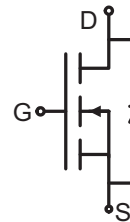


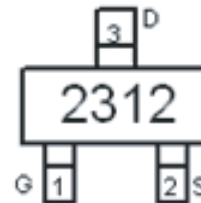
## N-Channel Enhancement Mode Power MOSFET

### Description

The RM2312 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a battery protection or in other switching application.



Schematic diagram



Marking and pin assignment



SOT-23 top view

### General Features

- $V_{DS} = 20V, I_D = 4.5A$
- $R_{DS(ON)} < 45m\Omega @ V_{GS}=1.8V$
- $R_{DS(ON)} < 40m\Omega @ V_{GS}=2.5V$
- $R_{DS(ON)} < 33m\Omega @ V_{GS}=4.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

### Application

- Battery protection
- Load switch
- Power management
- Package: 3K/Reel, 9K/Box, 72K/Carton
- Halogen-free
- P/N suffix V means AEC-Q101 qualified, e.g: RM2312V

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
2312	RM2312	SOT-23	Ø180mm	8 mm	3000 units

### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current	$I_D$	4.5	A
		3.6	
Drain Current-Pulsed (Note 1)	$I_{DM}$	13.5	A
Maximum Power Dissipation	$P_D$	1.25	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ\text{C}$

### Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	100	$^\circ\text{C/W}$
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### Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	20	22	-	V

Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =20V,V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±12V,V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics <sup>(Note 3)</sup>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA	0.5	0.65	1.2	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =1.8V, I <sub>D</sub> =2.0 A	-	28.5	45	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =4.0 A	-	21	40	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =4.5A	-	18	33	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =10V,I <sub>D</sub> =4A	-	10	-	S
Dynamic Characteristics <sup>(Note4)</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =8V,V <sub>GS</sub> =0V, F=1.0MHz	-	500	-	PF
Output Capacitance	C <sub>oss</sub>		-	300	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	140	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =10V,I <sub>D</sub> =1A V <sub>GS</sub> =4.5V,R <sub>GEN</sub> =6Ω	-	20	40	nS
Turn-on Rise Time	t <sub>r</sub>		-	18	40	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	60	108	nS
Turn-Off Fall Time	t <sub>f</sub>		-	28	56	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =10V,I <sub>D</sub> =3A,V <sub>GS</sub> =4.5V	-	10	15	nC
Gate-Source Charge	Q <sub>gs</sub>		-	2.3	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	2.9	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V,I <sub>S</sub> =1A	-	-	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	4.5	A

## Notes:

1. Repetitive rating: pulse width limited by maximum junction temperature.
2. Surface mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production



