

N-Channel Super Trench II Power MOSFET

Description

The series of devices uses **Super Trench II** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

Application

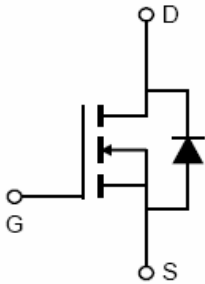
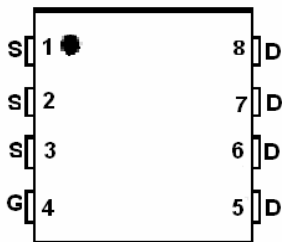
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS}=250V, I_D=80A$
 $R_{DS(ON)}=89m\Omega$, typical (TO-220)@ $V_{GS}=10V$
 $R_{DS(ON)}=89m\Omega$, typical (TO-252)@ $V_{GS}=10V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating

100% UIS TESTED!
100% ΔV_{ds} TESTED!

PDFN5X6-8L



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HMS20N25D	HMS20N25D	PDFN5X6-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	250	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	20	A
Drain Current-Continuous($T_C=100^{\circ}C$)	$I_D(100^{\circ}C)$	14	A
Pulsed Drain Current	I_{DM}	60	A
Maximum Power Dissipation	P_D	200	W
Derating factor		1.33	W/ $^{\circ}C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	1050	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	0.75	$^{\circ}\text{C/W}$
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Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	
Off Characteristics							
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	250		-	V	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =250V, 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	2.5	3.5	4.5	V	
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =70A	TO-220	-	89	100	mΩ
			TO-252		89	100	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =70A		90	-	S	
Dynamic Characteristics ^(Note4)							
Input Capacitance	C _{ISS}	V _{DS} =40V, V _{GS} =0V, F=1.0MHz	-	4950	-	PF	
Output Capacitance	C _{OSS}		-	850	-	PF	
Reverse Transfer Capacitance	C _{rss}		-	40	-	PF	
Switching Characteristics ^(Note 4)							
Turn-on Delay Time	t _{d(on)}	V _{DD} =40V, I _D =70A V _{GS} =10V, R _G =1.6Ω	-	18	-	nS	
Turn-on Rise Time	t _r		-	11	-	nS	
Turn-Off Delay Time	t _{d(off)}		-	38	-	nS	
Turn-Off Fall Time	t _f		-	9	-	nS	
Total Gate Charge	Q _g	V _{DS} =40V, I _D =70A, V _{GS} =10V	-	88	-	nC	
Gate-Source Charge	Q _{gs}		-	22		nC	
Gate-Drain Charge	Q _{gd}		-	25		nC	
Drain-Source Diode Characteristics							
Diode Forward Voltage ^(Note 3)	V _{SD}	V _{GS} =0V, I _S =70A	-		1.2	V	
Diode Forward Current ^(Note 2)	I _S		-	-	80	A	
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 70A di/dt = 100A/μs ^(Note3)	-	72	-	nS	
Reverse Recovery Charge	Q _{rr}		-	102	-	nC	

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
5. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=40V, V_G=10V, L=0.5\text{mH}, R_G=25\Omega$

