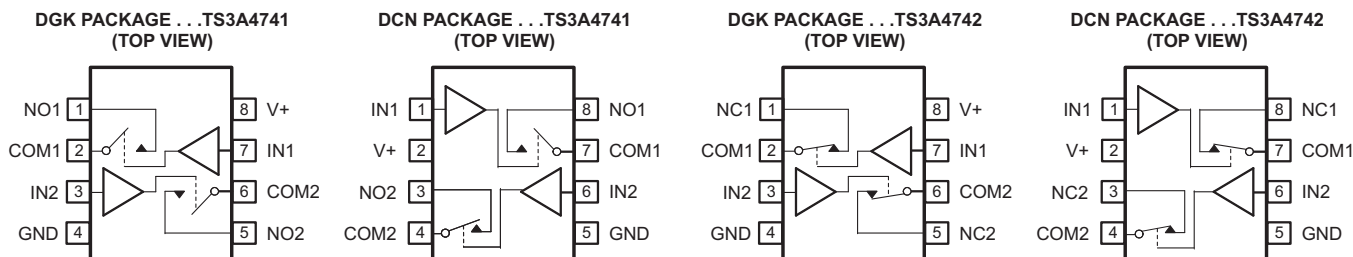


FEATURES

- Low ON-State Resistance (r_{on})
 - 0.9 Ω Max (3-V Supply)
 - 1.5 Ω Max (1.8-V Supply)
- 0.4-Ω Max r_{on} Flatness (3-V Supply)
- 1.6-V to 3.6-V Single-Supply Operation
- Available in SOT-23 and MSOP Packages
- High Current-Handling Capacity (100 mA Continuous)
- 1.8-V CMOS Logic Compatible (3-V Supply)
- Fast Switching: $t_{ON} = 14$ ns, $t_{OFF} = 9$ ns

APPLICATIONS

- Power Routing
- Battery-Powered Systems
- Audio and Video Signal Routing
- Low-Voltage Data-Acquisition Systems
- Communications Circuits
- PCMCIA Cards
- Cellular Phones
- Modems
- Hard Drives



DESCRIPTION/ORDERING INFORMATION

The TS3A4741/TS3A4742 are low ON-state resistance (r_{on}), low-voltage, dual single-pole/single-throw (SPST) analog switches that operate from a single 1.6-V to 3.6-V supply. These devices have fast switching speeds, handle rail-to-rail analog signals, and consume very low quiescent power.

The digital logic input is 1.8-V CMOS compatible when using a single 3-V supply.

The TS3A4741 has two normally open (NO) switches, and the TS3A4742 has two normally closed (NC) switches. Both devices are available in 8-pin SOT-23 and MSOP packages.

ORDERING INFORMATION

T_A	PACKAGE ⁽¹⁾⁽²⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	MSOP – DGK	Reel of 2500	TS3A4741DGKR	JYR
			TS3A4742DGKR	L7R
	SOT-23 – DCN	Reel of 3000	TS3A4741DCNR	8BLR
			TS3A4742DCNR	8BPR

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

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

FUNCTION TABLE

IN	NO TO COM, COM TO NO (TS3A4741)	NC TO COM, COM TO NC (TS3A4742)
L	OFF	ON
H	ON	OFF



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.

TS3A4741, TS3A4742

0.9-Ω LOW-VOLTAGE SINGLE-SUPPLY

DUAL SPST ANALOG SWITCHES

SCDS228D–AUGUST 2006–REVISED JANUARY 2008



ABSOLUTE MINIMUM AND MAXIMUM RATINGS⁽¹⁾

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

		MIN	MAX	UNIT
V_+	Supply voltage reference to GND ⁽²⁾	−0.3	4	V
V_{NO} V_{COM} V_{IN}	Analog and digital voltage range	−0.3	$V_+ + 0.3$	V
I_{NO} I_{COM}	On-state switch current $V_{NO}, V_{COM} = 0$ to V_+	−100	100	mA
I_+ I_{GND}	Continuous current through V_+ or GND		±100	mA
	Peak current pulsed at 1 ms, 10% duty cycle COM, V_{NO}, V_{COM}		±200	mA
T_A	Operating temperature range	−40	85	°C
T_J	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) Signals on COM or NO exceeding V_+ or GND are clamped by internal diodes. Limit forward diode current to maximum current rating.

PACKAGE THERMAL IMPEDANCE

			UNIT
θ_{JA}	Package thermal impedance ⁽¹⁾	DCN package	88
		DGK package	88

- (1) The package thermal impedance is measured in accordance with JESD 51-7.

