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

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
30	0.0057 at V_{GS} = 10 V	40	13.8 nC
	0.0076 at V_{GS} = 4.5 V	40	

FEATURES

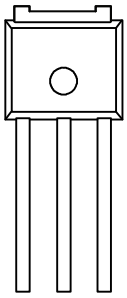
- **Halogen-free**
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested

RoHS COMPLIANT

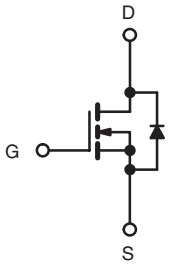
APPLICATIONS

- Low-Side Switch
- Notebook DC/DC

TO-251



Top View



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 = 150 °C)	T_C = 25 °C	I_D	40[a]	A
	T_C = 70 °C		40[a]	
	T_A = 25 °C		22.7[b, c]	
	T_A = 70 °C		19.7[b, c]	
Pulsed Drain Current		I_{DM}	70	
Avalanche Current	L = 0.1 mH	I_{AS}	35	
Avalanche Energy		E_{AS}	61	mJ
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	40[a]	A
	T_A = 25 °C		4.1[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	50	W
	T_C = 70 °C		32	
	T_A = 25 °C		5[b, c]	
	T_A = 70 °C		3.2[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)[d, e]			260	

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[b, f]	t ≤ 10 s	R_{thJA}	20	25	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	2.0	2.5	

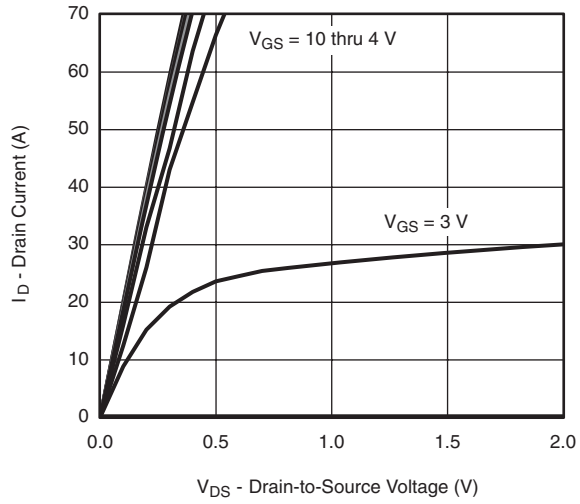
Notes:
a. Based on T_C = 25 °C. Package limited.
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 10 s.

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		27		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS} , I_D = 250 µA	1		3	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} = 30 V, V_{GS} = 0 V			1	µA
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 55 °C			5	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 10 V	50			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.0047	0.0057	Ω
		V_{GS} = 4.5 V, I_D = 18 A		0.0062	0.0076	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 20 A		90		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		1720		pF
Output Capacitance	C_{oss}			355		
Reverse Transfer Capacitance	C_{rss}			130		
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 20 A		29	44	nC
		V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 20 A		13.8	21	
Gate-Source Charge	Q_{gs}			5.0		
Gate-Drain Charge	Q_{gd}			4.6		
Gate Resistance	R_g	f = 1 MHz		1.1	2.2	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1.0 A, V_{GEN} = 4.5 V, R_g = 1 Ω		25	40	ns
Rise Time	t_r			14	25	
Turn-Off Delay Time	$t_{d(off)}$			30	45	
Fall Time	t_f			15	25	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1.0 A, V_{GEN} = 10 V, R_g = 1 Ω		11	20	
Rise Time	t_r			9	15	
Turn-Off Delay Time	$t_{d(off)}$			27	40	
Fall Time	t_f			9	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			40	A
Pulse Diode Forward Current	I_{SM}				70	
Body Diode Voltage	V_{SD}	I_S = 4.1 A, V_{GS} = 0 V		0.75	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 4.1 A, dI/dt = 100 A/µs, T_J = 25 °C		25	50	ns
Body Diode Reverse Recovery Charge	Q_{rr}			17	35	nC
Reverse Recovery Fall Time	t_a			13		ns
Reverse Recovery Rise Time	t_b			12		

