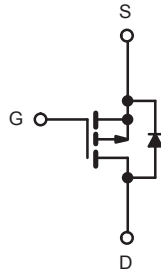
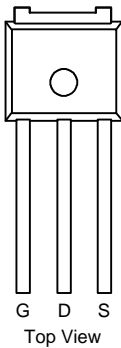


## P-Channel 30 V (D-S) MOSFET

### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ ) Max.	$I_D$ (A)	$Q_g$ (Typ.)
- 30	0.010 at $V_{GS} = -10$ V	- 50 <sup>d</sup>	43.1 nC
	0.015 at $V_{GS} = -4.5$ V	- 50 <sup>d</sup>	

TO-251



P-Channel MOSFET

### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- Low On-Resistance for Low Voltage Drop
- Extended  $V_{GS}$  max. Rating: 25 V
- 100 %  $R_g$  and UIS Tested


**RoHS**  
 COMPLIANT

### APPLICATIONS

- Battery, Load and Adaptor Switches
  - Notebook Computers
  - Notebook Battery Packs

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	- 30	V
Gate-Source Voltage	$V_{GS}$	$\pm 25$	
Continuous Drain Current ( $T_J = 150$ °C)	$T_C = 25$ °C	- 50 <sup>d</sup>	A
	$T_C = 70$ °C	- 50 <sup>d</sup>	
	$T_A = 25$ °C	- 23.1 <sup>a, b</sup>	
	$T_A = 70$ °C	- 18.4 <sup>a, b</sup>	
Pulsed Drain Current ( $t = 100$ $\mu$ s)	$I_{DM}$	- 300	
Continuous Source-Drain Diode Current	$T_C = 25$ °C	- 50 <sup>d</sup>	
	$T_A = 25$ °C	- 4.1 <sup>a, b</sup>	
Avalanche Current	$I_{AS}$	- 25	
Single-Pulse Avalanche Energy	$E_{AS}$	31.2	mJ
Maximum Power Dissipation	$T_C = 25$ °C	48	W
	$T_C = 70$ °C	31	
	$T_A = 25$ °C	5 <sup>a, b</sup>	
	$T_A = 70$ °C	3.2 <sup>a, b</sup>	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)		260	

### THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a, c</sup>	$t \leq 10$ s	$R_{thJA}$	21	25	°C/W
Maximum Junction-to-Case	Steady State	$R_{thJC}$	2.1	2.6	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

 b.  $t = 10$  s.

c. Maximum under steady state conditions is 70 °C/W.

d. Package limited.

