VBE1308 Datasheet

N-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a, c]	Q_g (Typ.)
30	0.007at V_{GS} = 10 V	70	60 nC
	0.009at V_{GS} = 4.5 V	65	

FEATURES

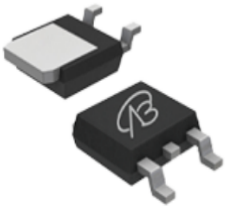
- Trench Power MOSFET
- 100 % R_g and UIS Tested

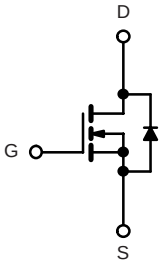
RoHS COMPLIANT

APPLICATIONS

- Synchronous Rectification
- Power Supplies

TO-252





N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 175 °C)	T_C = 25 °C	I_D	70[a, c]	A
	T_C = 70 °C		56[c]	
	T_A = 25 °C		59[b]	
	T_A = 70 °C		53[b]	
Pulsed Drain Current		I_{DM}	210	
Avalanche Current Pulse	L = 0.1 mH	I_{AS}	80	
Single Pulse Avalanche Energy		E_{AS}	310	mJ
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	110[a, c]	A
	T_A = 25 °C		2.6[b]	
Maximum Power Dissipation	T_C = 25 °C	P_D	312[a]	W
	T_C = 70 °C		200	
	T_A = 25 °C		3.13[b]	
	T_A = 70 °C		2.0[b]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[b]	Steady State	R_{thJA}	32	40	°C/W
Maximum Junction-to-Case	Steady State	R_{thJC}	0.33	0.4	

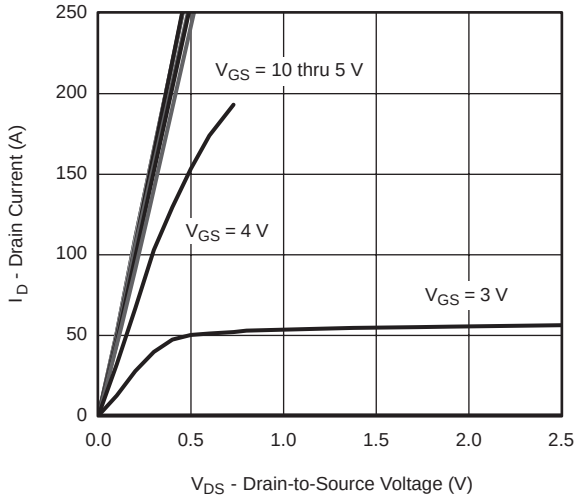
Notes:
a. Based on T_C = 25 °C.
b. Surface Mounted on 1" x 1" FR4 board.
c. Calculated based on maximum junction temperature. Package limitation current is 110 A.

SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	30			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		41		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 8		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	1.2		2.5	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 24 V, V_{GS} = 0 V			1	µA
		V_{DS} = 24 V, V_{GS} = 0 V, T_J = 55 °C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 10 V	120			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 30 A		0.007		Ω
		V_{GS} = 4.5 V, I_D = 20 A		0.009		
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 30 A		160		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz		2200		pF
Output Capacitance	C_{oss}			550		
Reverse Transfer Capacitance	C_{rss}			250		
Total Gate Charge	Q_g	V_{DS} = 20 V, V_{GS} = 10 V, I_D = 20 A		80	120	nC
Gate-Source Charge	Q_{gs}			20		
Gate-Drain Charge	Q_{gd}			12		
Gate Resistance	R_g	f = 1 MHz		0.85	1.3	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 1.0 Ω $I_D \cong$ 20 A, V_{GEN} = 10 V, R_g = 1 Ω		20	30	ns
Rise Time	t_r			11	17	
Turn-Off Delay Time	$t_{d(off)}$			77	115	
Fall Time	t_f			10	15	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 1.0 Ω $I_D \cong$ 20 A, V_{GEN} = 4.5 V, R_g = 1 Ω		102	155	
Rise Time	t_r			62	95	
Turn-Off Delay Time	$t_{d(off)}$			180	270	
Fall Time	t_f			60	90	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			70	A
Pulse Diode Forward Current[a]	I_{SM}				210	
Body Diode Voltage	V_{SD}	I_S = 20 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 20 A, di/dt = 100 A/µs, T_J = 25 °C		60	120	ns
Body Diode Reverse Recovery Charge	Q_{rr}			70	105	nC
Reverse Recovery Fall Time	t_a			30		ns
Reverse Recovery Rise Time	t_b			20		

