ULTRALOW-NOISE, HIGH-PSRR, FAST RF 200-mA LOW-DROPOUT LINEAR REGULATORS

FEATURES

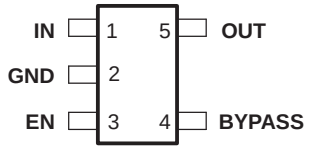
- **Controlled Baseline**
  - **One Assembly/Test Site, One Fabrication Site**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product-Change Notification**
- **Qualification Pedigree** (1)
- **200-mA Low-Dropout Regulator With EN**
- **Available in 1.8 V, 2.5 V, 2.8 V, 2.85 V, 3 V, 3.3 V, 4.75 V, and Adjustable**
- **High PSRR (70 dB at 10 kHz)**
- **Ultralow Noise (32 μV)**
- **Fast Start-Up Time (50 μs)**
- **Stable With a 2.2-μF Ceramic Capacitor**
- **Excellent Load/Line Transient**
- **Very Low Dropout Voltage (112 mV at Full Load, TPS79330)**
- **5-Pin SOT23 (DBV) Package**

APPLICATIONS

- **VCOs**
- **RF**
- **Bluetooth™, Wireless LAN**

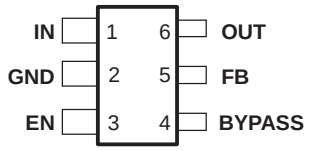
(1) Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over specified temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

DBV PACKAGE
(TOP VIEW)



Fixed Option

DBV PACKAGE
(TOP VIEW)



Adjustable Option

DESCRIPTION

The TPS793xx family of low-dropout (LDO) low-power linear voltage regulators features high power-supply rejection ratio (PSRR), ultralow noise, fast start-up, and excellent line and load transient responses in a small-outline SOT23 package. Each device in the family is stable, with a small 2.2-μF ceramic capacitor on the output. The TPS793xx family uses an advanced, proprietary, BiCMOS fabrication process to yield extremely low dropout voltages (e.g., 112 mV at 200 mA, TPS79330). Each device achieves fast start-up times (approximately 50 μs with a 0.001-μF bypass capacitor), while consuming very low quiescent current (170 μA typical). Moreover, when the device is placed in standby mode, the supply current is reduced to less than 1 μA. The TPS79328 exhibits approximately 32 μV_{RMS} of output voltage noise with a 0.1-μF bypass capacitor. Applications with analog components that are noise sensitive, such as portable RF electronics, benefit from the high PSRR and low-noise features, as well as the fast response time.

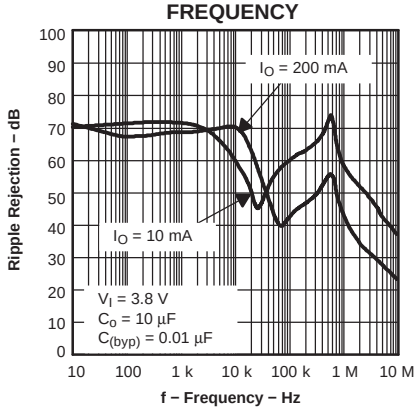
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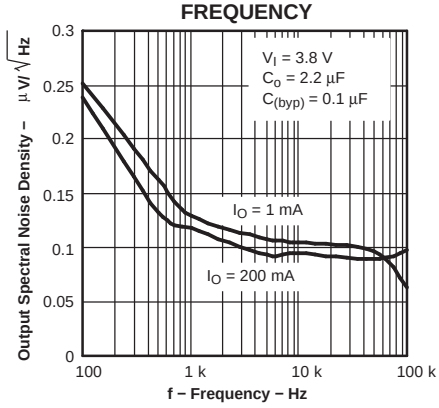
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TPS79328
RIPPLE REJECTION
vs
FREQUENCY



TPS79328
OUTPUT SPECTRAL NOISE DENSITY
vs
FREQUENCY



AVAILABLE OPTIONS

T_J	VOLTAGE	PACKAGE	PART NUMBER	SYMBOL
–40°C to 125°C	1.2 to 5.5 V	SOT23 (DBV)	TPS79301DBVREP(1)	PGVE
	1.8 V		TPS79318DBVREP(1)	PHHE
	2.5 V		TPS79325DBVREP(1)	PGWE
	2.8 V		TPS79328DBVREP(1)(2)	PGXE
	2.85 V		TPS793285DBVREP(1)(2)	PHIE
	3 V		TPS79330DBVREP(1)(2)	PGYE
	3.3 V		TPS793333DBVREP(1)	PHUE
	4.75 V		TPS793475DBVREP(1)	PHJE
–55°C to 125°C	1.2 to 5.5 V		TPS79301MDBVREP(1)	PMBM

(1) The DBVR indicates tape and reel of 3000 parts.
(2) Product preview

ABSOLUTE MAXIMUM RATINGS(1)

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

			MIN	MAX	UNIT
	Input voltage range(2)		–0.3	6	V
	Voltage range at EN		–0.3	V_I + 0.3	V
	Voltage on OUT		–0.3	6	V
	Peak output current			Internally limited	
	ESD rating	Human-Body Model (HBM)		2	kV
		Changed-Device Model (CDM)		500	V
	Continuous total power dissipation			See Dissipation Rating Table	
T_J	Operating virtual junction temperature range		–55	125	°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) All voltage values are with respect to network ground terminal

Dissipation Ratings

BOARD	PACKAGE	$R_{\theta JC}$	$R_{\theta JA}$	DERATING FACTOR ABOVE T_A = 25°C	$T_A \le 25°C$ POWER RATING	T_A = 70°C POWER RATING	T_A = 85°C POWER RATING
Low K(1)	DBV	63.75°C/W	256°C/W	3.906 mW/°C	391 mW	215 mW	156 mW
High K(2)	DBV	63.75°C/W	178.3°C/W	5.609 mW/°C	561 mW	308 mW	224 mW

(1) The JEDEC low K (1s) board design used to derive this data was a 3-in × 3-in, two layer board with 2-oz copper traces on top of the board.
(2) The JEDEC high K (2s2p) board design used to derive this data was a 3-in × 3-in, multilayer board with 1-oz internal power and ground planes and 2-oz copper traces on top and bottom of the board.