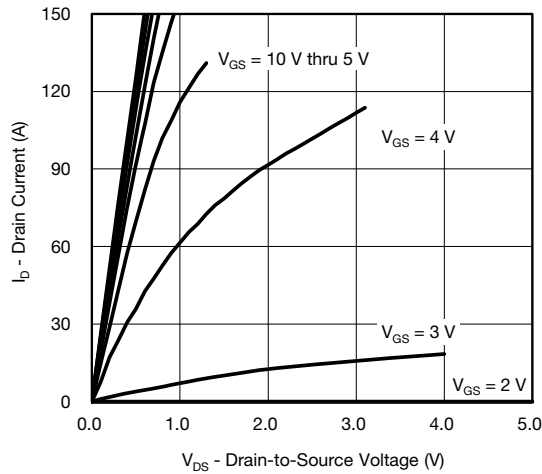
SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0, I <sub>D</sub> = - 250 μA	- 30			V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = - 250 μA		- 22		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			4.1		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 250 μA	- 1.2		- 2.5	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 25 V			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 30 V, V <sub>GS</sub> = 0 V			- 1	μA
		V <sub>DS</sub> = - 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			- 5	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ - 10 V, V <sub>GS</sub> = - 10 V	- 30			A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 15 A		0.010	0.011	Ω
		V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 10 A		0.015	0.017	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = - 10 V, I <sub>D</sub> = - 15 A		60		S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz		5125		pF
Output Capacitance	C <sub>oss</sub>			615		
Reverse Transfer Capacitance	C <sub>rss</sub>			554		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 10 A		90	135	nC
		V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 10 A		43.1	65	
Gate-Source Charge	Q <sub>gs</sub>			13.6		
Gate-Drain Charge	Q <sub>gd</sub>			28.8		
Gate Resistance	R <sub>g</sub>	f = 1 MHz	0.5	2.4	4.8	Ω
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 15 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ - 10 A, V <sub>GEN</sub> = - 10 V, R <sub>g</sub> = 1 Ω		15	30	ns
Rise Time	t <sub>r</sub>			12	24	
Turn-Off DelayTime	t <sub>d(off)</sub>			58	110	
Fall Time	t <sub>f</sub>			12	24	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 15 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ - 10 A, V <sub>GEN</sub> = - 4.5 V, R <sub>g</sub> = 1 Ω		60	120	
Rise Time	t <sub>r</sub>			60	120	
Turn-Off DelayTime	t <sub>d(off)</sub>			52	100	
Fall Time	t <sub>f</sub>			26	52	
Drain-Source Body Diode Characteristics						
Continous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			- 50	A
Pulse Diode Forward Current (100 μs)	I <sub>SM</sub>				- 300	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = - 3 A, V <sub>GS</sub> = 0		- 0.74	- 1.20	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = - 10 A, dI/dt = 100 A/μs, T <sub>J</sub> = 25 °C		23	46	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			12	24	nC
Reverse Recovery Fall Time	t <sub>a</sub>			9		ns
Reverse Recovery Rise Time	t <sub>b</sub>			14		

Notes:

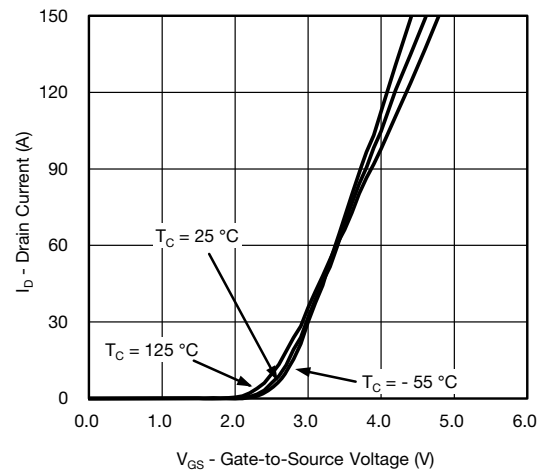
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.

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.

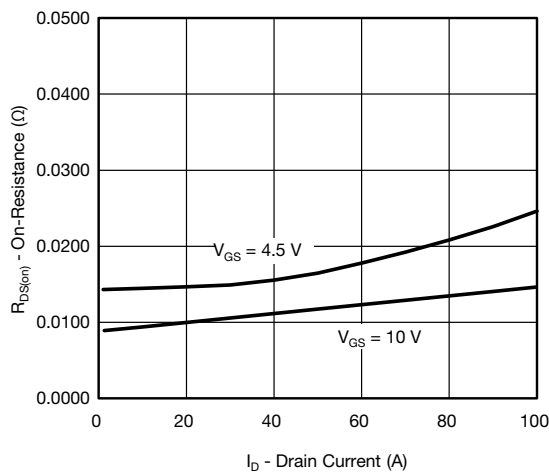
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



