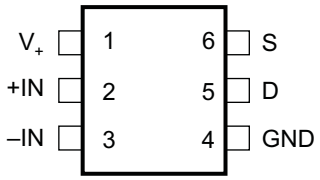
COMPARATOR WITH OUTPUT VOLTAGE-LEVEL TRANSLATION

FEATURES

- **Low Supply Current: 8 μA (Max)**
- **Supply Voltage: 2.5 V to 5.5 V**
- **Output FET Provides Down Translation**
- **Small Package: SOT-563**
- **Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II**
- **ESD Performance**
  - **2500-V Human-Body Model (JESD-A114E)**
  - **250-V Machine Model (EIA/JESD A115-A)**
  - **1500-V Charged-Device Model (JESD22-C101-A Level III)**

DRL PACKAGE
(TOP VIEW)



DESCRIPTION/ORDERING INFORMATION

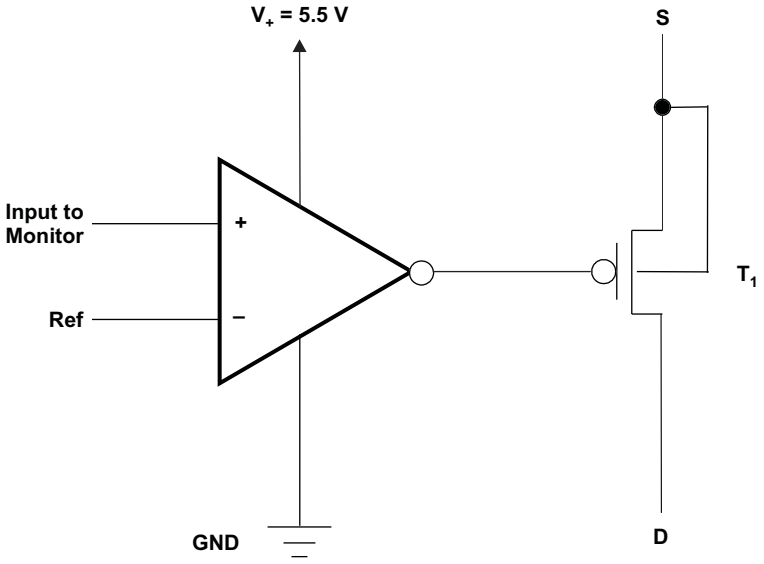
The TXS03121 is a comparator designed for battery monitoring applications. It can be operated with a voltage of 2.5 V to 5.5 V. The reference voltage is applied to the –IN terminal, whereas the voltage to be monitored is connected to +IN. When the voltage at +IN is greater than the voltage at –IN, the output FET is turned On. When the voltage at +IN is less than the voltage at –IN, the output FET is turned Off. The source (S) of the output FET can be connected to 1.1 V to 3.6 V, which allows the output signal to be level translated to another voltage value. The voltage at V_+ must be greater than or equal to the voltage at S. The voltage at S must be greater than or equal to the voltage at D ($V_+ \geq V_S \geq V_D$).

ORDERING INFORMATION

T_A	PACKAGE(1)(2)		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SOT-563 – DRL	Tape and reel	TXS03121DRLR	2FR

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

APPLICATION BLOCK DIAGRAM



PIN ASSIGNMENTS

NO.	NAME	DESCRIPTION
1	V_+	Comparator supply voltage
2	+IN	Comparator positive input
3	–IN	Comparator negative input
4	GND	Ground
5	D	Drain of output FET
6	S	Source of output FET

ABSOLUTE MAXIMUM RATINGS(1)

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

			MIN	MAX	UNIT
V_+	Supply voltage range(2)		–0.5	6.5	V
+IN, –IN	Input voltage range		–0.5	6.5	V
I_{IK}	Input clamp current	$V_I < 0$		–50	mA
I_{OK}	Output clamp current	$V_O < 0$		–50	mA
I_O	Continuous output current (On-state switch current)			–50	mA
	Continuous current through V_+ or GND			±100	mA
θ_{JA}	Package thermal impedance(3)	DRL package		171.6	°C/W
T_{stg}	Storage temperature range			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) The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
(3) The package thermal impedance is calculated in accordance with JESD 51-7.