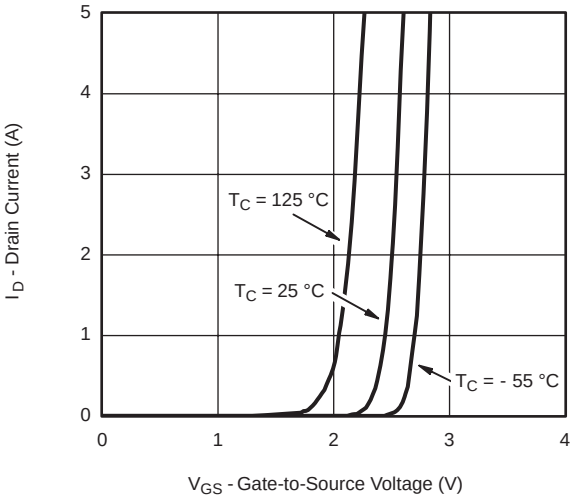
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

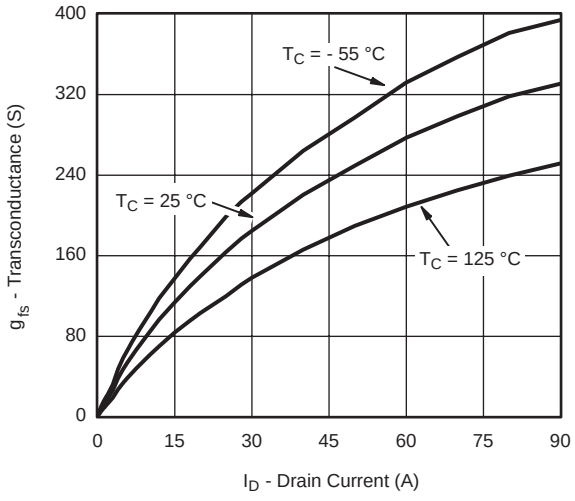
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



