

N-Channel Enhancement Mode Power MOSFET

Description

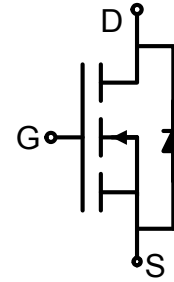
The HM5N06APR uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

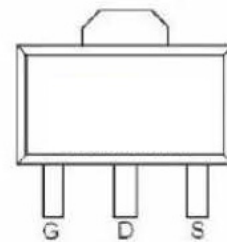
- $V_{DS} = 60V, I_D = 5A$
 $R_{DS(ON)} < 35m\Omega @ V_{GS} = 10V$ (Typ. 26m Ω)
 $R_{DS(ON)} < 45m\Omega @ V_{GS} = 4.5V$ (Typ. 32m Ω)

Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply



Schematic diagram



SOT-89-3L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM5N06APR	HM5N06APR	SOT-89-3L	Ø330mm	12mm	2500 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
Drain Current-Continuous	I_D	5	A
Drain Current-Continuous ($T_C = 100^\circ\text{C}$)	$I_D (100^\circ\text{C})$	3.5	A
Pulsed Drain Current	I_{DM}	24	A
Maximum Power Dissipation	P_D	2	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)	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
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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	69	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60V, V_{GS} = 0V$	-	-	1	μA

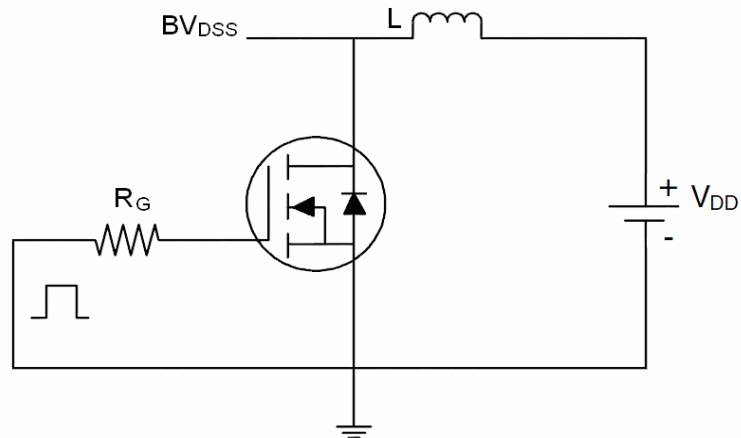
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.2	2	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =4.5A		26	35	
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =4.5A	11	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, F=1.0MHz		450		PF
Output Capacitance	C _{OSS}			60		PF
Reverse Transfer Capacitance	C _{RSS}			25		PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DS} =30V, I _D =4.5A V _{GS} =10V, R _{GEN} =3Ω	-	4.7	-	nS
Turn-on Rise Time	t _r		-	2.3	-	nS
Turn-Off Delay Time	t _{d(off)}		-	15.7	-	nS
Turn-Off Fall Time	t _f		-	1.9	-	nS
Total Gate Charge	Q _g	V _{DS} =30V, I _D =4.5A, V _{GS} =10V	-	8.5	-	nC
Gate-Source Charge	Q _{gs}		-	1.6	-	nC
Gate-Drain Charge	Q _{gd}		-	2.2	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =5A	-	-	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	5	A

Notes:

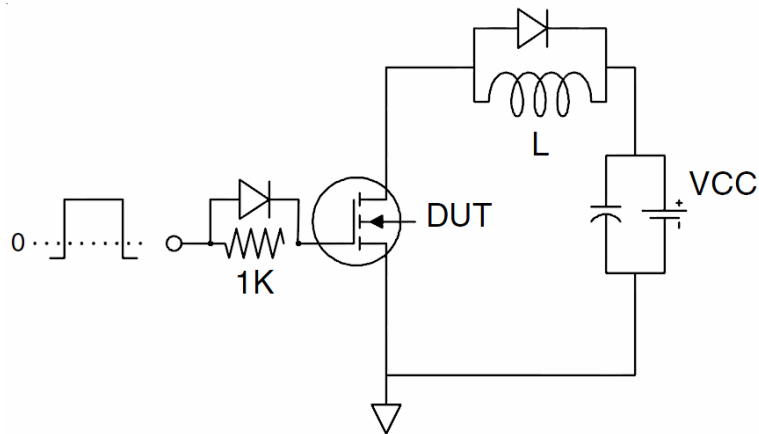
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Test Circuit