ELECTRICAL CHARACTERISTICS

over recommended operating free-air temperature range, EN = V_I, T_J = –55 to 125°C and T_J = –40 to 125°C, V_I = $V_{O(typ)}$ + 1 V, I_O = 1 mA, C_o = 10 µF, $C_{(byp)}$ = 0.01 µF (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_I Input voltage(1)				2.7		5.5	V
I_O Continuous output current(2)				0		200	mA
T_J Operating junction temperature				–55		125	°C
Output voltage	TPS79301	0 µA < I_O < 200 mA, 1.22 V ≤ V_O ≤ 5.2 V (3)	T_J = –40 to 125°C,	0.98 Vo		1.02 Vo	V
		0 µA < I_O < 200 mA, 1.22 V ≤ V_O ≤ 5.2 V (3)	T_J = –55 to 125°C,	0.97 Vo		1.025 Vo	
	TPS79318	T_J = 25°C			1.8		
		0 µA < I_O < 200 mA,	2.8 V < V_I < 5.5 V	1.764		1.836	
	TPS79325	T_J = 25°C			2.5		
		0 µA < I_O < 200 mA,	3.5 V < V_I < 5.5 V	2.45		2.55	
	TPS79328	T_J = 25°C			2.8		
		0 µA < I_O < 200 mA,	3.8 V < V_I < 5.5 V	2.744		2.856	
	TPS793285	T_J = 25°C			2.85		
		0 µA < I_O < 200 mA,	3.85 V < V_I < 5.5 V	2.793		2.907	
	TPS79330	T_J = 25°C			3		
		0 µA < I_O < 200 mA,	4 V < V_I < 5.5 V	2.94		3.06	
	TPS79333	T_J = 25°C			3.3		
		0 µA < I_O < 200 mA,	4.3 V < V_I < 5.5 V	3.234		3.366	
	TPS793475	T_J = 25°C			4.75		
		0 µA < I_O < 200 mA,	5.25 V < V_I < 5.5 V	4.655		4.845	
Quiescent current (GND current)		0 µA < I_O < 200 mA,	T_J = 25°C		170		µA
		0 µA < I_O < 200 mA				220	
Load regulation		0 µA < I_O < 200 mA,	T_J = 25°C		5		mV
Output voltage line regulation ($\Delta V_O/V_O$)(4)		V_O + 1 V < V_I ≤ 5.5 V,	T_J = 25°C		0.05		%/V
		V_O + 1 V < V_I ≤ 5.5 V				0.12	
Output noise voltage (TPS79328)		BW = 200 Hz to 100 kHz, I_O = 200 mA, T_J = 25°C	$C_{(byp)}$ = 0.001 µF		55		μV_{RMS}
			$C_{(byp)}$ = 0.0047 µF		36		
			$C_{(byp)}$ = 0.01 µF		33		
			$C_{(byp)}$ = 0.1 µF		32		
Time, start-up (TPS79328)		R_L = 14 Ω, C_o = 1 µF, T_J = 25°C	$C_{(byp)}$ = 0.001 µF		50		µs
			$C_{(byp)}$ = 0.0047 µF		70		
			$C_{(byp)}$ = 0.01 µF		100		
Output current limit		V_O = 0 V(3)		285		600	mA
Standby current		EN = 0 V,	2.7 V < V_I < 5.5 V		0.07	1	µA
High-level enable input voltage		2.7 V < V_I < 5.5 V		2			V
Low-level enable input voltage		2.7 V < V_I < 5.5 V				0.7	V
Input current (EN)		EN = 0		–1		1	µA

(1) To calculate the minimum input voltage for your maximum output current, use the following formula:
$V_I(min) = V_O(max) + V_{DO}$ (max load)

(2) Continuous output current and operating junction temperature are limited by internal protection circuitry, but it is not recommended that the device operate under conditions beyond those specified in this table for extended periods of time.

(3) The minimum IN operating voltage is 2.7 V or $V_{O(typ)}$ + 1 V, whichever is greater. The maximum IN voltage is 5.5 V. The maximum output current is 200 mA.

(4) If V_O ≤ 2.5 V, then V_{Imin} = 2.7 V, V_{Imax} = 5.5 V:

$$\text{Line Reg. (mV)} = (\%/V) \times \frac{V_O\left(V_{Imax} - 2.7\ V\right)}{100} \times 1000$$

If V_O ≥ 2.5 V, then $V_{Imin} = V_O$ + 1 V, V_{Imax} = 5.5 V.

ELECTRICAL CHARACTERISTICS (continued)

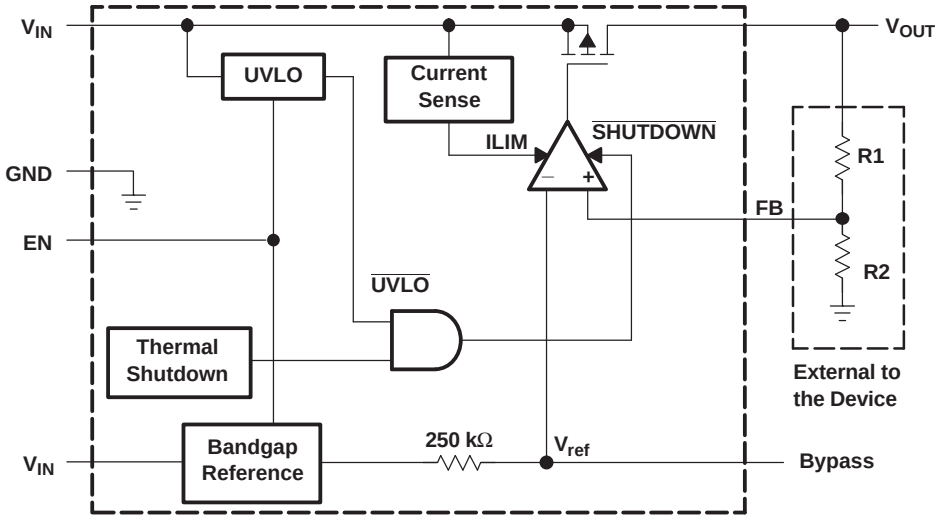
over recommended operating free-air temperature range, EN = V_I, T_J = –55 to 125°C and T_J = –40 to 125°C, V_I = $V_{O(typ)}$ + 1 V, I_O = 1 mA, C_o = 10 µF, $C_{(byp)}$ = 0.01 µF (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input current (FB) (TPS79301)		FB = 1.8 V				1	µA
Power-supply ripple rejection	TPS79328	f = 100 Hz, T_J = 25°C,	I_O = 10 mA		70		dB
		f = 100 Hz, T_J = 25°C,	I_O = 200 mA		68		
		f = 10 Hz, T_J = 25°C,	I_O = 200 mA		70		
		f = 100 Hz, T_J = 25°C,	I_O = 200 mA		43		
Dropout voltage(5)	TPS79328	I_O = 200 mA,	T_J = 25°C		120		mV
		I_O = 200 mA				200	
	TPS793285	I_O = 200 mA,	T_J= 25°C		120		
		I_O = 200 mA				200	
	TPS79330	I_O = 200 mA,	T_J = 25°C		112		
		I_O = 200 mA				200	
	TPS79333	I_O = 200 mA,	T_J = 25°C		102		
		I_O = 200 mA				180	
	TPS793475	I_O = 200 mA,	T_J = 25°C		77		
		I_O = 200 mA				125	
UVLO threshold		V_{CC} rising		2.25		2.65	V
UVLO hysteresis		T_J = 25°C	V_{CC} rising		100		mV

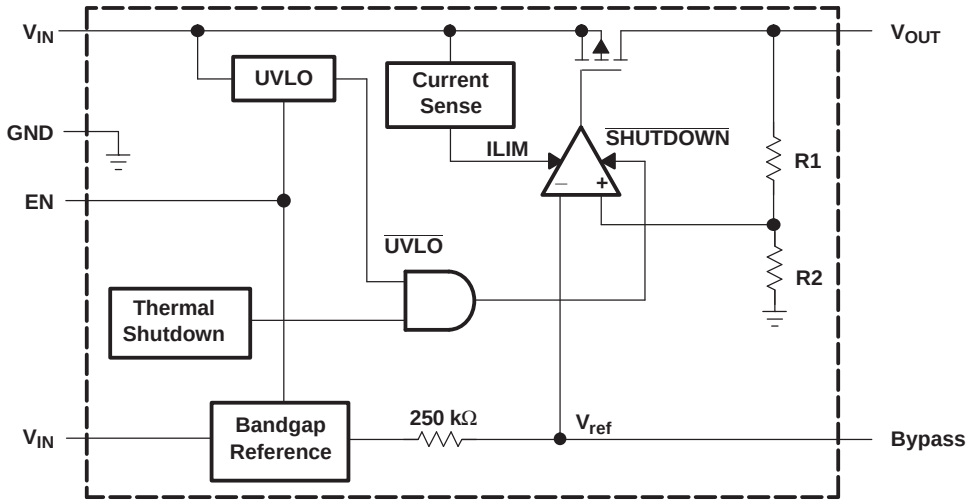
(5) IN voltage equals $V_{O(typ)}$– 100 mV; The TPS79325 dropout voltage is limited by the input voltage range limitations.