Typical Electrical and Thermal Characteristics

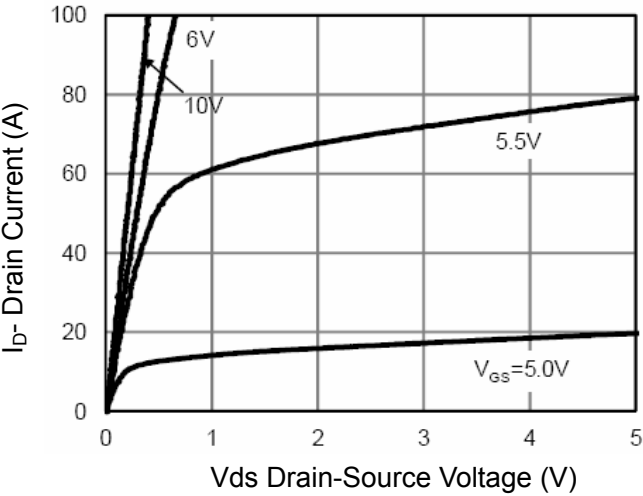


Figure 1 Output Characteristics

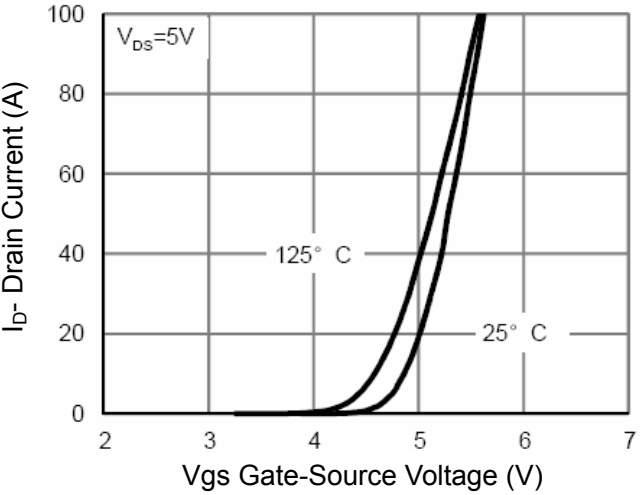


Figure 2 Transfer Characteristics

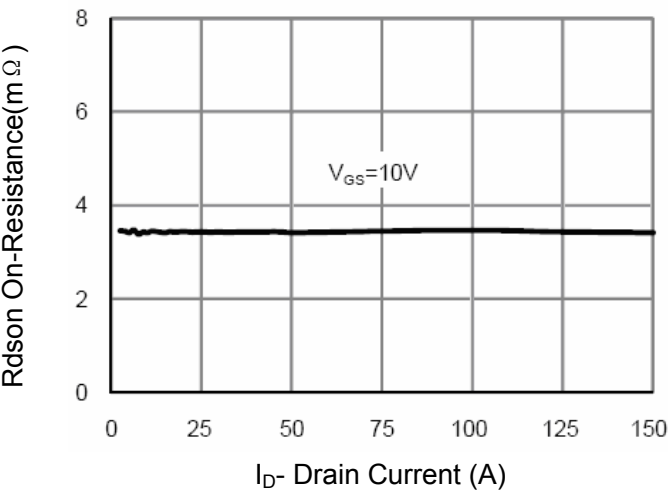


Figure 3 Rdson- Drain Current