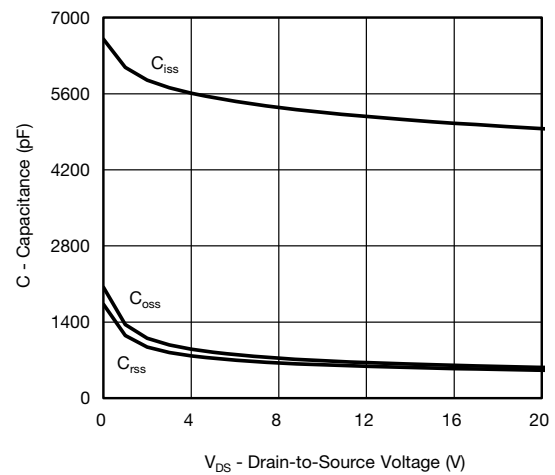
**Output Characteristics**



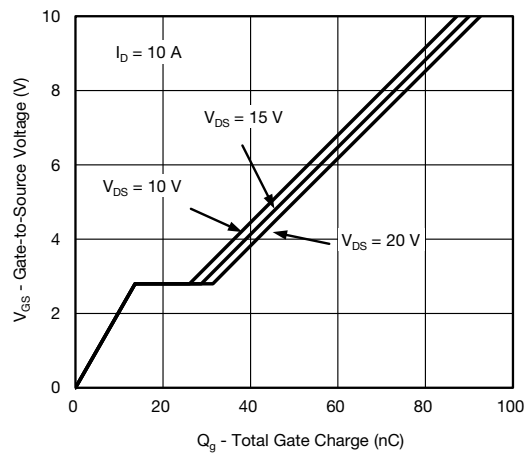
**Transfer Characteristics**



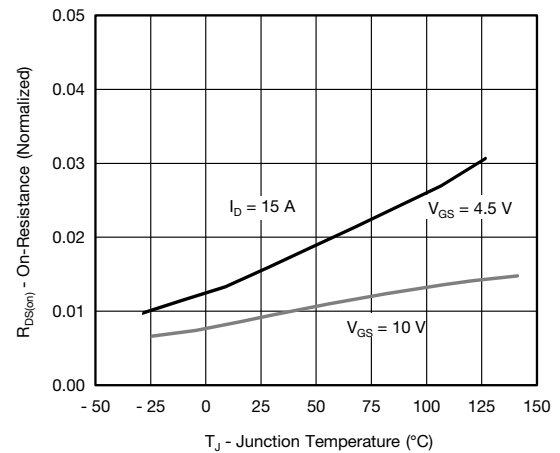
**On-Resistance vs. Drain Current**



**Capacitance**

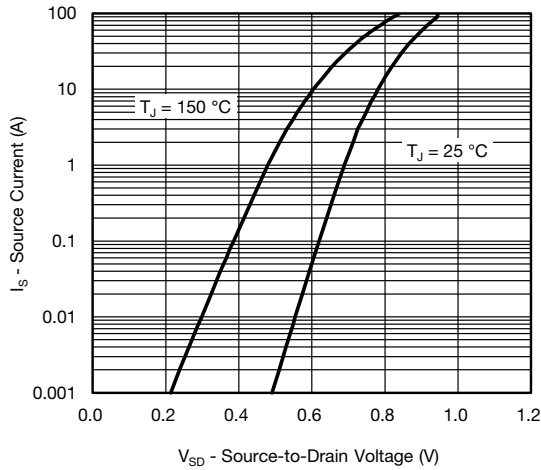


**Gate Charge**

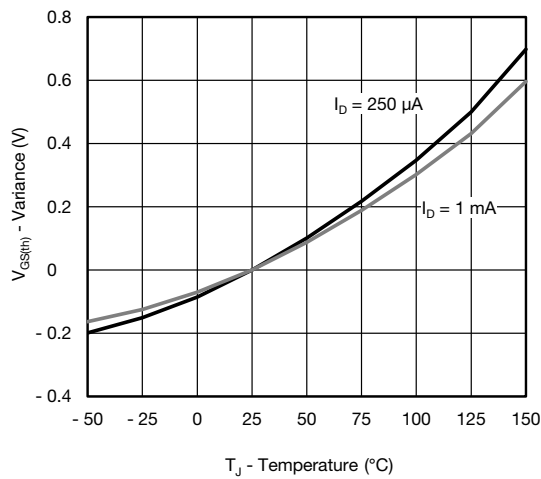