RECOMMENDED OPERATING CONDITIONS

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

		MIN	MAX	UNIT
V_+	Comparator supply voltage	2.5	5.5	V
V_S, V_D(1)	Output FET source or drain voltage	1.1	3.6	V
T_A	Operating free-air temperature	–40	85	°C

(1) V_+ must be greater than or equal to V_S, and V_S must be greater than or equal to V_D ($V_+ \geq V_S \geq V_D$).

COMPARATOR ELECTRICAL CHARACTERISTICS

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

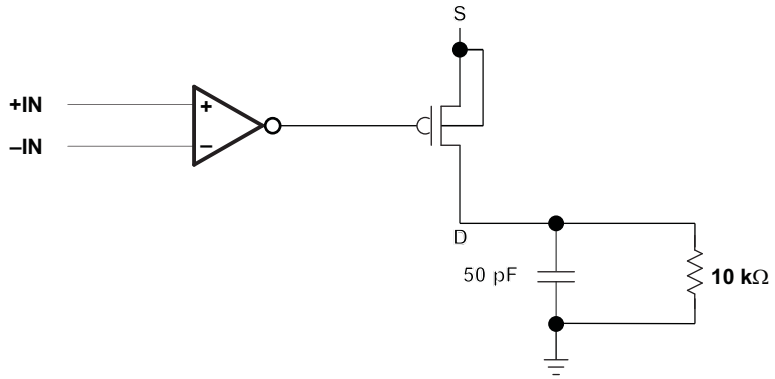
PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{OS}	Input offset voltage	V_+ = 2.5 V to 5.5 V	V_{CM} = 0.8 V, I_O = 0	–10	0.5	10	mV
			V_{CM} = V_+, I_O = 0				
V_{CM}	Common-mode voltage range	V_+ = 2.5 V to 5.5 V		0.8		V_+	V
I_{+IN}	Input leakage current	V_+ = 2.5 V to 5.5 V	V_{+IN} = 0 V to V_+			0.5	µA
$I_{–IN}$			$V_{–IN}$ = 0 V to V_+				
I_+	Supply current	V_+ = 2.5 V to 5.5 V				8	µA
C_{IN}	Capacitance of +IN, –IN pins				2	2.5	pF

