300mA,Ultra-low noise, Small Package Ultra-Fast CMOS LDO Regulator

General Description

The LP3992 is designed for portable RF and wireless applications with demanding performance and space requirements. The LP3992 performance is optimized for battery-powered systems to deliver ultra low noise and low quiescent current. The LP3992 also works with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications, critical in hand-held wireless devices. The LP3992 consumes less than 0.1μA in shutdown mode and has fast turn-on time less than 50μs. The other features include ultra low dropout voltage, high output accuracy, current limiting protection, and high ripple rejection ratio. It is available in the 5-lead of SOT23-5 and TSOT23-5 packages.

Order Information

LP3992 □□ □□ □

- F: Pb-Free
- Package Type
  - B3: SOT23-3
  - B5: SOT23-5
  - J5: TSOT23-5
- Output Type
  - 12: 1.2V
  - 15: 1.5V
  - 18: 1.8V
  - 25: 2.5V
  - 28: 2.8V
  - 30: 3.0V
  - 33: 3.3V
  - 36: 3.6V
  - 50: 5.0V

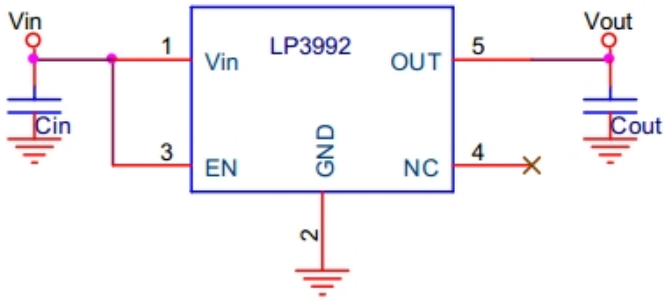
Features

- Ultra-Low-Noise for RF Application
- 2.5V- 5.5V Input Voltage Range
- Low Dropout : 220mV @ 300mA
- 1.2V, 1.5V, 1.8V, 2.5V, 2.8V,3.0V,3.3V, 3.6V and 5V Fixed
- 300mA Output Current
- High PSRR:-76dB at 1KHz
- < 1uA Standby Current When Shutdown
- Available in SOT23-5、SOT23 and TSOT23-5 Package
- TTL-Logic-Controlled Shutdown Input
- Ultra-Fast Response in Line/Load transient
- Current Limiting and Thermal Shutdown Protection
- Quick start-up (typically 50uS)

Applications

- Portable Media Players/MP3 players
- Cellular and Smart mobile phone
- LCD
- DSC Sensor
- Wireless Card

Typical Application Circuit

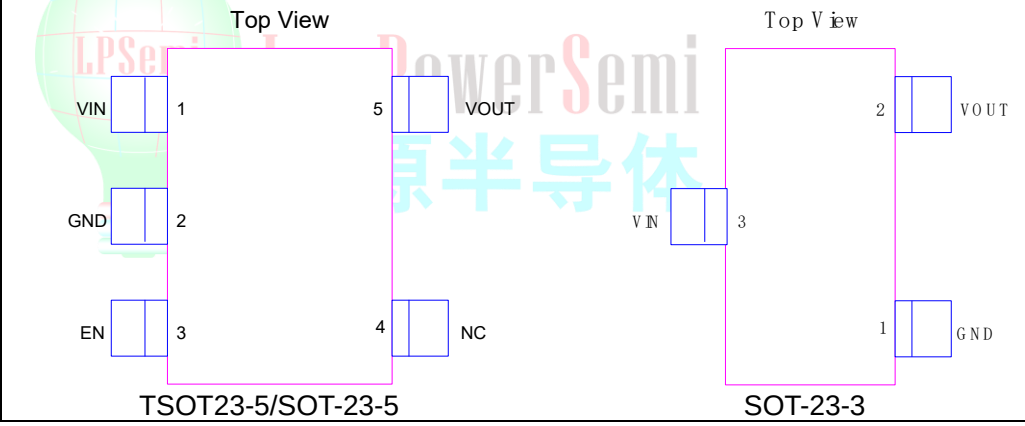


Marking Information

Device	Marking	Package	Shipping
LP3992-12B5F	LPS 1BYWX	SOT23-3 SOT23-5 TSOT23-5	3K/REEL
LP3992-15B5F	LPS 1NYWX / LPS 4NYWX	SOT23-3 SOT23-5 TSOT23-5	3K/REEL
LP3992-18B5F	LPS 1CYWX	SOT23-3 SOT23-5 TSOT23-5	3K/REEL