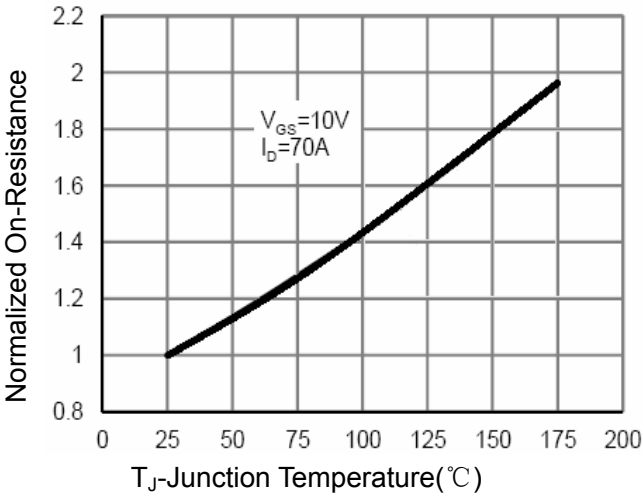


Figure 4 Rdson-Junction Temperature

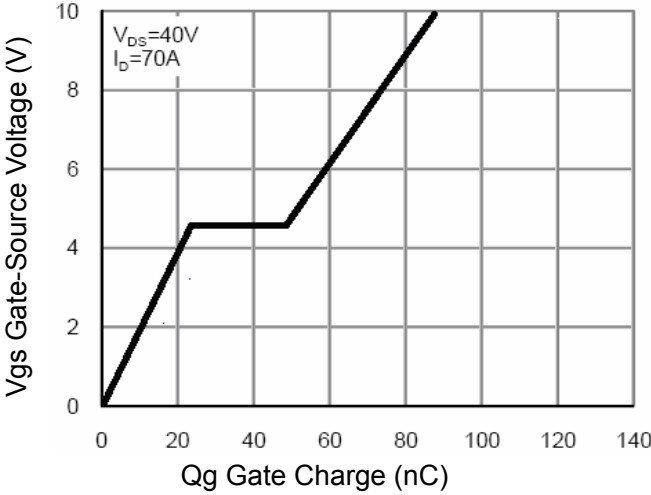


Figure 5 Gate Charge

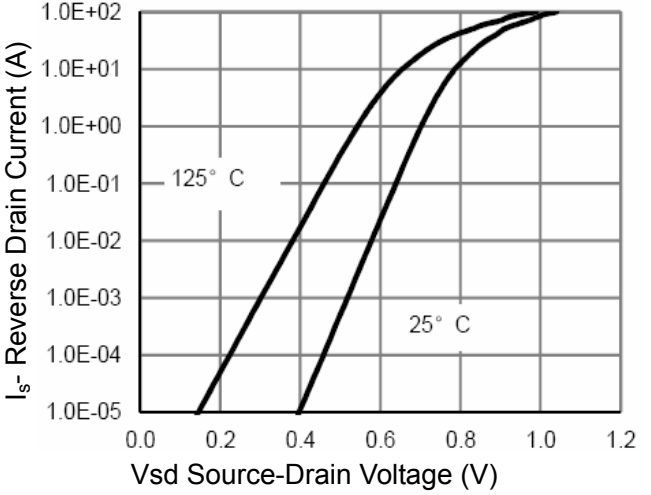


Figure 6 Source- Drain Diode Forward

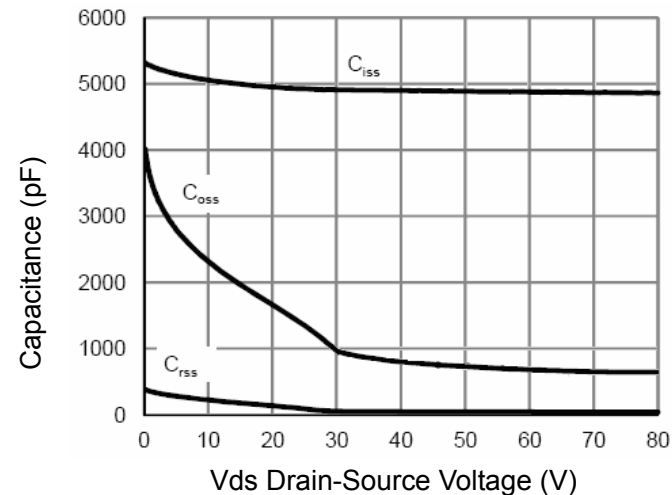


Figure 7 Capacitance vs Vds