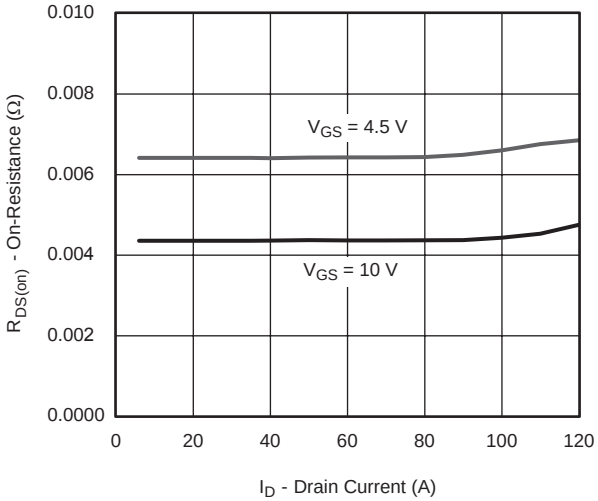
Output Characteristics



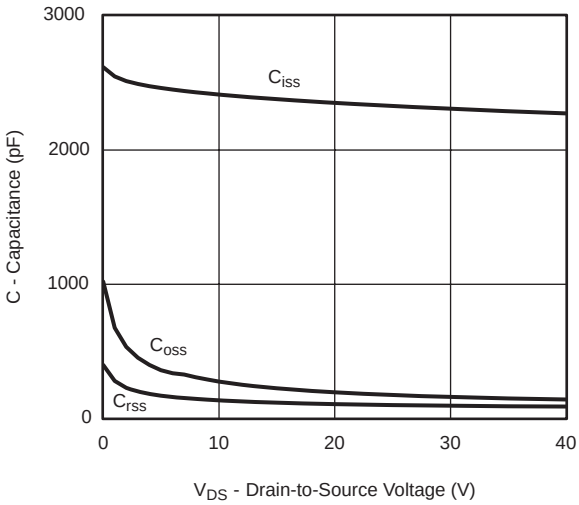
Transfer Characteristics



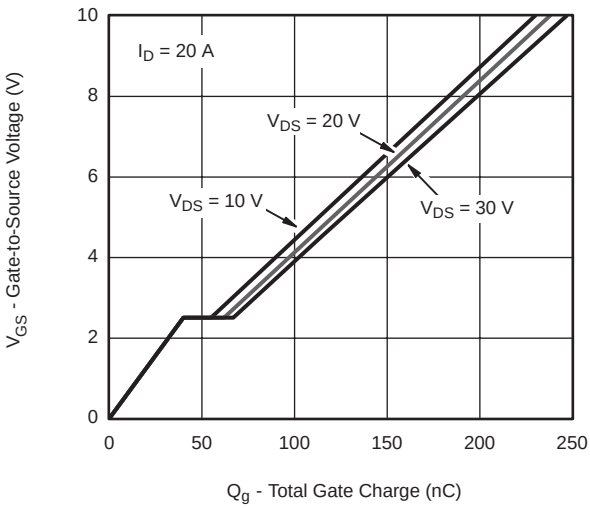
Transconductance



On-Resistance vs. Drain Current

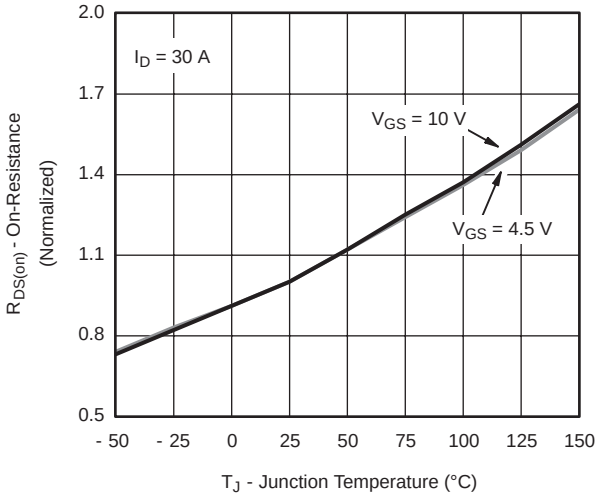


Capacitance

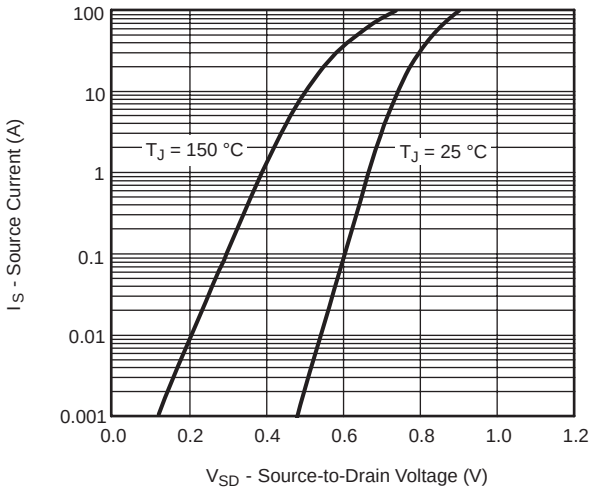


Gate Charge

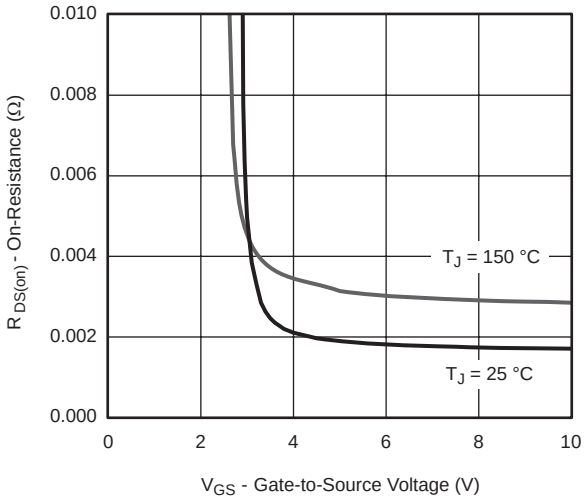
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