Device	Marking	Package	Shipping
LP3992-28B5F	LPS 1HYWX	SOT23-3 SOT23-5 TSOT23-5	3K/REEL
LP3992-25B5F	LPS 1DYWX	SOT23-3 SOT23-5 TSOT23-5	3K/REEL
LP3992-30B5F	LPS 1GYWX	SOT23-3 SOT23-5 TSOT23-5	3K/REEL
LP3992-33B5F	LPS 1EYWX	SOT23-3 SOT23-5 TSOT23-5	3K/REEL
Y: Y is year code. W: W is week code. X: X is series number.			

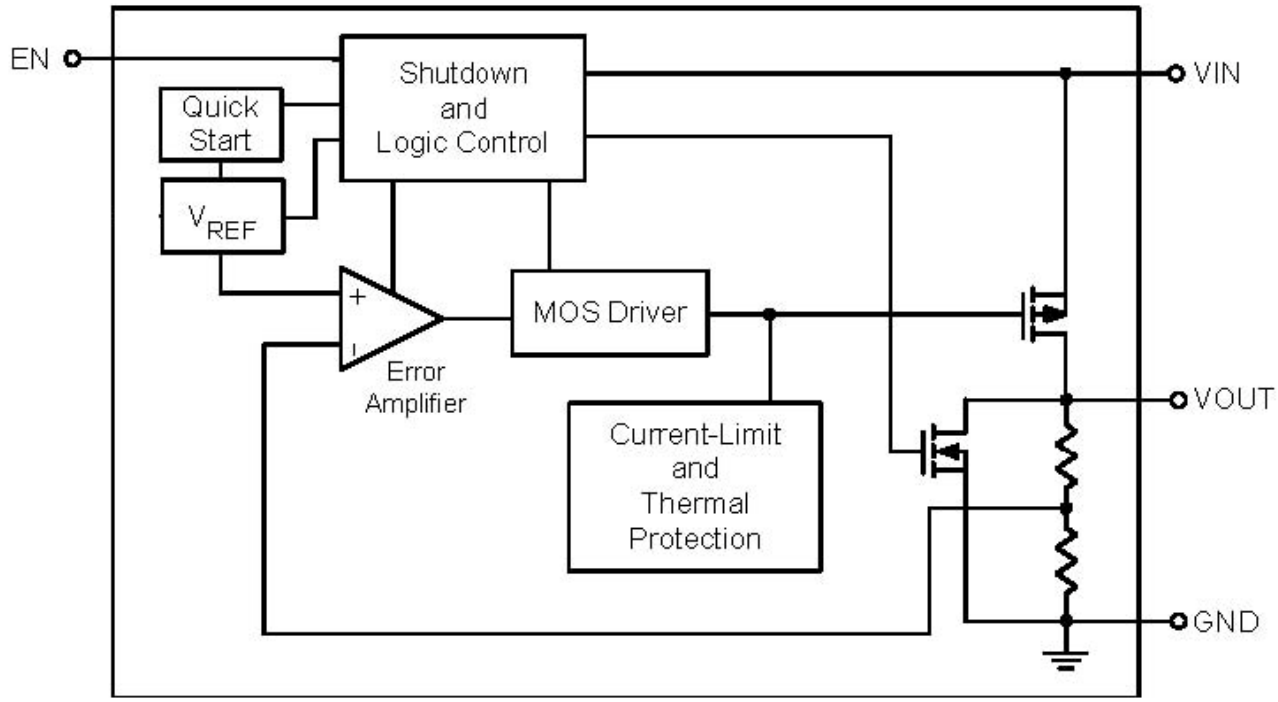
Functional Pin Description

Package Type	Pin Configurations
TSOT23-5 SOT-23-5 SOT-23-3	

Pin Description

Pin		Name	Description
SOT23-5	SOT23-3		
1	3	VIN	Power Input Voltage.
2	1	GND	Ground.
3		EN	Chip Enable (Active High).
4		NC	No Connection.
5	2	VOUT	Output Voltage.