**On-Resistance vs. Junction Temperature**

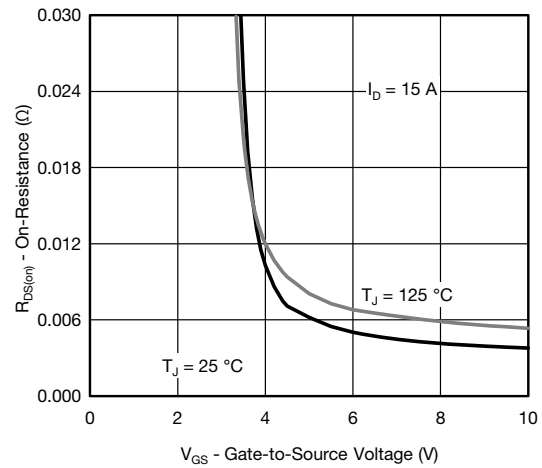
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



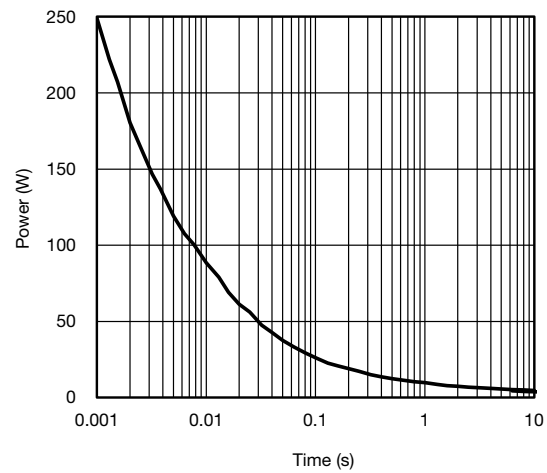
**Source-Drain Diode Forward Voltage**



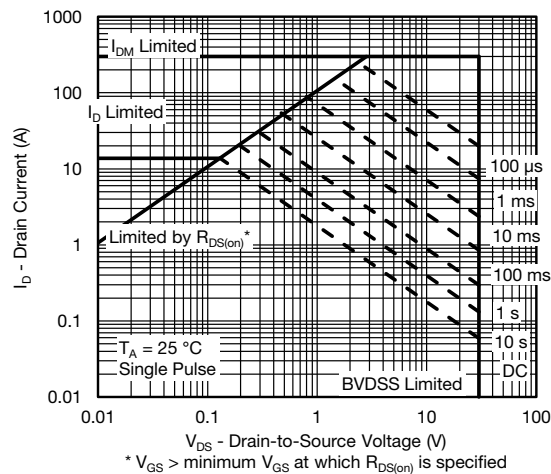
**Threshold Voltage**



**On-Resistance vs. Gate-to-Source Voltage**



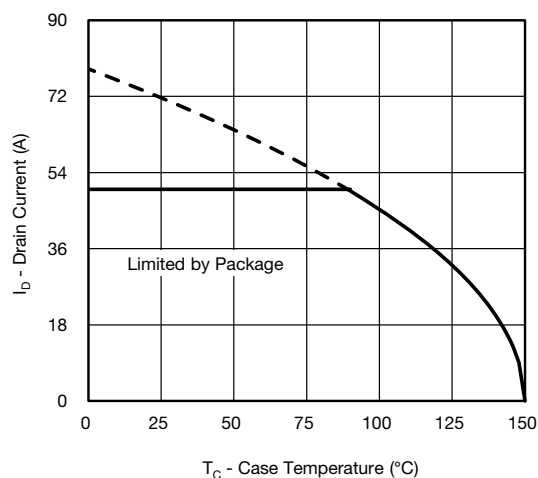
**Single Pulse Power, Junction-to-Ambient**



