

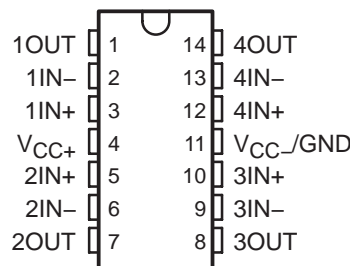
# TL3474, TL3474A

## HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

SLVS461B – JANUARY 2003 – REVISED JULY 2003

- Low Offset . . . 3 mV (Max) for A-Grade
- Wide Gain-Bandwidth Product . . . 4 MHz
- High Slew Rate . . . 13 V/ $\mu$ s
- Fast Settling Time . . . 1.1  $\mu$ s to 0.1%
- Wide-Range Single-Supply Operation  
. . . 4 V to 36 V
- Wide Input Common-Mode Range Includes  
Ground ( $V_{CC-}$ )
- Low Total Harmonic Distortion . . . 0.02%
- Large-Capacitance Drive Capability  
. . . 10,000 pF
- Output Short-Circuit Protection
- Alternative to MC33074/A and MC34074/A

D, N, OR PW PACKAGE  
(TOP VIEW)



### description/ordering information

#### ORDERING INFORMATION

$T_A$	$V_{IOmax}$ AT 25°C	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	A-grade: 3 mV	PDIP (N)	Tube of 25	TL3474ACN	TL3474ACN
		SOIC (D)	Tube of 50	TL3474ACD	TL3474A
			Reel of 2500	TL3474ACDR	
		TSSOP (PW)	Tube of 90	TL3474ACPW	T3474A
			Reel of 2000	TL3474ACPWR	
	Standard grade: 10 mV	PDIP (N)	Tube of 25	TL3474CN	TL3474CN
		SOIC (D)	Tube of 50	TL3474CD	TL3474C
			Reel of 2500	TL3474CDR	
		TSSOP (PW)	Tube of 90	TL3474CPW	TL3474
			Reel of 2000	TL3474CPWR	
–40°C to 105°C	A-grade: 3 mV	PDIP (N)	Tube of 25	TL3474AIN	Z3474A
		SOIC (D)	Tube of 50	TL3474AID	TL3474AI
			Reel of 2500	TL3474AIDR	
		TSSOP (PW)	Tube of 90	TL3474AIPW	Z3474A
			Reel of 2000	TL3474AIPWR	
	Standard grade: 10 mV	PDIP (N)	Tube of 25	TL3474IN	TL3474IN
		SOIC (D)	Tube of 50	TL3474ID	TL3474I
			Reel of 2500	TL3474IDR	
		TSSOP (PW)	Tube of 90	TL3474IPW	Z3474
			Reel of 2000	TL3474IPWR	

† 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).



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**TEXAS  
INSTRUMENTS**

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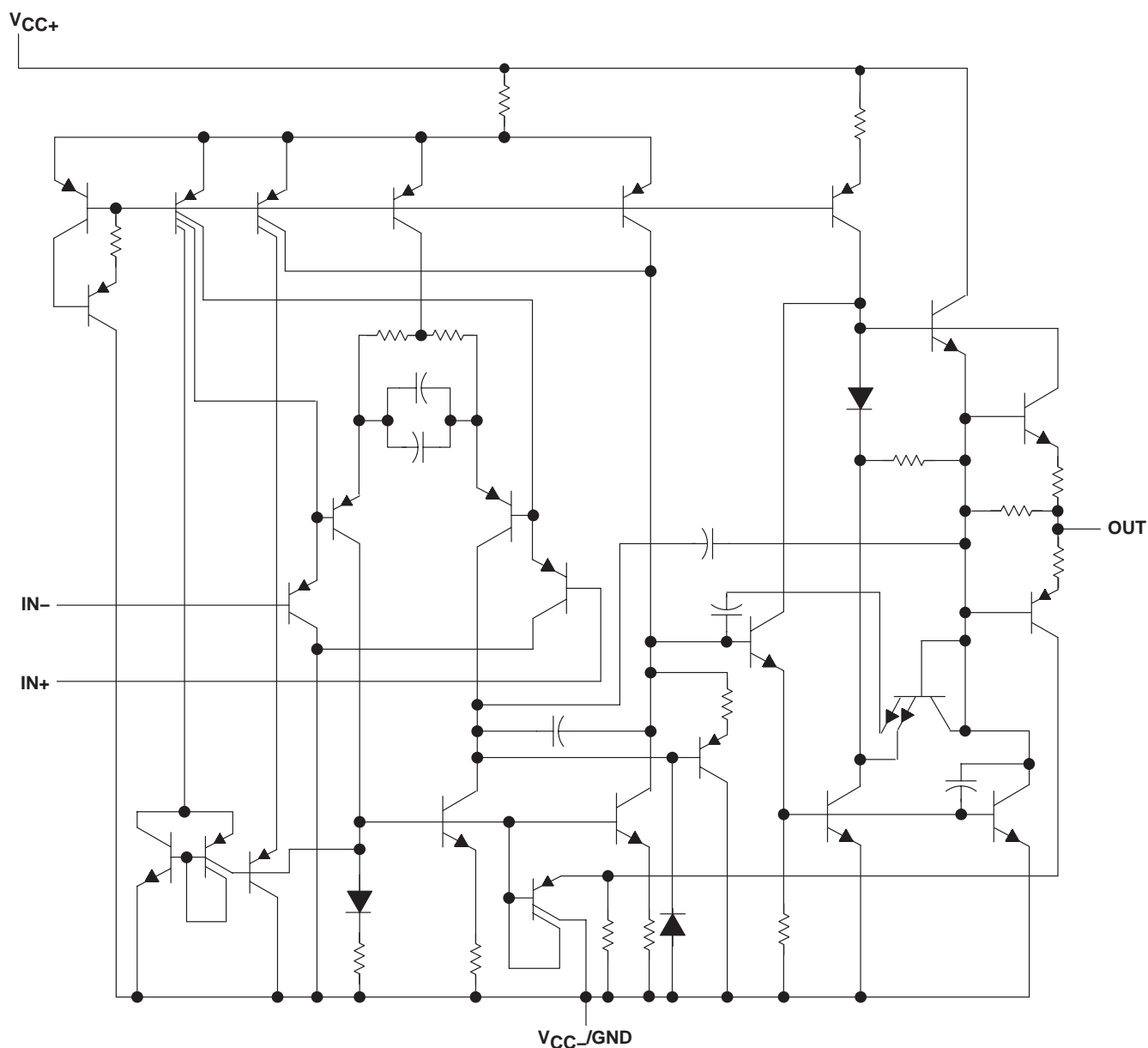
# TL3474, TL3474A HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

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## description/ordering information (continued)

Quality, low-cost, bipolar fabrication with innovative design concepts is employed for the TL3474, TL3474A operational amplifiers. These devices offer 4 MHz of gain-bandwidth product, 13-V/ $\mu$ s slew rate, and fast settling time without the use of JFET device technology. Although the TL3474 and TL3474A can be operated from split supplies, they are particularly suited for single-supply operation because the common-mode input voltage range includes ground potential ( $V_{CC-}$ ). With a Darlington transistor input stage, these devices exhibit high input resistance, low input offset voltage, and high gain. The all-npn output stage, characterized by no dead-band crossover distortion and large output voltage swing, provides high-capacitance drive capability, excellent phase and gain margins, low open-loop high-frequency output impedance, and symmetrical source/sink ac frequency response. These low-cost amplifiers are an alternative to the MC34074/A and MC33074/A operational amplifiers.