Function Diagram



Absolute Maximum Ratings

- ✧ Supply Input Voltage ---------- 6.5V
- ✧ Other Pin Voltage ---------- -0.3V to VIN+0.3V

Power Dissipation, PD @ TA = 25°C

- ✧ T/SOT23-5 ---------- 500mW
- ✧ SOT23-3 ---------- 500mW

Package Thermal Resistance

- ✧ Thermal Resistance(SOT23-5/SOT23) (JA) ---------- 195℃/W
- ✧ Thermal Resistance(SOT23-5/SOT23) (JC) ---------- 60℃/W
- ✧ Maximum Junction Temperature ---------- 150°C
- ✧ Maximum Soldering Temperature (at leads, 10 sec) ---------- 260°C
- ✧ Storage Temperature Range ---------- −60°C to 125°C

ESD Susceptibility

- ✧ HBM (Human Body Mode) ---------- 2kV
- ✧ MM(Machine-Mode) ---------- 200V

Recommended Operating Conditions

- ✧ Supply Input Voltage ---------- 2.5V to 5.5V
- ✧ EN Input Voltage ---------- 0V to Vin+0.3V
- ✧ Operation Junction Temperature Range ---------- −40°C to 125°C
- ✧ Operation Ambient Temperature Range ---------- −40°C to 85°C

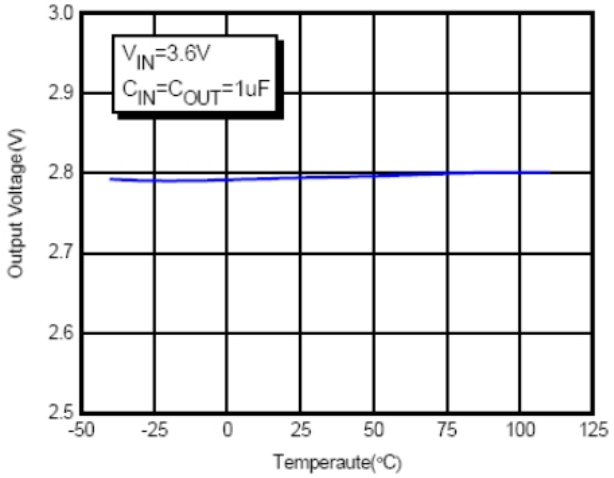
Electrical Characteristics

(LP3992-33B5F,VIN = VOUT + 1V, CIN = COUT = 1μF, TA = 25° C, unless otherwise specified)