## RATING AND CHARACTERISTICS CURVES (RM2312)

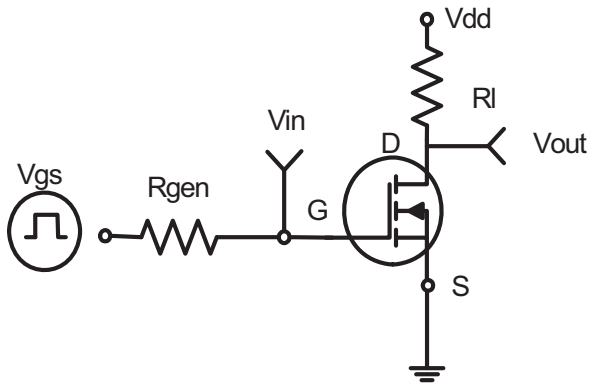


Figure 1: Switching Test Circuit

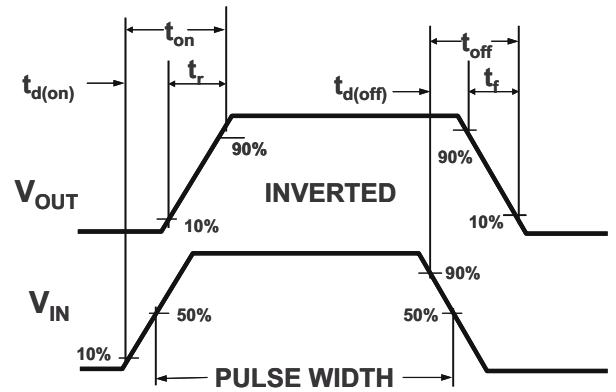


Figure 2: Switching Waveforms

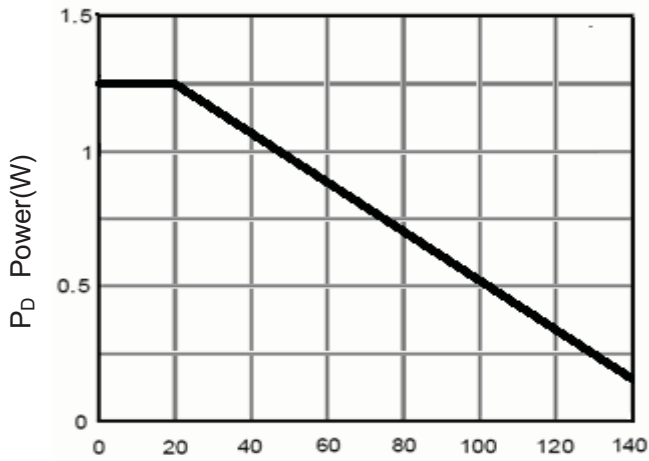


Figure 3 Power Dissipation

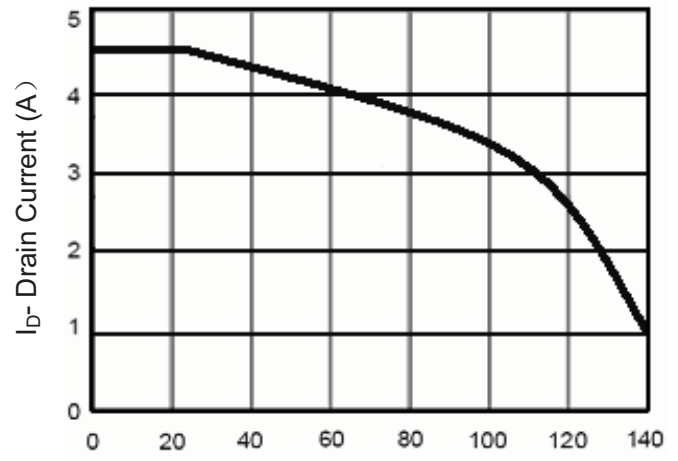


Figure 4 Drain Current

