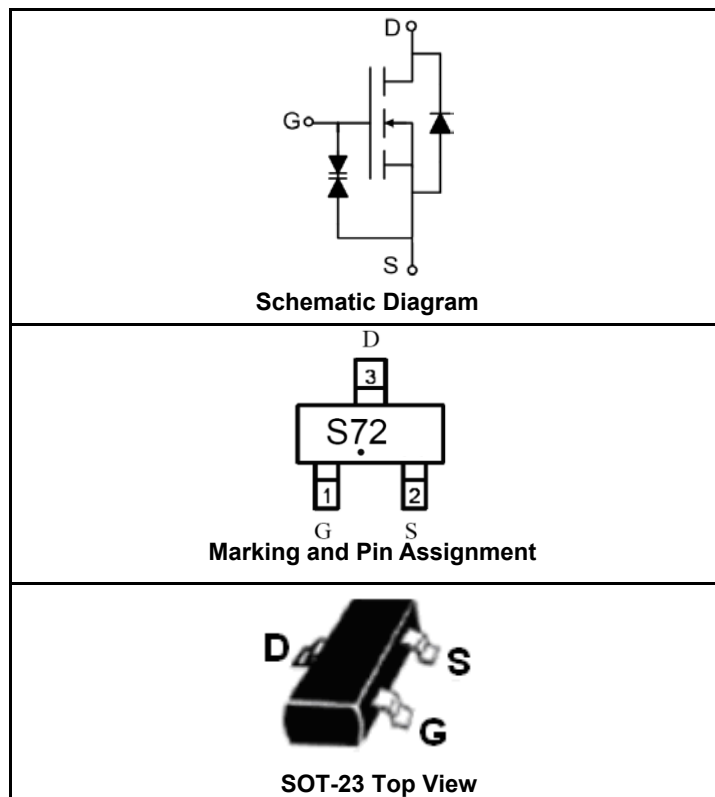


**FEATURES**

- $V_{DS}=60V, I_D=0.3A$   
 $R_{DS(ON)} < 3.5\Omega @ V_{GS}=5V$   
 $R_{DS(ON)} < 3\Omega @ V_{GS}=10V$   
ESD Rating: 1000V HBM
- High Power and Current Handling Capability
- Lead Free
- Surface Mount Package

**APPLICATIONS**

- Direct Logic-Level Interface: TTL/CMOS
- Drivers: Relays, Solenoids, Lamps  
Hammers, Display, Memories, Transistors etc
- Battery Operated Systems
- Solid-State Relays



**PACKAGE MARKING AND ORDERING INFORMATION**

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
S72	2N7002K	SOT-23	Ø180mm	8 mm	3000 units

**ABSOLUTE MAXIMUM RATINGS** ( $T_A=25^\circ C$  unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous@ Current-Pulsed (Note 1)	$I_D$	0.3	A
	$I_D(70^\circ C)$	0.26	
		$I_{DM}$	0.8
Maximum Power Dissipation	$P_D$	0.43	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ C$

**THERMAL CHARACTERISTICS**

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	350	$^\circ C/W$
--	-----------------	-----	--------------

**ELECTRICAL CHARACTERISTICS** ( $T_A=25^\circ C$  unless otherwise noted)

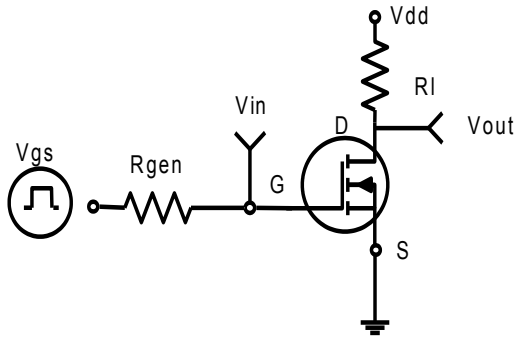
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			V

Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$			1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 5V, V_{DS}=0V$			100	nA
		$V_{GS}=\pm 10V, V_{DS}=0V$			150	nA
		$V_{GS}=\pm 20V, V_{DS}=0V$			10	$\mu A$
Gate-Source Breakdown Voltage	$BV_{GSO}$	$V_{DS}=0V, I_G=\pm 250\mu A$	$\pm 20$			V
<b>ON CHARACTERISTICS (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1		2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=0.5A$			3	$\Omega$
		$V_{GS}=5V, I_D=0.05A$			3.5	
Forward Transconductance	$g_{FS}$	$V_{DS}=10V, I_D=0.2A$	0.08			S
<b>DYNAMIC CHARACTERISTICS (Note4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V,$ $F=1.0MHz$			30	PF
Output Capacitance	$C_{oss}$				6	PF
Reverse Transfer Capacitance	$C_{rss}$				3	PF
<b>SWITCHING CHARACTERISTICS (Note 4)</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, V_{GS}=10V,$ $R_{GEN}=10\Omega, R_L=150\Omega$ $I_D=0.2A$			25	nS
Turn-Off Delay Time	$t_{d(off)}$				35	nS
Total Gate Charge	$Q_g$	$V_{DS}=10V, I_D=0.25A, V_{GS}=4.5V$		0.4	0.6	nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=0.2A$			1.3	V

