P-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[d]	Q_g (Typ.)
- 20	0.016 at V_{GS} = - 4.5 V	- 40	13 nC
	0.025 at V_{GS} = - 2.5 V	- 35	

FEATURES

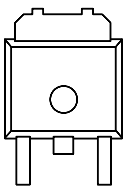
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- 100 % R_g Tested

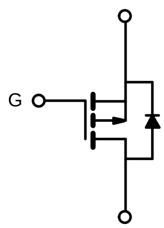
Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

APPLICATIONS

- Load Switch
- Battery Switch

TO-252





P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	- 20	V
Gate-Source Voltage		V_{GS}	± 12	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	- 40	A
	T_C = 70 °C		- 35	
	T_A = 25 °C		- 30.0[a, b]	
	T_A = 70 °C		- 28 [a, b]	
Pulsed Drain Current		I_{DM}	- 150	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	- 3.5	
	T_A = 25 °C		- 2.1[a, b]	
Maximum Power Dissipation	T_C = 25 °C	P_D	40	W
	T_C = 70 °C		27	
	T_A = 25 °C		2.5[a, b]	
	T_A = 70 °C		1.6[a, 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[a, c]	t ≤ 10 s	R_{thJA}	40	50	°C/W
Maximum Junction-to-Foot	Steady State	R_{thJF}	24	30	

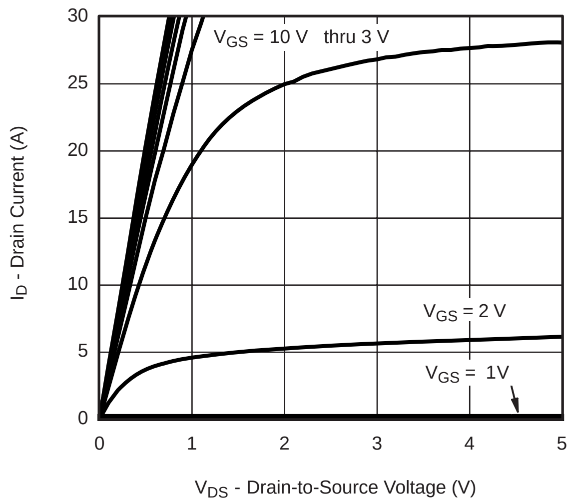
Notes:
a. Surface mounted on 1" x 1" FR4 board.
b. t = 10 s.
c. Maximum under Steady State conditions is 95 °C/W.
d. Based on T_C = 25 °C.

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	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 31		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			4.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	-0.5		- 2.0	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 12 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 20 V, V_{GS} = 0 V			- 1	µA
		V_{DS} = -20 V , V_{GS} = 0 V, T_J = 55 °C			- 5	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ - 5 V, V_{GS} = - 10 V	- 40			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 4.5 V, I_D = - 7.0 A		0.016		Ω
		V_{GS} = - 2.5 V, I_D = - 5.6 A		0.025		
Forward Transconductance[a]	g_{fs}	V_{DS} = - 15 V, I_D = - 7.0 A		18		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 10 V, V_{GS} = 0 V, f = 1 MHz		1455		pF
Output Capacitance	C_{oss}			180		
Reverse Transfer Capacitance	C_{rss}			145		
Total Gate Charge	Q_g	V_{DS} = - 10 V, V_{GS} = - 10 V, I_D = - 7.0 A		25	38	nC
		V_{DS} = - 10 V, V_{GS} = - 4.5 V, I_D = - 7.0 A		13	20	
Gate-Source Charge	Q_{gs}			3.5		
Gate-Drain Charge	Q_{gd}			5.5		
Gate Resistance	R_g	f = 1 MHz	0.4	2.0	4.0	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 2.7 Ω $I_D \cong$ - 5.6 A, V_{GEN} = - 10 V, R_g = 1 Ω		10	20	ns
Rise Time	t_r			13	20	
Turn-Off DelayTime	$t_{d(off)}$			23	35	
Fall Time	t_f			9	18	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 2.7 Ω $I_D \cong$ - 5.6 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		38	57	
Rise Time	t_r			89	134	
Turn-Off DelayTime	$t_{d(off)}$			22	33	
Fall Time	t_f			11	17	
Drain-Source Body Diode Characteristics						
Continous Source-Drain Diode Current	I_S	T_C = 25 °C			- 6.5	A
Pulse Diode Forward Current	I_{SM}				- 30	
Body Diode Voltage	V_{SD}	I_S = - 5.6 A, V_{GS} = 0 V		- 0.71	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 5.6 A, dI/dt = 100 A/µs, T_J = 25 °C		22	33	ns
Body Diode Reverse Recovery Charge	Q_{rr}			17	26	nC
Reverse Recovery Fall Time	t_a			13		ns
Reverse Recovery Rise Time	t_b			9		