DEVICE INFORMATION

FUNCTIONAL BLOCK DIAGRAM – ADJUSTABLE VERSION



FUNCTIONAL BLOCK DIAGRAM – FIXED VERSION



TERMINAL FUNCTIONS

TERMINAL			I/O	DESCRIPTION
NAME	ADJ	FIXED		
BYPASS	4	4		An external bypass capacitor, connected to this terminal, in conjunction with an internal resistor, creates a low-pass filter to further reduce regulator noise.
EN	3	3	I	Enable input that enables or shuts down the device. When EN goes to a logic high, the device is enabled. When the device goes to a logic low, the device is in shutdown mode.
FB	5	N/A	I	Feedback input voltage for the adjustable device
GND	2	2		Regulator ground
IN	1	1	I	Input to the device
OUT	6	5	O	Regulated output of the device

TYPICAL CHARACTERISTICS

TPS79328
OUTPUT VOLTAGE vs OUTPUT CURRENT

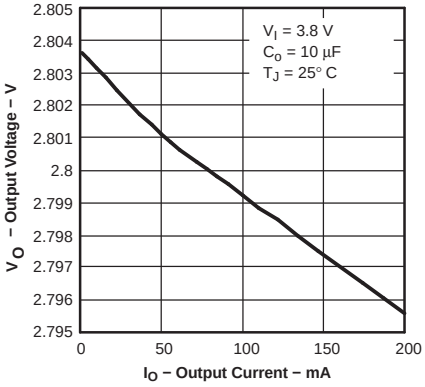


Figure 1.

TPS79328
OUTPUT VOLTAGE vs JUNCTION TEMPERATURE

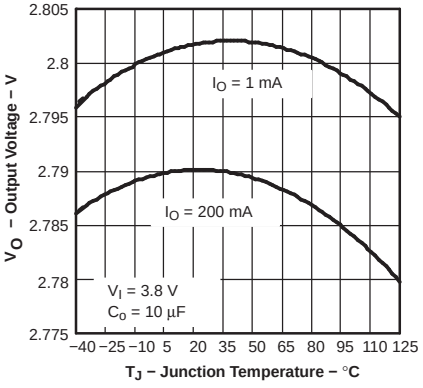


Figure 2.

TPS79328
GROUND CURRENT vs JUNCTION TEMPERATURE

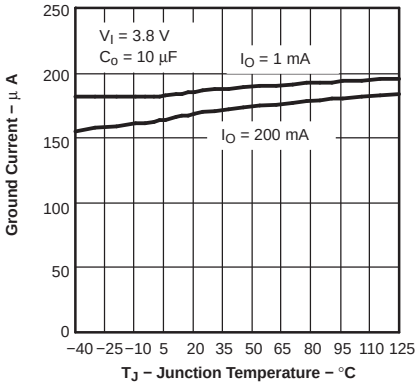


Figure 3.

TPS79328
OUTPUT SPECTRAL NOISE DENSITY vs FREQUENCY

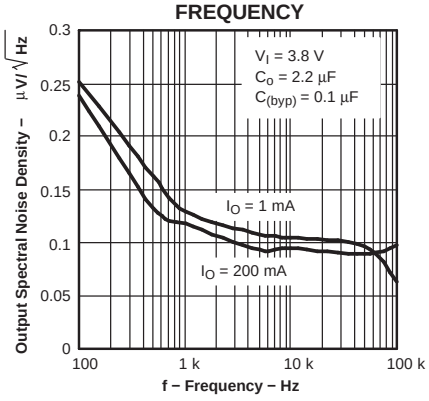


Figure 4.

TPS79328
OUTPUT SPECTRAL NOISE DENSITY vs FREQUENCY

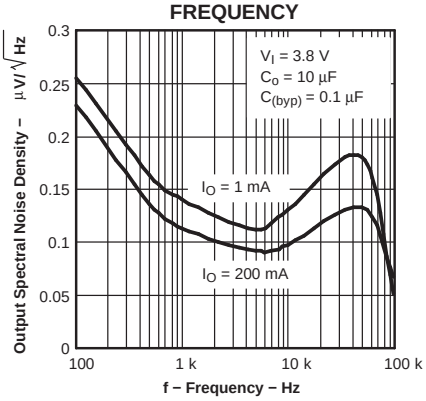


Figure 5.

TPS79328
OUTPUT SPECTRAL NOISE DENSITY vs FREQUENCY

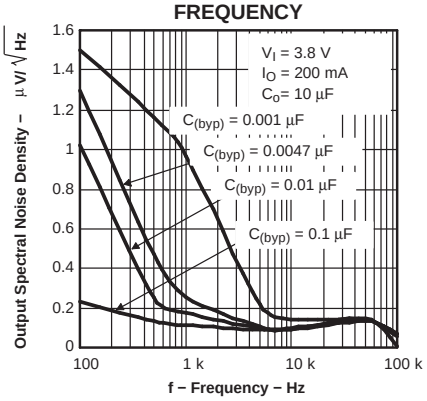


Figure 6.

ROOT MEAN SQUARED OUTPUT NOISE vs BYPASS CAPACITANCE

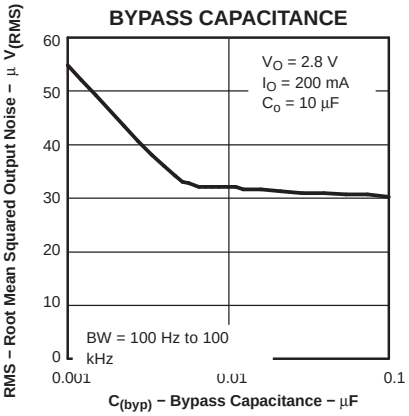


Figure 7.

OUTPUT IMPEDANCE vs FREQUENCY

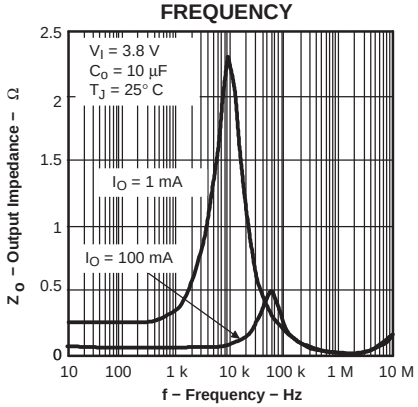


Figure 8.

TPS79328
DROPOUT VOLTAGE vs JUNCTION TEMPERATURE

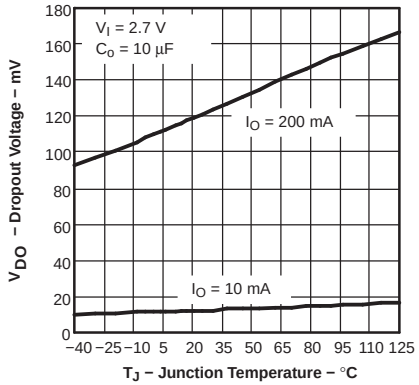


Figure 9.