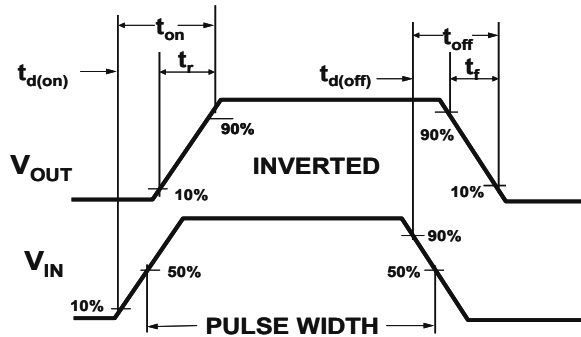
**NOTES:**

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 testing.

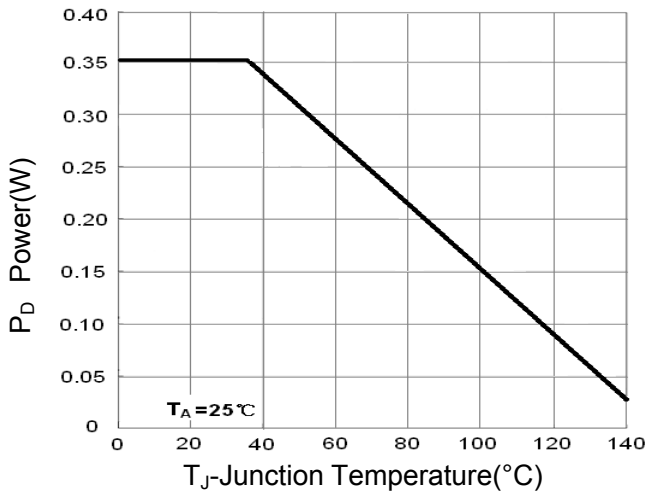
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



