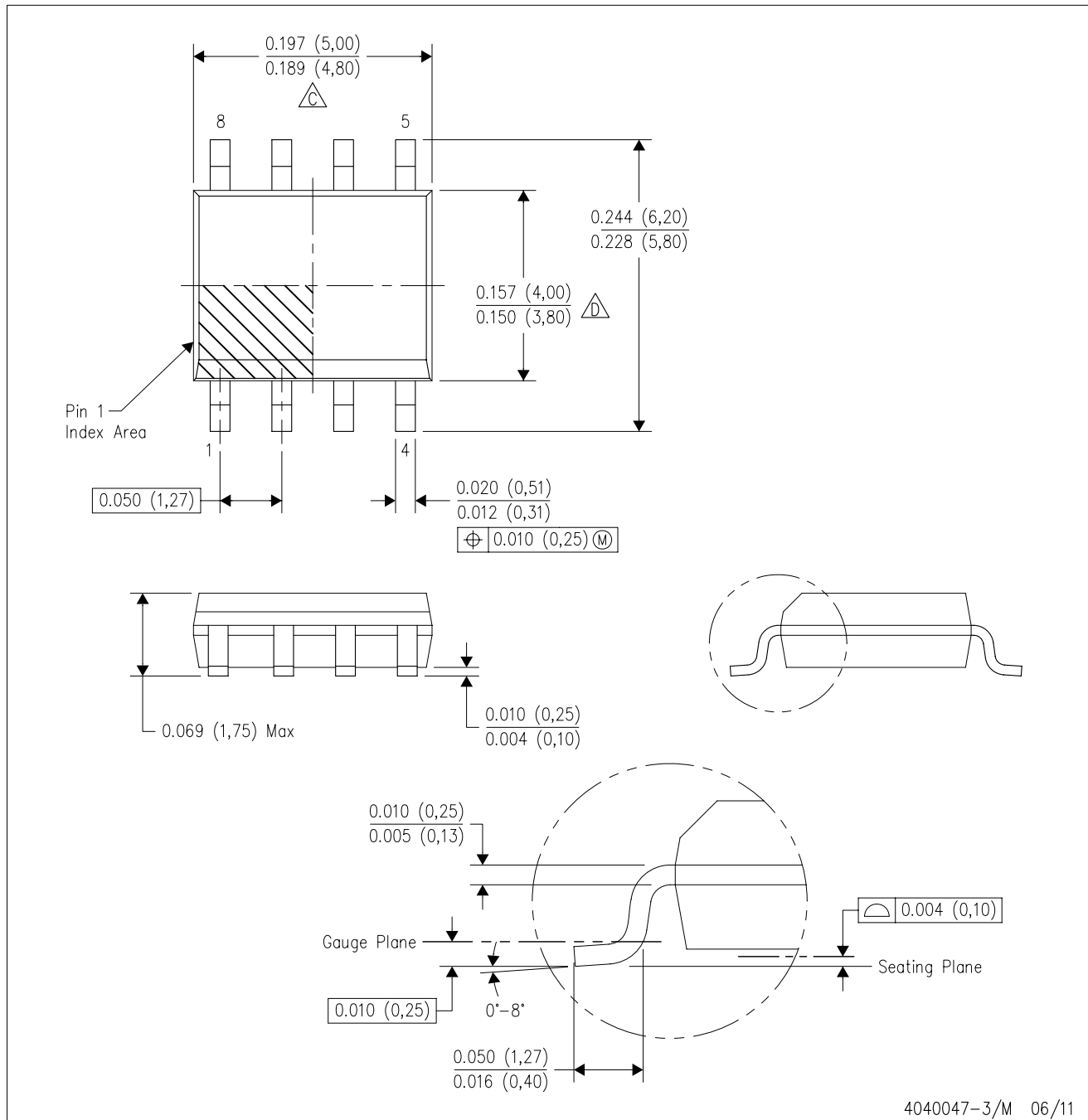
PLASTIC DUAL-IN-LINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MS-001 variation BA.