TYPICAL CHARACTERISTICS (continued)

TPS79328
RIPPLE REJECTION
vs
FREQUENCY

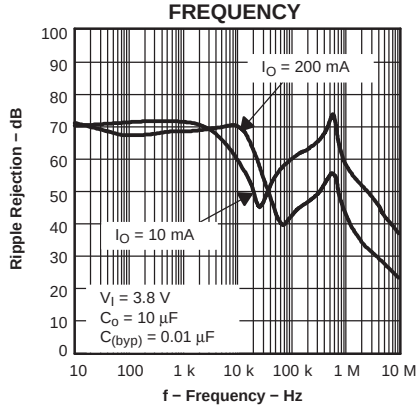


Figure 10.

TPS79328
RIPPLE REJECTION
vs
FREQUENCY

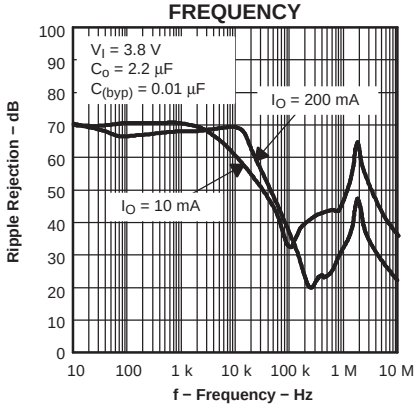


Figure 11.

TPS79328
RIPPLE REJECTION
vs
FREQUENCY

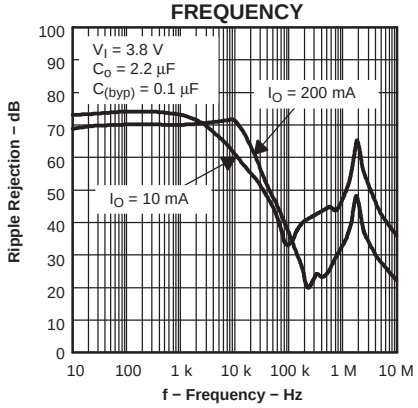


Figure 12.

TPS79328
OUTPUT VOLTAGE, ENABLE VOLTAGE
vs
TIME (START-UP)

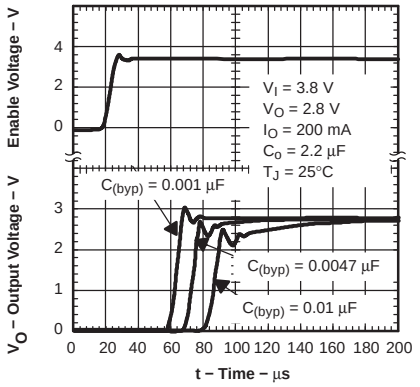


Figure 13.

TPS79328
LINE TRANSIENT RESPONSE

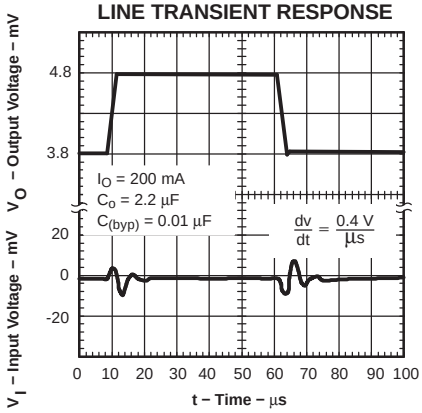


Figure 14.

TPS79328
LOAD TRANSIENT RESPONSE

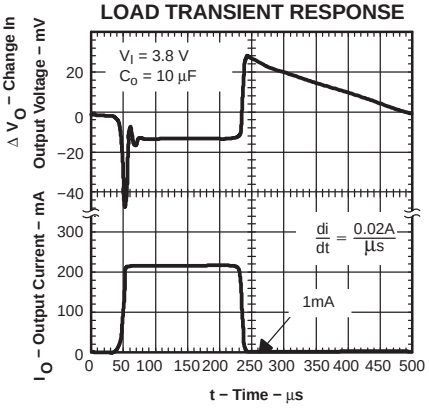


Figure 15.

POWER UP / POWER DOWN

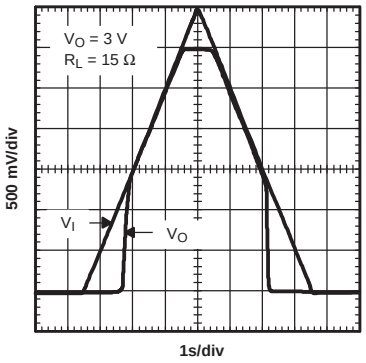


Figure 16.

DC DROPOUT VOLTAGE
vs
OUTPUT CURRENT

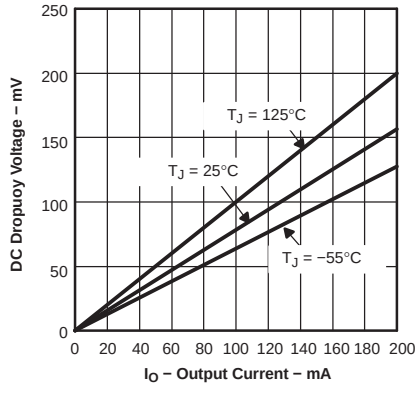


Figure 17.

TPS79301
DROPOUT VOLTAGE
vs
INPUT VOLTAGE

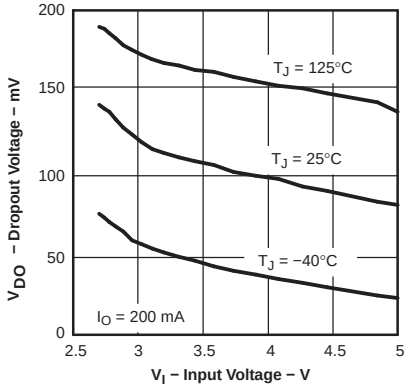


Figure 18.

TYPICAL CHARACTERISTICS (continued)

MINIMUM REQUIRED INPUT VOLTAGE vs OUTPUT VOLTAGE

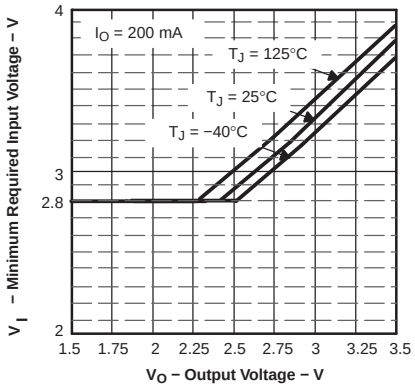


Figure 19.

TYPICAL REGIONS OF STABILITY EQUIVALENT SERIES RESISTANCE (ESR) vs OUTPUT CURRENT

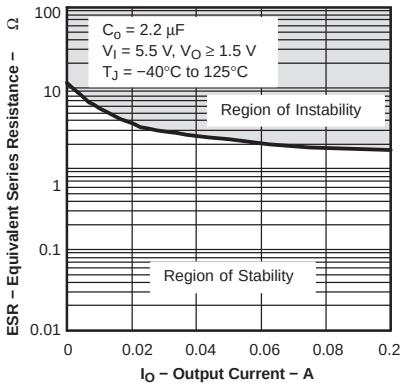


Figure 20.

TYPICAL REGIONS OF STABILITY EQUIVALENT SERIES RESISTANCE (ESR) vs OUTPUT CURRENT

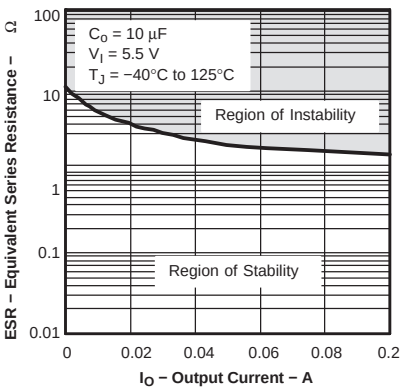


Figure 21.