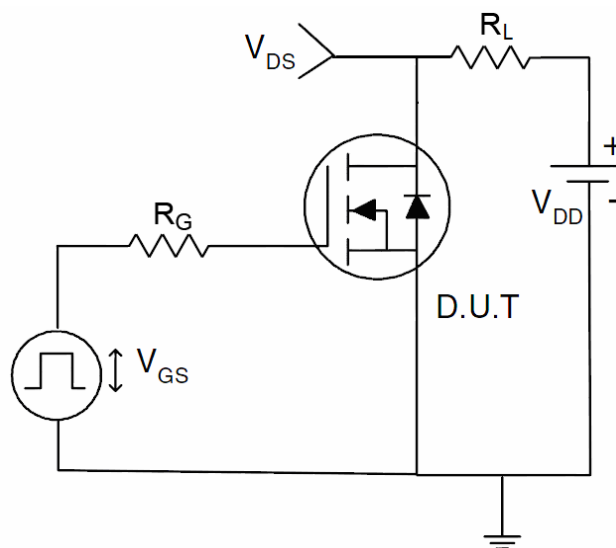
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

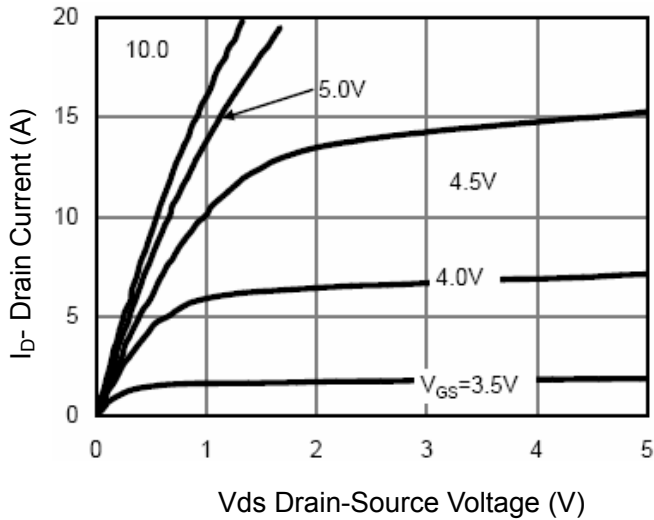


Figure 1 Output Characteristics

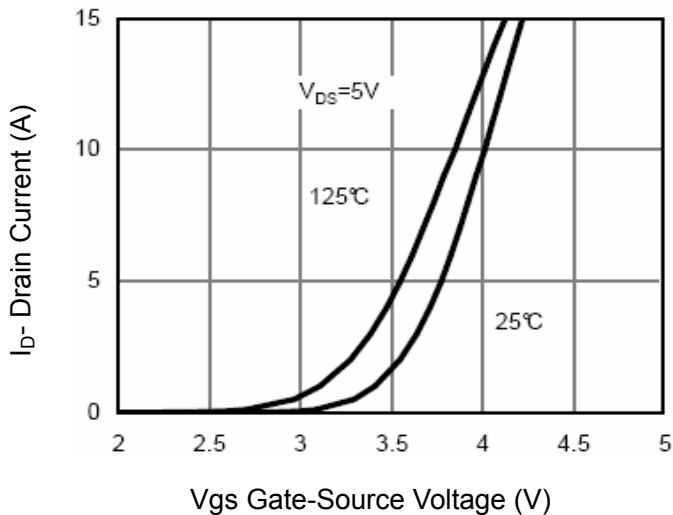


Figure 2 Transfer Characteristics

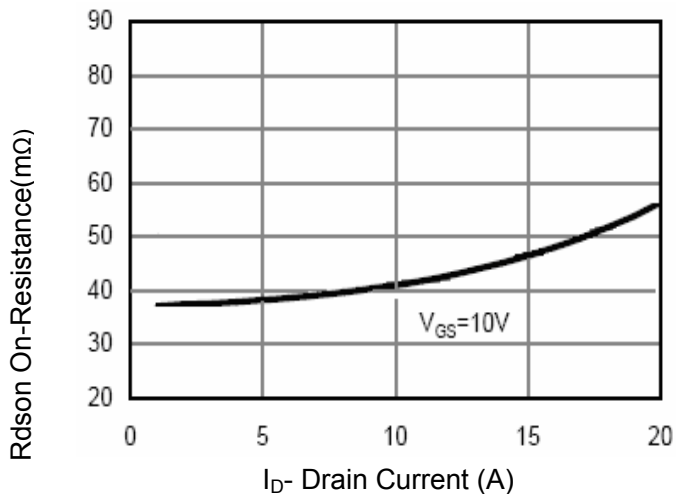