D (R-PDSO-G8)

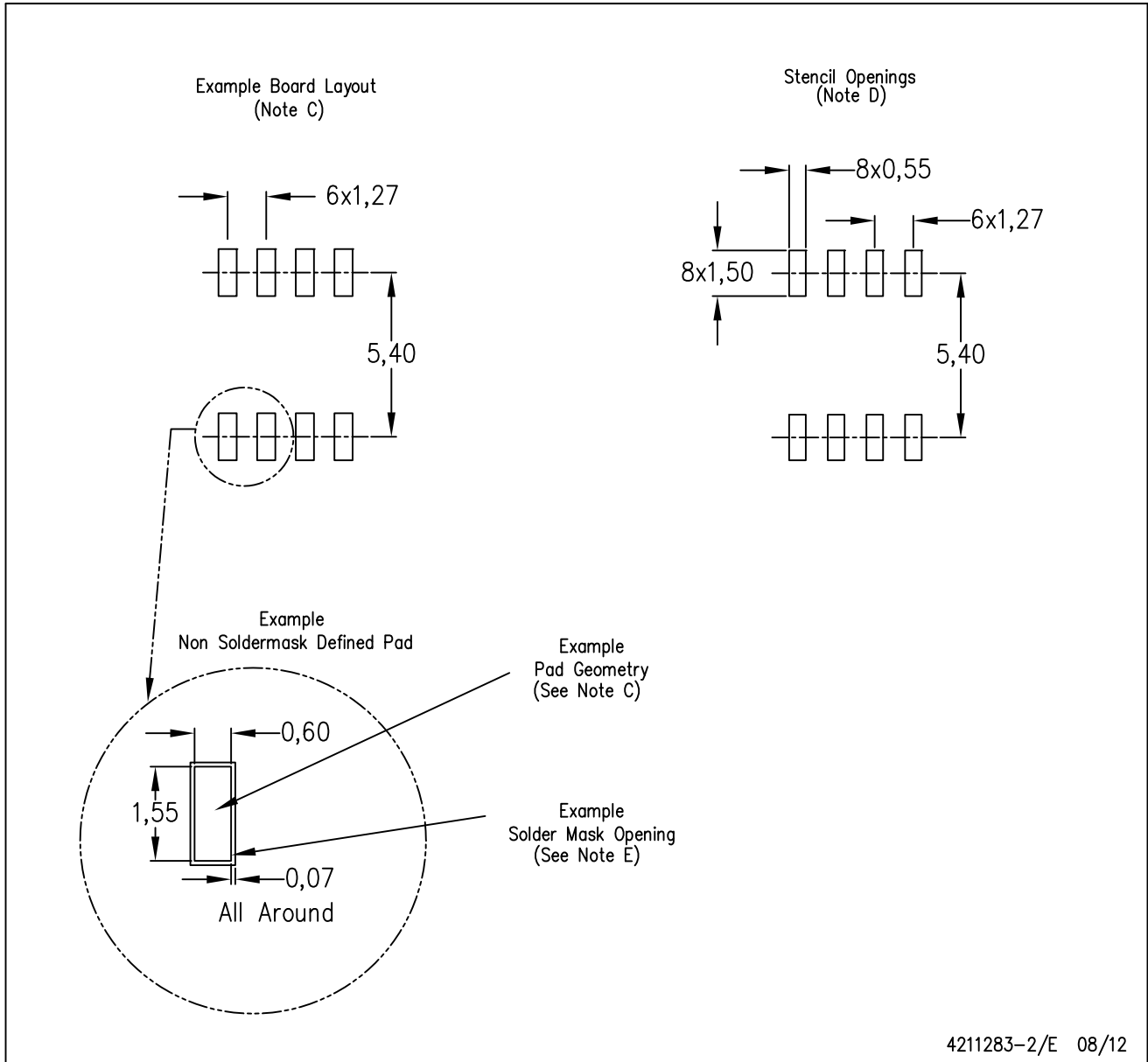
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - 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 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.

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