ELECTRICAL CHARACTERISTICS FOR 3-V SUPPLY⁽¹⁾⁽²⁾
 $V_+ = 2.7\text{ V to }3.6\text{ V}$, $T_A = -40^\circ\text{C to }85^\circ\text{C}$, $V_{IH} = 1.4\text{ V}$, $V_{IL} = 0.5\text{ V}$ (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T _A	MIN	TYP ⁽³⁾	MAX	UNIT
Analog Switch								
Analog signal range	V _{COM} , V _{NO}				0		V ₊	V
ON-state resistance	r _{on}	V ₊ = 2.7 V, I _{COM} = −100 mA, V _{NO} = 1.5 V		25°C	0.7	0.9		Ω
				Full	1.1			
ON-state resistance match between channels ⁽⁴⁾	Δr _{on}	V ₊ = 2.7 V, I _{COM} = −100 mA, V _{NO} = 1.5 V		25°C	0.03	0.05		Ω
				Full	0.15			
ON-state resistance flatness ⁽⁵⁾	r _{on(flat)}	V ₊ = 2.7 V, I _{COM} = −100 mA, V _{NO} = 1 V, 1.5 V, 2 V		25°C	0.23	0.4		Ω
				Full	0.5			
NO OFF leakage current ⁽⁶⁾	I _{NO(OFF)}	V ₊ = 3.6 V, V _{COM} = 0.3 V, 3 V, V _{NO} = 3 V, 0.3 V		25°C	−2	1	2	nA
				Full	−18	18		
COM OFF leakage current ⁽⁶⁾	I _{COM(OFF)}	V ₊ = 3.6 V, V _{COM} = 0.3 V, 3 V, V _{NO} = 3 V, 0.3 V		25°C	−2	1	2	nA
				Full	−18	18		
COM ON leakage current ⁽⁶⁾	I _{COM(ON)}	V ₊ = 3.6 V, V _{COM} = 0.3 V, 3 V, V _{NO} = 0.3 V, 3 V, or floating		25°C	−2.5	0.01	2.5	nA
				Full	−5	5		
Dynamic								
Turn-on time	t _{ON}	V _{NO} = 1.5 V, R _L = 50 Ω, C _L = 35 pF, See Figure 14		25°C	5	14		ns
				Full	15			
Turn-off time	t _{OFF}	V _{NO} = 1.5 V, R _L = 50 Ω, C _L = 35 pF, See Figure 14		25°C	4	9		ns
				Full	10			
Charge injection	Q _C	V _{GEN} = 0, R _{GEN} = 0, C _L = 1 nF, See Figure 15		25°C	3			pC
NO OFF capacitance	C _{NO(OFF)}	f = 1 MHz, See Figure 16		25°C	23			pF
COM OFF capacitance	C _{COM(OFF)}	f = 1 MHz, See Figure 16		25°C	20			pF
COM ON capacitance	C _{COM(ON)}	f = 1 MHz, See Figure 16		25°C	43			pF
Bandwidth	BW	R _L = 50 Ω, Switch ON		25°C	125			MHz
OFF isolation ⁽⁷⁾	O _{ISO}	R _L = 50 Ω, C _L = 5 pF, See Figure 17	f = 10 MHz	25°C	−40			dB
			f = 1 MHz		−62			
Crosstalk	X _{TALK}	R _L = 50 Ω, C _L = 5 pF, See Figure 17	f = 10 MHz	25°C	−73			dB
			f = 1 MHz		−95			
Total harmonic distortion	THD	f = 20 Hz to 20 kHz, V _{COM} = 2 V _{P-P}	R _L = 32 Ω	25°C	0.04			%
			R _L = 600 Ω		0.003			
Digital Control Inputs (IN1, IN2)								
Input logic high	V _{IH}			Full	1.4			V
Input logic low	V _{IL}			Full		0.5		V
Input leakage current	I _{IN}	V _I = 0 or V ₊		25°C	0.5	1		nA
				Full	−20	20		
Supply								
Power-supply range	V ₊				2.7	3.6		V
Positive-supply current	I ₊	V ₊ = 3.6 V, V _{IN} = 0 or V ₊		25°C		0.075		μA
				Full	0.75			

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

(2) Parts are tested at 85°C and specified by design and correlation over the full temperature range.

(3) Typical values are at $V_+ = 3\text{ V}$, $T_A = 25^\circ\text{C}$.

(4) $\Delta r_{on} = r_{on(max)} - r_{on(min)}$

(5) Flatness is defined as the difference between the maximum and minimum value of r_{on} as measured over the specified analog signal ranges.

(6) Leakage parameters are 100% tested at the maximum-rated hot operating temperature and specified by correlation at $T_A = 25^\circ\text{C}$.

(7) OFF isolation = $20\log_{10}(V_{COM}/V_{NO})$, V_{COM} = output, V_{NO} = input to OFF switch

TS3A4741, TS3A4742

0.9-Ω LOW-VOLTAGE SINGLE-SUPPLY

DUAL SPST ANALOG SWITCHES

SCDS228D—AUGUST 2006—REVISED JANUARY 2008

ELECTRICAL CHARACTERISTICS FOR 1.8-V SUPPLY⁽¹⁾⁽²⁾

$V_+ = 1.65\text{ V}$ to 1.95 V , $T_A = -40^\circ\text{C}$ to 85°C , $V_{IH} = 1\text{ V}$, $V_{IL} = 0.4\text{ V}$ (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T _A	MIN	TYP ⁽³⁾	MAX	UNIT
Analog Switch								
Analog signal range	V _{COM} , V _{NO}				0		V ₊	V
ON-state resistance	r _{on}	V ₊ = 1.8 V, I _{COM} = −10 mA, V _{NO} = 0.9 V		25°C	1		1.5	Ω
				Full			2	
ON-state resistance match between channels ⁽⁴⁾	Δr _{on}	V ₊ = 1.8 V, I _{COM} = −10 mA, V _{NO} = 0.9 V		25°C	0.09		0.15	Ω
				Full			0.25	
ON-state resistance flatness ⁽⁵⁾	r _{on(flat)}	V ₊ = 1.8 V, I _{COM} = −10 mA, 0 ≤ V _{NO} ≤ V ₊		25°C	0.7		0.9	Ω
				Full			1.5	
NO OFF leakage current ⁽⁶⁾	I _{NO(OFF)}	V ₊ = 1.95 V, V _{COM} = 0.15 V, 1.65 V, V _{NO} = 1.8 V, 0.15 V		25°C	−1	0.5	1	nA
				Full	−10		10	
COM OFF leakage current ⁽⁶⁾	I _{COM(OFF)}	V ₊ = 1.95 V, V _{COM} = 0.15 V, 1.65 V, V _{NO} = 1.8 V, 0.15 V		25°C	−1	0.5	1	nA
				Full	−10		10	
COM ON leakage current ⁽⁶⁾	I _{COM(ON)}	V ₊ = 1.95 V, V _{COM} = 0.15 V, 1.65 V, V _{NO} = 0.15 V, 1.65 V, or floating		25°C	−1	0.01	1	nA
				Full	−3		3	
Dynamic								
Turn-on time	t _{ON}	V _{NO} = 1.5 V, R _L = 50 Ω, C _L = 35 pF, See Figure 14		25°C	6		18	ns
				Full			20	
Turn-off time	t _{OFF}	V _{NO} = 1.5 V, R _L = 50 Ω, C _L = 35 pF, See Figure 14		25°C	5		10	ns
				Full			12	
Charge injection	Q _C	V _{GEN} = 0, R _{GEN} = 0, C _L = 1 nF, See Figure 15		25°C		3.2		pC
NO OFF capacitance	C _{NO(OFF)}	f = 1 MHz, See Figure 16		25°C		23		pF
COM OFF capacitance	C _{COM(OFF)}	f = 1 MHz, See Figure 16		25°C		20		pF
COM ON capacitance	C _{COM(ON)}	f = 1 MHz, See Figure 16		25°C		43		pF
Bandwidth	BW	R _L = 50 Ω, Switch ON		25°C		123		MHz
OFF isolation ⁽⁷⁾	O _{ISO}	R _L = 50 Ω, C _L = 5 pF, See Figure 17	f = 10 MHz	25°C		−61		dB
			f = 100 MHz				−36	
Crosstalk	X _{TALK}	R _L = 50 Ω, C _L = 5 pF, See Figure 17	f = 10 MHz	25°C		−95		dB
			f = 100 MHz				−73	
Total harmonic distortion	THD	f = 20 Hz to 20 kHz, V _{COM} = 2 V _{P-P}	R _L = 32 Ω	25°C		0.14		%
			R _L = 600 Ω				0.013	
Digital Control Inputs (IN1, IN2)								
Input logic high	V _{IH}			Full	1			V
Input logic low	V _{IL}			Full			0.4	V
Input leakage current	I _{IN}	V _I = 0 or V ₊		25°C		0.1	5	nA
				Full	−10		10	
Supply								
Power-supply range	V ₊				1.65		1.95	V
Positive-supply current	I ₊	V _I = 0 or V ₊		25°C			0.05	μA
				Full			0.5	

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

(2) Parts are tested at 85°C and specified by design and correlation over the full temperature range.