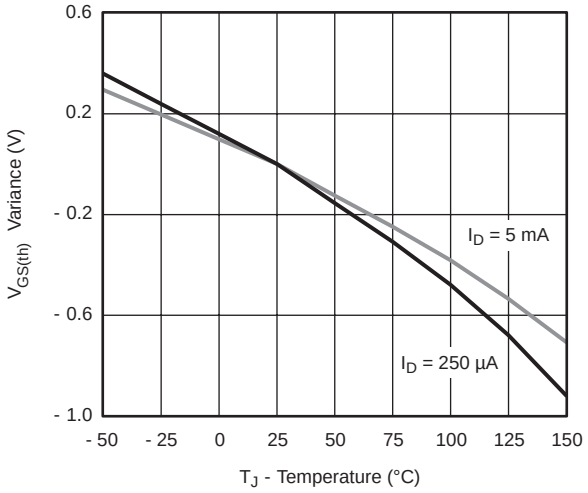
On-Resistance vs. Junction Temperature



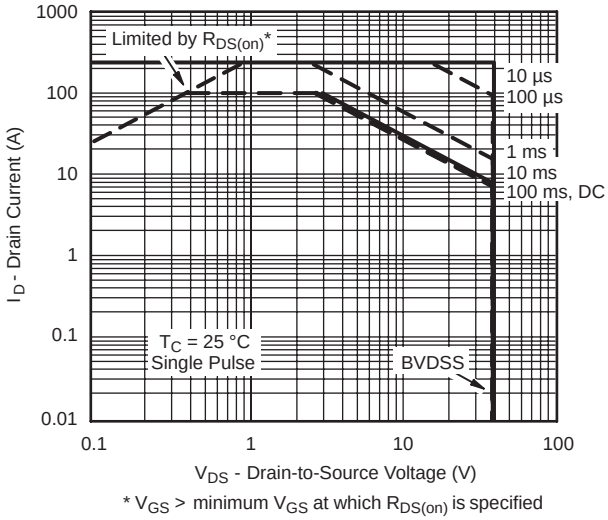
Forward Diode Voltage vs. Temperature



On-Resistance vs. Gate-to-Source Voltage



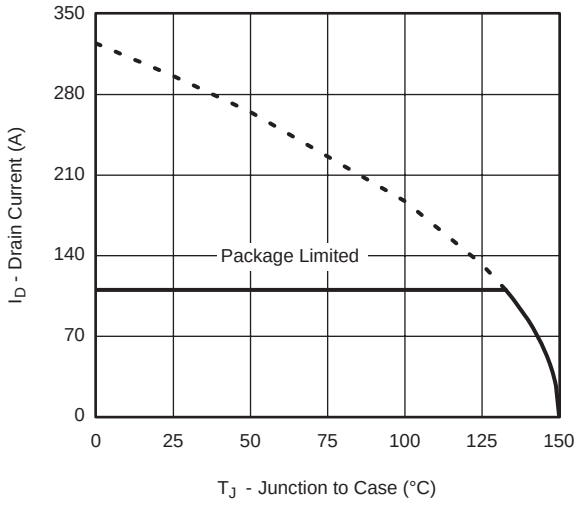
Threshold Voltage



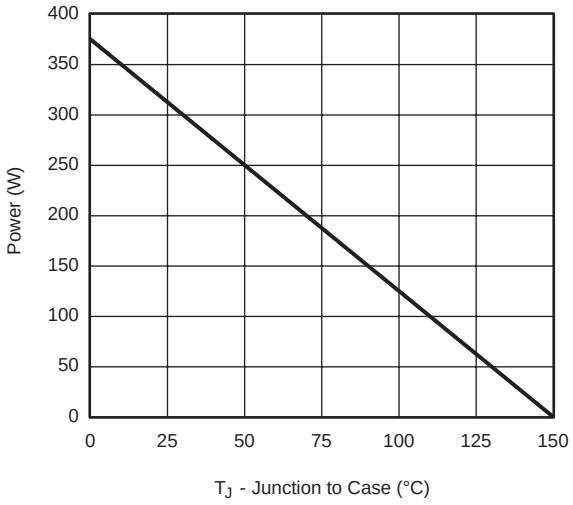
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