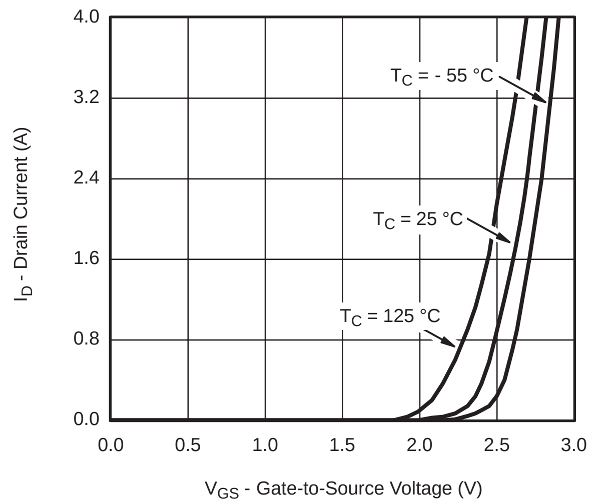
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

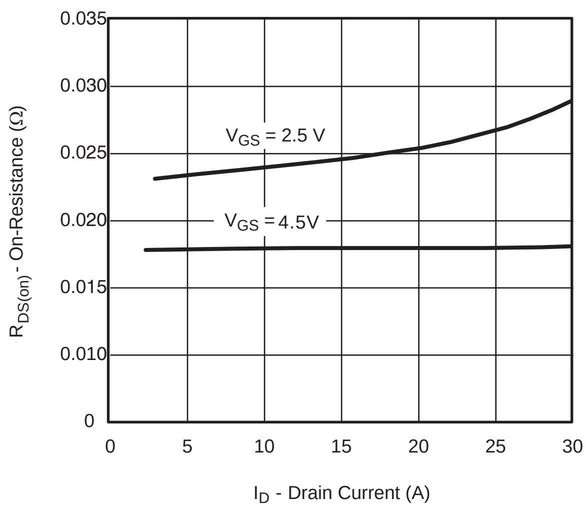
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