(3) Typical values are at $T_A = 25^\circ\text{C}$.

(4) $\Delta r_{on} = r_{on(max)} - r_{on(min)}$

(5) Flatness is defined as the difference between the maximum and minimum value of r_{on} as measured over the specified analog signal ranges.

(6) Leakage parameters are 100% tested at the maximum-rated hot operating temperature and specified by correlation at $T_A = 25^\circ\text{C}$.

(7) OFF isolation = $20_{\log 10} (V_{COM}/V_{NO})$, V_{COM} = output, V_{NO} = input to OFF switch

TYPICAL PERFORMANCE

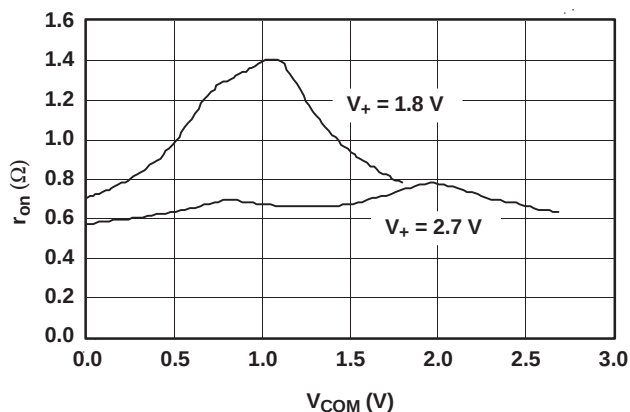


Figure 1. r_{on} vs V_{COM}

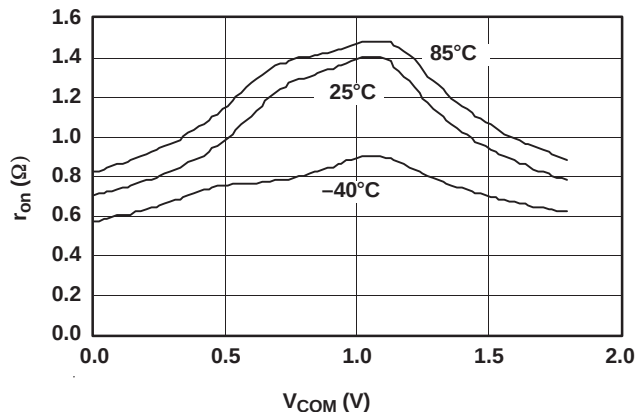


Figure 2. r_{on} vs V_{COM} ($V_+ = 1.8$ V)

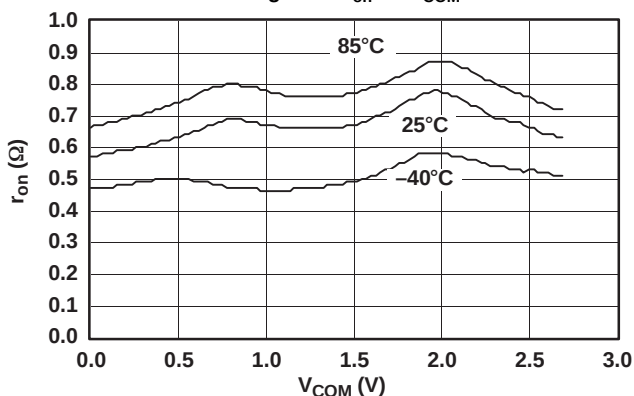


Figure 3. r_{on} vs V_{COM} ($V_+ = 2.7$ V)

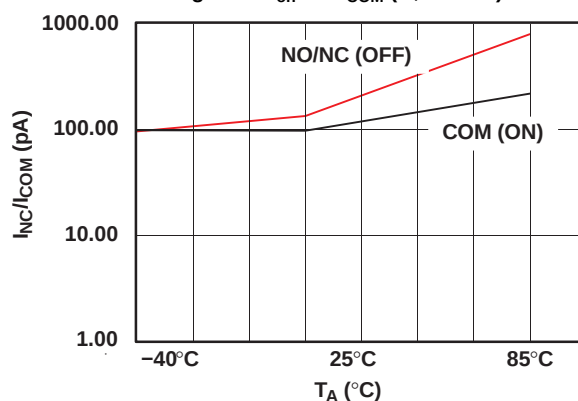


Figure 4. I_{ON} and I_{OFF} vs Temperature
($V_+ = 3.6$ V)

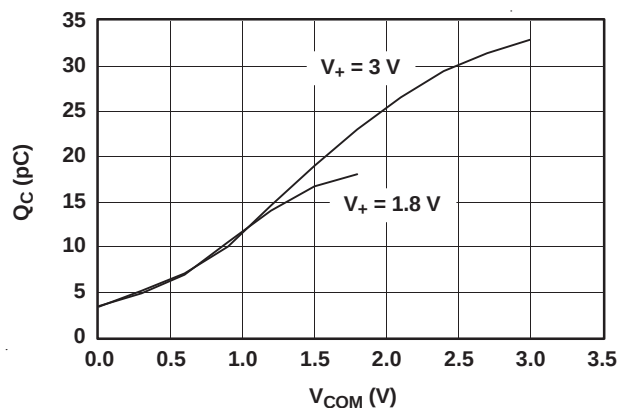


Figure 5. Q_C vs V_{COM}

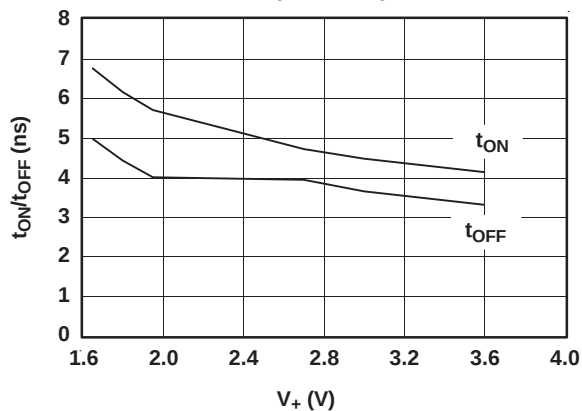


Figure 6. t_{ON} and t_{OFF} vs Supply Voltage

TYPICAL PERFORMANCE (continued)