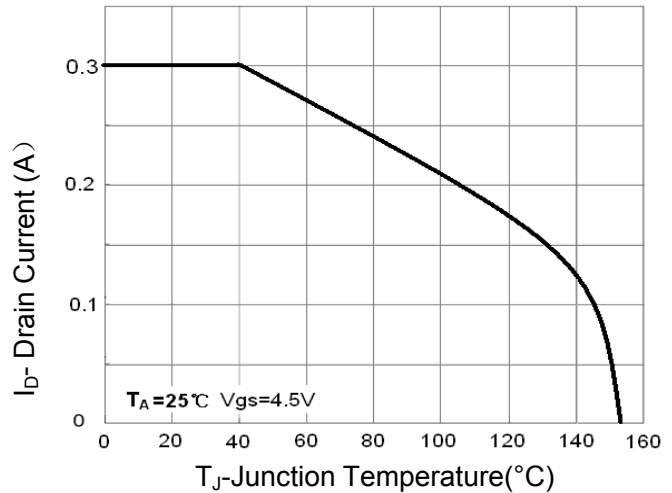
**Figure 1. Switching Test Circuit**



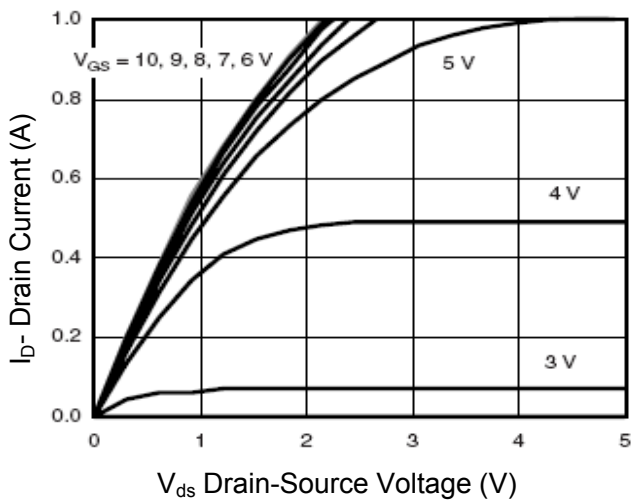
**Figure 2. Switching Waveforms**



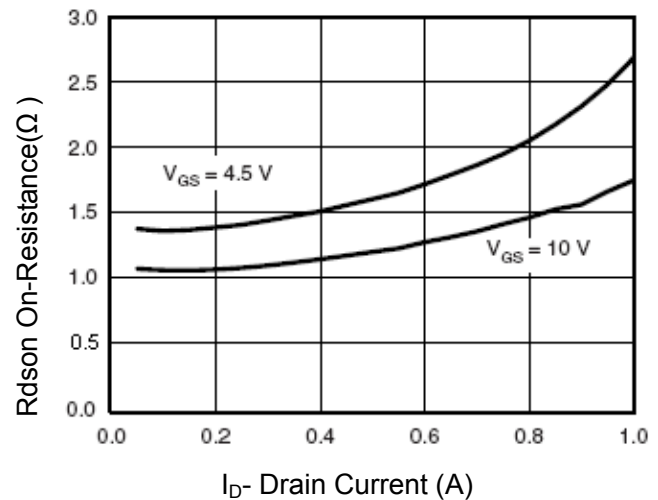
**Figure 3. Power Dissipation**



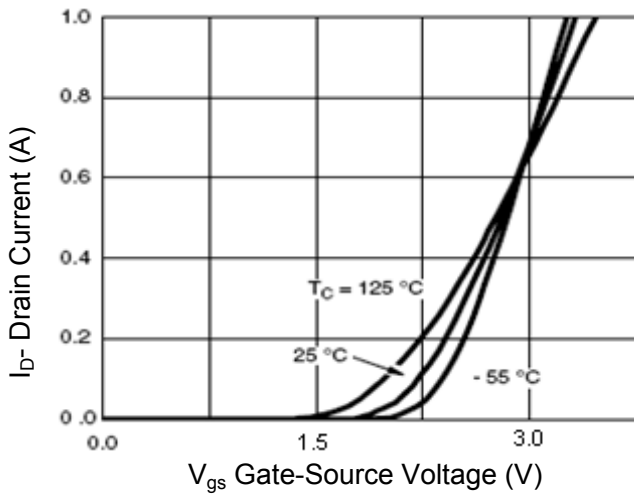
**Figure 4. Drain Current**



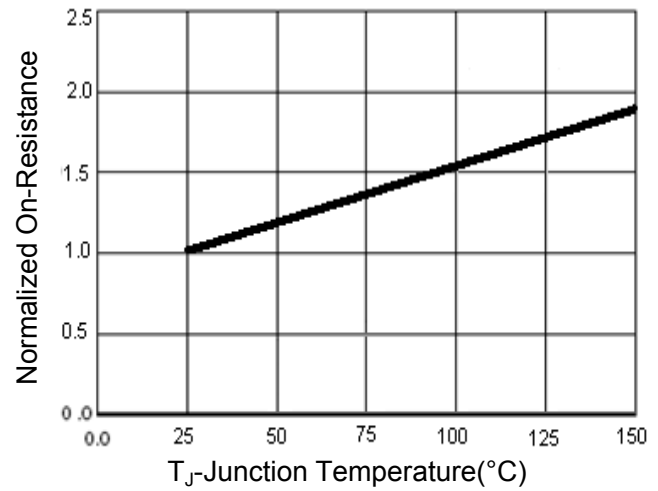
**Figure 5. Output Characteristics**



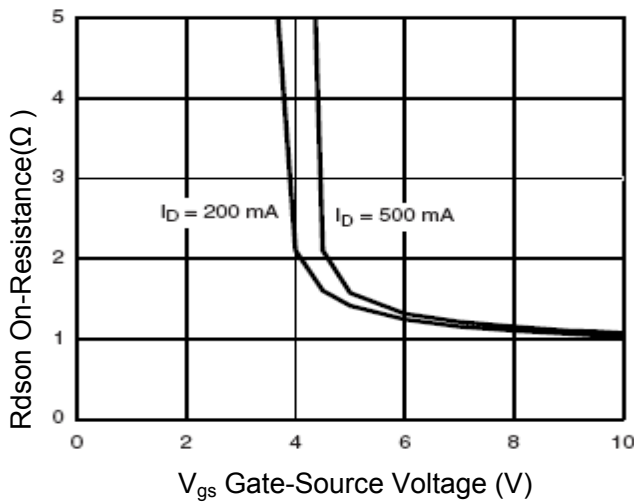
**Figure 6. Drain-Source On-Resistance**