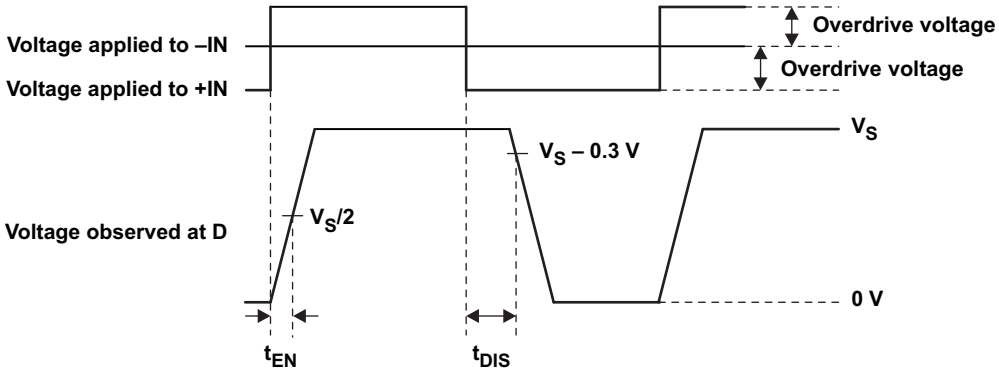
OUTPUT FET ELECTRICAL CHARACTERISTICS

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

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
$I_{DS(ON)}$	On leakage current	V_S = 1.1 V to 3.6 V, Switch ON					0.5	µA
$I_{DS(OFF)}$	Off leakage current	V_S = 1.1 V to 3.6 V, V_D = Open, Switch OFF					0.5	µA
$C_{(ON)}$	On capacitance				4	5.1	6	pF
$C_{(OFF)}$	Off capacitance, S and D terminals				1.5	3.4	5	pF
r_{ON}	On resistance of output FET	$V_+ \geq V_S$, I_D = -100 µA		V_S = 1.1 V			150	Ω
				V_S = 1.4 V			65	
				V_S = 1.65 V			61	
				V_S = 2.3 V			50	
				V_S = 3 V			44	
t_{EN}	Enable time	20-mV overdrive	$V_{–IN}$ = 0.8 V, V_S = 1.65 V	V_+ = 4.5 V			1.7	µs
				V_+ = 3 V			3.9	
			$V_{–IN}$ = V_+, V_S = 1.65 V	V_+ = 4.5 V			1	
				V_+ = 3 V			3.9	
		50-mV overdrive	V_{-IN} = 0.8 V, V_S = 1.65 V	V_+ = 4.5 V			1.2	
				V_+ = 3 V			2.7	
				V_+ = 2.5 V			6.2	
			$V_{–IN}$ = V_+, V_S = 1.65 V	V_+ = 4.5 V			1	
				V_+ = 3 V			2.4	
				V_+ = 2.5 V			5.3	
		100-mV overdrive	$V_{–IN}$ = 0.8 V, V_S = 1.65 V	V_+ = 4.5 V			0.8	
				V_+ = 3 V			1.4	
				V_+ = 2.5 V			5	
			$V_{–IN}$ = V_+, V_S = 1.65 V	V_+ = 4.5 V			0.7	
				V_+ = 3 V			1.3	
				V_+ = 2.5 V			4.7	
t_{DIS}	Disable time	20-mV overdrive	$V_{–IN}$ = 0.8 V, V_S = 1.65 V	V_+ = 4.5 V			4.4	µs
				V_+ = 3 V			12	
			$V_{–IN}$ = V_+, V_S = 1.65 V	V_+ = 4.5 V			3.5	
				V_+ = 3 V			6.1	
		50-mV overdrive	$V_{–IN}$ = 0.8 V, V_S = 1.65 V	V_+ = 4.5 V			4.1	
				V_+ = 3 V			9.6	
				V_+ = 2.5 V			5.3	
			$V_{–IN}$ = V_+, V_S = 1.65 V	V_+ = 4.5 V			2.5	
				V_+ = 3 V			3.2	
				V_+ = 2.5 V			5.2	
		100-mV overdrive	$V_{–IN}$ = 0.8 V, V_S = 1.65 V	V_+ = 4.5 V			4.6	
				V_+ = 3 V			6.7	
				V_+ = 2.5 V			5.2	
			$V_{–IN}$ = V_+, V_S = 1.65 V	V_+ = 4.5 V			1.9	
				V_+ = 3 V			2.8	
				V_+ = 2.3 V			4.9	

PARAMETER MEASUREMENT INFORMATION





PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TXS03121DRLR	ACTIVE	SOT-OTHER	DRL	6	4000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	2FR	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.

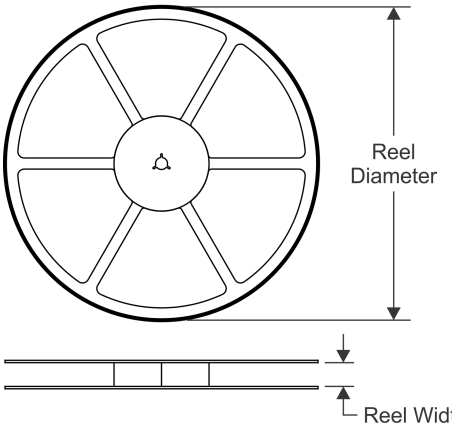
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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.

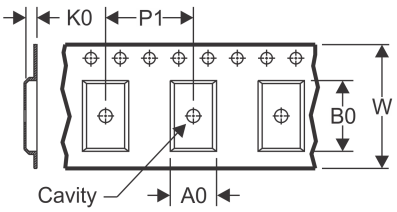
(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