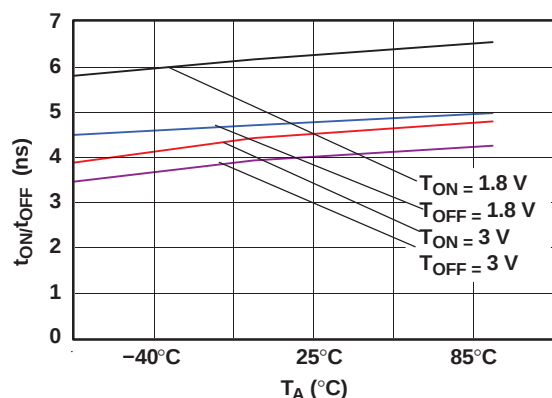


Figure 7. t_{ON} and t_{OFF} vs Temperature

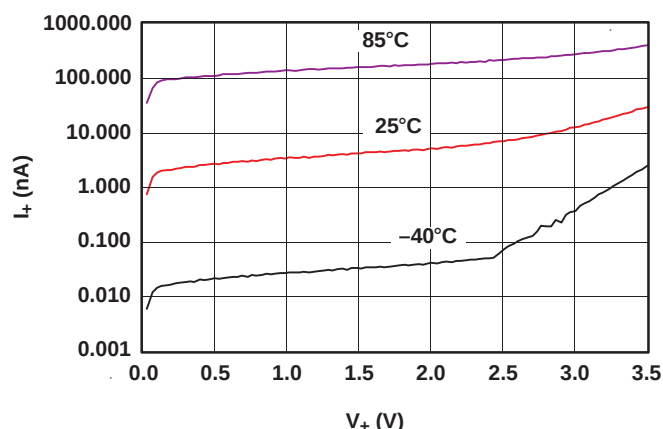


Figure 8. I_+ vs V_+

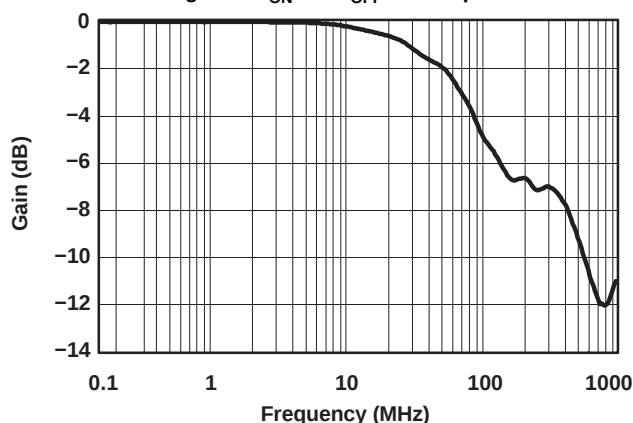


Figure 9. Gain vs Frequency ($V_+ = 3\text{ V}$)

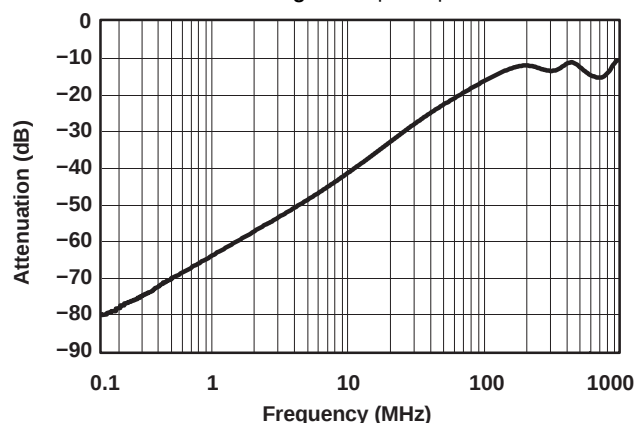


Figure 10. OFF Isolation vs Frequency ($V_+ = 3\text{ V}$)

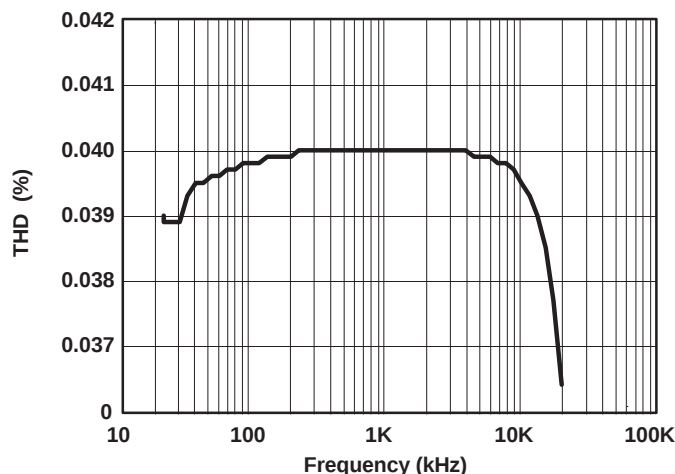


Figure 11. Total Harmonic Distortion vs Frequency ($R_L = 32\ \Omega$)

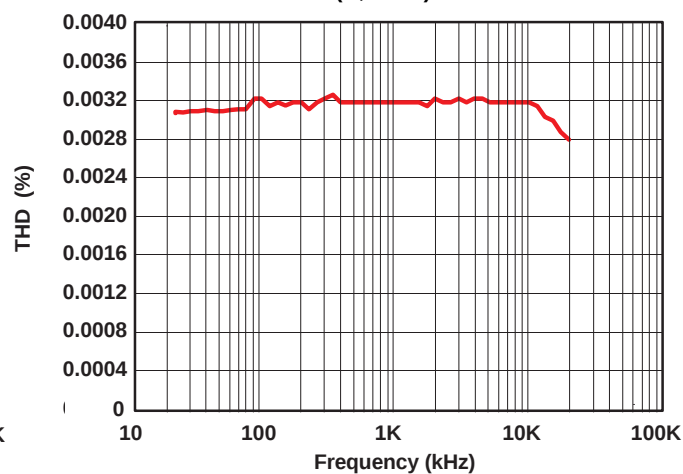


Figure 12. Total Harmonic Distortion vs Frequency ($R_L = 600\ \Omega$)