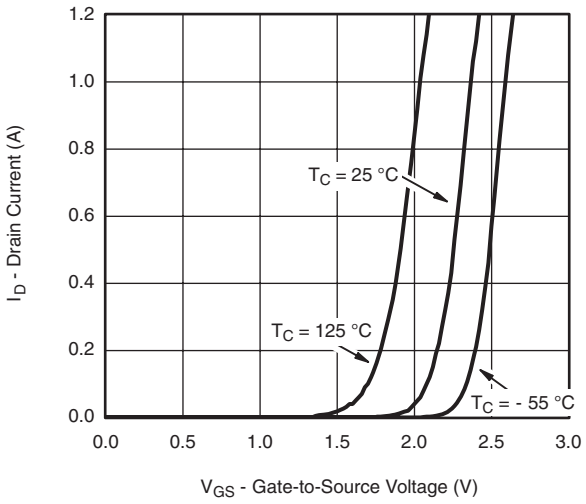
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

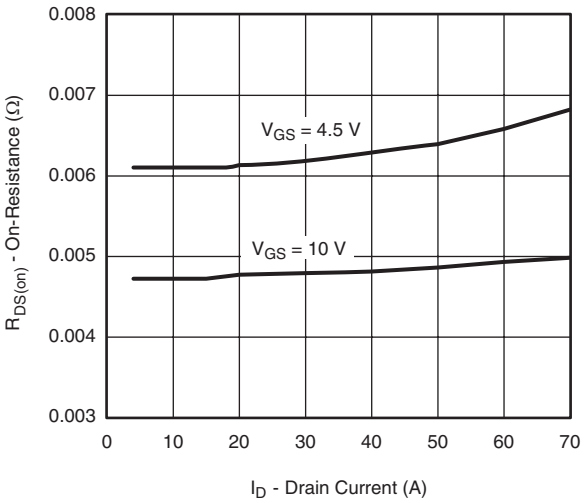
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



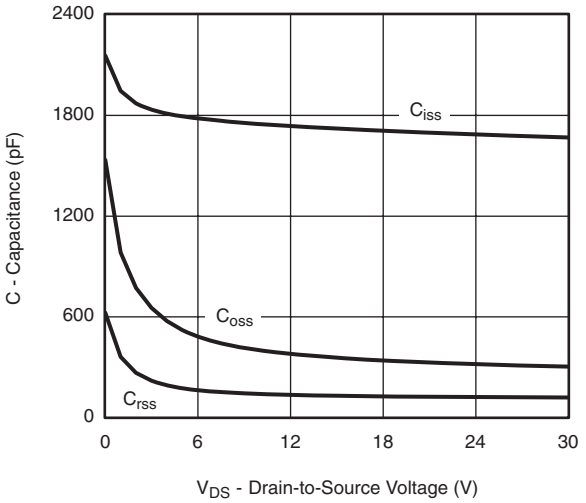
Output Characteristics



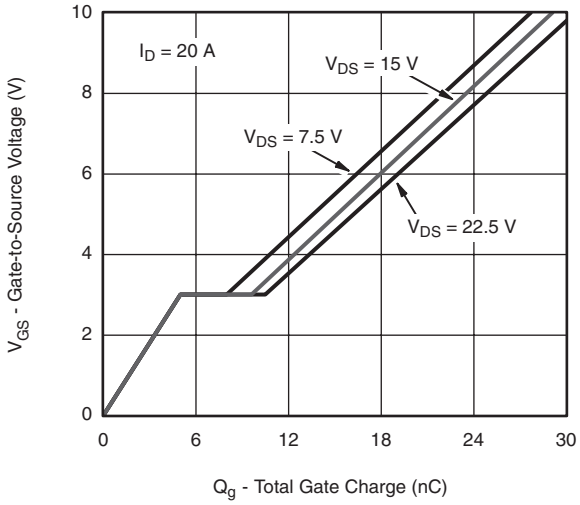
Transfer Characteristics



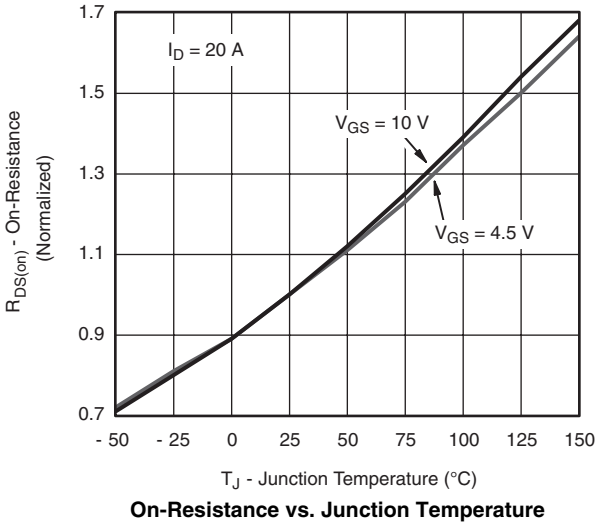
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