APPLICATION INFORMATION

The TPS793xx family of low-dropout (LDO) regulators has been optimized for use in noise-sensitive battery-operated equipment. The device features extremely low dropout voltages, high PSRR, ultralow output noise, low quiescent current (170 μA typically), and enable-input to reduce supply currents to less than 1 μA when the regulator is turned off.

A typical application circuit is shown in Figure 22.

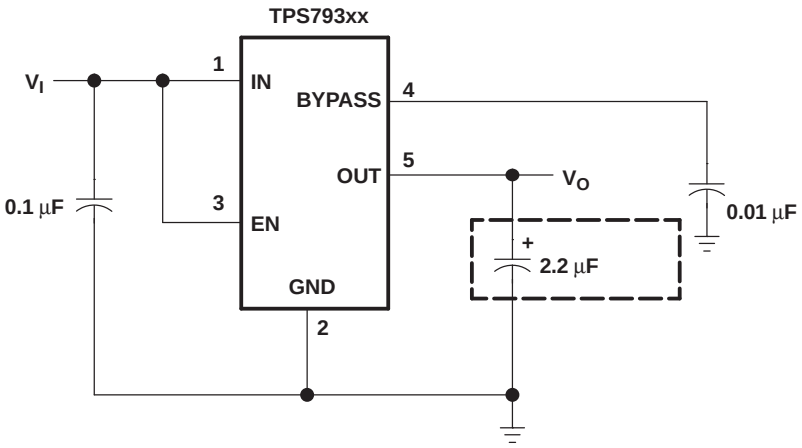


Figure 22. Typical Application Circuit

External Capacitor Requirements

A 0.1-μF or larger ceramic input bypass capacitor, connected between IN and GND and located close to the TPS793xx, is required for stability and improves transient response, noise rejection, and ripple rejection. A higher-value electrolytic input capacitor may be necessary if large, fast-rise-time load transients are anticipated and the device is located several inches from the power source.

Like all LDOs, the TPS793xx requires an output capacitor connected between OUT and GND to stabilize the internal control loop. The minimum recommended capacitance is 2.2-μF. Any 2.2-μF or larger ceramic capacitor is suitable, provided the capacitance does not vary significantly over temperature.

The internal voltage reference is a key source of noise in an LDO regulator. The TPS793xx has a BYPASS pin that is connected to the voltage reference through a 250-kΩ internal resistor. The 250-kΩ internal resistor, in conjunction with an external bypass capacitor connected to the BYPASS pin, creates a low pass filter to reduce the voltage reference noise and, therefore, the noise at the regulator output. In order for the regulator to operate properly, the current flow out of the BYPASS pin must be at a minimum, because any leakage current creates an IR drop across the internal resistor, thus, creating an output error. Therefore, the bypass capacitor must have minimal leakage current.

For example, the TPS79328 exhibits only 32 μV_{RMS} of output voltage noise using a 0.1-μF ceramic bypass capacitor and a 2.2-μF ceramic output capacitor. Note that the output starts up slower as the bypass capacitance increases due to the RC time constant at the BYPASS pin that is created by the internal 250-kΩ resistor and external capacitor.

Board Layout Recommendation to Improve PSRR and Noise Performance

To improve ac measurements like PSRR, output noise, and transient response, it is recommended that the board be designed with separate ground planes for V_{IN} and V_{OUT}, with each ground plane connected only at the GND pin of the device. In addition, the ground connection for the bypass capacitor should connect directly to the GND pin of the device.

APPLICATION INFORMATION (continued)

Power Dissipation and Junction Temperature

Specified regulator operation is ensured to a junction temperature of 125°C; the maximum junction temperature should be restricted to 125°C under normal operating conditions. This restriction limits the power dissipation the regulator can handle in any given application. To ensure the junction temperature is within acceptable limits, calculate the maximum allowable dissipation, $P_{D(max)}$, and the actual dissipation, P_D, which must be less than or equal to $P_{D(max)}$.

The maximum power dissipation limit is determined using the following equation:

$$P_{D(max)} = \frac{T_J max - T_A}{R_{\theta JA}} \quad (1)$$

Where:

$T_J max$ = Maximum allowable junction temperature

$R\theta_{JA}$ = Thermal resistance, junction to ambient, for the package, see the dissipation rating table

T_A = Ambient temperature

The regulator dissipation is calculated using:

$$P_D = \left(V_I - V_O\right) \times I_O \quad (2)$$

Power dissipation resulting from quiescent current is negligible. Excessive power dissipation triggers the thermal protection circuit.

Programming the TPS79301 Adjustable LDO Regulator

The output voltage of the TPS79301 adjustable regulator is programmed using an external resistor divider as shown in Figure 23. The output voltage is calculated using:

$$V_O = V_{ref} \times \left(1 + \frac{R1}{R2}\right) \quad (3)$$

Where:

V_{ref} = 1.2246 V typical (the internal reference voltage)

APPLICATION INFORMATION (continued)

Programming the TPS79301 Adjustable LDO Regulator (continued)

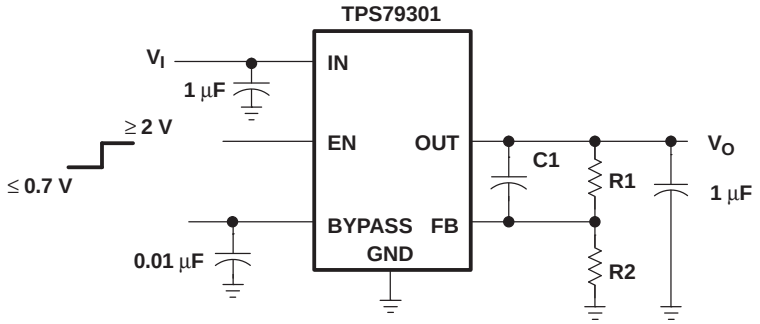
Resistors R1 and R2 should be chosen for approximately 50-μA divider current. Lower-value resistors can be used for improved noise performance, but the solution consumes more power. Higher resistor values should be avoided as leakage current into/out of FB across R1/R2 creates an offset voltage that artificially increases/decreases the feedback voltage and, thus, erroneously decreases/increases V_O. The recommended design procedure is to choose R2 = 30.1 kΩ to set the divider current at 50 μA, C1 = 15 pF for stability, and then calculate R1 using:

$$R1 = \left(\frac{V_O}{V_{ref}} - 1 \right) \times R2 \quad (4)$$

In order to improve the stability of the adjustable version, it is suggested that a small compensation capacitor be placed between OUT and FB. For voltages <1.8 V, the value of this capacitor should be 100 pF. For voltages >1.8 V, the approximate value of this capacitor can be calculated as:

$$C1 = \frac{(3 \times 10^{-7}) \times (R1 + R2)}{(R1 \times R2)} \quad (5)$$

The suggested value of this capacitor for several resistor ratios is shown in the table below. If this capacitor is not used (such as in a unity-gain configuration) or if an output voltage <1.8 V is chosen, then the minimum recommended output capacitor is 4.7 μF instead of 2.2 μF.