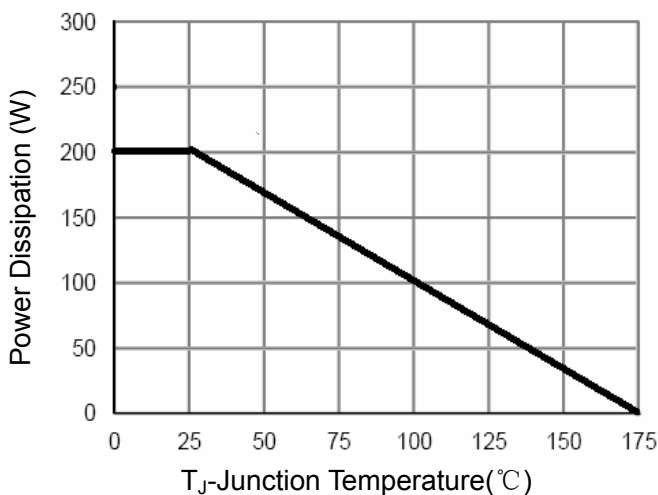


Figure 9 Power De-rating

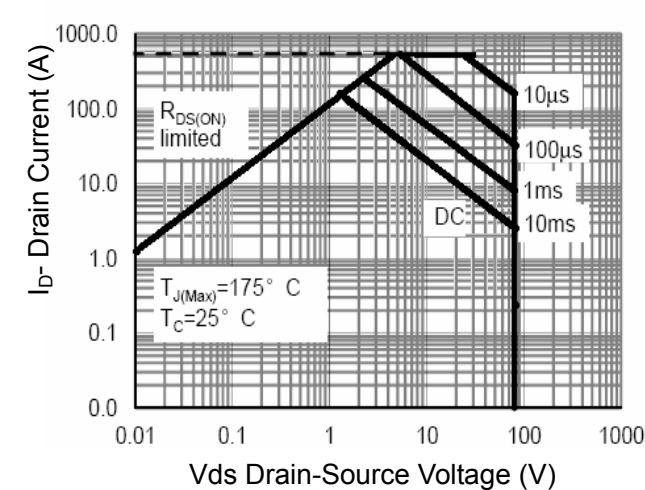


Figure 8 Safe Operation Area

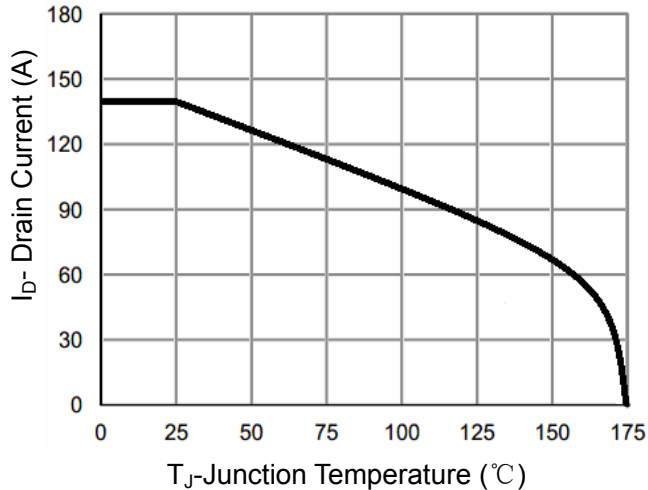


Figure 10 Current De-rating

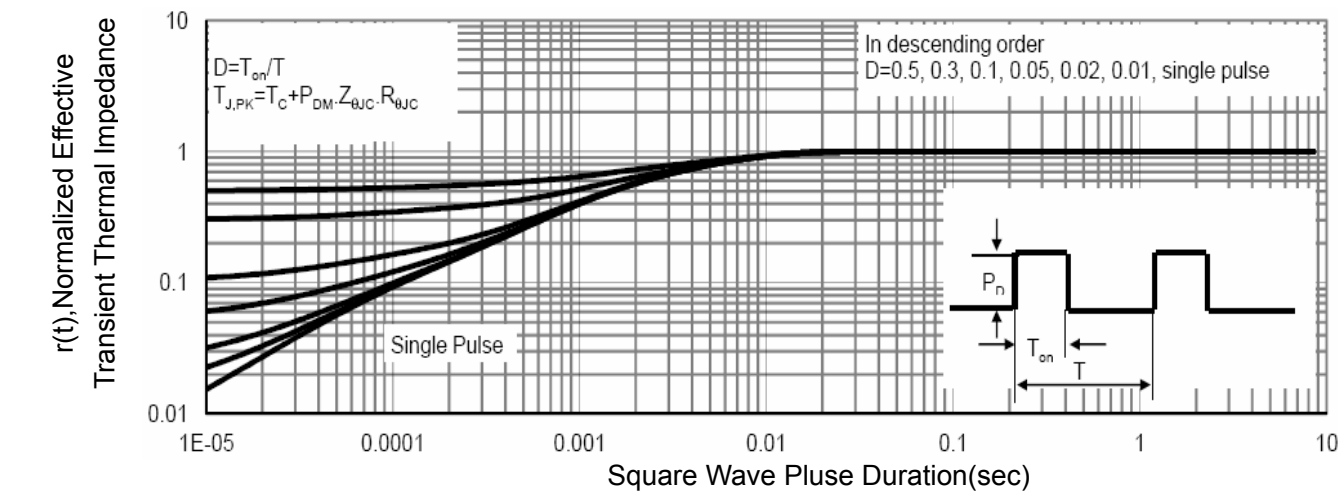
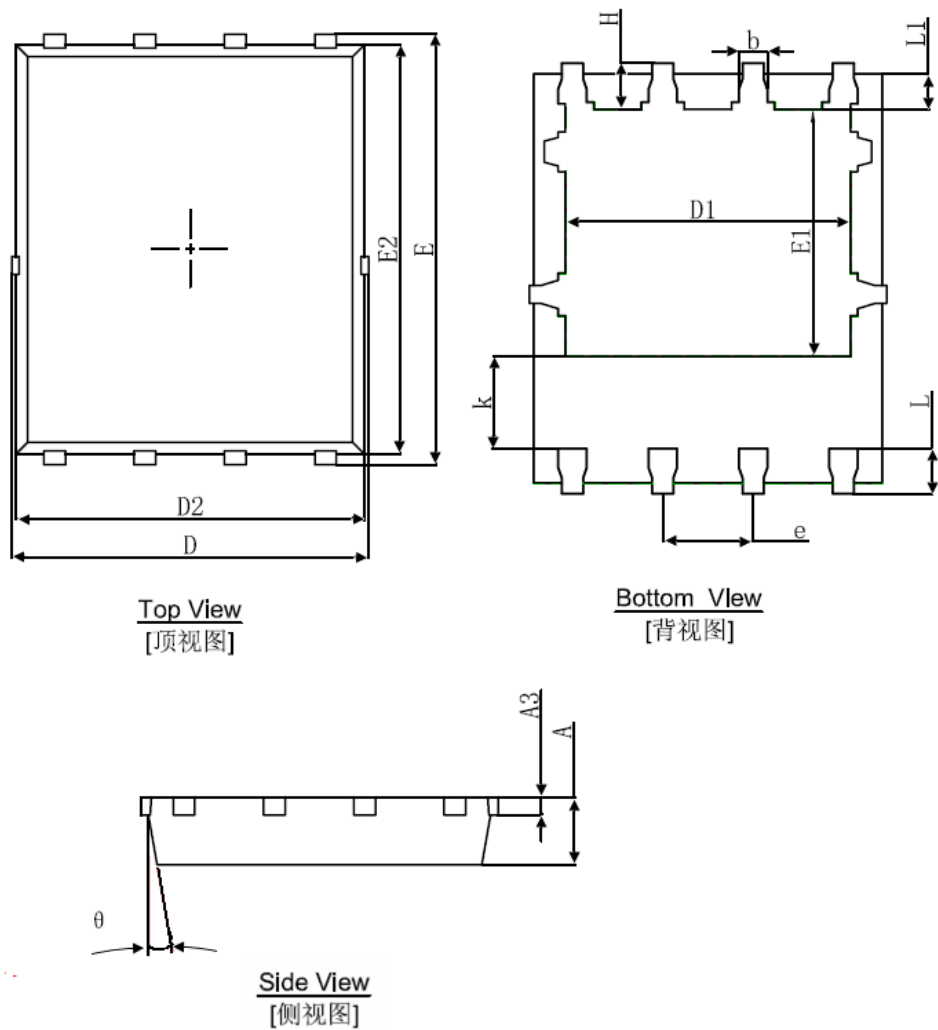