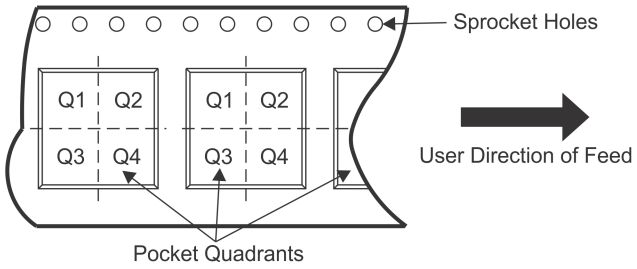


TAPE DIMENSIONS



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

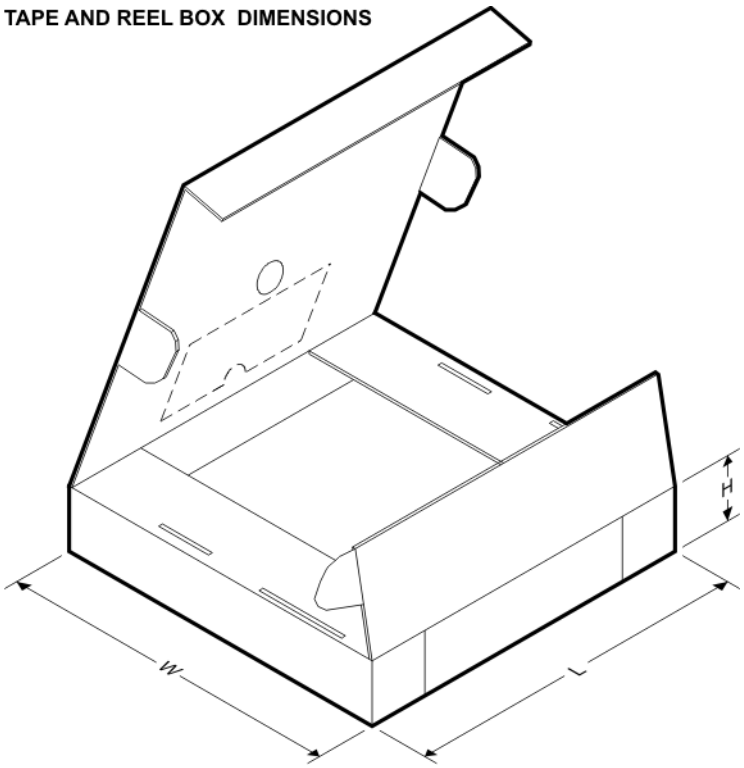
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

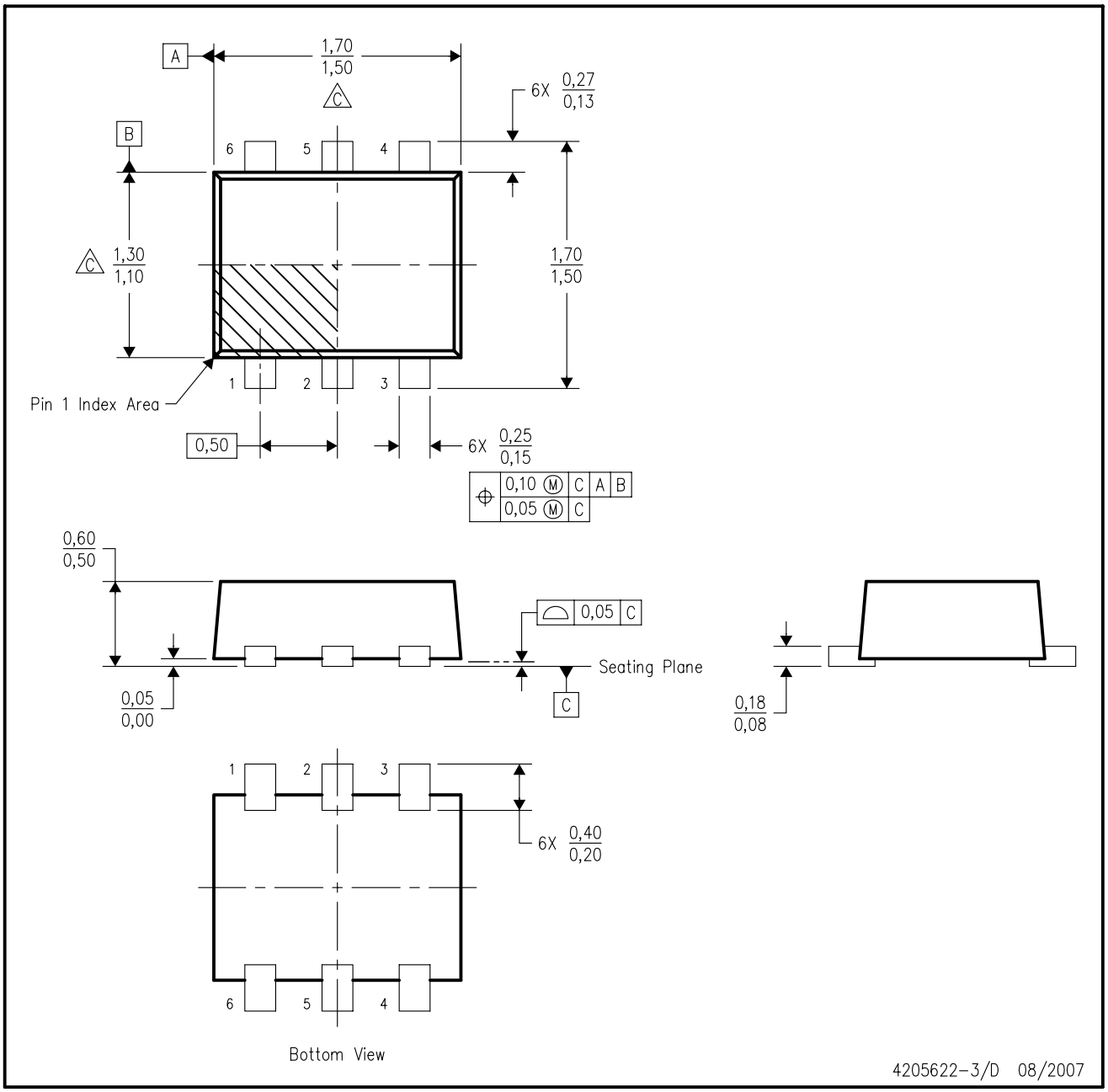
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TXS03121DRLR	SOT-OTHER	DRL	6	4000	180.0	8.4	1.98	1.78	0.69	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