Figure 3 $R_{DS(on)}$ - Drain Current

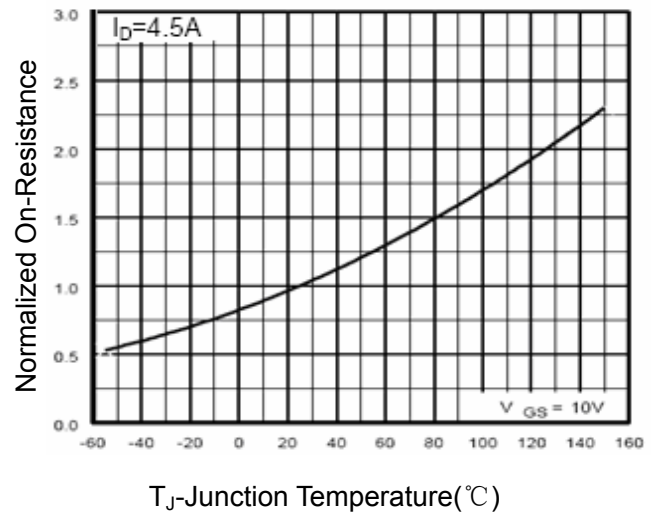


Figure 4 $R_{DS(on)}$ -Junction Temperature

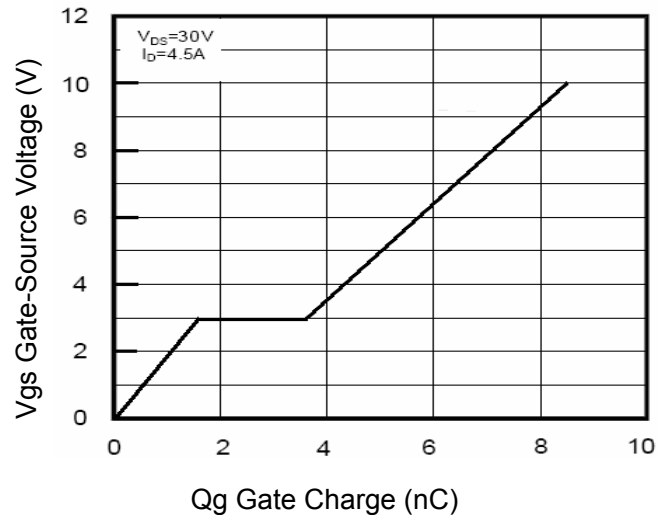


Figure 5 Gate Charge

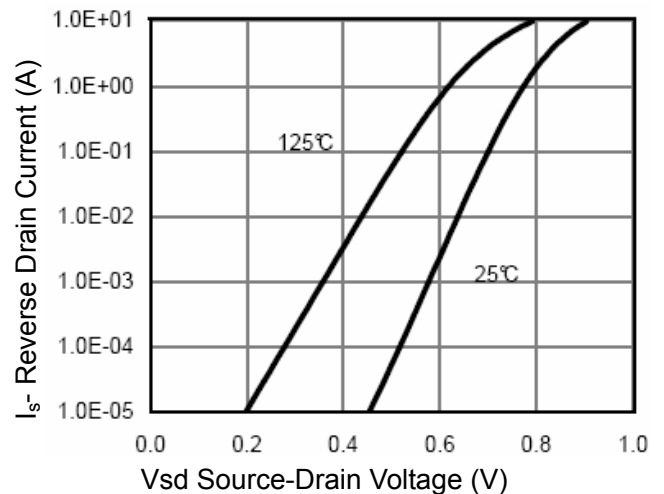


Figure 6 Source- Drain Diode Forward