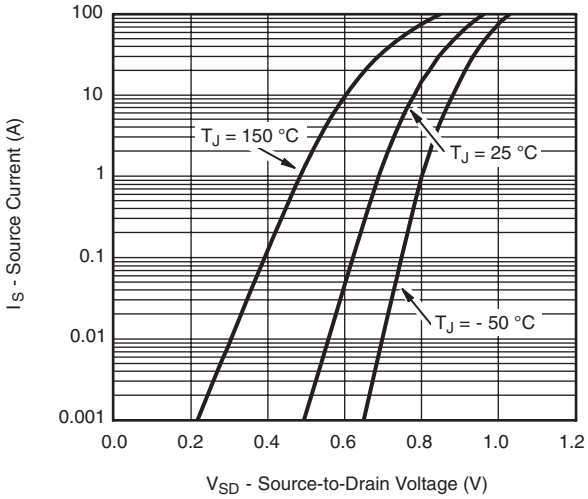


Gate Charge

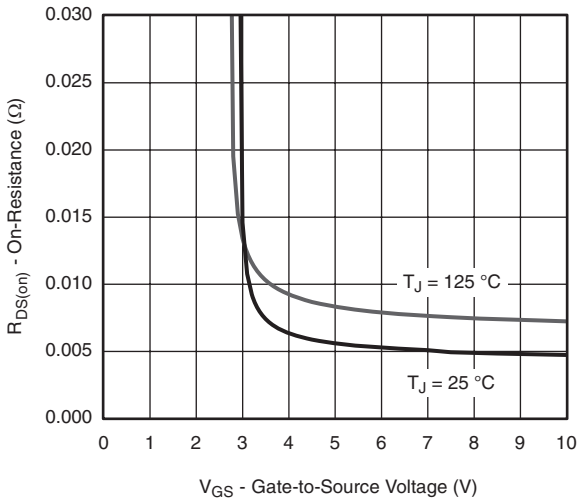


On-Resistance vs. Junction Temperature

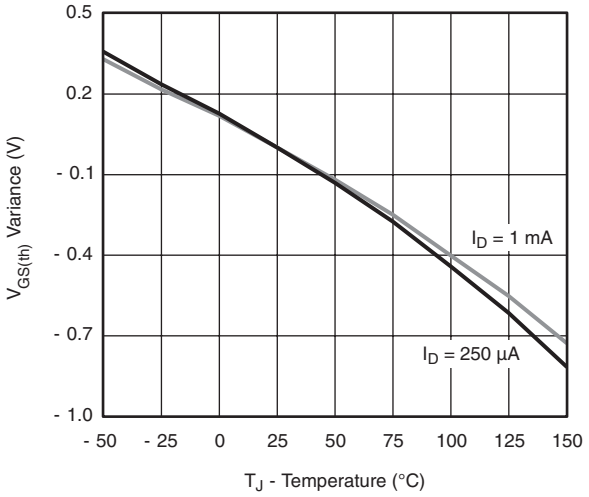
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



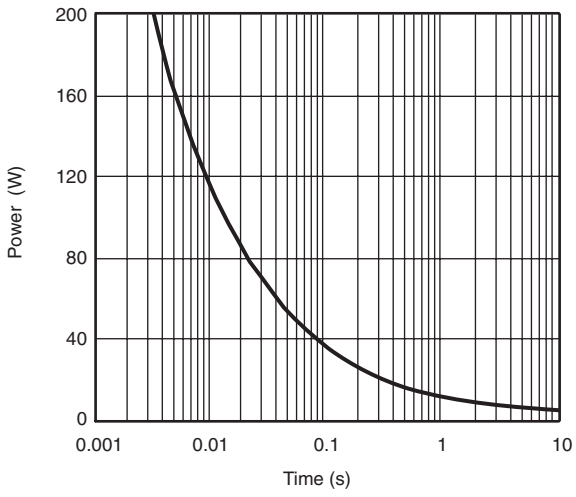
Source-Drain Diode Forward Voltage



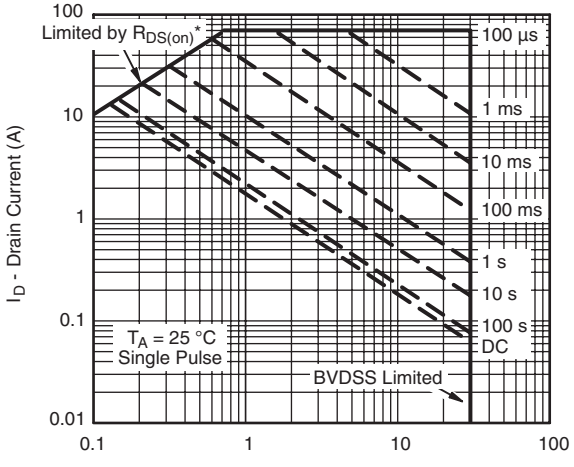
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