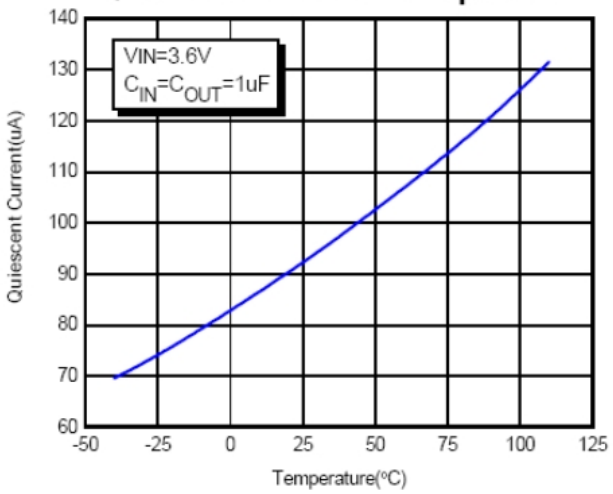
Parameter		Symbol	Test Conditions	Min	Typ.	Max	Units
Output Voltage Accuracy		ΔVOUT	IOUT = 1mA	−3	--	+3	%
Output Voltage		VOUT	IOUT = 1mA		3.33		V
Output Loading Current		I_{LOAD}	VEN=VIN,VIN>2.5V	300			mA
Current Limit		ILIM	RLOAD = 1Ω	420	450		mA
Quiescent Current		IQ	VEN ≥ 1.4V, IOUT = 0mA		75	130	μA
Dropout Voltage		VDROP	IOUT = 200mA, VOUT > 2.8V		130	200	mV
			IOUT = 300mA, VOUT > 2.8V		220	300	
Line Regulation		ΔVLINE	VIN = (VOUT + 1V) to 5.5V, IOUT = 50mA			0.2	%/V
Load Regulation		ΔLOAD	1mA < IOUT < 300mA			2	%/A
Standby Current		ISTBY	VEN = GND, Shutdown		0.01	1	μA
EN Input Bias Current		IIBSD	VEN = 3V		1.5	3.5	μA
EN Threshold	Logic-Low Voltage	VIL	VIN = 3V to 5.5V, Shutdown			0.4	V
	Logic-High Voltage	VIH	VIN = 3V to 5.5V, Start-Up	1.4		VIN+ 0.3	
Output Noise Voltage			10Hz to 100kHz, IOUT = 200mA, COUT = 1μF		300		uVRMS
Power Supply Rejection Rate	f = 1kHz		COUT = 1μF, IOUT = 100mA		-76		dB
	f = 10kHz				−65		
Thermal Shutdown Temperature		TSD			150		°C