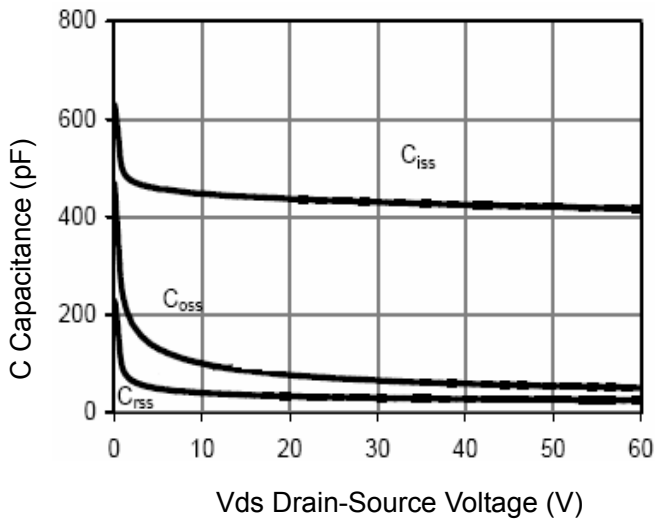


Figure 7 Capacitance vs V_{ds}

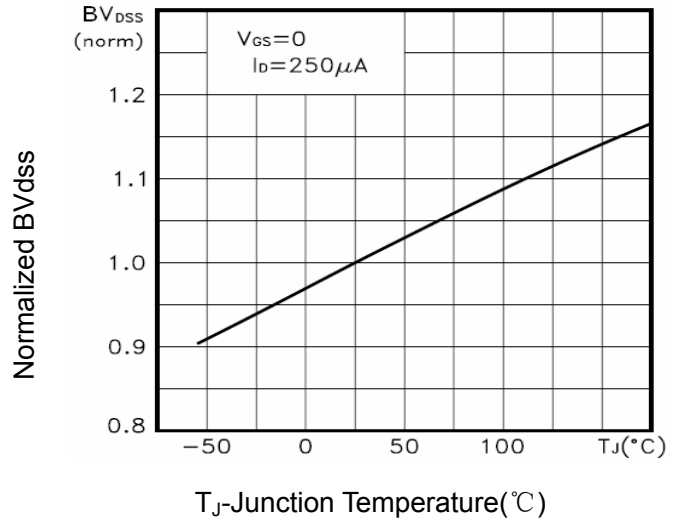


Figure 9 BV_{DSS} vs Junction Temperature

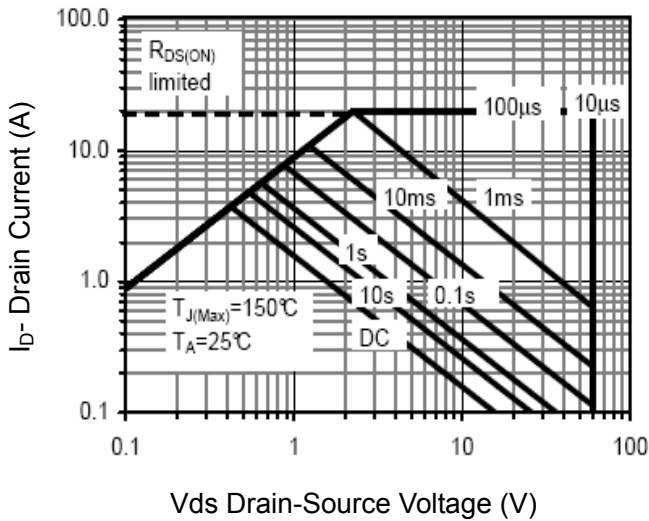


Figure 8 Safe Operation Area

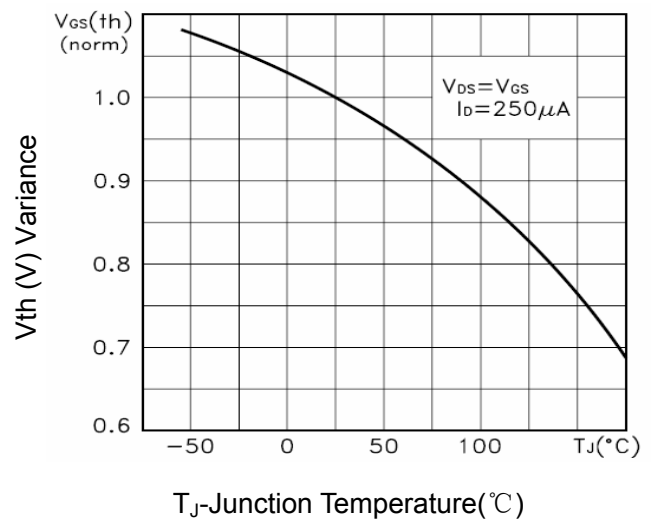