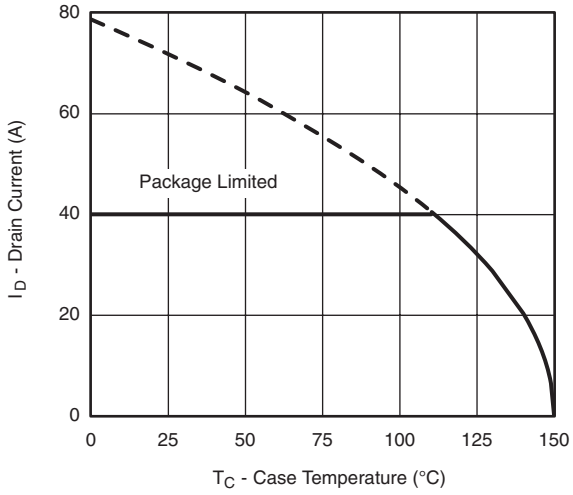
Single Pulse Power (Junction-to-Ambient)



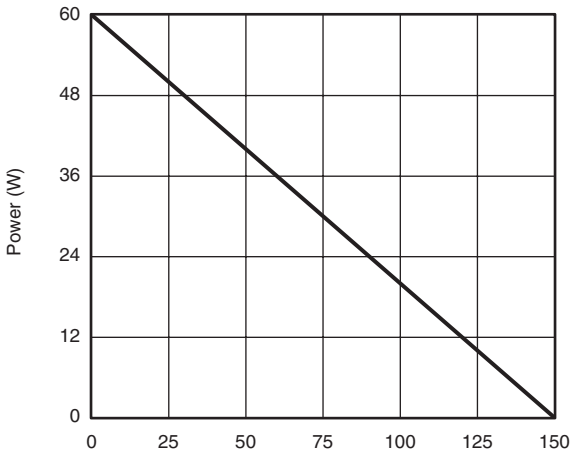
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

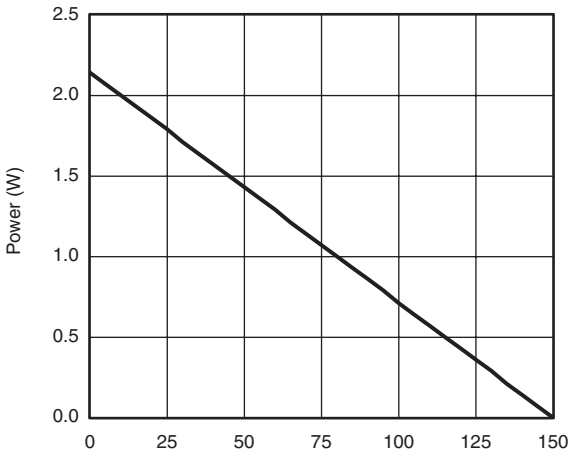
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