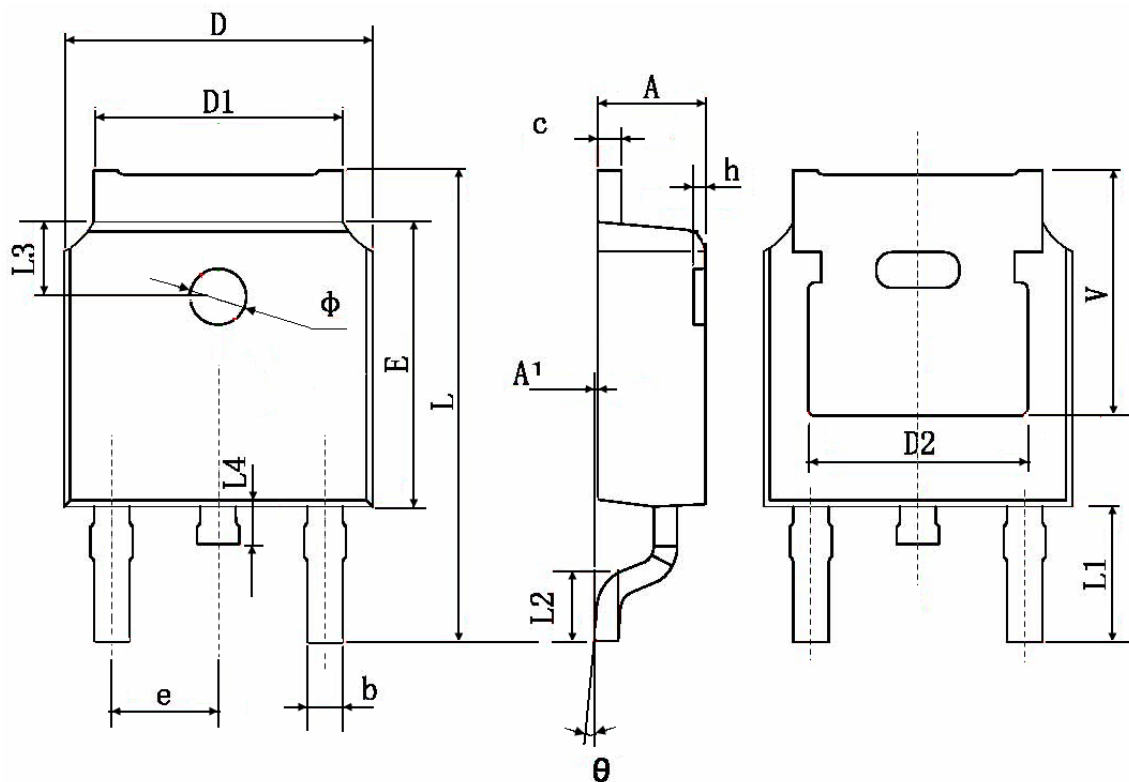
Figure 11 Normalized Maximum Transient Thermal Impedance

DFN5X6-8L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	3.910	4.110	0.154	0.162
E1	3.375	3.575	0.133	0.141
D2	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	8°	12°	8°	12°

TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	0.483 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	