## schematic (each amplifier)



# TL3474, TL3474A

## HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

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

Supply voltage: $V_{CC+}$ (see Note 1)	18 V
$V_{CC-}$	–18 V
Differential input voltage, $V_{ID}$ (see Note 2)	±36 V
Input voltage, $V_I$ (any input)	$V_{CC\pm}$
Input current, $I_I$ (each input)	±1 mA
Output current, $I_O$	±80 mA
Total current into $V_{CC+}$	80 mA
Total current out of $V_{CC-}$	80 mA
Duration of short-circuit current at (or below) 25°C (see Note 3)	Unlimited
Package thermal impedance, $\theta_{JA}$ (see Notes 4 and 5): D package	86°C/W
N package	80°C/W
PW package	113°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

<sup>†</sup> 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 voltages, are with respect to the midpoint between  $V_{CC+}$  and  $V_{CC-}/GND$ .
  2. Differential voltages are at the noninverting input with respect to the inverting input. Excessive input current can flow when the input is less than  $V_{CC-} - 0.3$  V.
  3. The output can be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation rating is not exceeded.
  4. 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.
  5. The package thermal impedance is calculated in accordance with JESD 51-7.

### recommended operating conditions

			MIN	MAX	UNIT
$V_{CC\pm}$	Supply voltage		4	36	V
$V_{IC}$	Common-mode input voltage	$V_{CC} = 5$ V	0	2.8	V
		$V_{CC\pm} = \pm 15$ V	–15	12.8	
$T_A$	Operating free-air temperature	TL3474C, TL3474AC	0	70	°C
		TL3474I, TL3474AI	–40	105	



# TL3474, TL3474A

## HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

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electrical characteristics at specified free-air temperature,  $V_{CC\pm} = \pm 15\text{ V}$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS		T <sub>A</sub>	TL3474			TL3474A			UNIT
					MIN	TYP†	MAX	MIN	TYP†	MAX	
V <sub>IO</sub>	Input offset voltage	V <sub>IC</sub> = 0, V <sub>O</sub> = 0, R <sub>S</sub> = 50 Ω	V <sub>CC</sub> = 5 V	25°C	1.5	10	1.5	3	mV		
			V <sub>CC</sub> = ±15 V	25°C	1.0	10	1.0	3			
Full range‡	12			5	μV/°C						
	V <sub>CC</sub> = ±15 V		Full range‡	10		10	nA				
αV <sub>IO</sub>	Temperature coefficient of input offset voltage		V <sub>CC</sub> = ±15 V	25°C	6	75		6	75	nA	
				Full range‡	300	300					
I <sub>IO</sub>	Input offset current		V <sub>CC</sub> = ±15 V	25°C	100	500	100	500	nA		
I <sub>IB</sub>	Input bias current			Full range‡	700	700					
		V <sub>ICR</sub>	Common-mode input voltage range		R <sub>S</sub> = 50 Ω	25°C	–15 to 12.8	–15 to 12.8	V		
Full range‡	–15 to 12.8			–15 to 12.8							
V <sub>OH</sub>	High-level output voltage	V <sub>CC+</sub> = 5 V, V <sub>CC–</sub> = 0, R <sub>L</sub> = 2 kΩ	25°C	3.7	4	3.7	4	V			
		R <sub>L</sub> = 10 kΩ	25°C	13.6	14	13.6	14				
		R <sub>L</sub> = 2 kΩ	Full range‡	13.4	13.4						
V <sub>OL</sub>	Low-level output voltage	V <sub>CC+</sub> = 5 V, V <sub>CC–</sub> = 0, R <sub>L</sub> = 2 kΩ	25°C	0.1	0.3	0.1	0.3	V			
		R <sub>L</sub> = 10 kΩ	25°C	–14.7	–14.3	–14.7	–14.3				
		R <sub>L</sub> = 2 kΩ	Full range‡	–13.5	–13.5						
A <sub>VD</sub>	Large-signal differential voltage amplification	V <sub>O</sub> = ±10 V, R <sub>L</sub> = 2 kΩ	25°C	25	100	25	100	V/mV			
			Full range‡	20	20						
I <sub>OS</sub>	Short-circuit output current	Source: V <sub>ID</sub> = 1 V, V <sub>O</sub> = 0	25°C	–10	–34	–10	–34	mA			
		Sink: V <sub>ID</sub> = –1 V, V <sub>O</sub> = 0		20	27	20	27				
CMRR	Common-mode rejection ratio	V <sub>IC</sub> = V <sub>ICR</sub> (min), R <sub>S</sub> = 50 Ω	25°C	65	97	80	97	dB			
k <sub>SVR</sub>	Supply-voltage rejection ratio (ΔV <sub>CC±</sub> /ΔV <sub>IO</sub> )	V <sub>CC±</sub> = ±13.5 V to ±16.5 V, R <sub>S</sub> = 100 Ω	25°C	70	97	70	97	dB			
I <sub>CC</sub>	Supply current (per channel)	V <sub>O</sub> = 0, No load	25°C	3.5	4.5	3.5	4.5	mA			
			Full range‡	4.5	5.5	4.5	5.5				
		V <sub>CC+</sub> = 5 V, V <sub>O</sub> = 2.5 V, V <sub>CC–</sub> = 0, No load	25°C	3.5	4.5	3.5	4.5				

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

‡ Full range is  $0^\circ\text{C}$  to  $70^\circ\text{C}$  for the TL3474C, TL3474AC devices and  $-40^\circ\text{C}$  to  $105^\circ\text{C}$  for the TL3474I, TL3474AI devices.