TYPICAL PERFORMANCE (continued)

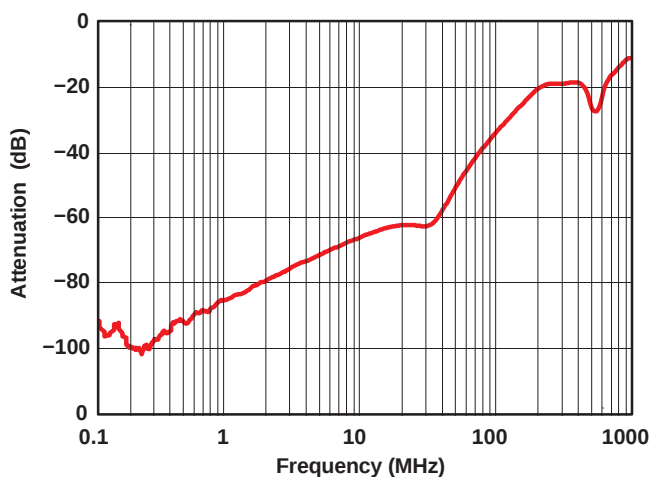


Figure 13. Crosstalk vs Frequency
($V_+ = 3\text{ V}$)

PIN DESCRIPTION

PIN NO.				NAME	DESCRIPTION
TS3A4741		TS3A4742			
MSOP (DGK)	SOT-23 (DCN)	MSOP (DGK)	SOT-23 (DCN)		
2, 6	7, 4	2, 6	7, 4	COM1, COM2	Common
4	5	4	5	GND	Digital ground
7, 3	1, 6	7, 3	1, 6	IN1, IN2	Digital control to connect COM to NO or NC
		1, 5	8, 3	NC1, NC2	Normally closed
1, 5	8, 3			NO1, NO2	Normally open
8	2	8	2	V ₊	Power supply

APPLICATION INFORMATION

Proper power-supply sequencing is recommended for all CMOS devices. Do not exceed the absolute maximum ratings, because stresses beyond the listed ratings can cause permanent damage to the device. Always sequence V_+ on first, followed by NO, NC, or COM.

Although it is not required, power-supply bypassing improves noise margin and prevents switching noise propagation from the V_+ supply to other components. A 0.1- μ F capacitor, connected from V_+ to GND, is adequate for most applications.

Logic Inputs

The TS3A4741 logic inputs can be driven up to 3.6 V, regardless of the supply voltage. For example, with a 1.8-V supply, IN may be driven low to GND and high to 3.6 V. Driving IN rail to rail minimizes power consumption.

Analog Signal Levels

Analog signals that range over the entire supply voltage (V_+ to GND) can be passed with very little change in r_{on} (see Typical Operating Characteristics). The switches are bidirectional, so the NO, NC, and COM pins can be used as either inputs or outputs.

Layout

High-speed switches require proper layout and design procedures for optimum performance. Reduce stray inductance and capacitance by keeping traces short and wide. Ensure that bypass capacitors are as close to the device as possible. Use large ground planes where possible.

PARAMETER MEASUREMENT INFORMATION

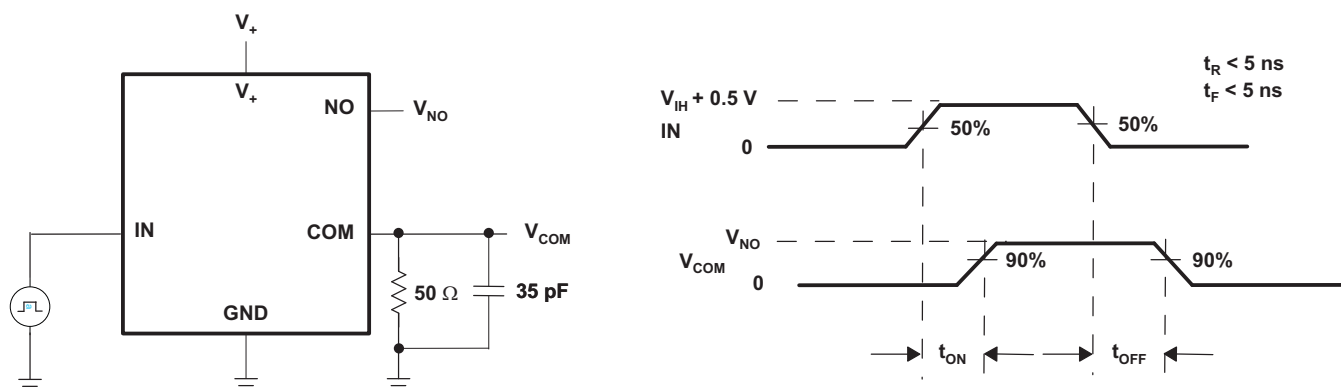


Figure 14. Switching Times

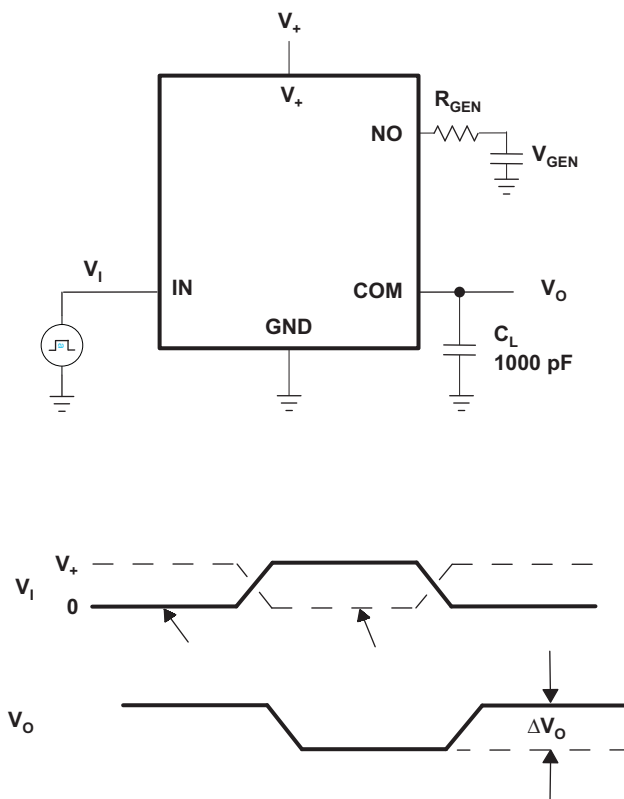


Figure 15. Charge Injection (Q_C)

