



THE DATASHEET OF 2N7002KA



N-Channel Enhancement Mode Power MOSFET

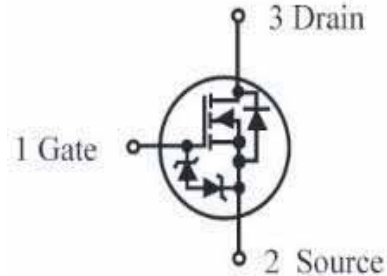
General Features

- $V_{DS} = 60V, I_D = 0.32A$
 $R_{DS(ON)} < 4.0\Omega @ V_{GS}=5V, I_D = 500 \text{ mA}$
 $R_{DS(ON)} < 3.0\Omega @ V_{GS}=10V, I_D = 50\text{mA}$
- ESD Rating: HBM 1000V

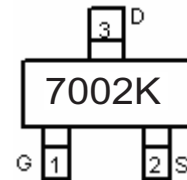
- High power and current handing capability
- Lead free product is acquired
- Surface mount package

Application

- Direct logic-level interface: TTL/CMOS
- Drivers: relays, solenoids, lamps, hammers, display, memories, transistors, etc.
- Battery operated systems
- Solid-state relays
- Halogen-free



Schematic diagram



Marking and pin assignment



SOT-23 top view

Package Marking And Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
7002K	2N7002KA	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}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	I_D	$T_A = 25^\circ\text{C}$	0.32
		$T_A = 100^\circ\text{C}$	0.18
Drain Current-Pulsed ^(Note 1)	I_{DM}	0.8	A
Maximum Power Dissipation	P_D	0.3	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)	$R_{\theta JA}$	556	$^\circ\text{C/W}$
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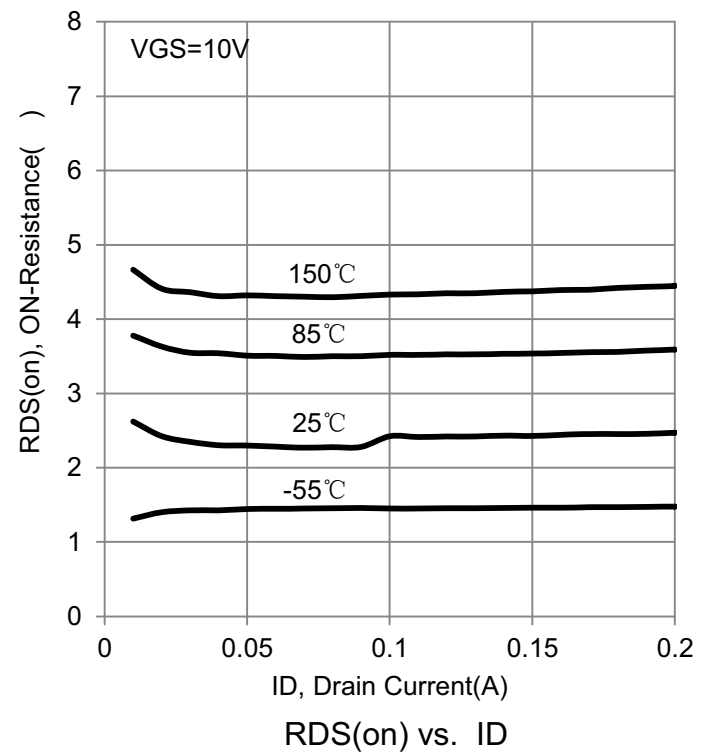