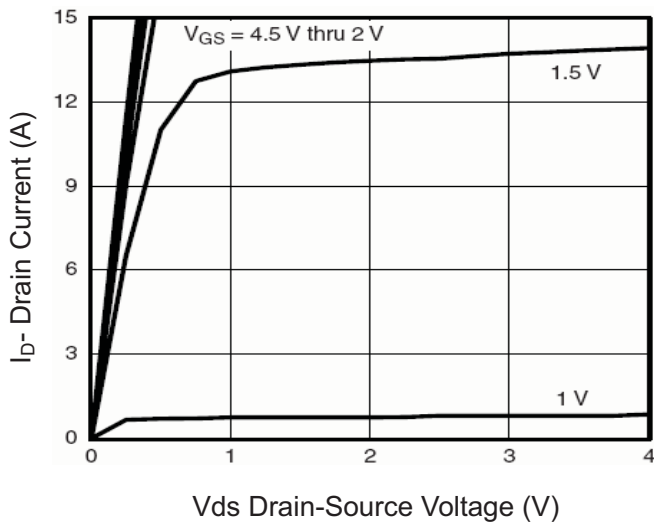


Figure 5 Output Characteristics

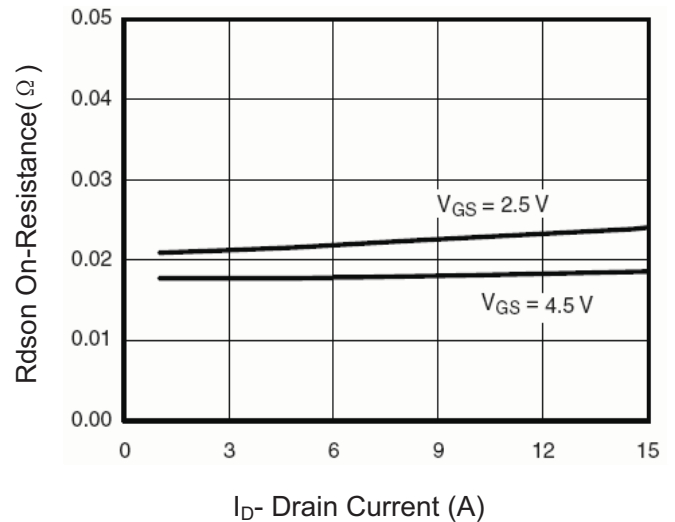
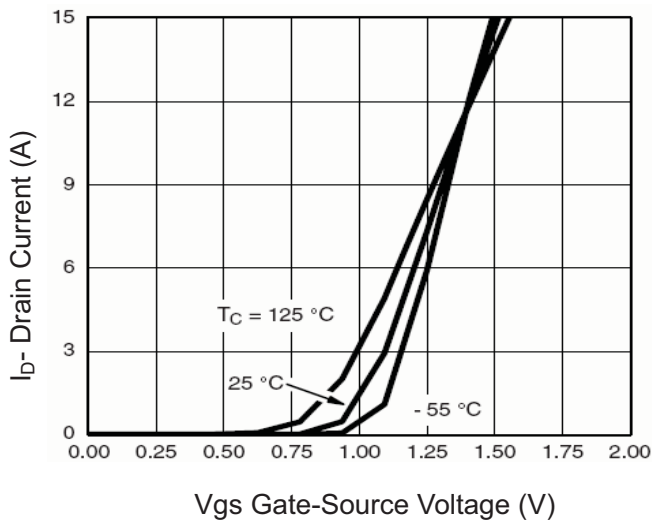
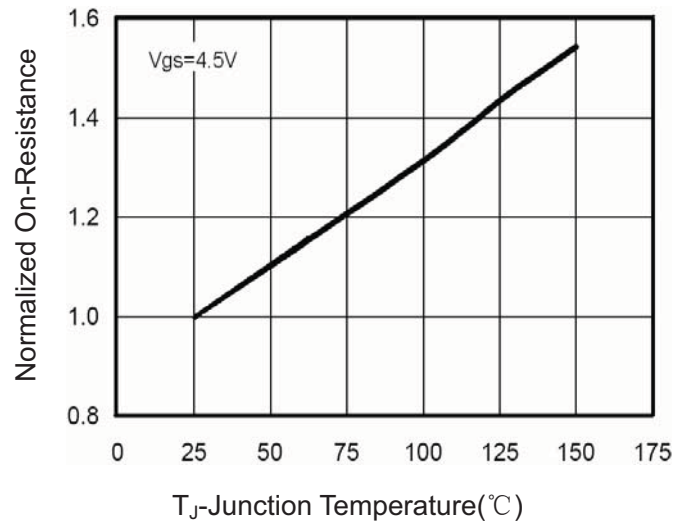


Figure 6 Drain-Source On-Resistance

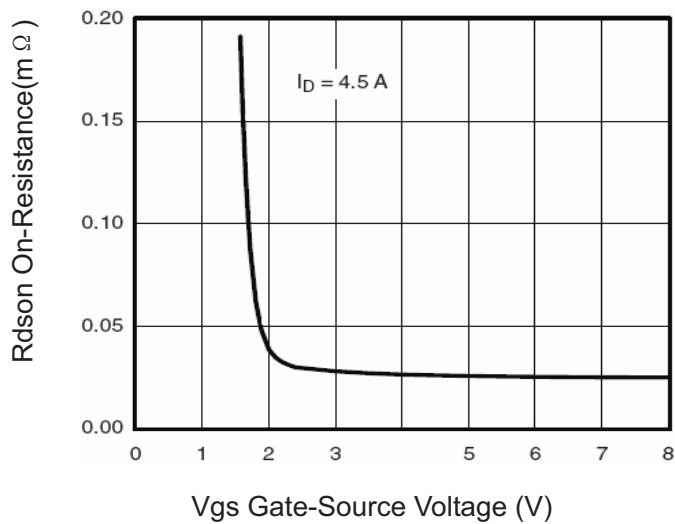
## RATING AND CHARACTERISTICS CURVES (RM2312)