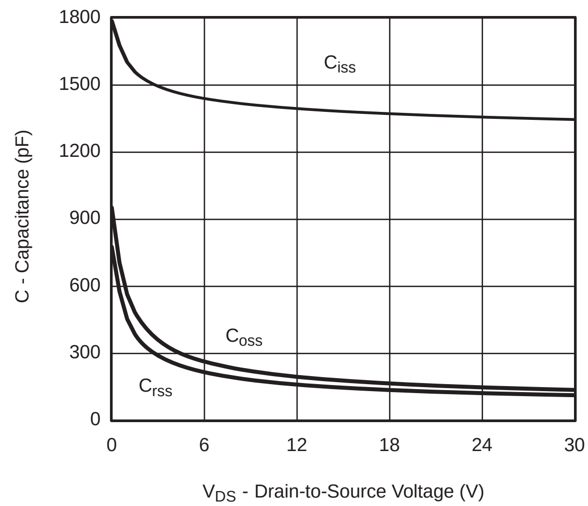
Output Characteristics



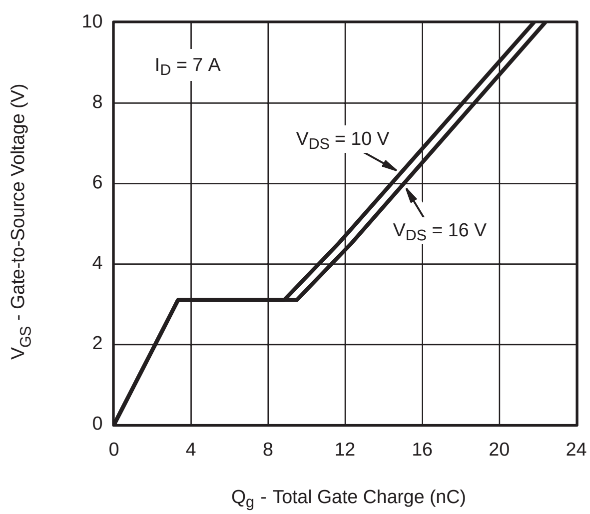
Transfer Characteristics



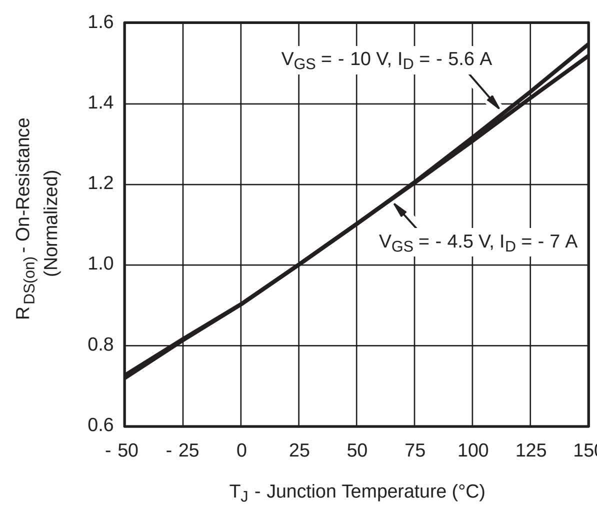
On-Resistance vs. Drain Current



Capacitance

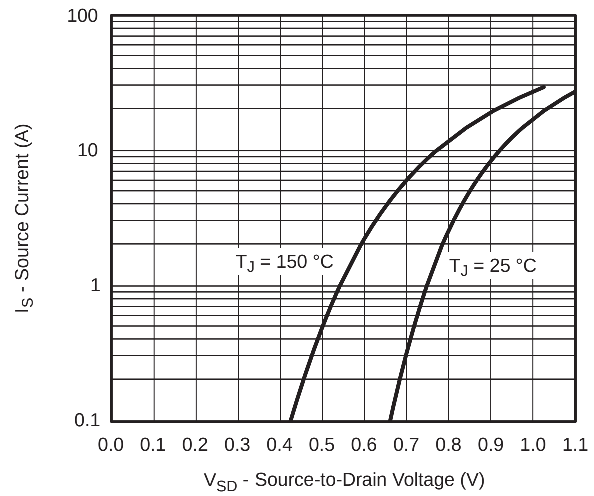


Gate Charge

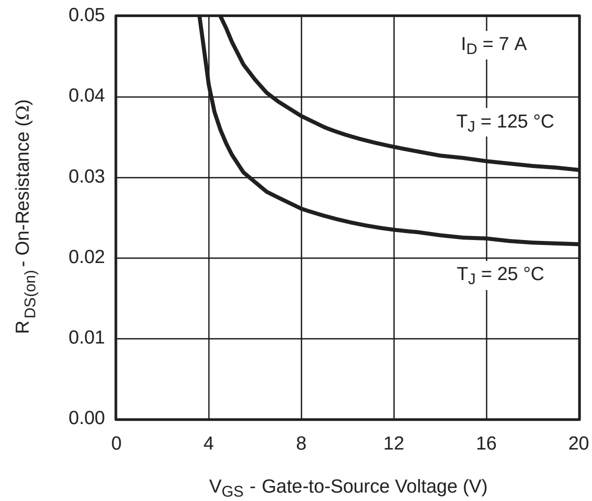


On-Resistance vs. Junction Temperature

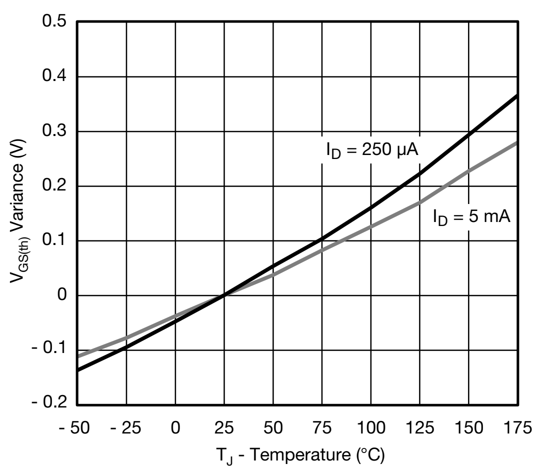
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