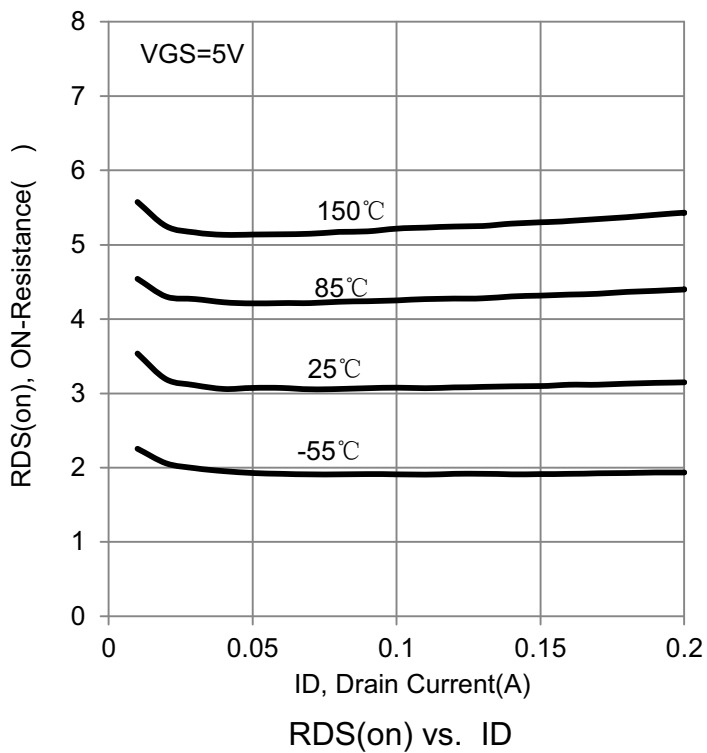
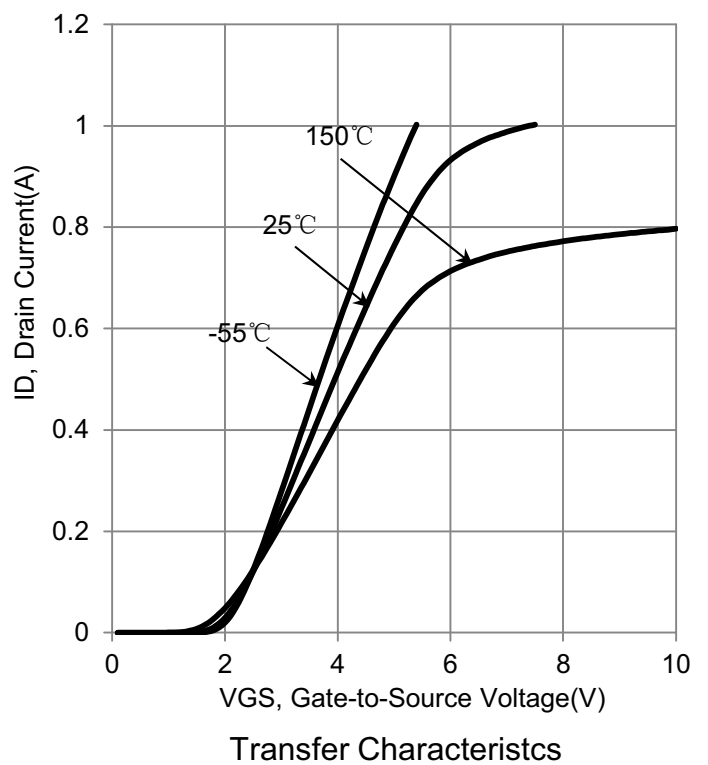
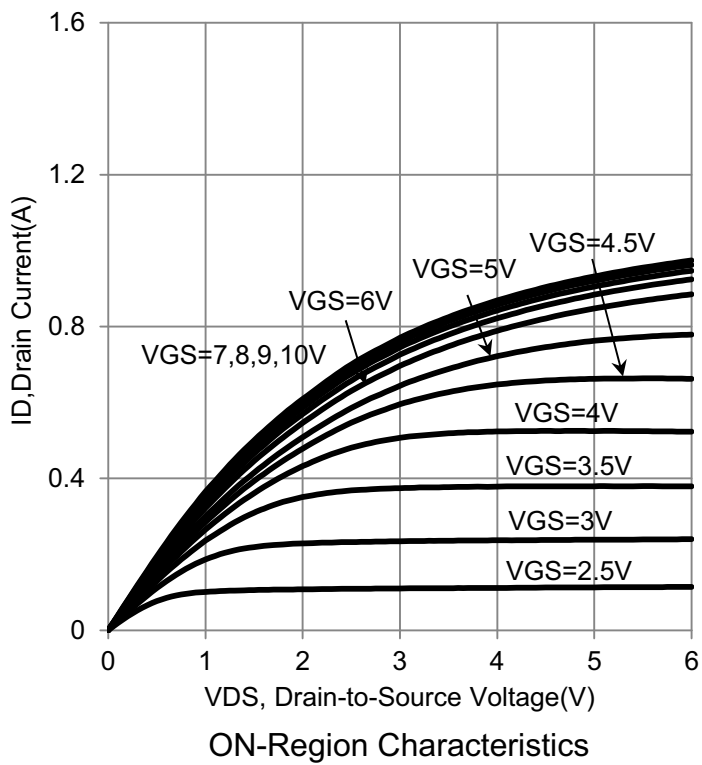
Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
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	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 1.0	μA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.6	2.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=5V, I_D=0.05A$	-	1.4	4.0	Ω
		$V_{GS}=10V, I_D=0.5A$	-	1.8	3.0	Ω
Forward Transconductance	g_{FS}	$V_{DS}\geq 2.0V, I_D=0.2A$	80	-	-	mS
Dynamic Characteristics ^(Note 4)						
Input Capacitance	C_{iss}	$V_{DS}=25V, V_{GS}=0V,$ $F=1.0MHz$	-	17	50	PF
Output Capacitance	C_{oss}		-	10	25	PF
Reverse Transfer Capacitance	C_{rss}		-	2.5	5.0	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=25V, I_D=0.5A$ $V_{GS}=10V, R_{GEN}=10\Omega$	-	7	20	nS
Turn-on Rise Time	t_r		-	-	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	11	40	nS
Turn-Off Fall Time	t_f		-	-	-	nS
Total Gate Charge	Q_g	$V_{DS}=10V, I_D=0.3A,$ $V_{GS}=4.5V$	-	-	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V_{SD}	$V_{GS}=0V, I_S=0.115A$	-	-	1.5	V
Diode Forward Current ^(Note 2)	I_S		-	-	0.32	A