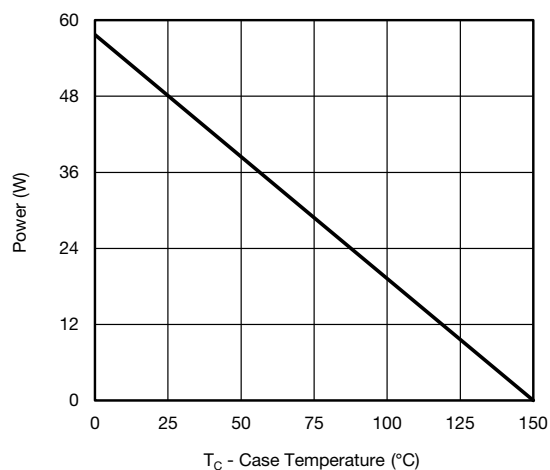
\*  $V_{GS}$  > minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**Safe Operating Area**

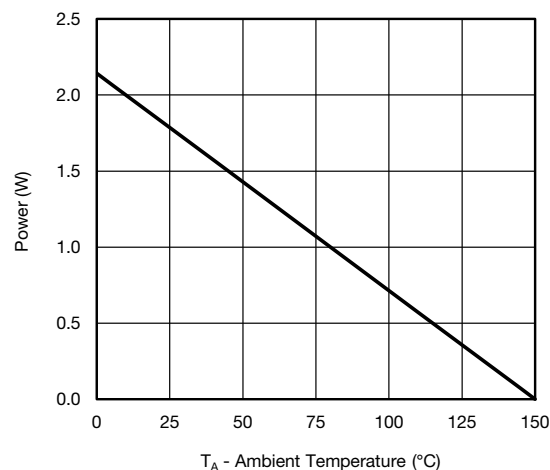
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Current Derating\***