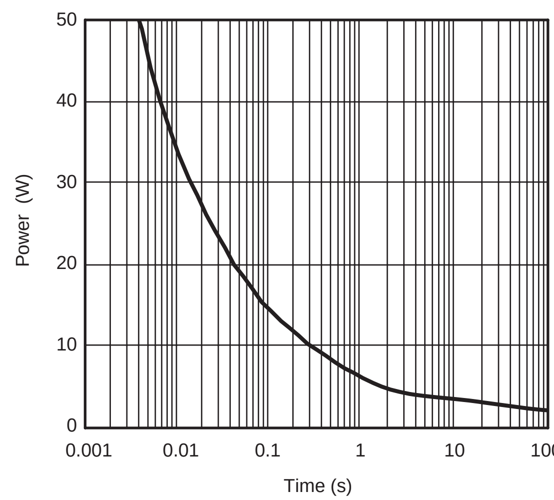
Source-Drain Diode Forward Voltage



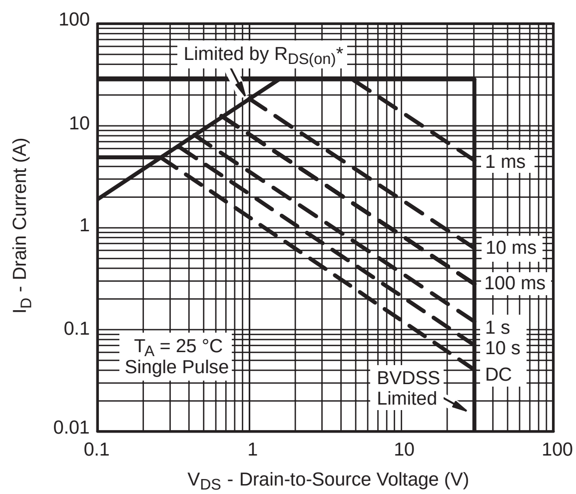
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



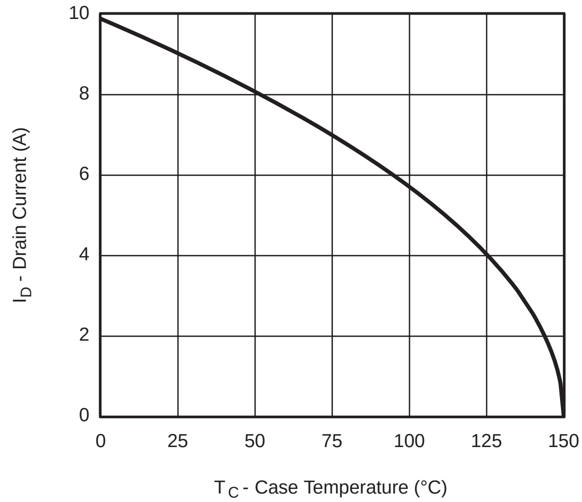
Single Pulse Power, Junction-to-Ambient



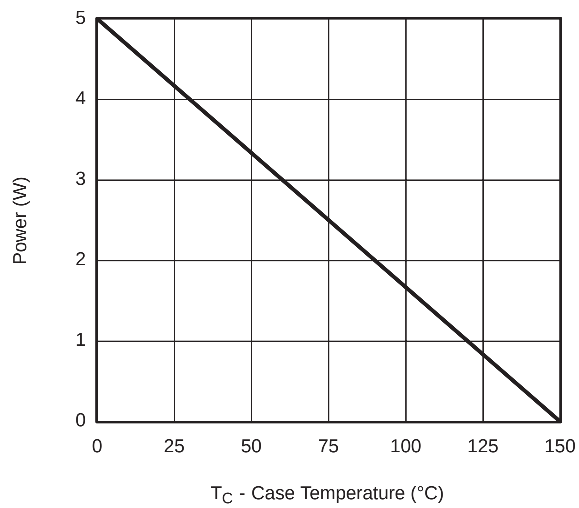
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area