Typical Operating Characteristics

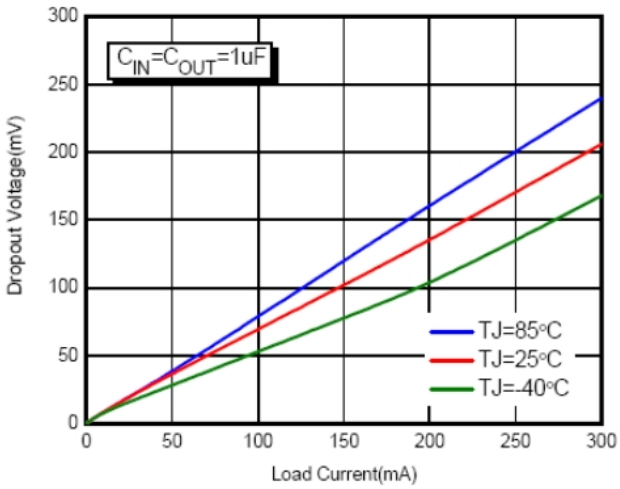
Output Voltage Vs. Temperature



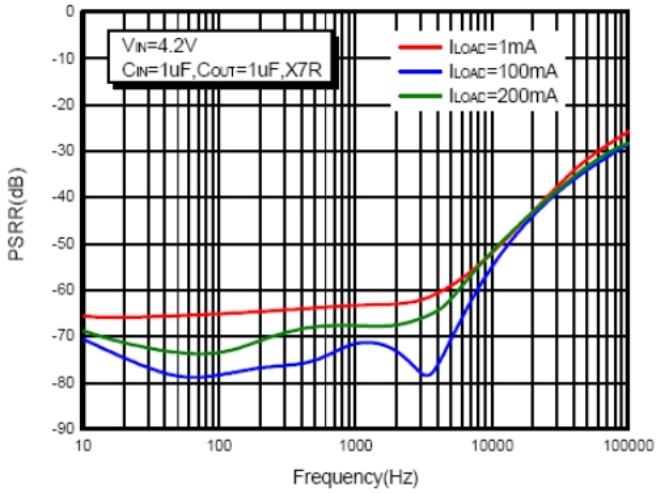
Quiescent Current Vs. Temperature



Dropout Voltage Vs. Load Current



PSRR



Applications Information

Like any low-dropout regulator, the external capacitors used with the LP3992 must be carefully selected for regulator stability and performance. Using a capacitor whose value is > 1μF on the LP3992 input and the amount of capacitance can be increased without limit. The input capacitor must be located a distance of not more than 0.5 inch from the input pin of the IC and returned to a clean analog ground. Any good quality ceramic or tantalum can be used for this capacitor. The capacitor with larger value and lower ESR (equivalent series resistance) provides better PSRR and line-transient response. The output capacitor must meet both requirements for minimum amount of capacitance and ESR in all LDOs application. The LP3992 is designed specifically to work with low ESR ceramic output capacitor in space-saving and performance consideration. Using a ceramic capacitor whose value is at least 1μF with ESR is > 25mΩ on the LP3992 output ensures stability. The LP3992 still works well with output capacitor of other types due to the wide stable ESR range. Output capacitor of larger capacitance can reduce noise and improve load transient response, stability, and PSRR. The output capacitor should be located not more than 0.5 inch from the VOUT pin of the LP3992 and returned to a clean analog ground.

Start-up Function Enable Function

The LP3992 features an LDO regulator enable/disable function. To assure the LDO regulator will switch on, the EN turn on control level must be greater than 1.4 volts. The LDO regulator will go into the shutdown mode when the voltage on the EN pin falls below 0.4 volts. For to protecting the system, the LP3992 have a quick-discharge function. If the enable function is not needed in a specific application, it may be tied to VIN to keep the LDO regulator in a continuously on state.

Thermal Considerations

Thermal protection limits power dissipation in LP3992. When the operation junction temperature exceeds 150°C, the OTP circuit starts the thermal shutdown function turn the pass element off. The pass element turns on again after the junction temperature cools by 25°C. For continue operation, do not exceed absolute maximum operation junction temperature 125°C.

The power dissipation definition in device is:

$$\mathbf{PD = (VIN-VOUT) \times IOUT + VIN \times IQ}$$

The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junction to ambient.

The maximum power dissipation can be calculated by following formula:

$$\mathbf{PD(MAX) = (TJ(MAX) - TA) /\theta JA}$$

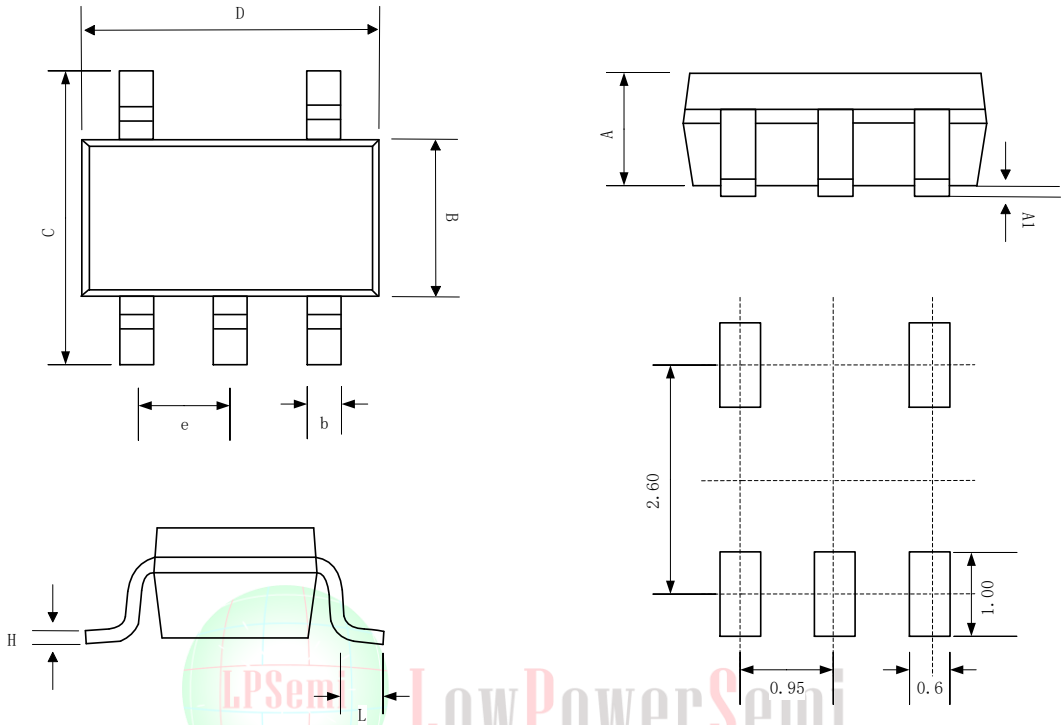
Where TJ(MAX) is the maximum operation junction temperature 125°C, TA is the ambient temperature and the θJA is the junction to ambient thermal resistance. For recommended operating conditions specification of LP3992, where TJ(MAX) is the maximum junction temperature of the die (125°C) and TA is the maximum ambient temperature. The junction to ambient thermal resistance (θJA is layout dependent) for SOT23-5 package is 195°C/W.