OUTPUT VOLTAGE PROGRAMMING GUIDE

OUTPUT VOLTAGE	R1	R2	C1
2.5 V	31.6 kΩ	30.1 kΩ	22 pF
3.3 V	51 kΩ	30.1 kΩ	15 pF
3.6 V	59 kΩ	30.1 kΩ	15 pF

Figure 23. TPS79301 Adjustable LDO Regulator Programming

Regulator Protection

The TPS793xx features internal current limiting and thermal protection. During normal operation, the TPS793xx limits output current to approximately 400 mA. When current limiting engages, the output voltage scales back linearly until the overcurrent condition ends. While current limiting is designed to prevent gross device failure, care should be taken not to exceed the power dissipation ratings of the package or the absolute maximum voltage ratings of the device. If the temperature of the device exceeds approximately 165°C, thermal-protection circuitry shuts it down. Once the device has cooled down to below approximately 140°C, regulator operation resumes.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TPS79301DBVREP	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PGVE
TPS79301DBVREP.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PGVE
TPS79301MDBVREP	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PMBM
TPS79301MDBVREP.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PMBM
TPS79318DBVREP	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PHHE
TPS79318DBVREP.A	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PHHE
TPS79333DBVREP	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PHUE
TPS79333DBVREP.A	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PHUE
TPS793475DBVREP	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PHJE
TPS793475DBVREP.A	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PHJE
V62/03634-01YE	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PGVE
V62/03634-02XE	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PHHE
V62/03634-07XE	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PHUE
V62/03634-08XE	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PHJE
V62/03634-09XE	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	PMBM

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

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

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

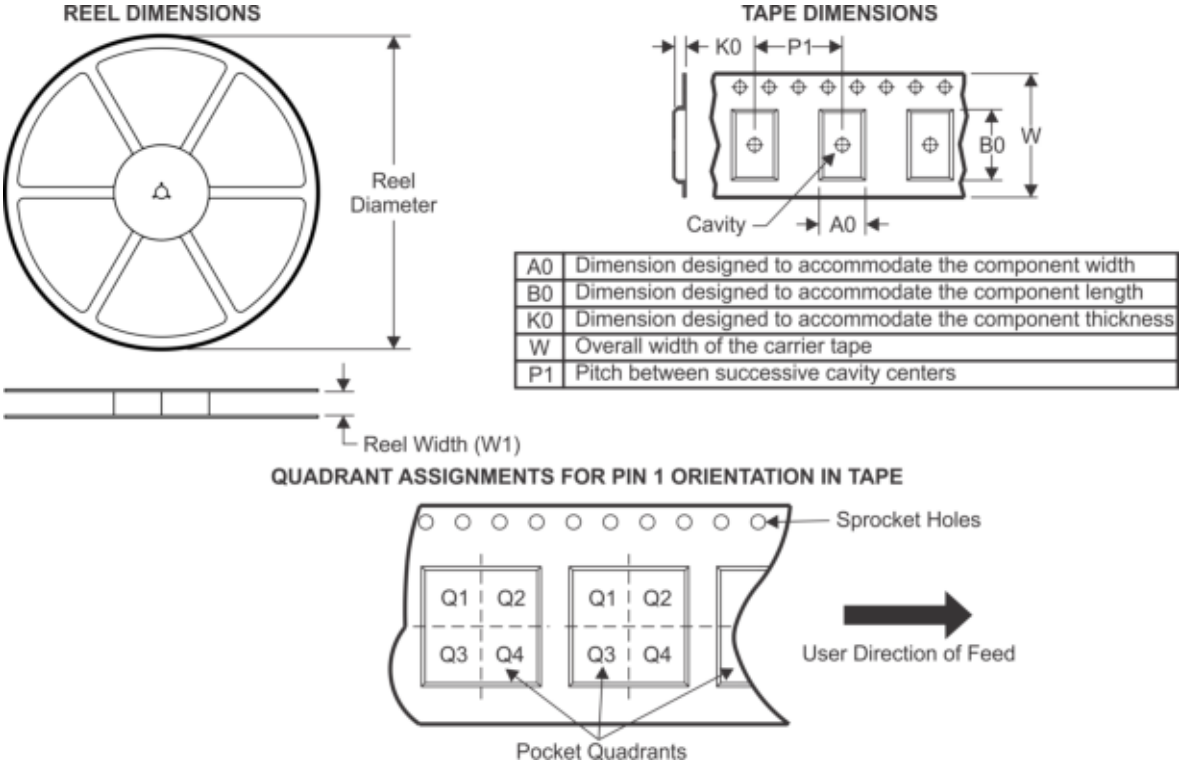
(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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TAPE AND REEL INFORMATION

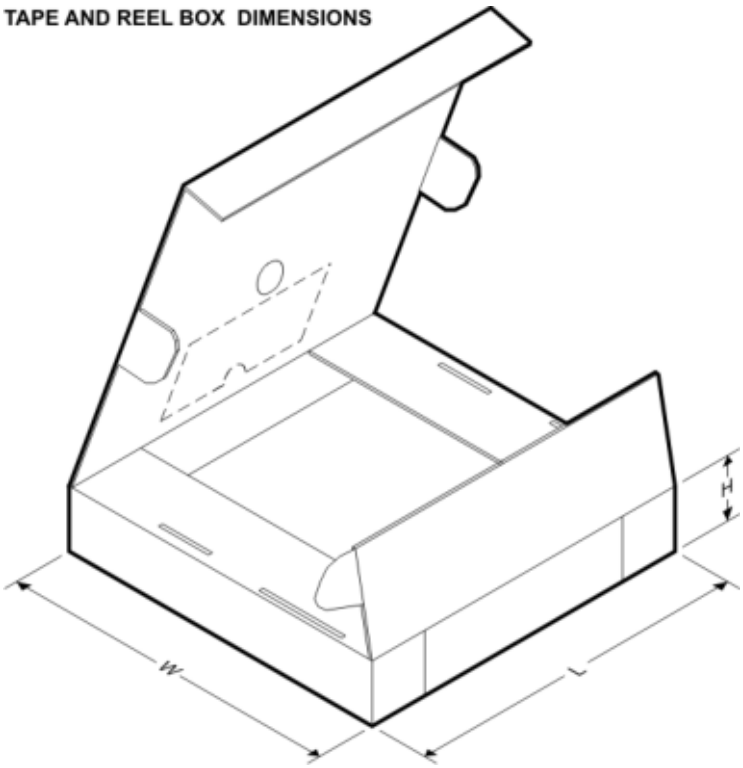


A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

*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
TPS79301DBVREP	SOT-23	DBV	6	3000	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TPS79301MDBVREP	SOT-23	DBV	6	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS79318DBVREP	SOT-23	DBV	5	3000	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TPS79333DBVREP	SOT-23	DBV	5	3000	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TPS793475DBVREP	SOT-23	DBV	5	3000	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