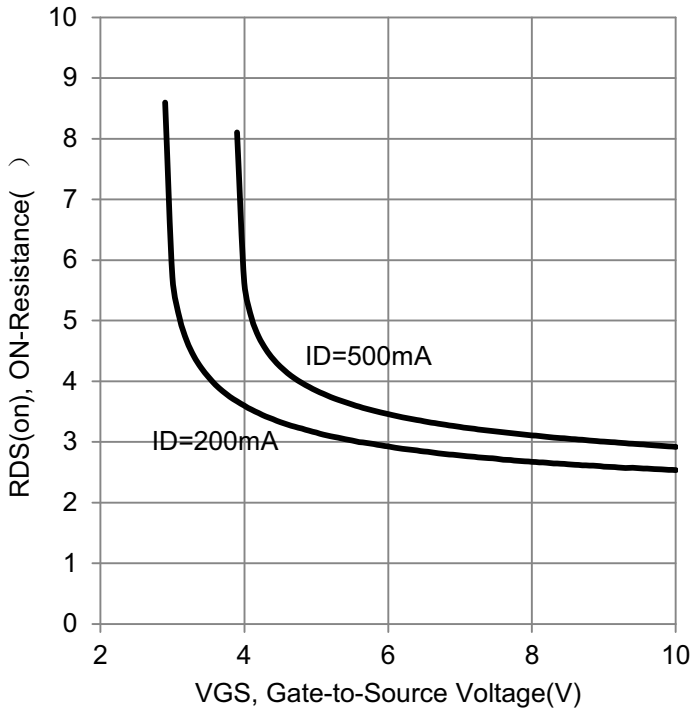
Notes:

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

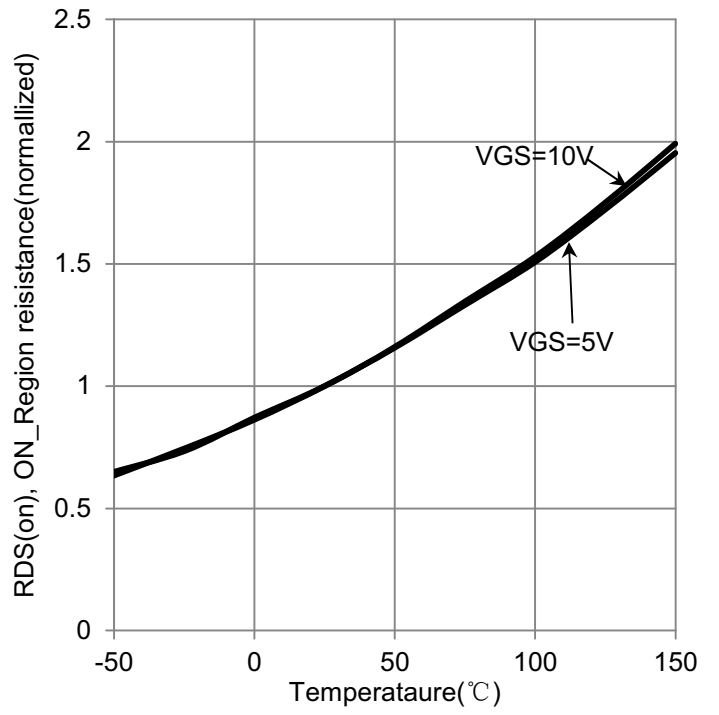
RATING AND CHARACTERISTICS CURVES (2N7002KA)