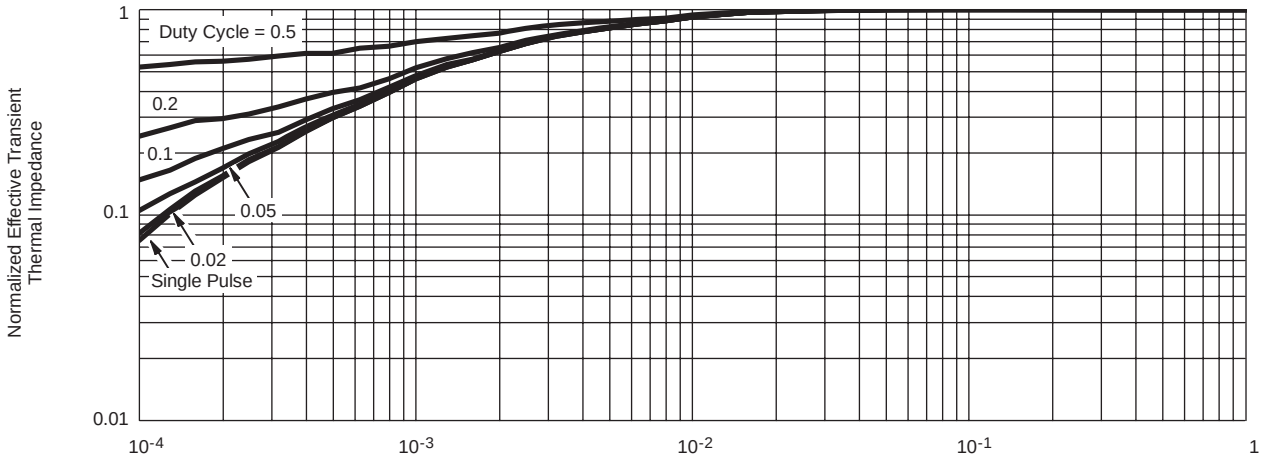


Current Derating*



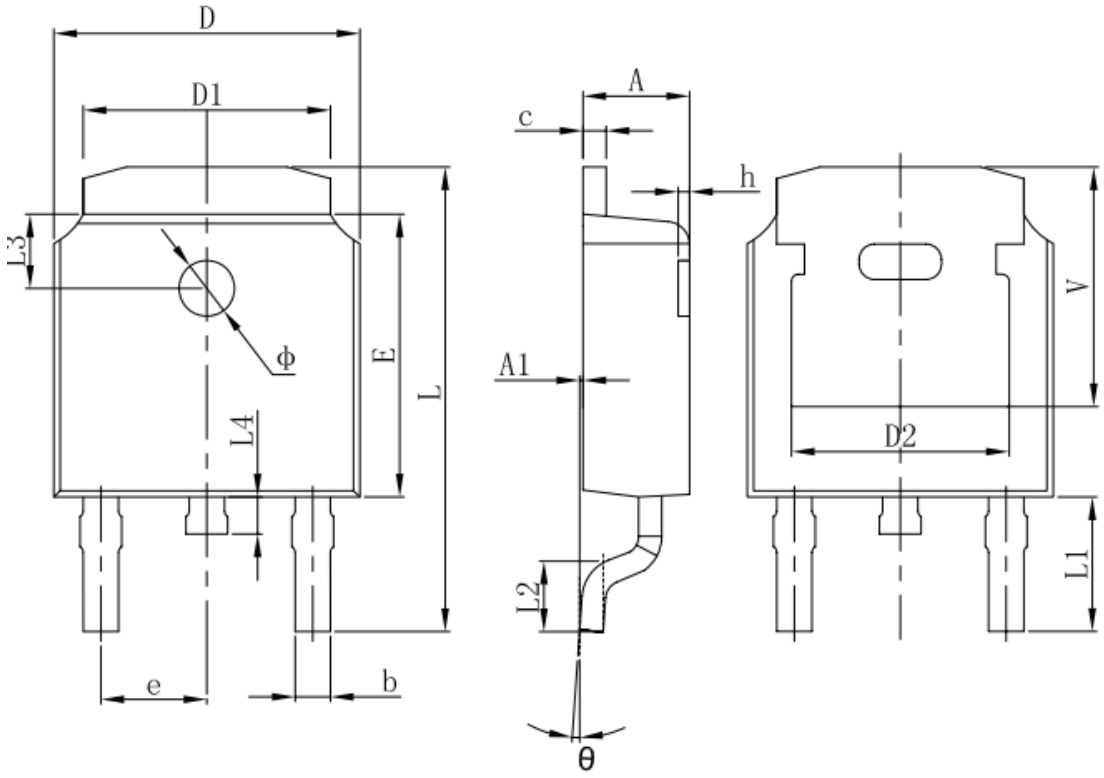
Power Derating

* The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



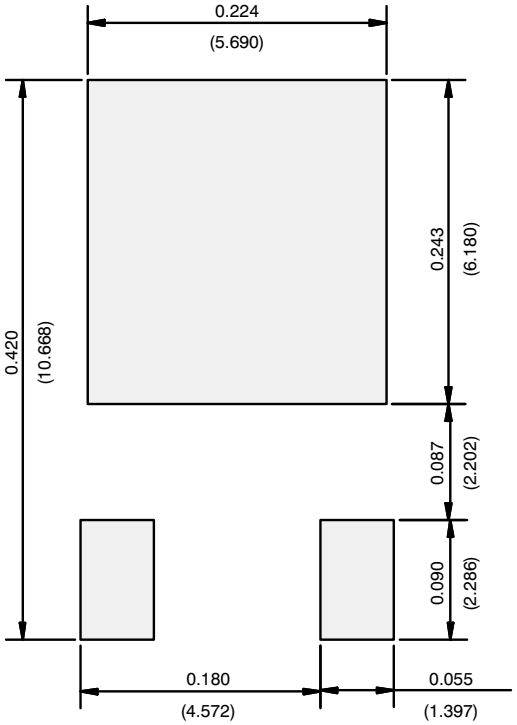
Normalized Thermal Transient Impedance, Junction-to-Case

TO252 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	0.635	0.770	0.025	0.030
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	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.382	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
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	5.250 REF.		0.207 REF.	

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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