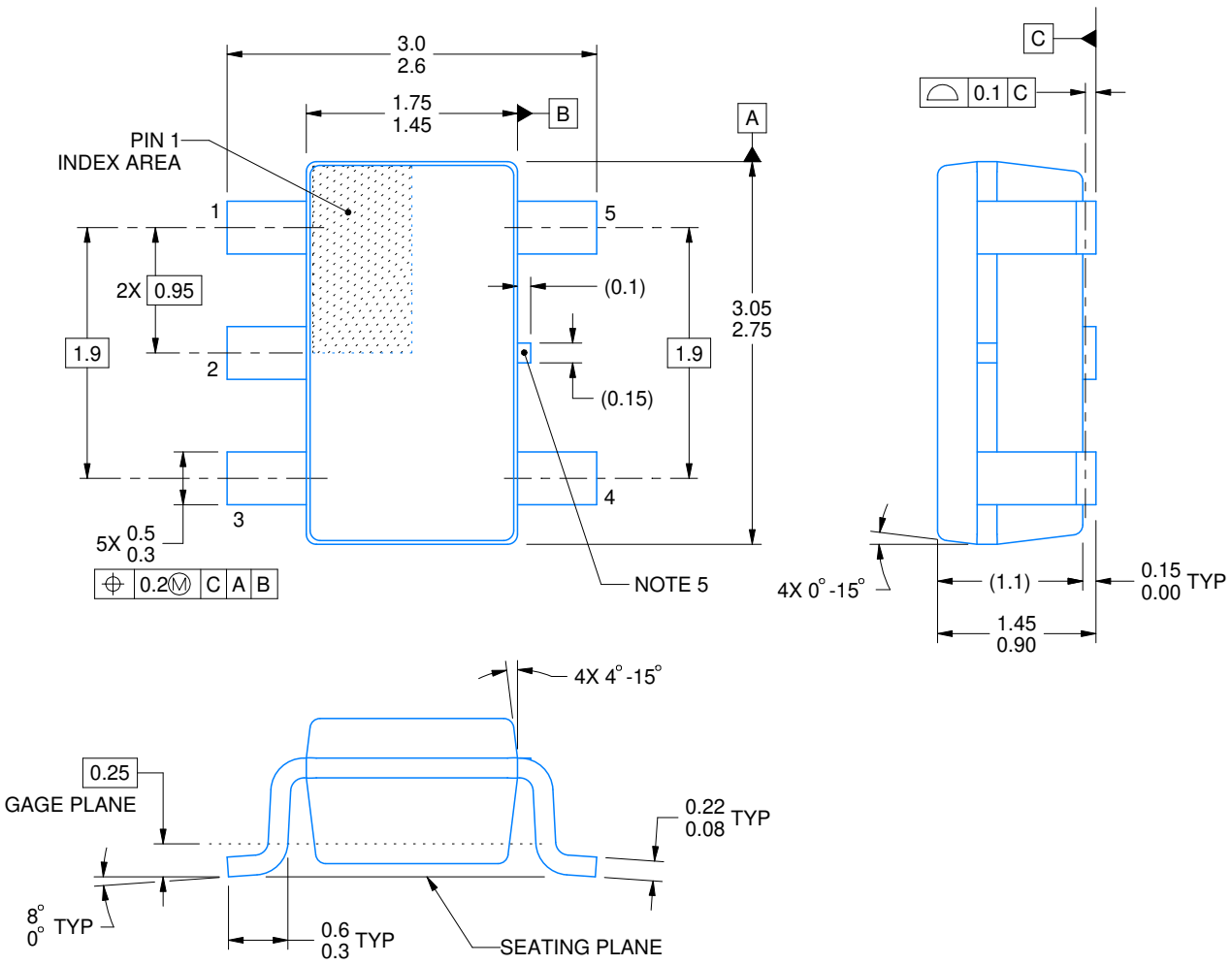
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS79301DBVREP	SOT-23	DBV	6	3000	182.0	182.0	20.0
TPS79301MDBVREP	SOT-23	DBV	6	3000	200.0	183.0	25.0
TPS79318DBVREP	SOT-23	DBV	5	3000	182.0	182.0	20.0
TPS79333DBVREP	SOT-23	DBV	5	3000	182.0	182.0	20.0
TPS793475DBVREP	SOT-23	DBV	5	3000	182.0	182.0	20.0

PACKAGE OUTLINE

DBV0005A

SOT-23 - 1.45 mm max height

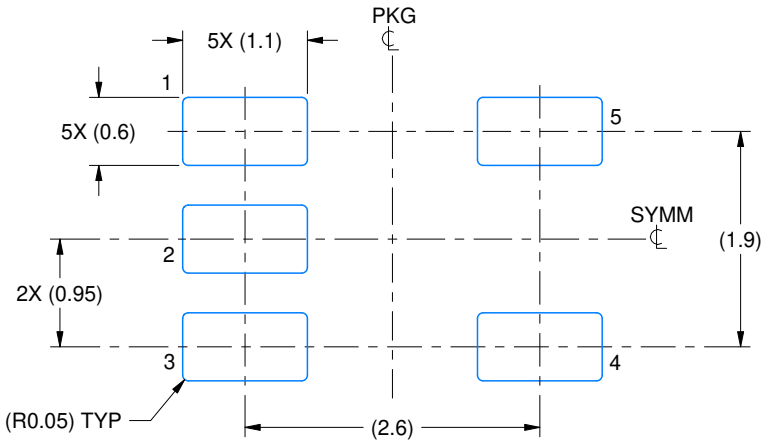
SMALL OUTLINE TRANSISTOR



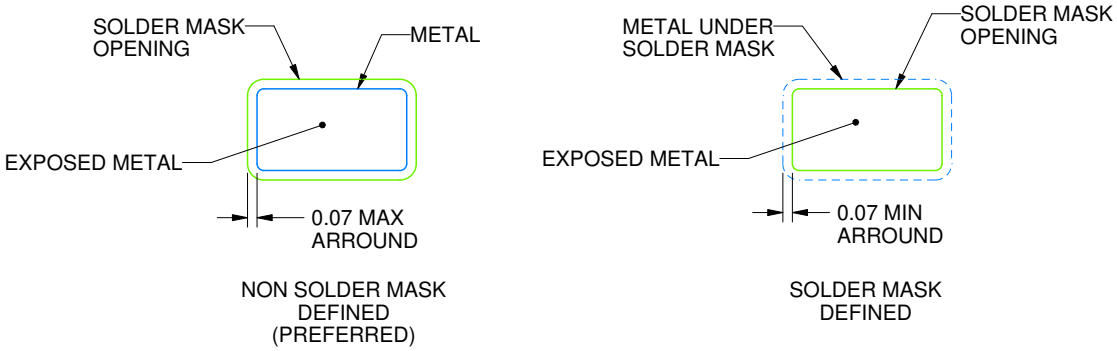
4214839/K 08/2024

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Refernce JEDEC MO-178.
4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
5. Support pin may differ or may not be present.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X

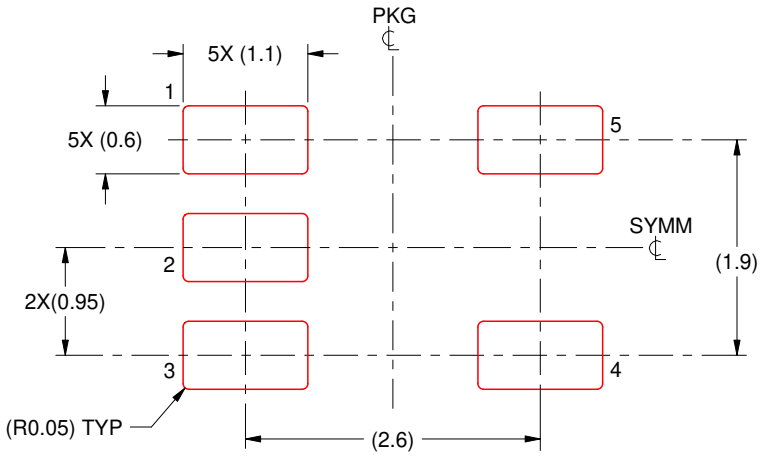


SOLDER MASK DETAILS

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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

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NOTES: (continued)