# TL3474, TL3474A

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operating characteristics,  $V_{CC\pm} = \pm 15\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS		TL3474			TL3474A			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR+	Positive slew rate	$V_I = -10\text{ V to } 10\text{ V}$ , $R_L = 2\text{ k}\Omega$ , $C_L = 300\text{ pF}$	$A_V = 1$	8	10		8	10		$\text{V}/\mu\text{s}$
SR–	Negative slew rate		$A_V = -1$		13			13		
$t_s$	Settling time	$A_{VD} = -1$ , 10-V step	To 0.1%		1.1			1.1		$\mu\text{s}$
			To 0.01%		2.2			2.2		
$V_n$	Equivalent input noise voltage	$f = 1\text{ kHz}$ ,	$R_S = 100\ \Omega$		49			49		$\text{nV}/\sqrt{\text{Hz}}$
$I_n$	Equivalent input noise current	$f = 1\text{ kHz}$			0.22			0.22		$\text{pA}/\sqrt{\text{Hz}}$
THD	Total harmonic distortion	$V_{O(PP)} = 2\text{ V to } 20\text{ V}$ , $R_L = 2\text{ k}\Omega$ , $A_{VD} = 10$ , $f = 10\text{ kHz}$			0.02			0.02		%
GBW	Gain-bandwidth product	$f = 100\text{ kHz}$		3	4		3	4		MHz
BW	Power bandwidth	$V_{O(PP)} = 20\text{ V}$ , $R_L = 2\text{ k}\Omega$ , $A_{VD} = 1$ , THD = 5.0%			160			160		kHz
$\phi_m$	Phase margin	$R_L = 2\text{ k}\Omega$ ,	$C_L = 0$		70			70		deg
		$R_L = 2\text{ k}\Omega$ ,	$C_L = 300\text{ pF}$		50			50		
	Gain margin	$R_L = 2\text{ k}\Omega$ ,	$C_L = 0$		12			12		dB
		$R_L = 2\text{ k}\Omega$ ,	$C_L = 300\text{ pF}$		4			4		
$r_i$	Differential input resistance	$V_{IC} = 0$			150			150		$\text{M}\Omega$
$C_i$	Input capacitance	$V_{IC} = 0$			2.5			2.5		pF
	Channel separation	$f = 10\text{ kHz}$			101			101		dB
$z_o$	Open-loop output impedance	$f = 1\text{ MHz}$ ,	$A_V = 1$		20			20		$\Omega$

# TL3474, TL3474A HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

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## TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