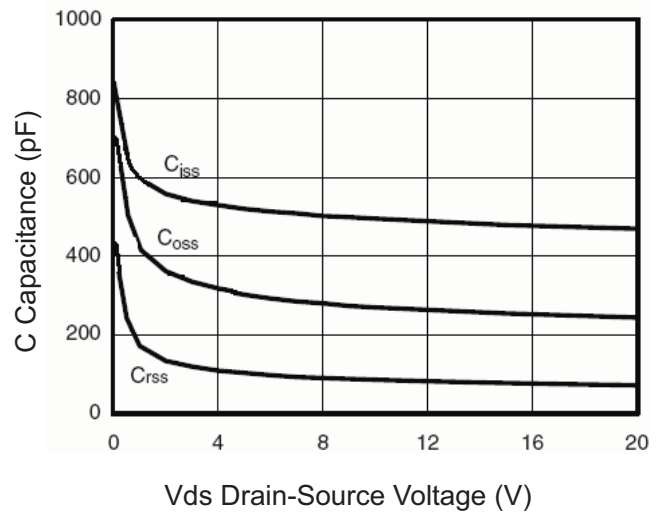
**Figure 7 Transfer Characteristics**



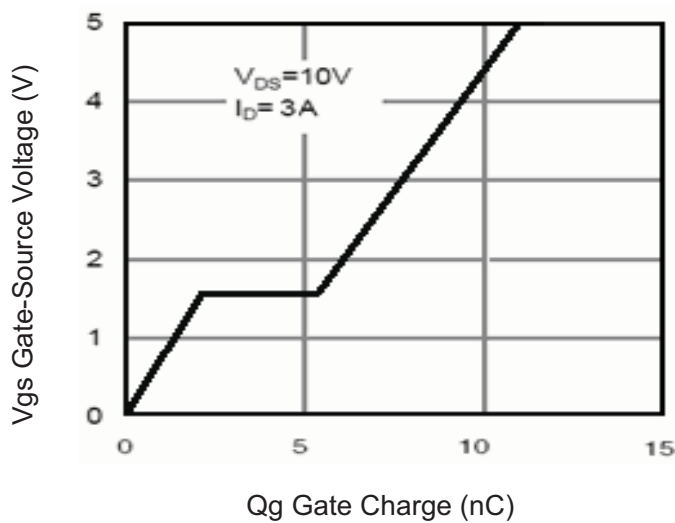
**Figure 8 Drain-Source On-Resistance**



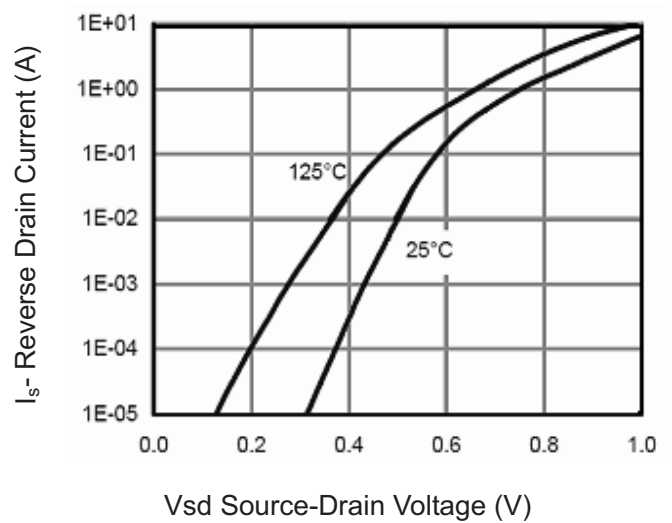
**Figure 9 Rdson vs. Vgs**



**Figure 10 Capacitance vs Vds**



**Figure 11 Gate Charge**



**Figure 12 Source- Drain Diode Forward**

## RATING AND CHARACTERISTICS CURVES (RM2312)

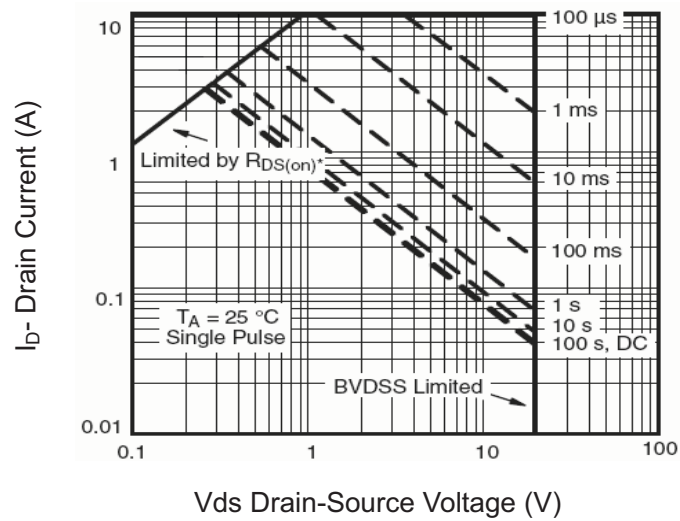