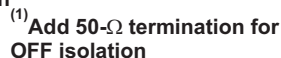
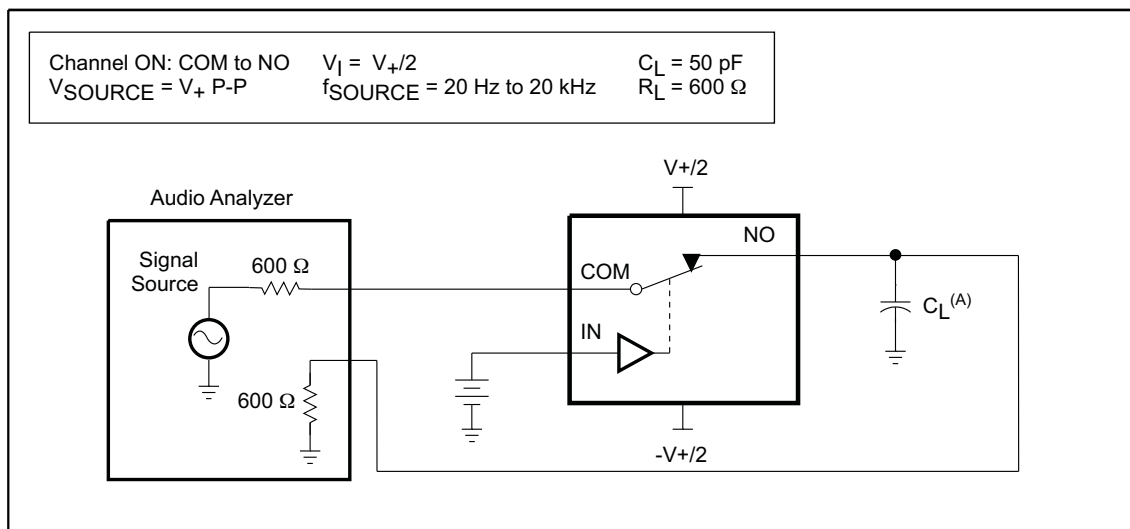


Figure 17. OFF Isolation, Bandwidth, and Crosstalk

PARAMETER MEASUREMENT INFORMATION (continued)



A. C_L includes probe and jig capacitance.

Figure 18. Total Harmonic Distortion (THD)

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
TS3A4741DCNR	ACTIVE	SOT-23	DCN	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(8BLO ~ 8BLR)	Samples
TS3A4741DGKR	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	JYR	Samples
TS3A4741DGKRG4	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	JYR	Samples
TS3A4742DCNR	ACTIVE	SOT-23	DCN	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	8BPR	Samples
TS3A4742DGKR	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	L7R	Samples
TS3A4742DGKRG4	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	L7R	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)

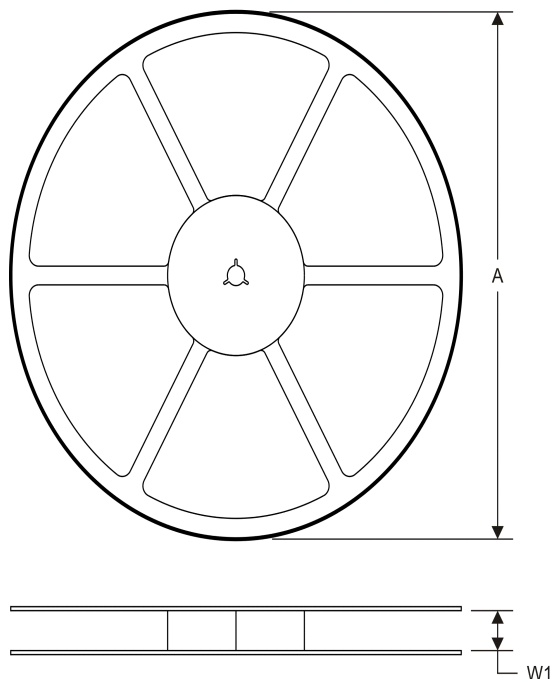
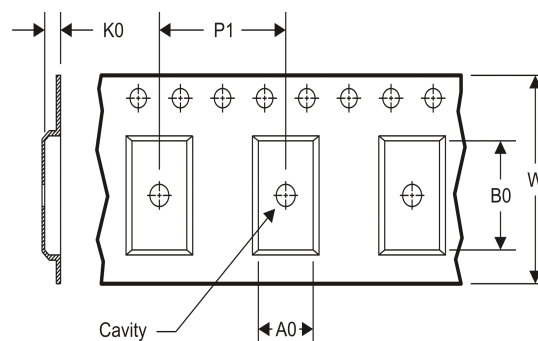
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(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.

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TAPE AND REEL INFORMATION
REEL DIMENSIONS

TAPE DIMENSIONS


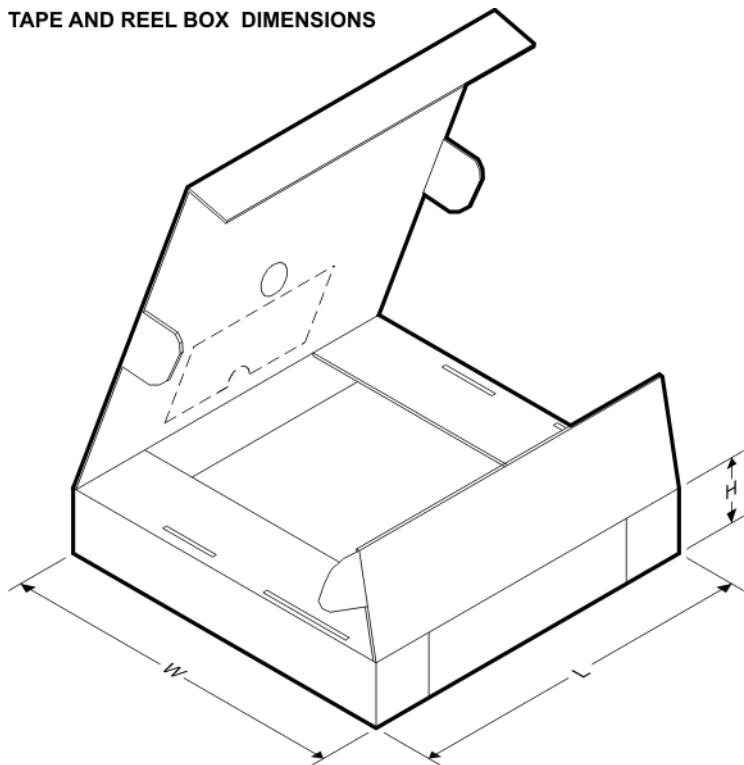
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