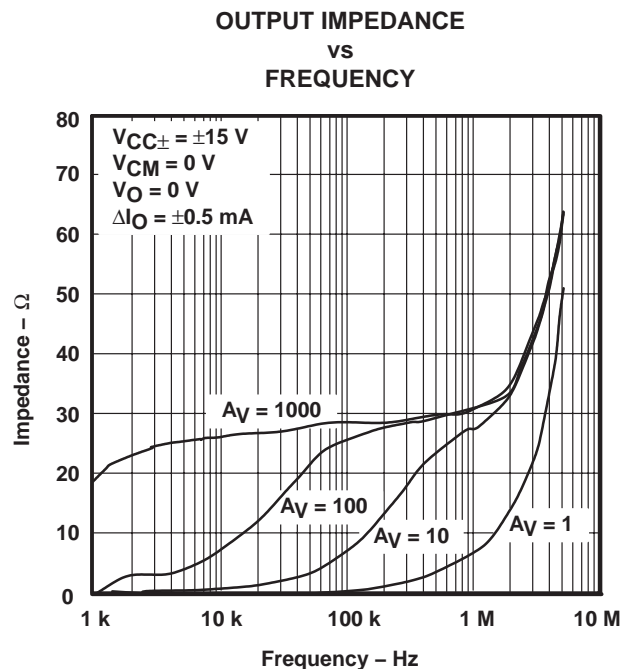


Figure 1

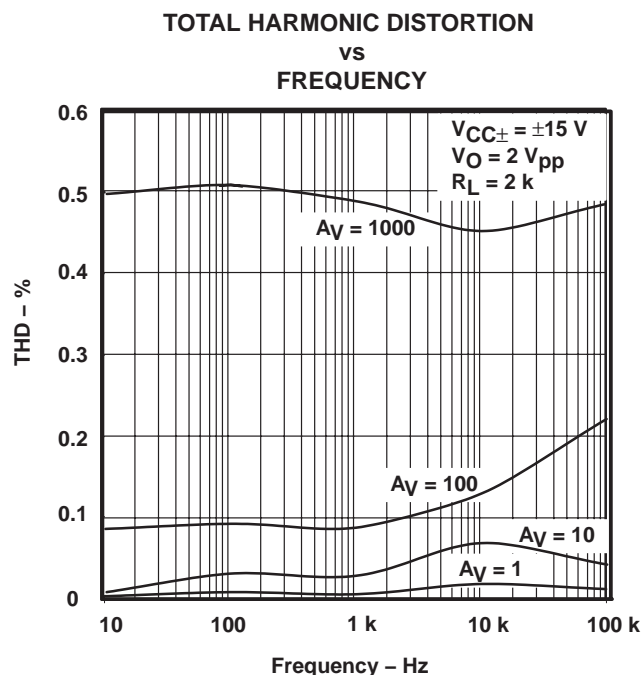


Figure 2

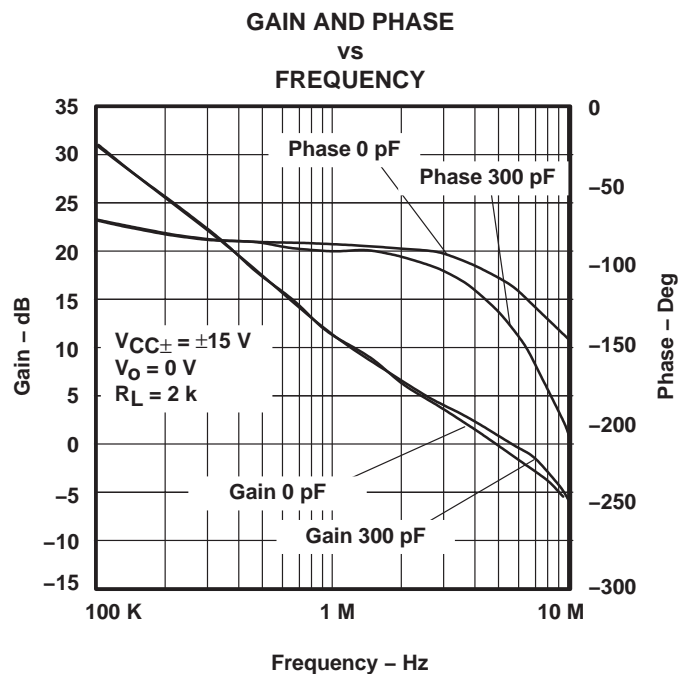


Figure 3

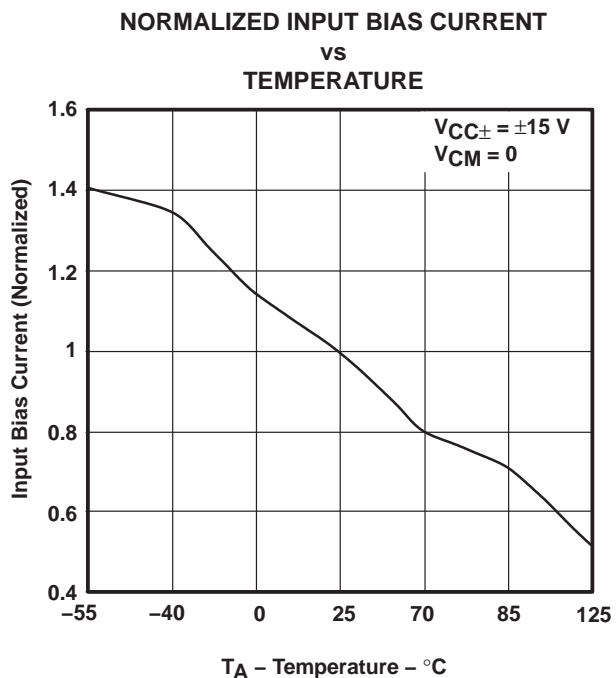


Figure 4

**TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

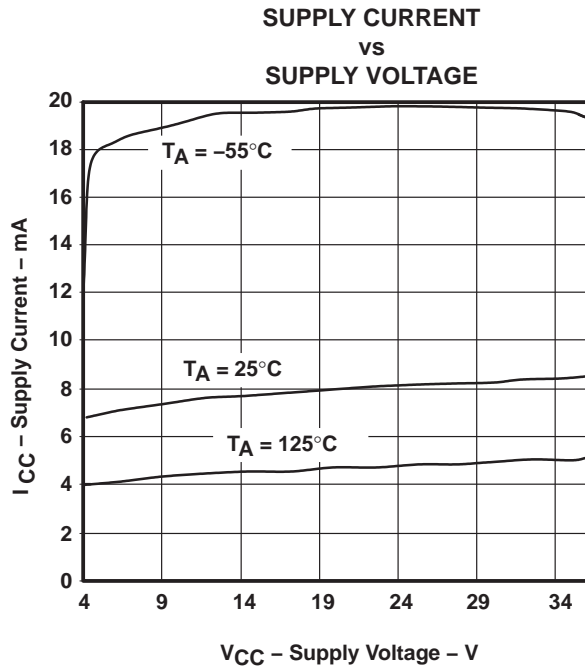


Figure 5

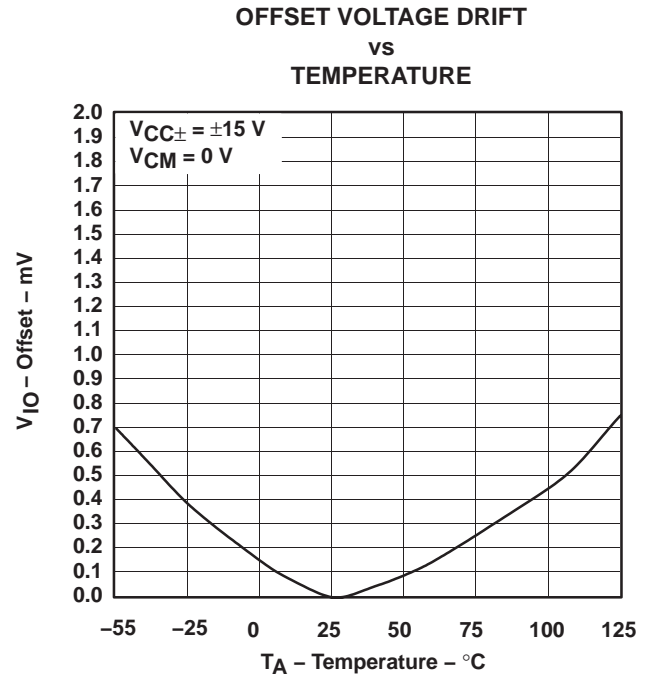


Figure 6

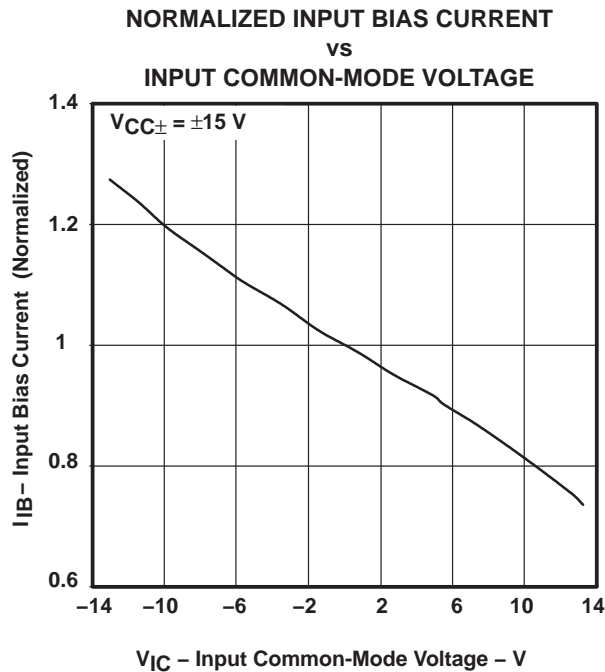


Figure 7

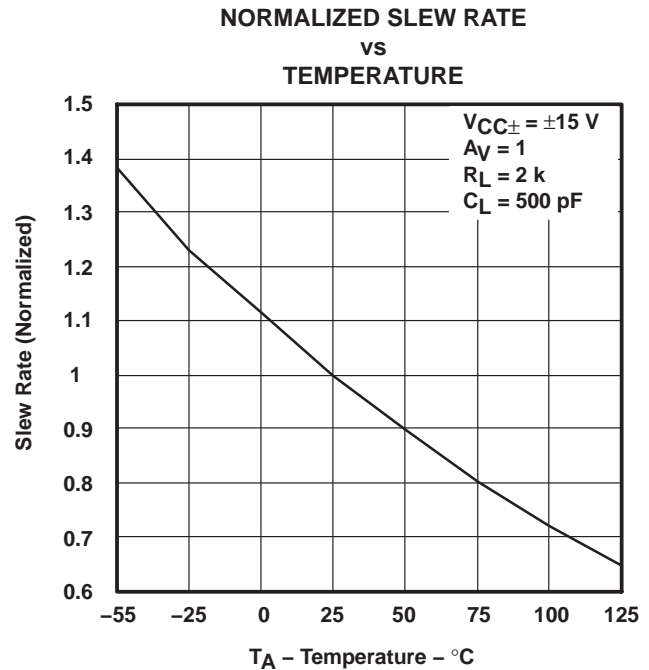


Figure 8

# TL3474, TL3474A HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

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## TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