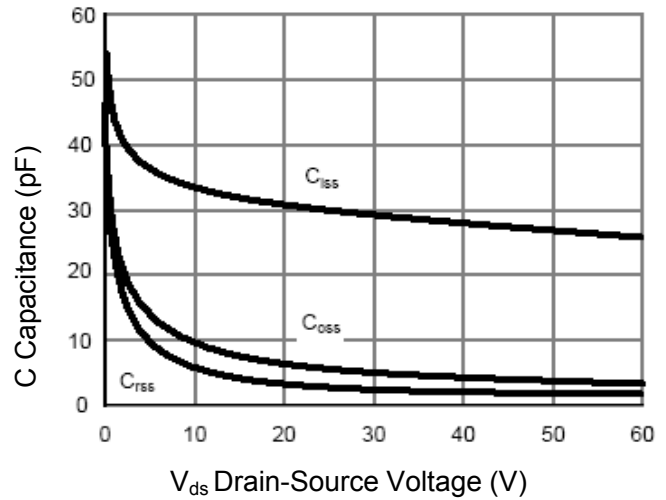
**Figure 7. Transfer Characteristics**



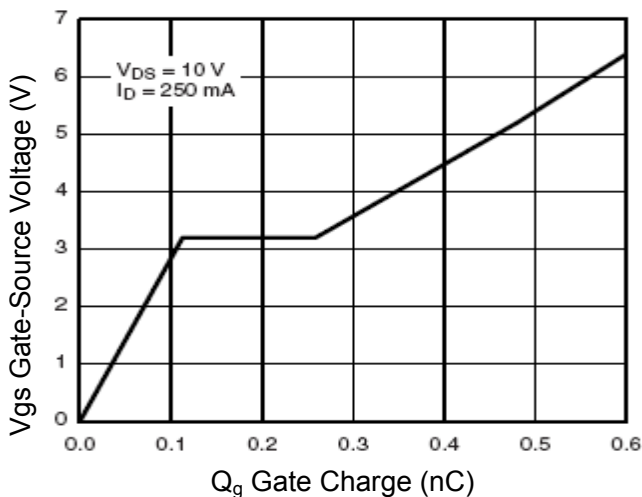
**Figure 8. Drain-Source On-Resistance**



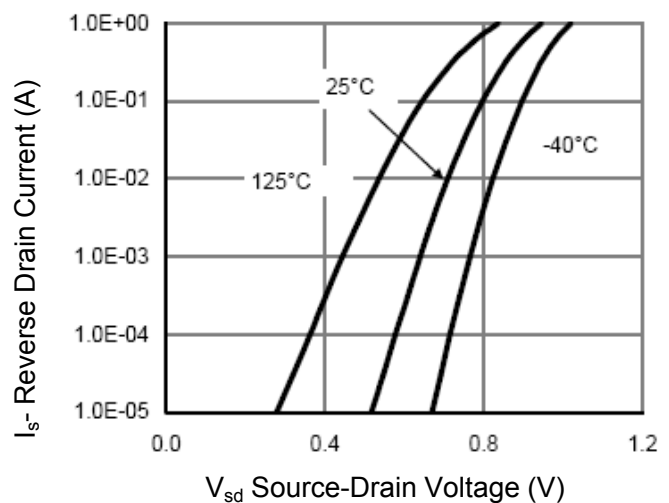
**Figure 9.  $R_{ds(on)}$  vs  $V_{gs}$**