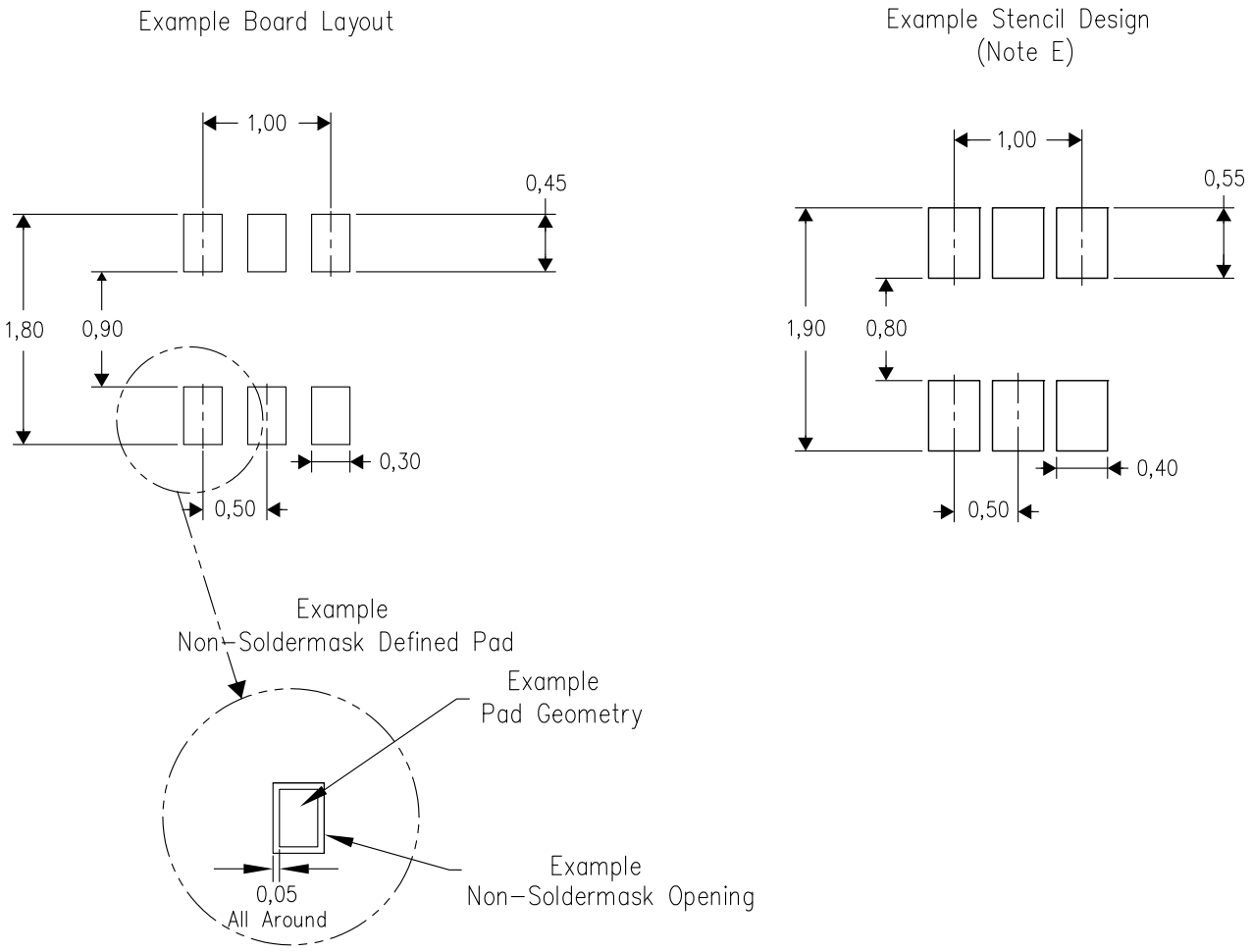
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TXS03121DRLR	SOT-OTHER	DRL	6	4000	202.0	201.0	28.0