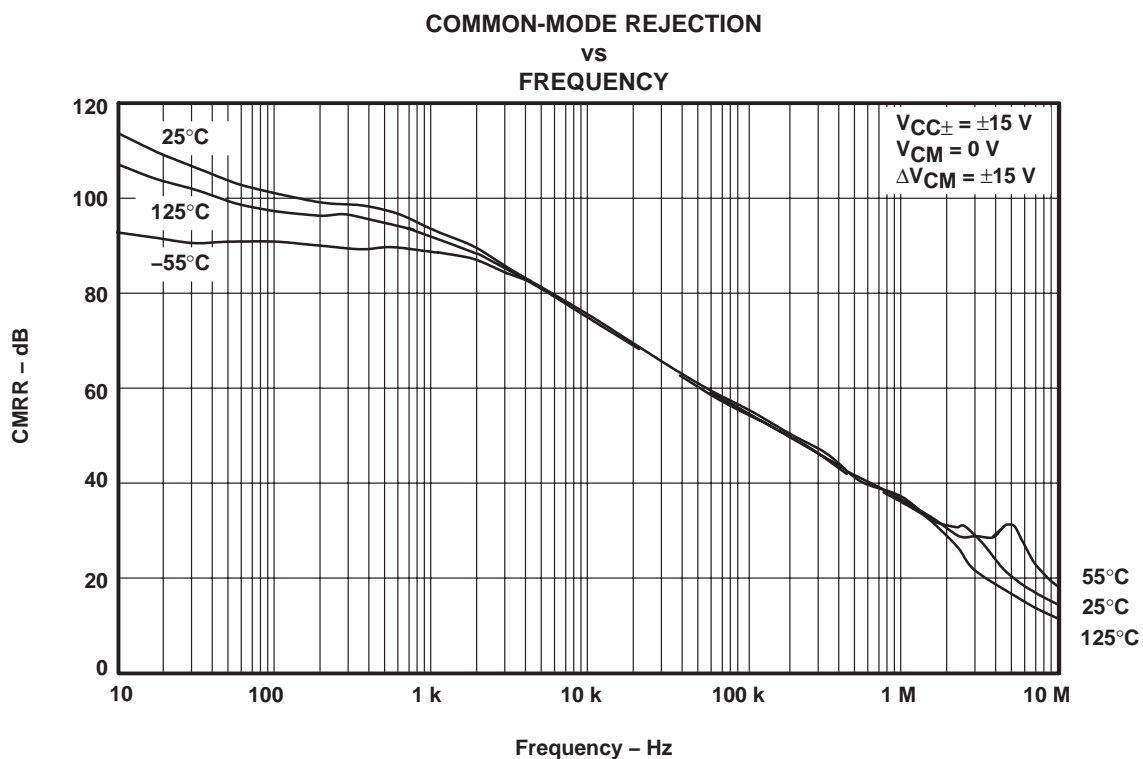


Figure 9

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
TL3474ACD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACDE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACDRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TL3474ACNE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TL3474ACPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACPWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACPWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ACPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AID	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AIDE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AIDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AIDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AIDRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AIDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AIN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TL3474AINE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TL3474AIPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AIPWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AIPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
TL3474AIPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AIPWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474AIPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CDE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CDRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TL3474CNE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TL3474CPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CPWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CPWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474CPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474ID	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474IDE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474IDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474IDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474IDRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474IDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474IN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TL3474INE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TL3474IPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
TL3474IPWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474IPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474IPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474IPWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3474IPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> 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.

<sup>(2)</sup> 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.

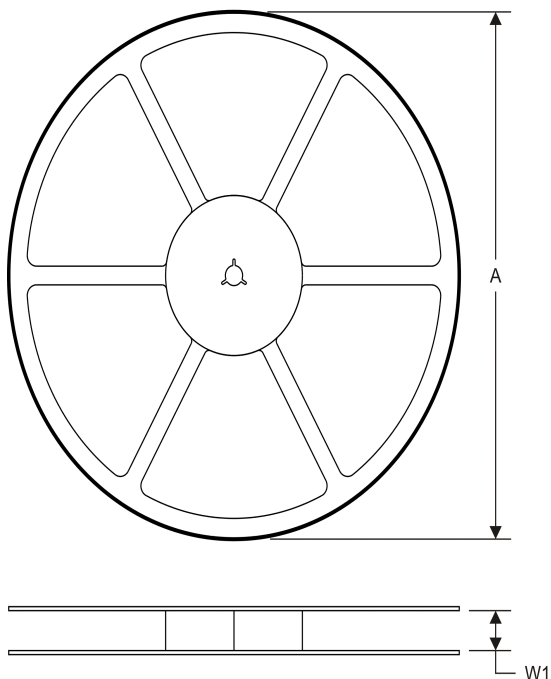
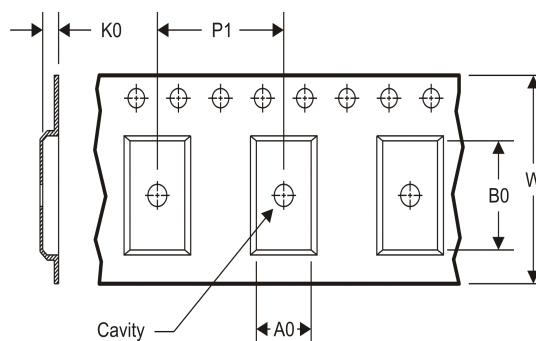
**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**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)

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

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**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


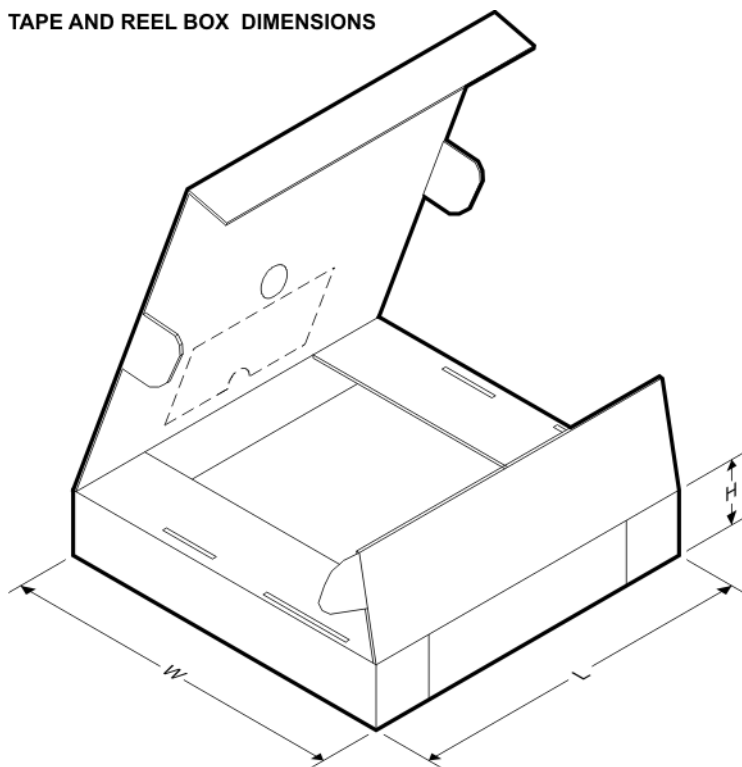
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