$$\mathbf{PD(MAX) = (125°C-25°C) / 195 = 500mW}$$

The maximum power dissipation depends on operating ambient temperature for fixed TJ(MAX) and thermal resistance θJA.

Packaging Information

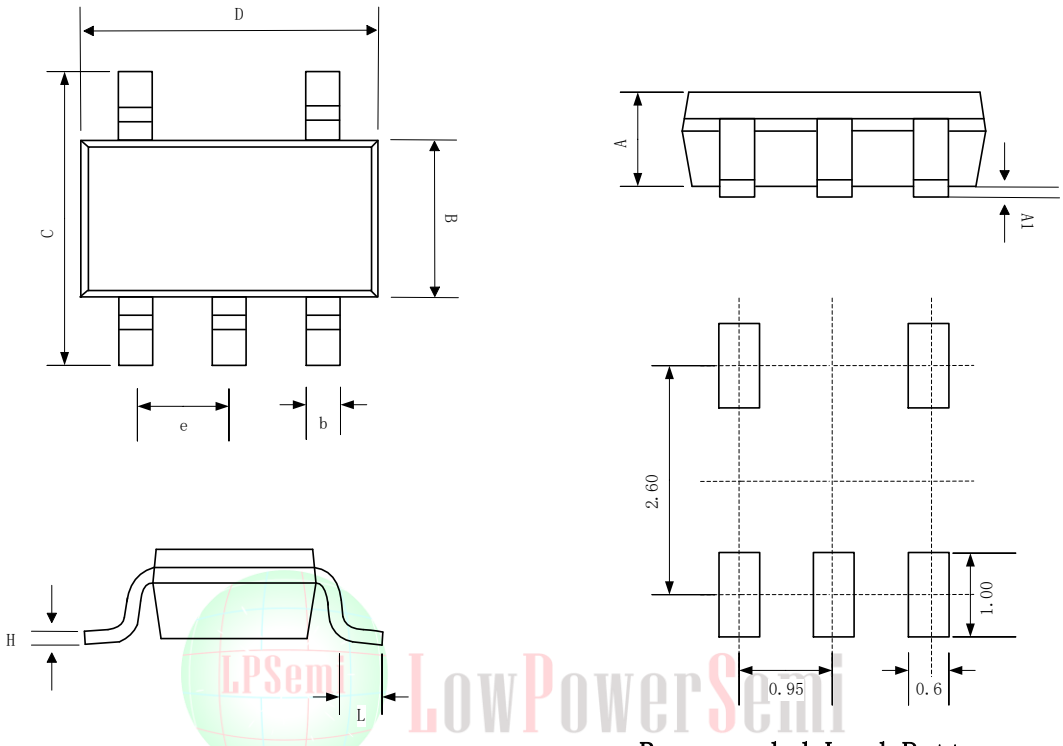
SOT23-5



Recommended Land Pattern

SYMBOL	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.889	1.100	1.295
A1	0.000	0.050	0.152
B	1.397	1.600	1.803
b	0.28	0.35	0.559
C	2.591	2.800	3.000
D	2.692	2.920	3.120
e	0.95BSC		
H	0.080	0.152	0.254
L	0.300	0.450	0.610