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 dimensions do not include mold flash, interlead flash, protrusions, or gate burrs. Mold flash, interlead flash, protrusions, or gate burrs shall not exceed 0,15 per end or side.
D. JEDEC package registration is pending.

DRL (R–PDSO–N6) PLASTIC SMALL OUTLINE



4208207–3/E 06/12

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. 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.

IMPORTANT NOTICE FOR TI DESIGN INFORMATION AND RESOURCES

Texas Instruments Incorporated ('TI") technical, application or other design advice, services or information, including, but not limited to, reference designs and materials relating to evaluation modules, (collectively, "TI Resources") are intended to assist designers who are developing applications that incorporate TI products; by downloading, accessing or using any particular TI Resource in any way, you (individually or, if you are acting on behalf of a company, your company) agree to use it solely for this purpose and subject to the terms of this Notice.

TI's provision of TI Resources does not expand or otherwise alter TI's applicable published warranties or warranty disclaimers for TI products, and no additional obligations or liabilities arise from TI providing such TI Resources. TI reserves the right to make corrections, enhancements, improvements and other changes to its TI Resources.

You understand and agree that you remain responsible for using your independent analysis, evaluation and judgment in designing your applications and that you have full and exclusive responsibility to assure the safety of your applications and compliance of your applications (and of all TI products used in or for your applications) with all applicable regulations, laws and other applicable requirements. You represent that, with respect to your applications, you have all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. You agree that prior to using or distributing any applications that include TI products, you will thoroughly test such applications and the functionality of such TI products as used in such applications. TI has not conducted any testing other than that specifically described in the published documentation for a particular TI Resource.

You are authorized to use, copy and modify any individual TI Resource only in connection with the development of applications that include the TI product(s) identified in such TI Resource. NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT OF TI OR ANY THIRD PARTY IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of TI Resources may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI RESOURCES ARE PROVIDED "AS IS" AND WITH ALL FAULTS. TI DISCLAIMS ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING TI RESOURCES OR USE THEREOF, INCLUDING BUT NOT LIMITED TO ACCURACY OR COMPLETENESS, TITLE, ANY EPIDEMIC FAILURE WARRANTY AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY YOU AGAINST ANY CLAIM, INCLUDING BUT NOT LIMITED TO ANY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON ANY COMBINATION OF PRODUCTS EVEN IF DESCRIBED IN TI RESOURCES OR OTHERWISE. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, DIRECT, SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF TI RESOURCES OR USE THEREOF, AND REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

You agree to fully indemnify TI and its representatives against any damages, costs, losses, and/or liabilities arising out of your non-compliance with the terms and provisions of this Notice.

This Notice applies to TI Resources. Additional terms apply to the use and purchase of certain types of materials, TI products and services. These include; without limitation, TI's standard terms for semiconductor products http://www.ti.com/sc/docs/stdterms.htm), evaluation modules, and samples (http://www.ti.com/sc/docs/sampterms.htm).

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265