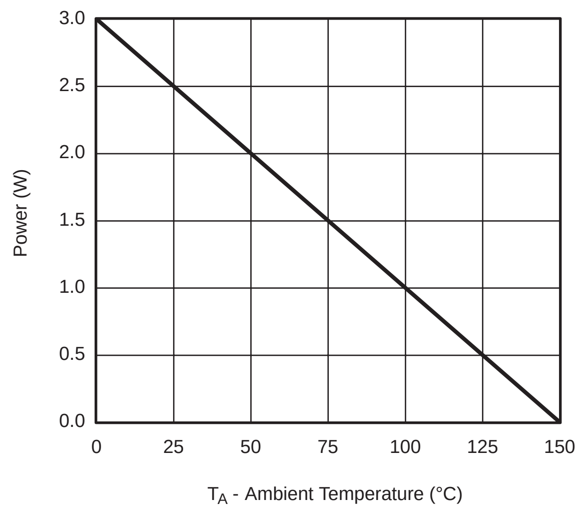
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



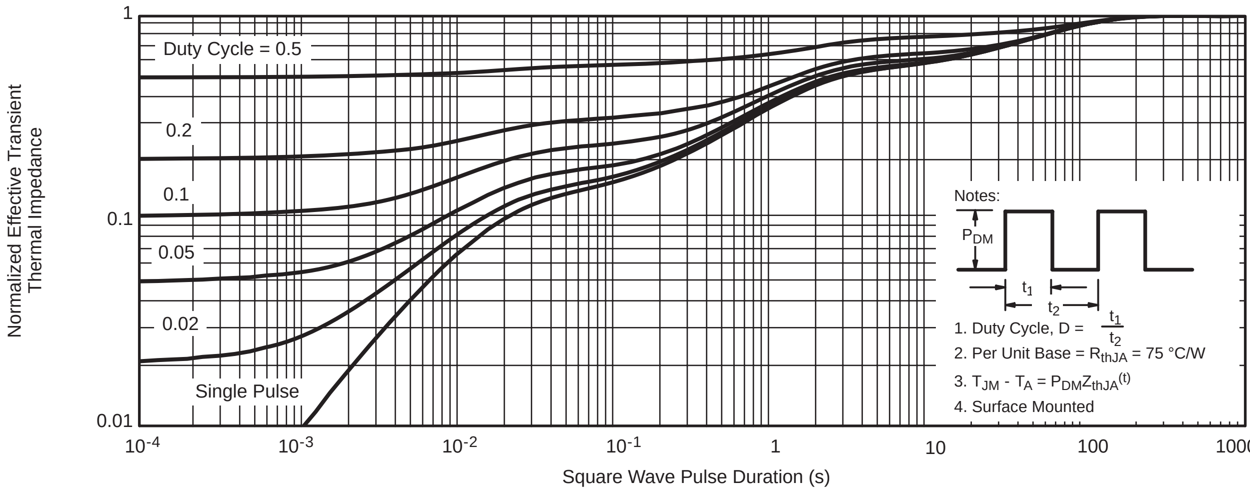
Power, Junction-to-Foot



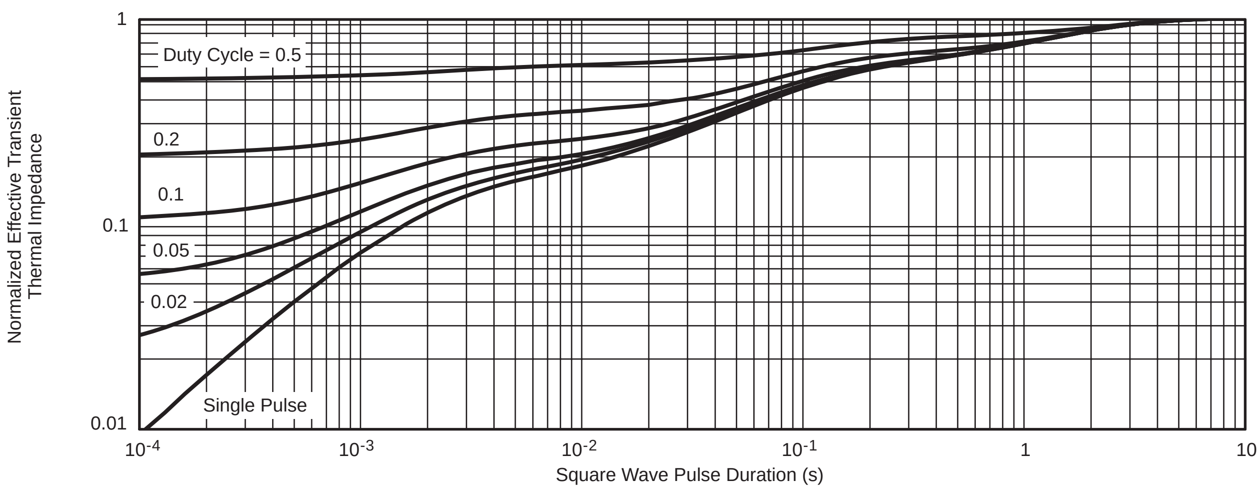
Power Derating, Junction-to-Ambient

* 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

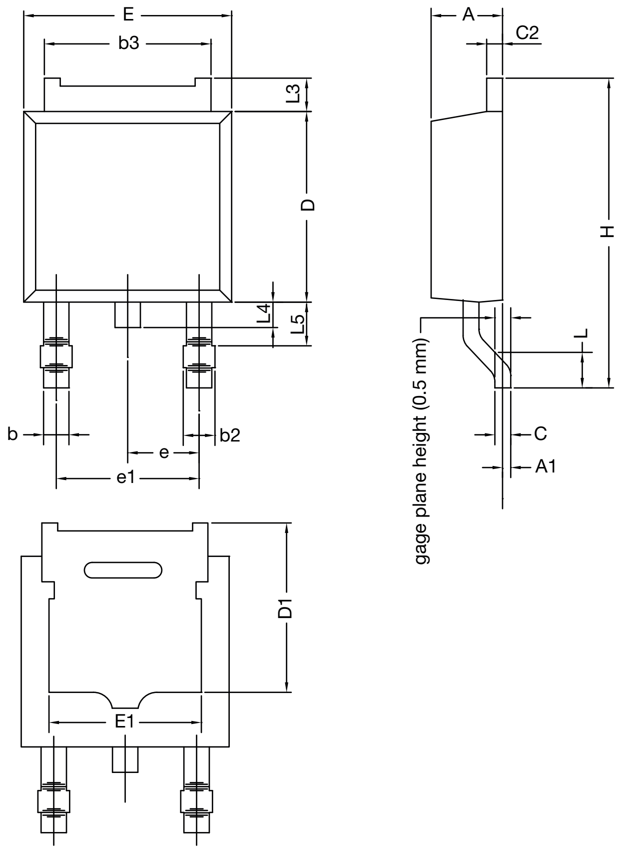


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

TO-252AA CASE OUTLINE



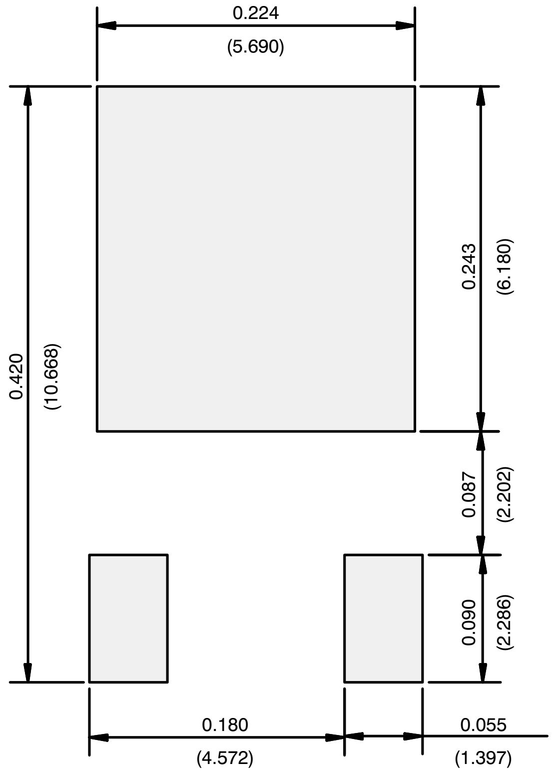
	MILLIMETERS		INCHES	
DIM.	**MIN.**	**MAX.**	**MIN.**	**MAX.**
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	10.41	0.370	0.410
e	2.28 BSC		0.090 BSC	
e1	4.56 BSC		0.180 BSC	
L	1.40	1.78	0.055	0.070
L3	0.89	1.27	0.035	0.050
L4	-	1.02	-	0.040
L5	1.14	1.52	0.045	0.060

ECN: X12-0247-Rev. M, 24-Dec-12
DWG: 5347

Note

- Dimension L3 is for reference only.

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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