Figure 13 Safe Operation Area

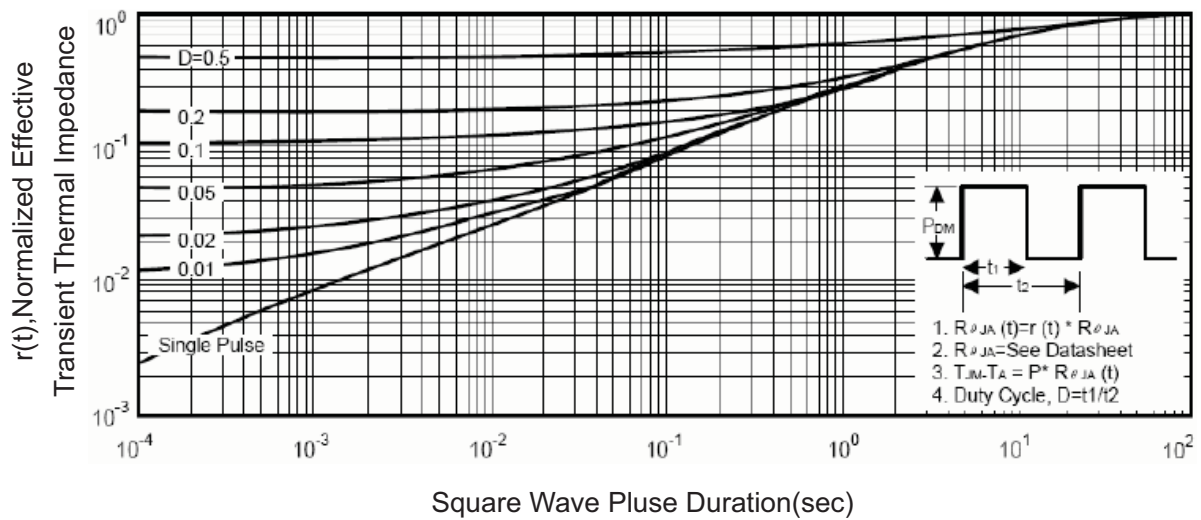
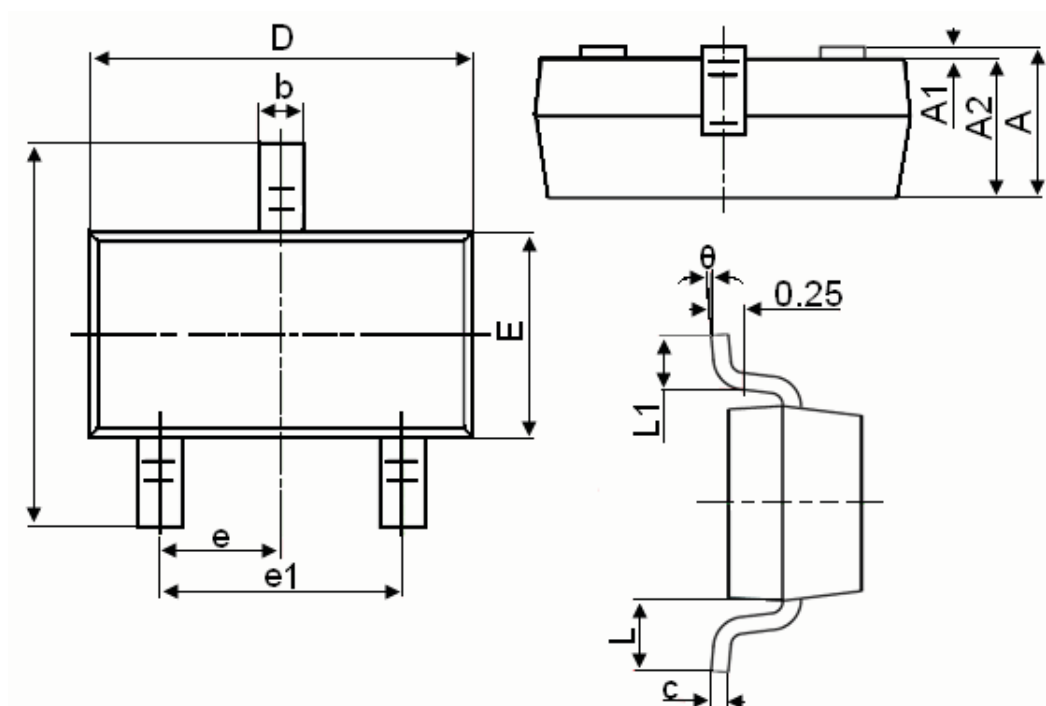


Figure 14 Normalized Maximum Transient Thermal Impedance

## SOT-23 Package Information



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

### Notes

1. All dimensions are in millimeters.
2. Tolerance  $\pm 0.10\text{mm}$  (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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