**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
TL3474ACDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TL3474ACPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
TL3474AIDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TL3474AIPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
TL3474CDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TL3474CPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
TL3474IDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TL3474IPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

## TAPE AND REEL BOX DIMENSIONS



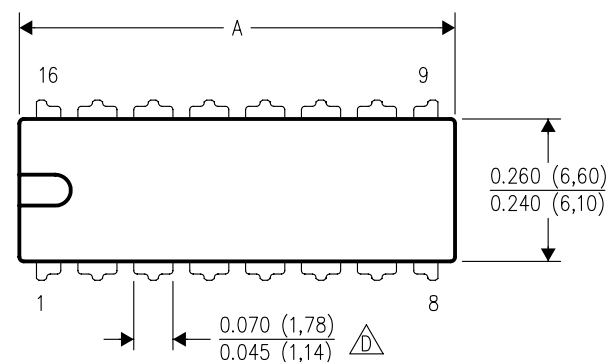
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TL3474ACDR	SOIC	D	14	2500	333.2	345.9	28.6
TL3474ACPWR	TSSOP	PW	14	2000	367.0	367.0	35.0
TL3474AIDR	SOIC	D	14	2500	333.2	345.9	28.6
TL3474AIPWR	TSSOP	PW	14	2000	367.0	367.0	35.0
TL3474CDR	SOIC	D	14	2500	333.2	345.9	28.6
TL3474CPWR	TSSOP	PW	14	2000	367.0	367.0	35.0
TL3474IDR	SOIC	D	14	2500	333.2	345.9	28.6
TL3474IPWR	TSSOP	PW	14	2000	367.0	367.0	35.0

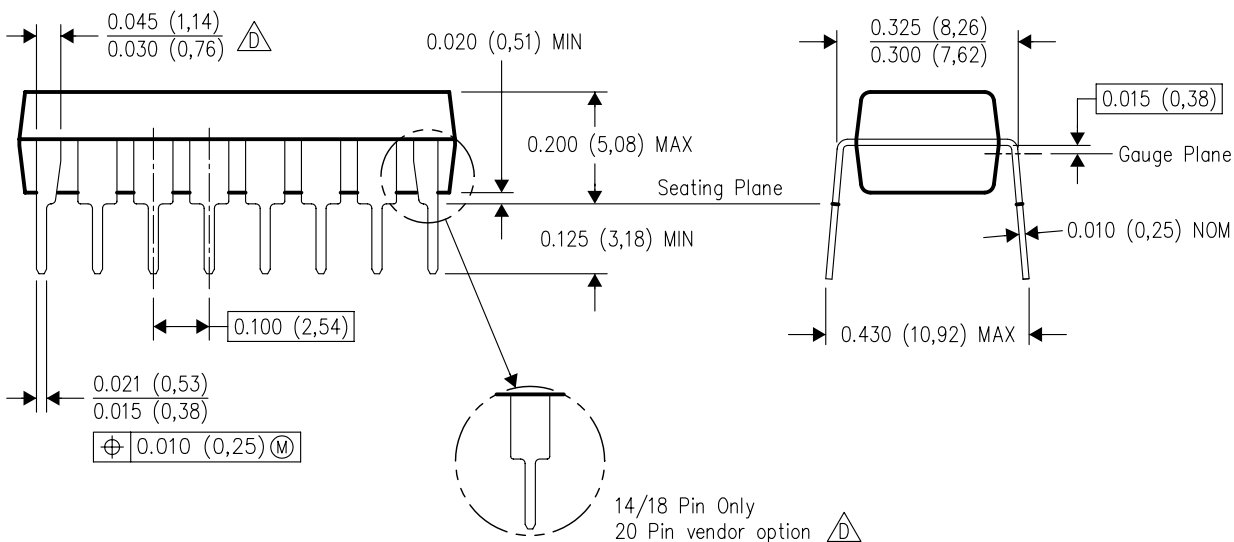
N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE





PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



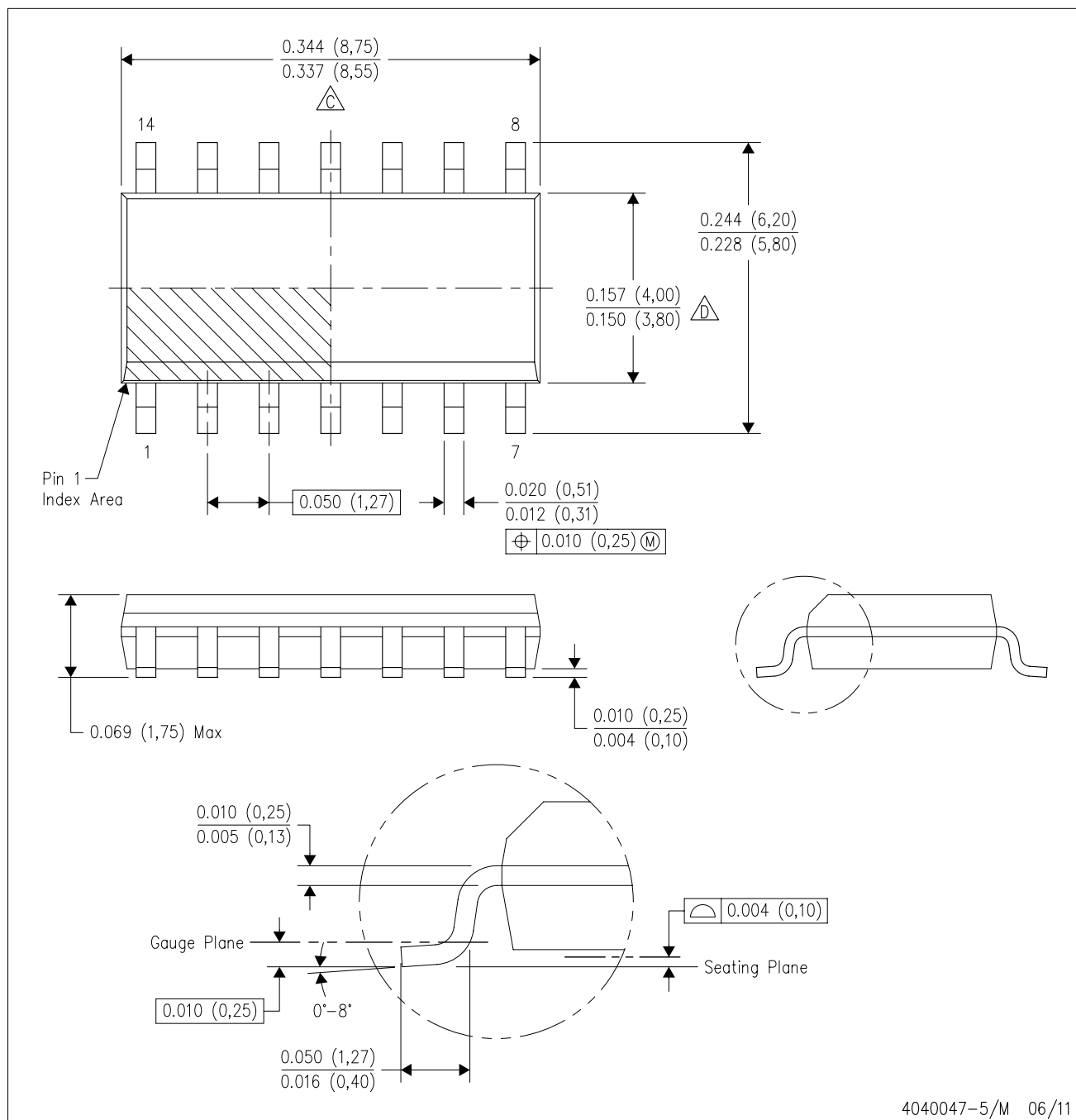
4040049/E 12/2002

NOTES:

- A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.
-  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).  
 The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



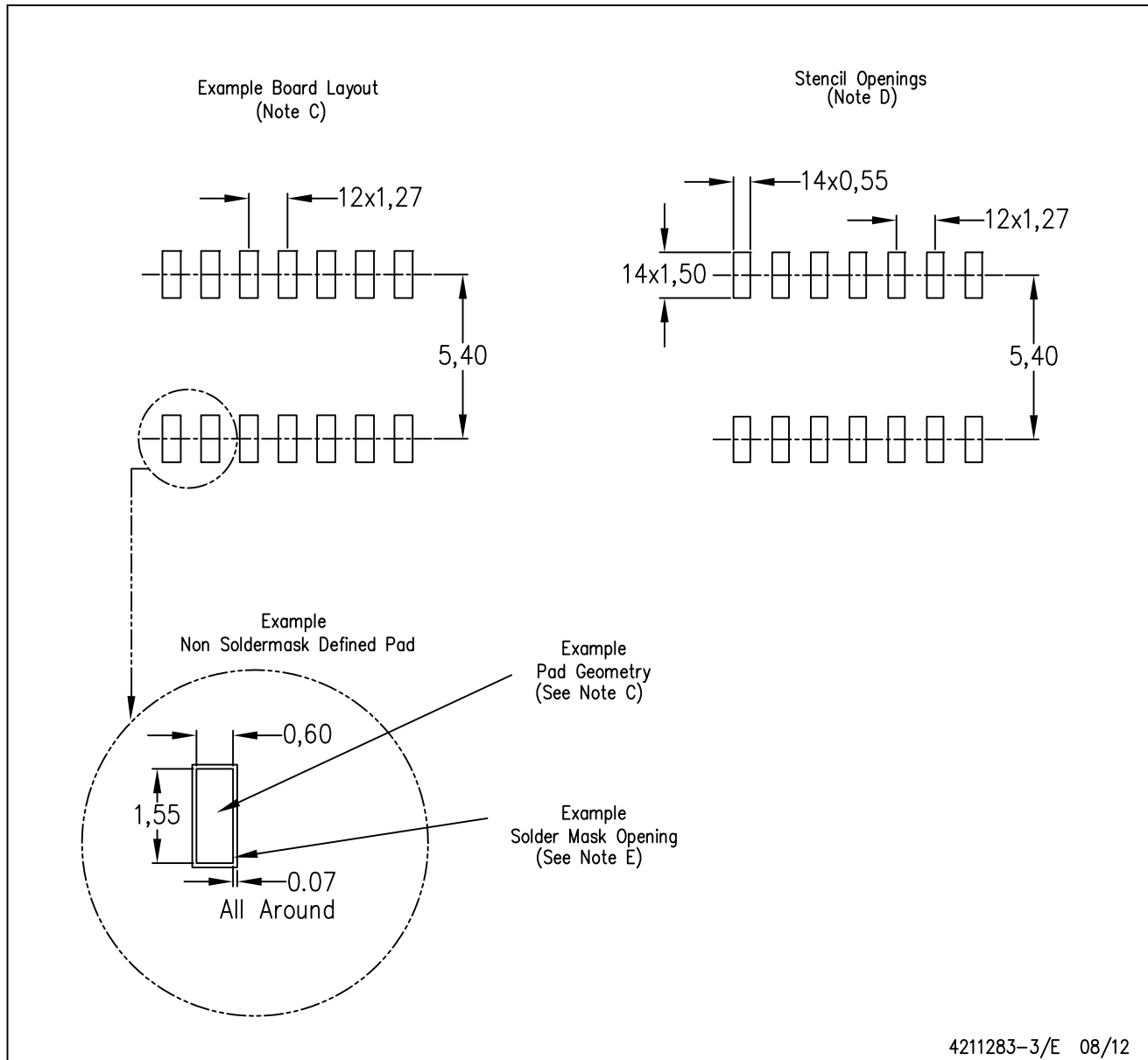
4040047-5/M 06/11

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)