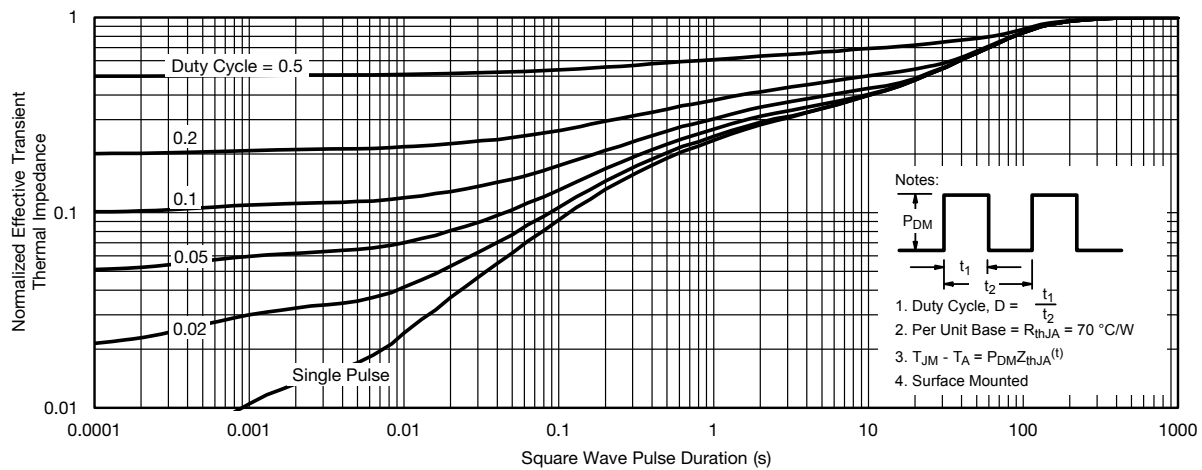
**Power, Junction-to-Case**



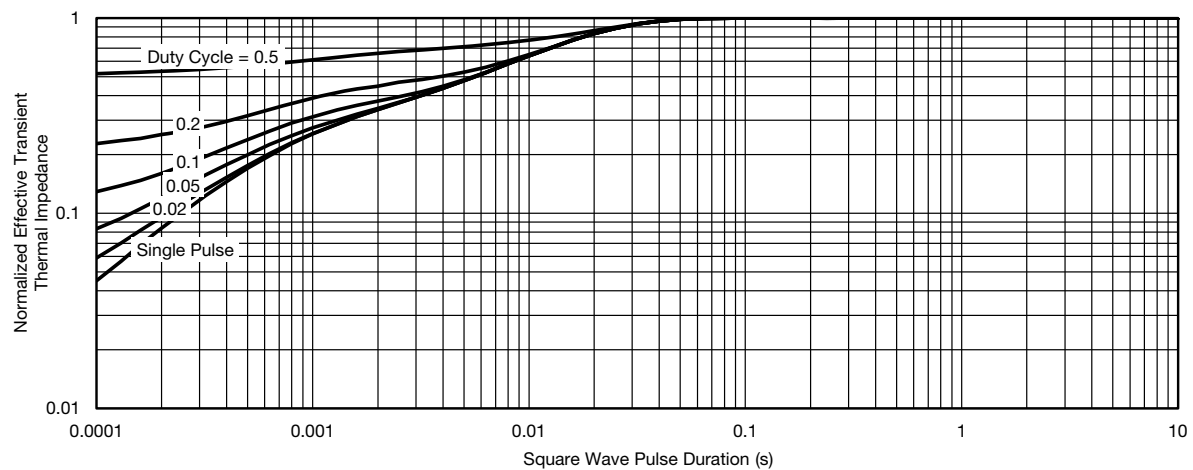
**Power Derating, Junction-to-Ambient**

\* 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.

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

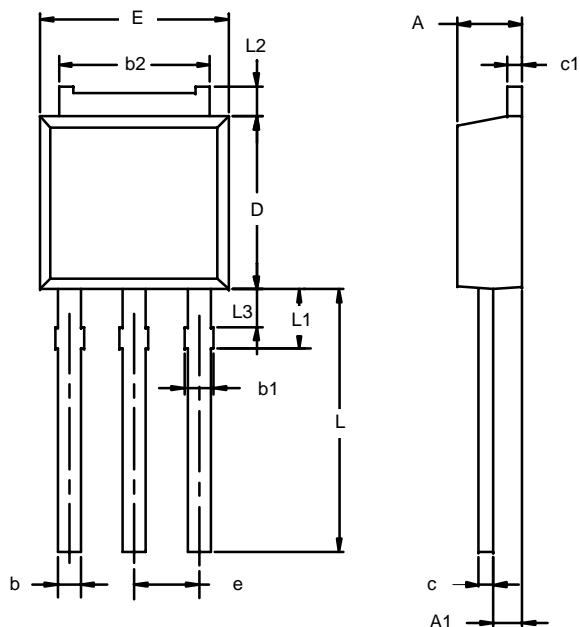


**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Case**

**TO-251AA (DPAK)**



Note: Dimension L3 is for reference only.

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
<b>A</b>	2.21	2.38	0.087	0.094
<b>A1</b>	0.89	1.14	0.035	0.045
<b>b</b>	0.71	0.89	0.028	0.035
<b>b1</b>	0.76	1.14	0.030	0.045
<b>b2</b>	5.23	5.43	0.206	0.214
<b>c</b>	0.46	0.58	0.018	0.023
<b>c1</b>	0.46	0.58	0.018	0.023
<b>D</b>	5.97	6.22	0.235	0.245
<b>E</b>	6.48	6.73	0.255	0.265
<b>e</b>	2.28 BSC		0.090 BSC	
<b>L</b>	8.89	9.53	0.350	0.375
<b>L1</b>	1.91	2.28	0.075	0.090
<b>L2</b>	0.89	1.27	0.035	0.050
<b>L3</b>	1.15	1.52	0.045	0.060
ECN: S-03946—Rev. E, 09-Jul-01 DWG: 5346				

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