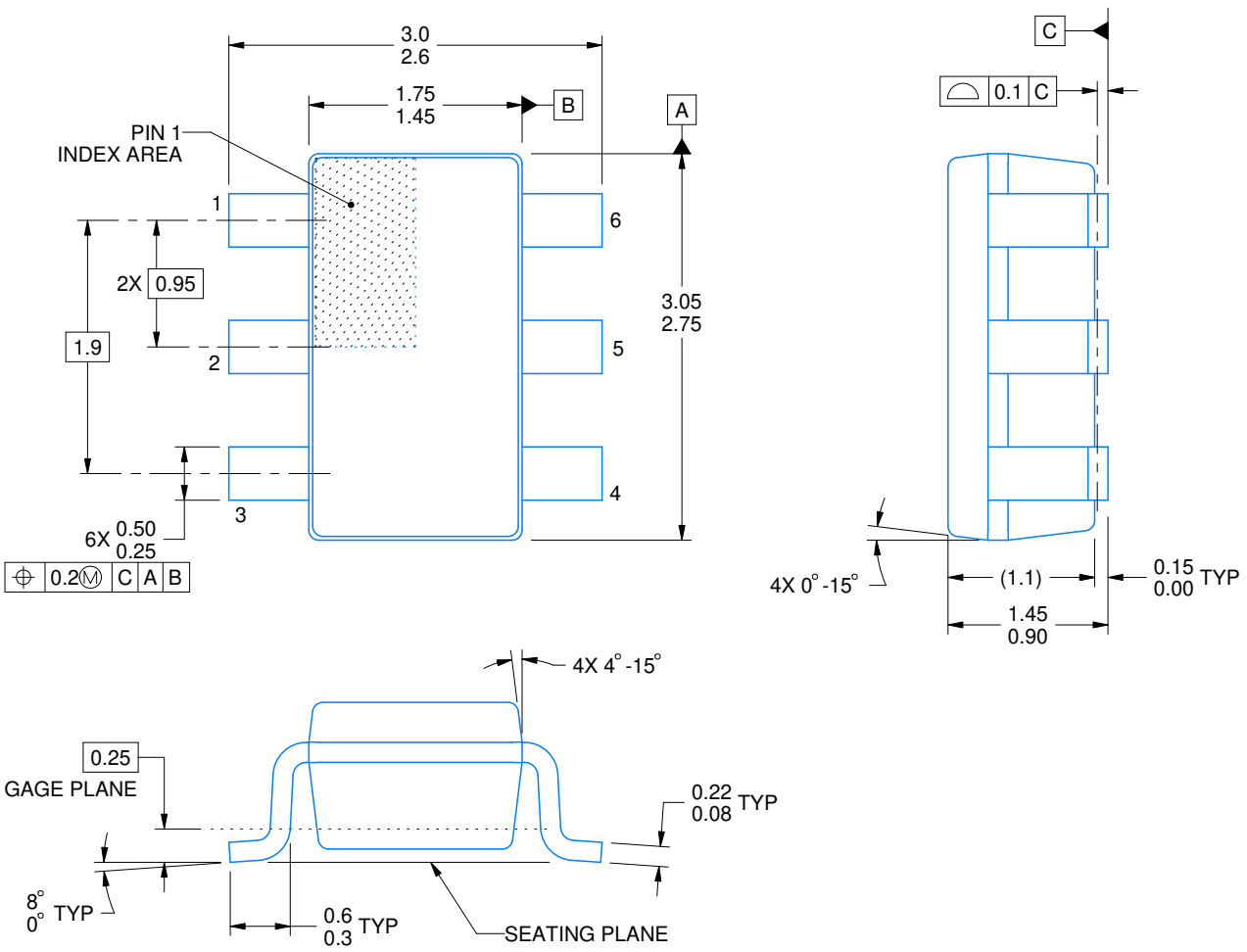
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

PACKAGE OUTLINE

DBV0006A

SOT-23 - 1.45 mm max height

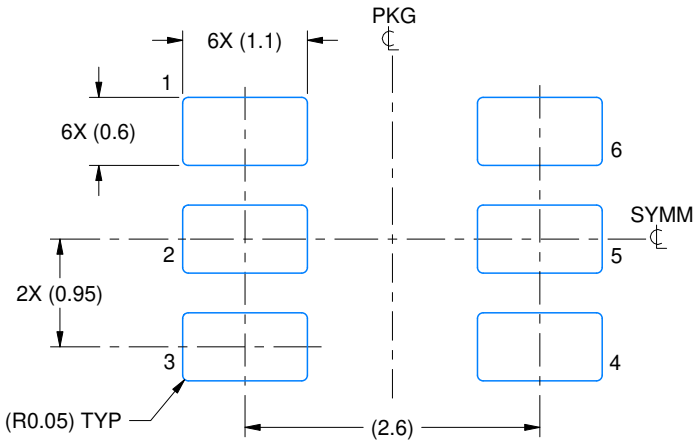
SMALL OUTLINE TRANSISTOR



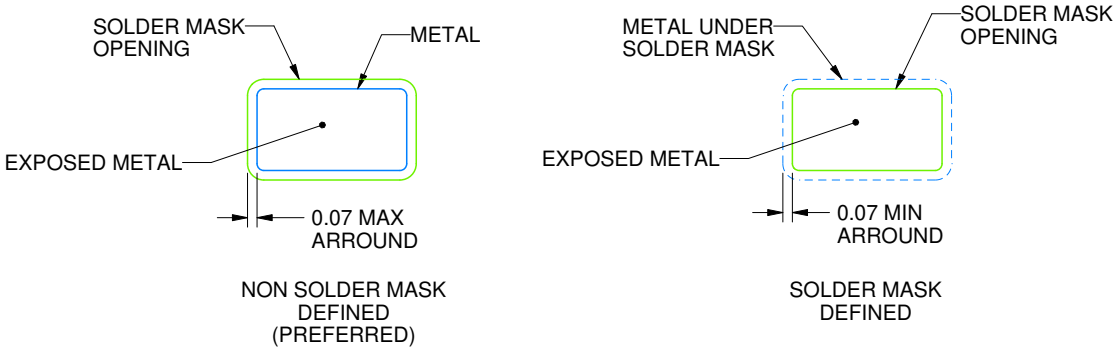
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NOTES:

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2. This drawing is subject to change without notice.
3. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.25 per side.
4. Leads 1,2,3 may be wider than leads 4,5,6 for package orientation.
5. Refernce JEDEC MO-178.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X

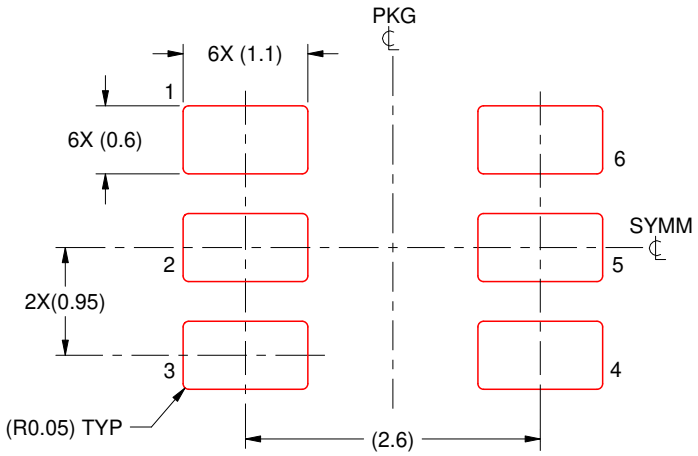


SOLDER MASK DETAILS

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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

4214840/G 08/2024

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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