Figure 10 $V_{GS(th)}$ vs Junction Temperature

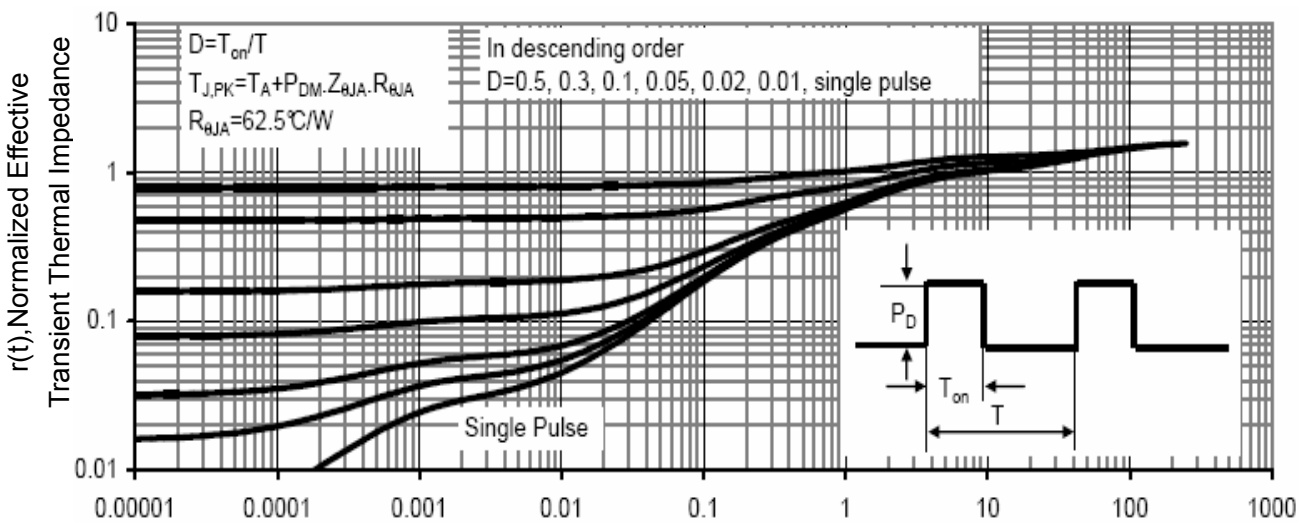
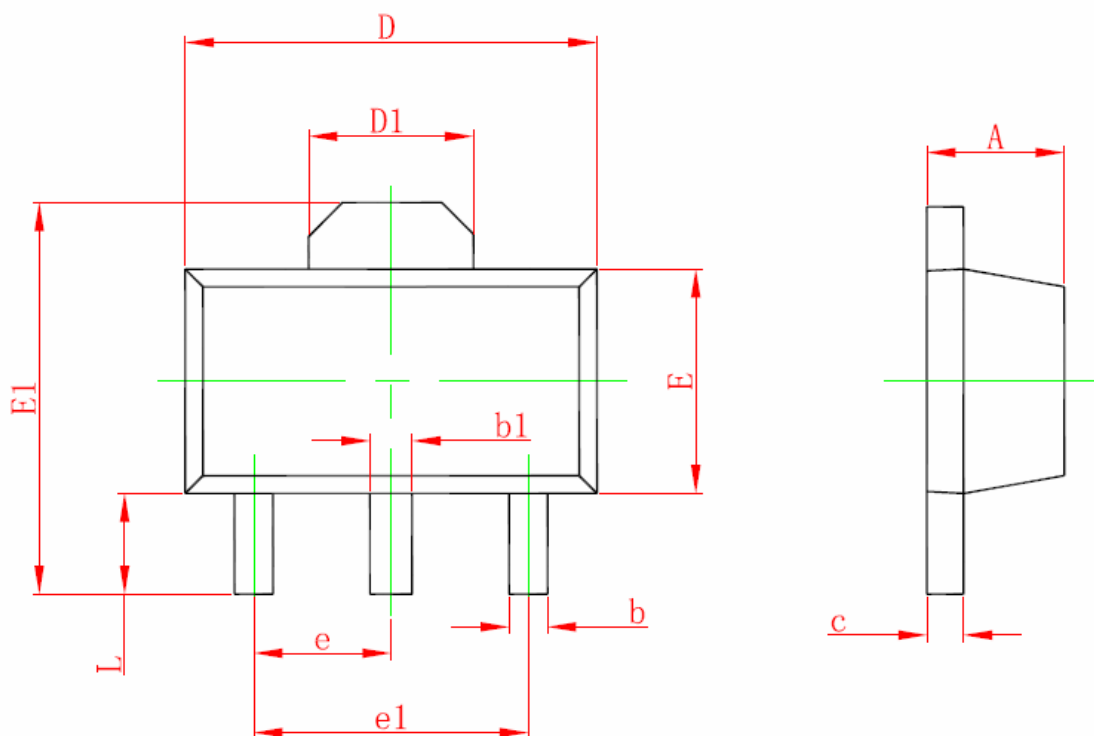


Figure 11 Normalized Maximum Transient Thermal Impedance

SOT-89-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047

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.