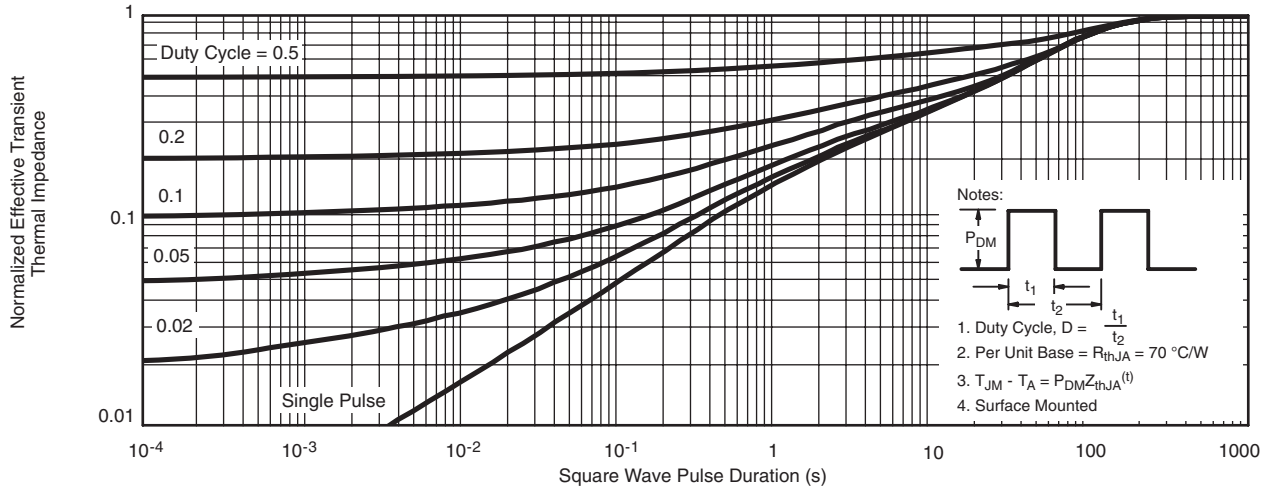
Power, Junction-to-Case



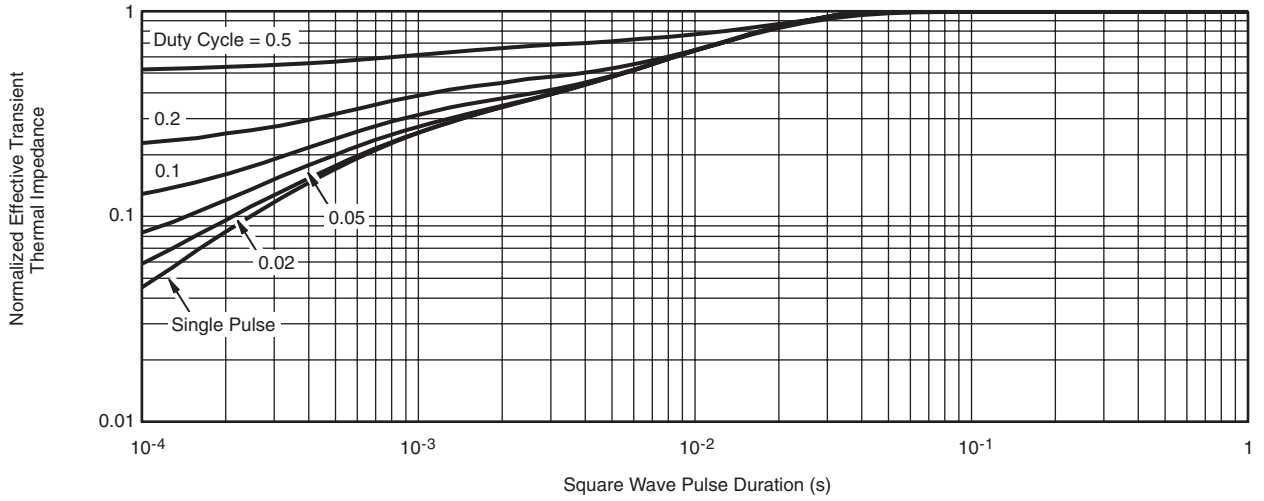
Power, Junction-to-Ambient

* 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

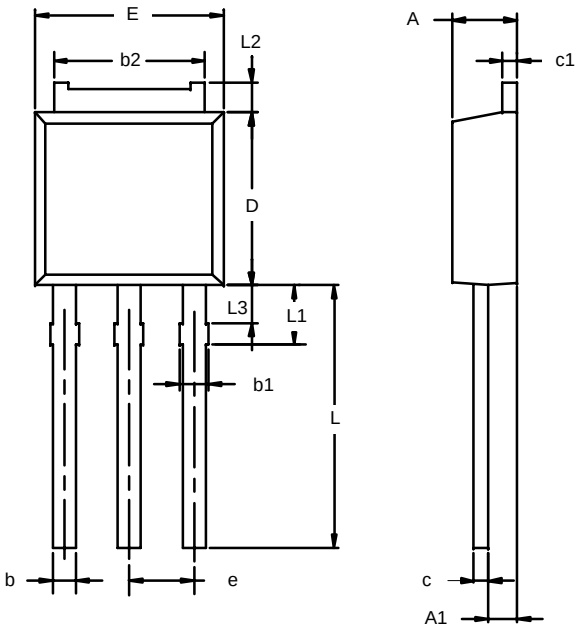


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

TO-251AA (DPAK)



Note: Dimension L3 is for reference only.

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

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