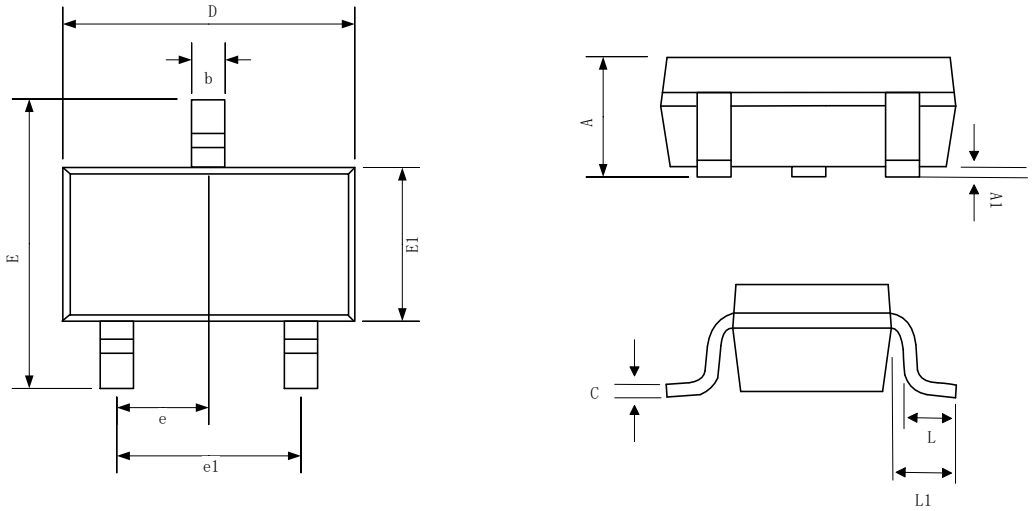
TSOT23-5



Recommended Land Pattern

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	-	-	1.00
A1	0.00	0.05	0.15
B	1.40	1.60	1.80
b	0.28	0.35	0.56
C	2.59	2.80	3.00
D	2.69	2.92	3.12
e	0.95 BSC		
H	0.08	0.15	0.25
L	0.30	0.45	0.61

SOT23-3



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.000	1.150	1.330
A1	0.000	0.050	0.130
b	0.300	0.380	0.450
c	0.110	0.150	0.190
D	2.820	2.920	3.020
E	2.600	2.800	3.000
E1	1.400	1.600	1.800
e		0.950BSC	
e1		1.900BSC	
L	0.300	0.450	0.600
L1		0.600REF	

Classification of IR Reflow Profile

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat/Soak Temperature Min(T_{SMIN}) Temperature Max(T_{SMAX}) Time(T_S) from (T_{SMIN} to T_{SMAX})	 100℃ 150℃ 60~120 seconds	 150℃ 200℃ 60~120 seconds
Ramp-up rate (T_L to T_P)	3℃/second max	3℃/second max
Liquidous temperature(T_L) Time(t_L) maintained above T_L	183℃ 60~150 seconds	217℃ 60~150 seconds
Peak package body temperature (T_P)	For users T_P must not exceed theClassification temp in Table 1. For suppliers T_P must equal or exceedthe Classification temp in Table 1.	For users T_P must not exceed theClassification temp in Table 2. For suppliers T_P must equal or exceedthe Classification temp in Table 2.
Time(t_P)* within 5℃ of the specified classification temperature(T_C), see Figure1	20* seconds	30* seconds
Ramp-down rate (T_P to T_L)	6℃/second max	6℃/second max
Time 25℃ to peak temperature	6 minutes max	8minutes max
* Tolerance for peak profile temperature (T_P) is defined as a supplier minimum and a user maximum.		