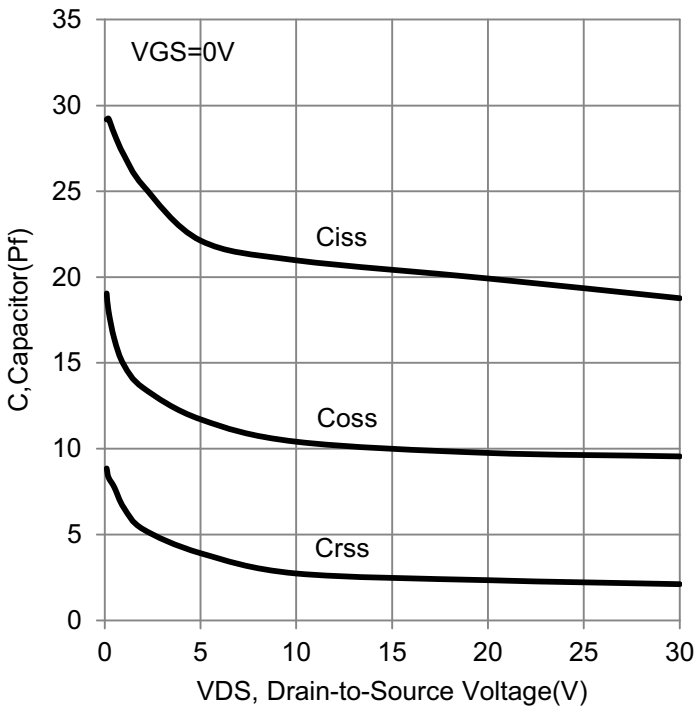
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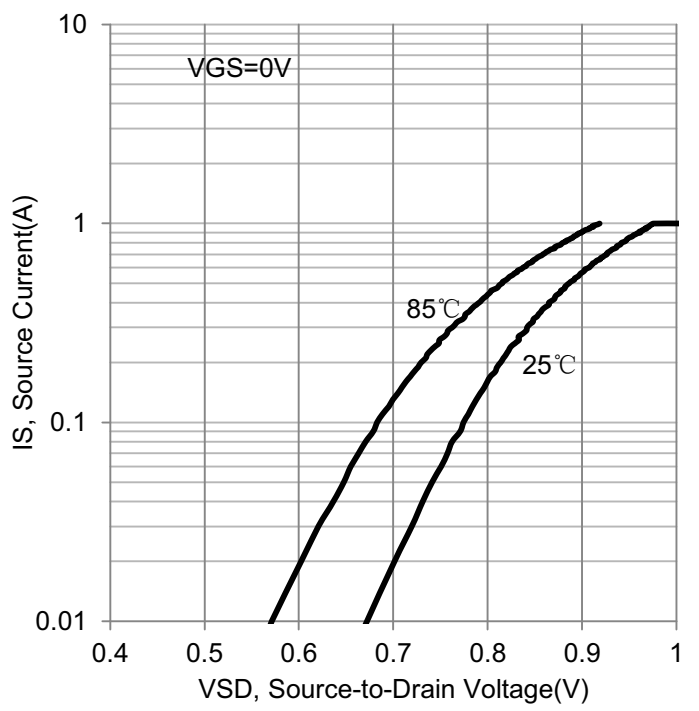
RDS(on) vs. VGS