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
TS3A4741DCNR	SOT-23	DCN	8	3000	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
TS3A4741DGKR	VSSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TS3A4742DCNR	SOT-23	DCN	8	3000	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
TS3A4742DGKR	VSSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

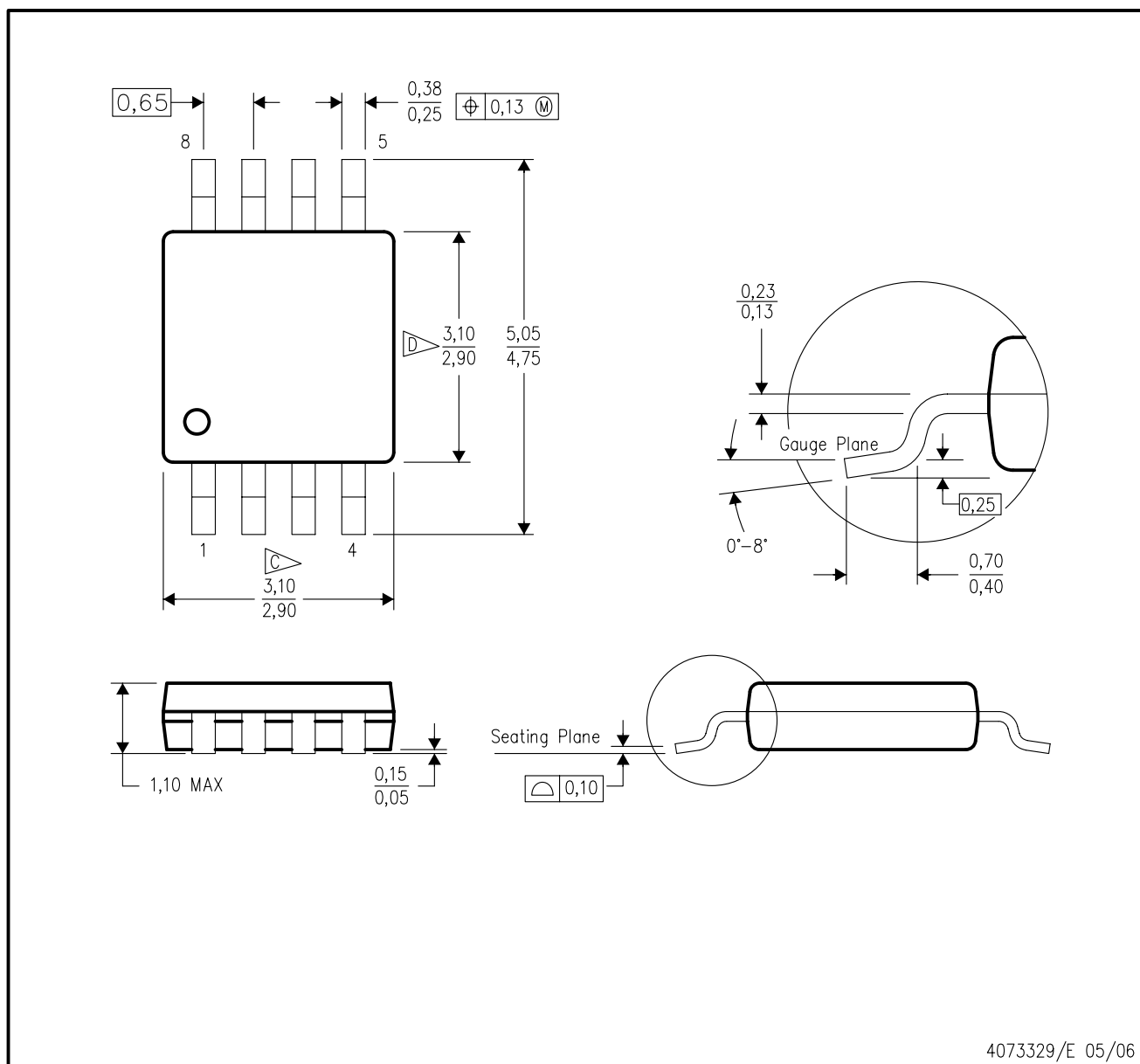


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TS3A4741DCNR	SOT-23	DCN	8	3000	202.0	201.0	28.0
TS3A4741DGKR	VSSOP	DGK	8	2500	358.0	335.0	35.0
TS3A4742DCNR	SOT-23	DCN	8	3000	202.0	201.0	28.0
TS3A4742DGKR	VSSOP	DGK	8	2500	358.0	335.0	35.0

DGK (S-PDSO-G8)