Table 1Sn-Pb Eutectic Process - Classification Temperatures (T_C)

Package Thickness	Volume mm^3 <350	Volume mm^3 ≥350
<2.5mm	235℃	220℃
≥2.5mm	220℃	220℃

Table 2 Pb-Free Process - Classification Temperatures (T_C)

Package Thickness	Volume mm^3 <350	Volume mm^3 350~2000	Volume mm^3 ≥350
<1.6mm	260℃	260℃	260℃
1.6mm~2.5mm	260℃	250℃	245℃
>2.5mm	250℃	245℃	245℃

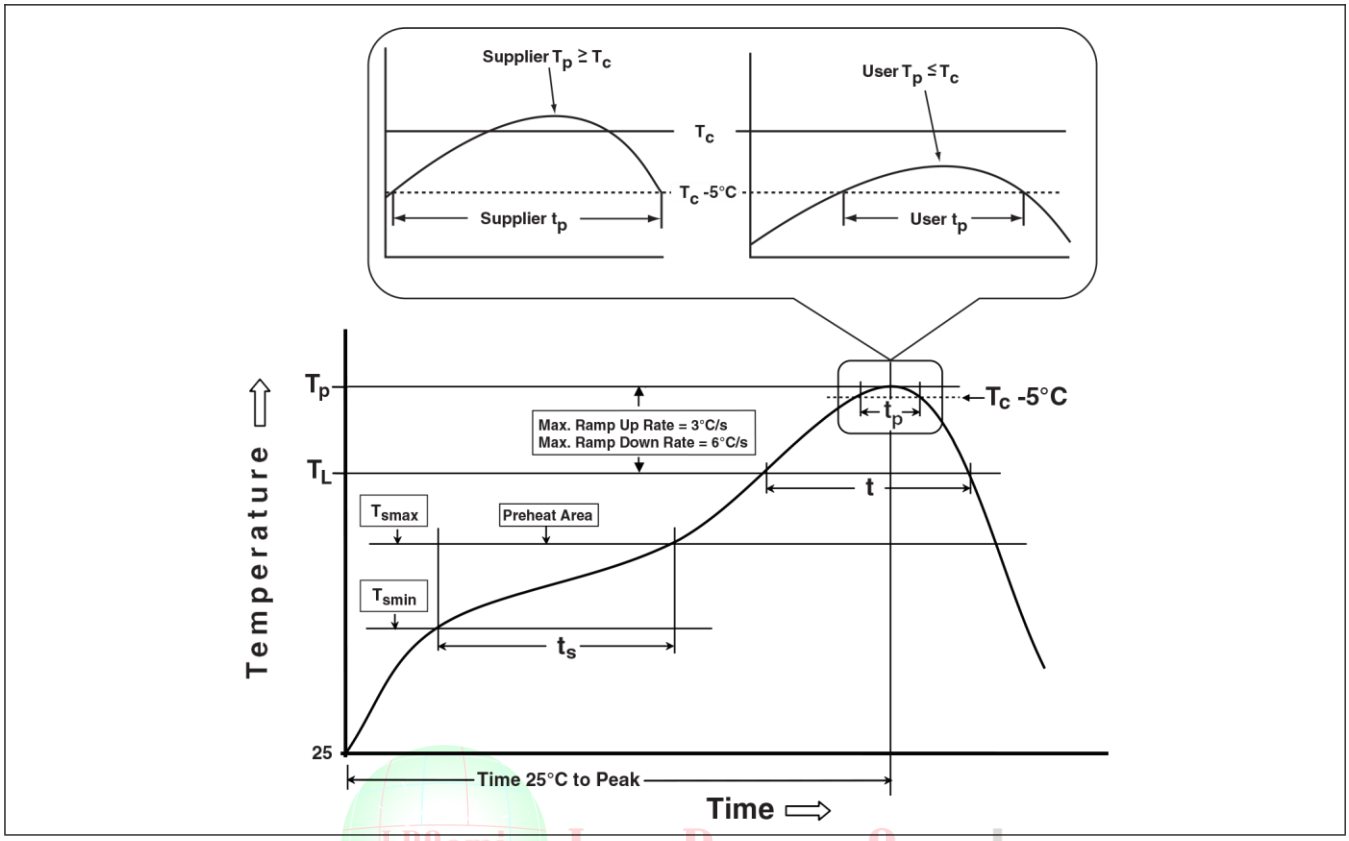


Figure1Classification Profile (Not to scale)

Products shipped conform to "Rohs" standards;

Moisture Sensitivity Level：MSL3（CONDITION：≦30 °C/60%RH、Time control:168 hours）;