RDS(on) vs. Temperature

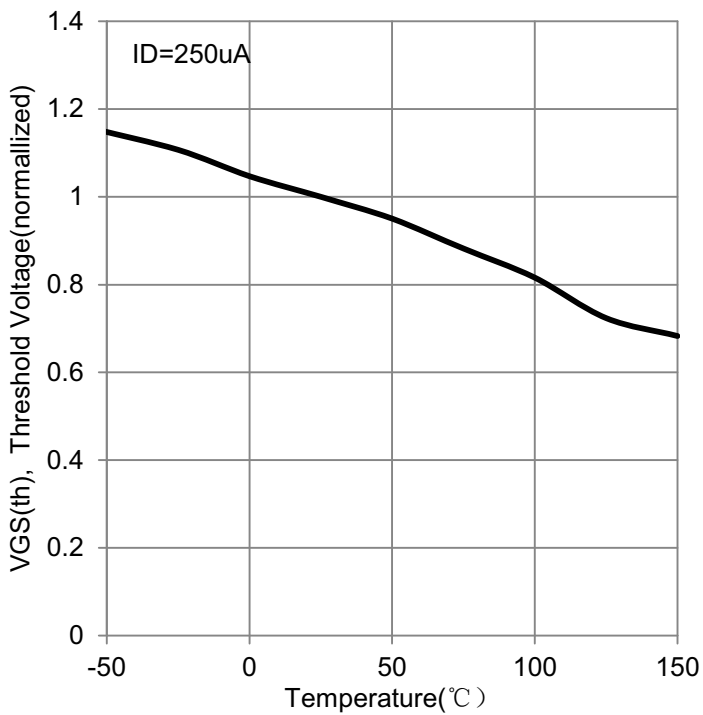


Capacitor vs. VDS

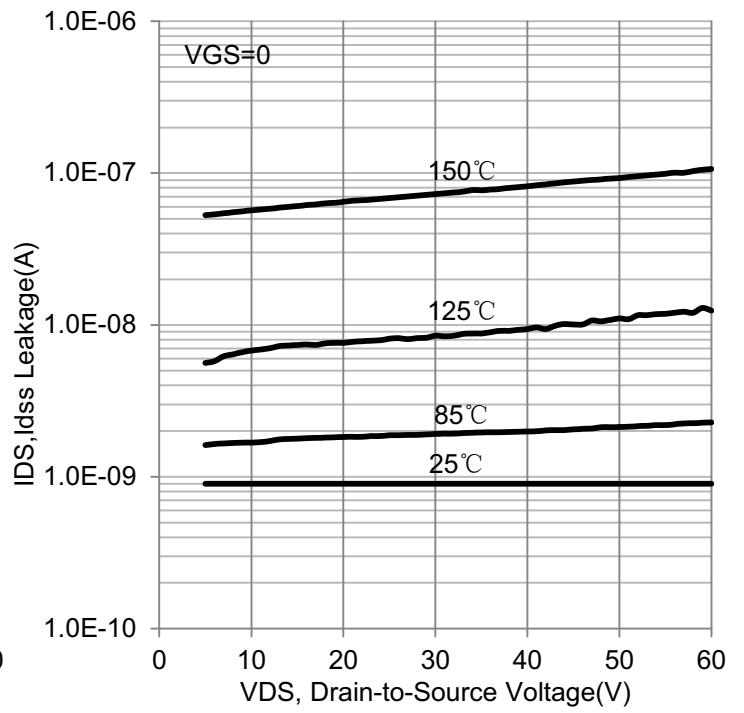


IS vs. VSD

RATING AND CHARACTERISTICS CURVES (2N7002KA)

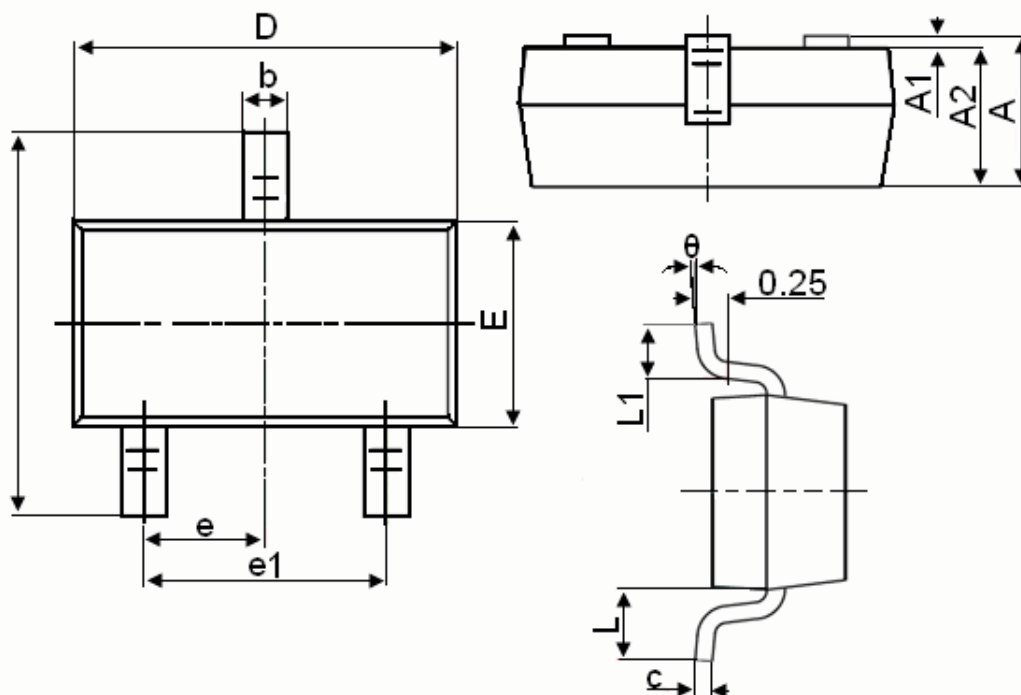


VGS(th) vs. Temperature



IDS vs. VDS

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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