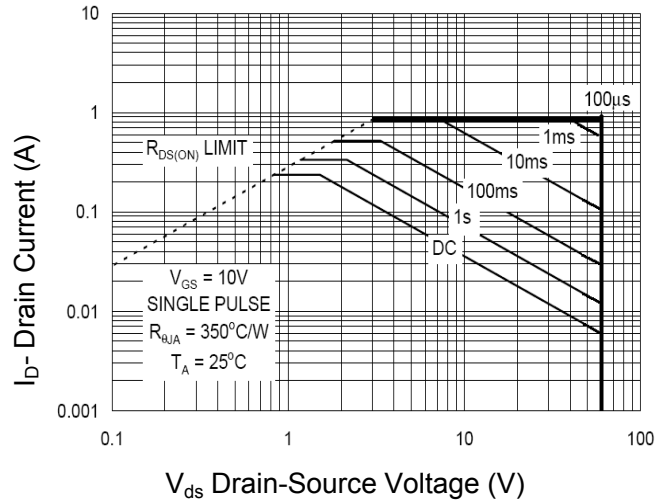
**Figure 10. Capacitance vs  $V_{ds}$**



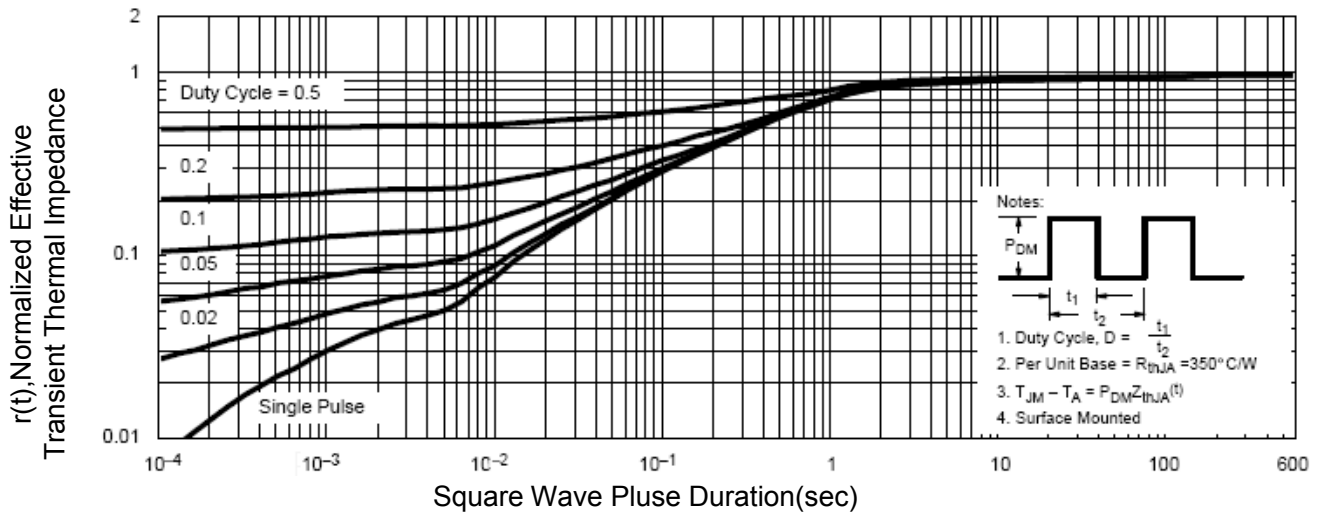
**Figure 11. Gate Charge**



**Figure 12. Source- Drain Diode Forward**



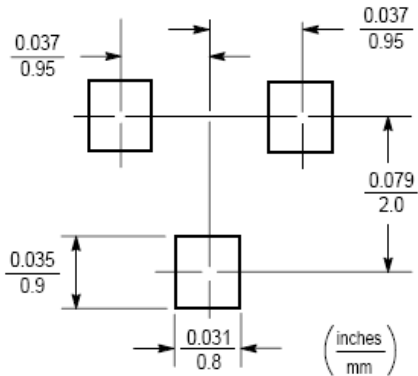
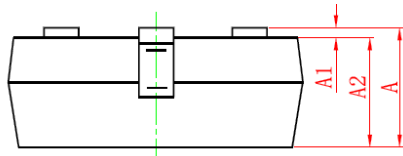
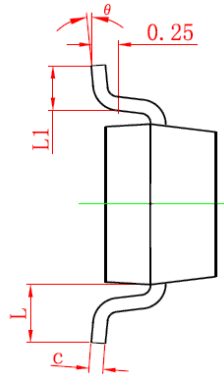
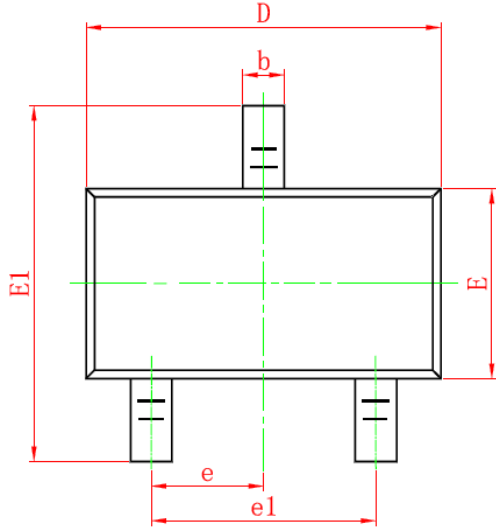
**Figure 13. Safe Operation Area**



**Figure 14. Normalized Maximum Transient Thermal Impedance**

**SOT-23 PACKAGE INFORMATION**

Dimensions in Millimeters (UNIT:mm)



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

**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.