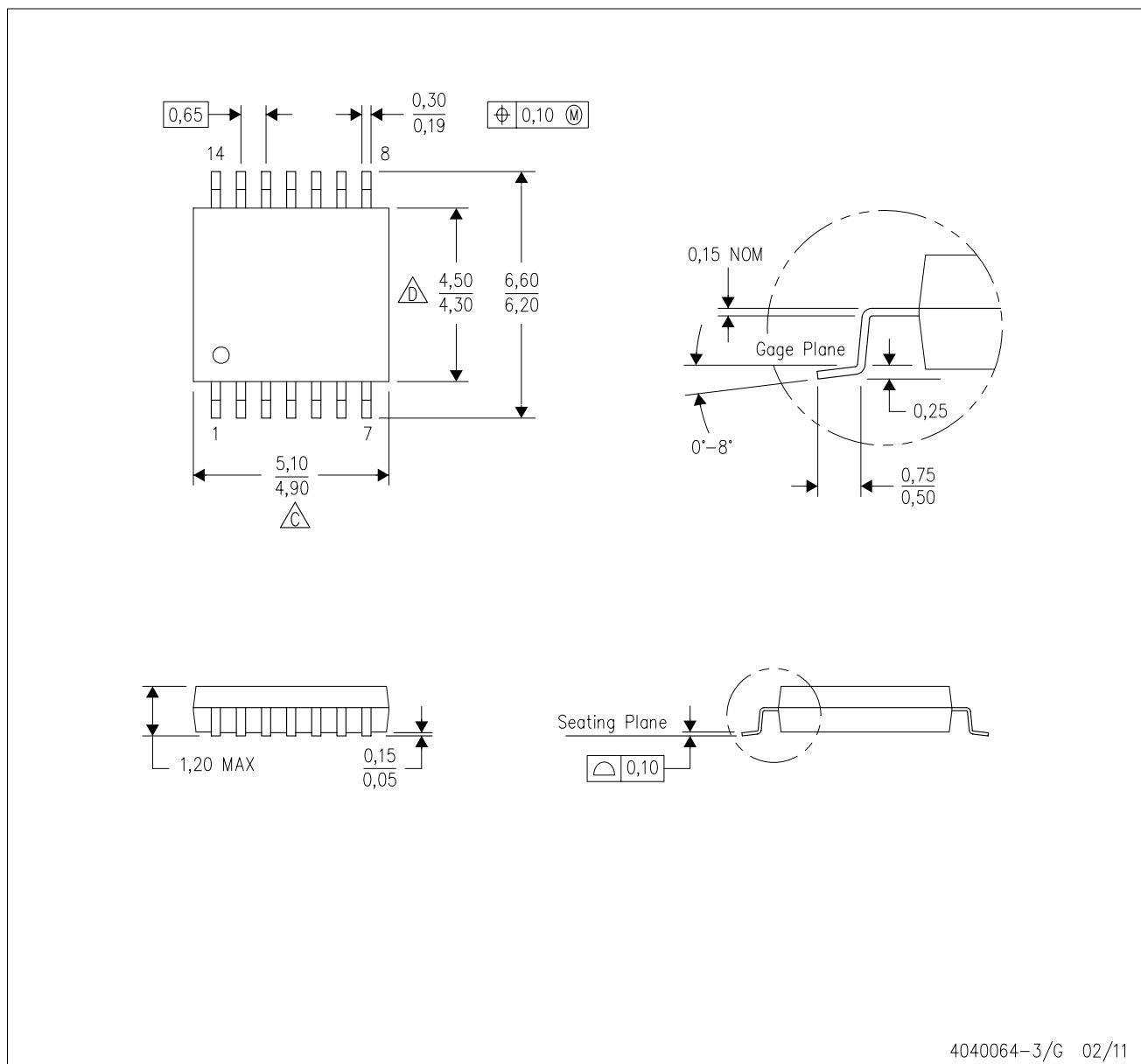
PLASTIC SMALL OUTLINE



- 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)

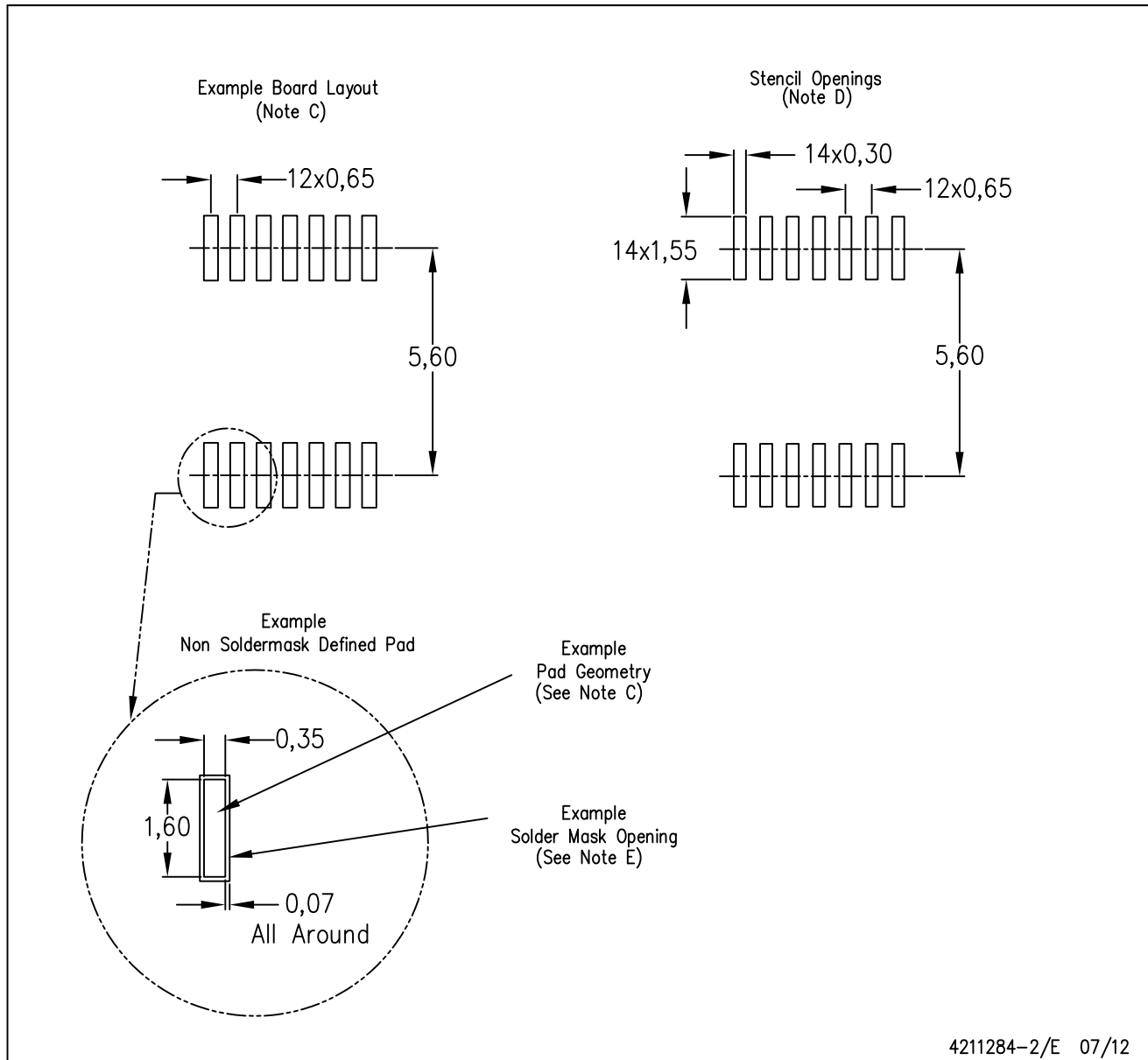
PLASTIC SMALL OUTLINE



- 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

PW (R-PDSO-G14)

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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