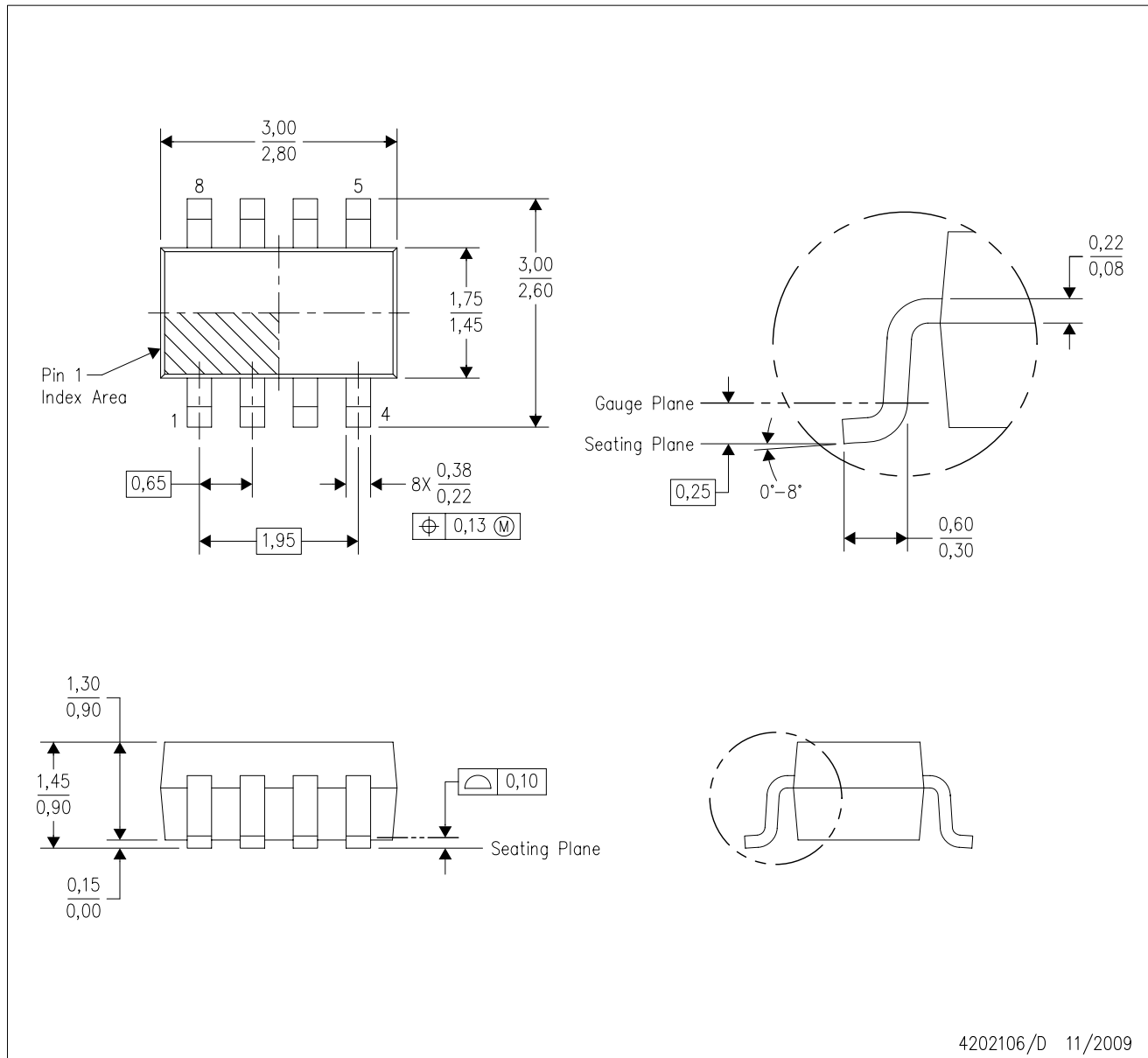
PLASTIC SMALL-OUTLINE PACKAGE



- 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.

DCN (R-PDSO-G8)

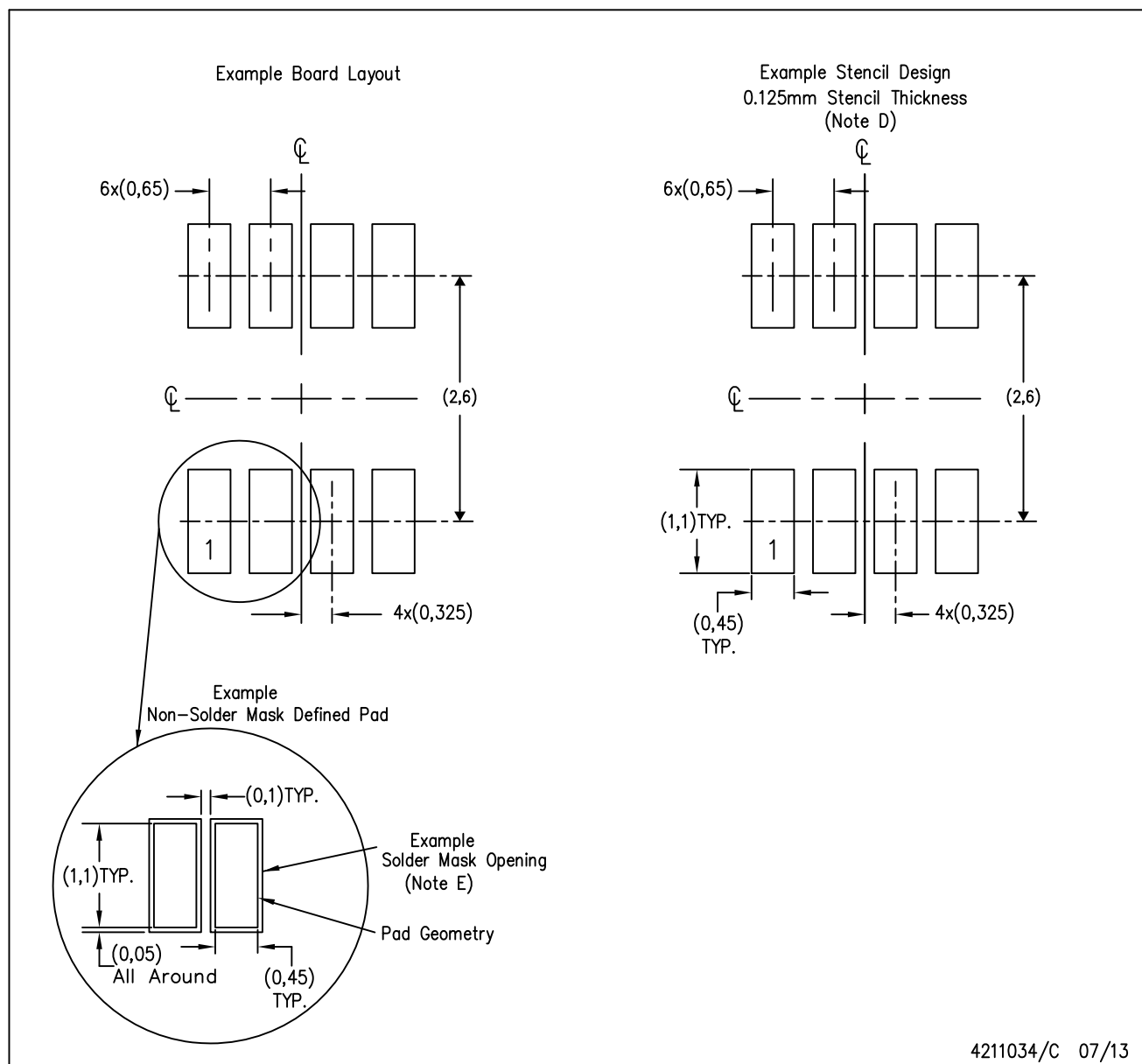
PLASTIC SMALL-OUTLINE PACKAGE (DIE DOWN)



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Package outline exclusive of metal burr & dambar protrusion/intrusion.
 - D. Package outline inclusive of solder plating.
 - E. A visual index feature must be located within the Pin 1 index area.
 - F. Falls within JEDEC MO-178 Variation BA.
 - G. Body dimensions do not include flash or protrusion. Mold flash and protrusion shall not exceed 0.25 per side.

DCN (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE (DIE DOWN)



- 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.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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