

SM1F12NSU-VB Datasheet

N-Channel 150 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
150	0.032 at $V_{GS} = 10$ V	40	23 nC
	0.045 at $V_{GS} = 8$ V	35	

FEATURES

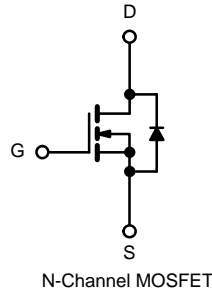
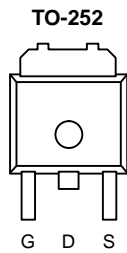
- Halogen-free According to IEC 61249-2-21 Definition
- Extremely Low Q_{gd} for Switching Losses
- 100 % R_g Tested
- 100 % Avalanche Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Primary Side Switch



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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	150	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	$T_C = 25$ °C	40	A
	$T_C = 70$ °C	35	
	$T_A = 25$ °C	35.5 ^{b, c}	
	$T_A = 70$ °C	34.5 ^{b, c}	
Pulsed Drain Current	I_{DM}	50	
Continuous Source-Drain Diode Current	$T_C = 25$ °C	4.5	
	$T_A = 25$ °C	2.6 ^{b, c}	
Single Pulse Avalanche Current	I_{AS}	20	mJ
Single Pulse Avalanche Energy	E_{AS}	20	
Maximum Power Dissipation	$T_C = 25$ °C	5.9	W
	$T_C = 70$ °C	3.8	
	$T_A = 25$ °C	3.1 ^{b, c}	
	$T_A = 70$ °C	2 ^{b, c}	
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, f}	R_{thJA}	33	40	°C/W
Maximum Junction-to-Foot (Drain)	R_{thJF}	17	21	

Notes:

- Based on $T_C = 25$ °C.
- Surface mounted on 1" x 1" FR4 board.
- $t = 10$ s.
- Maximum under steady state conditions is 80 °C/W.

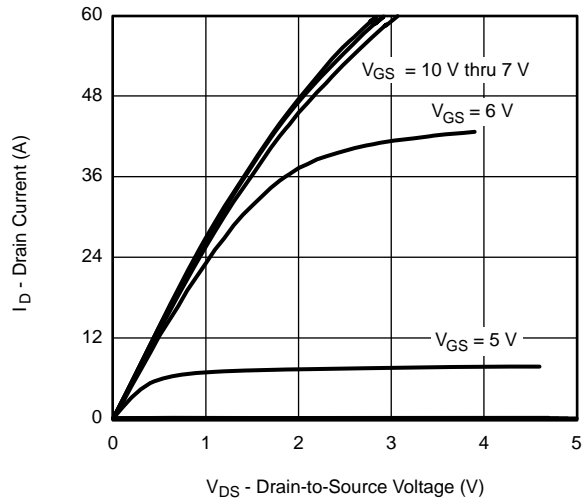
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	150			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		172		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 10		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.5		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} = 100 V, V _{GS} = 0 V			1	μA
		V _{DS} = 100 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 10 V, V _{GS} = 10 V	30			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 5 A		0.032		Ω
		V _{GS} = 8 V, I _D = 5 A		0.045		
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 5 A		23		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 50 V, V _{GS} = 0 V, f = 1 MHz		1735		pF
Output Capacitance	C _{oss}			160		
Reverse Transfer Capacitance	C _{rss}			37		
Total Gate Charge	Q _g	V _{DS} = 75 V, V _{GS} = 10 V, I _D = 5 A		28.5	43	nC
		V _{DS} = 75 V, V _{GS} = 8 V, I _D = 5 A		23	35	
Gate-Source Charge	Q _{gs}			8		
Gate-Drain Charge	Q _{gd}			6.5		
Gate Resistance	R _g	f = 1 MHz		0.85	1.3	Ω
Turn-on Delay Time	t _{d(on)}	V _{DD} = 50 V, R _L = 10 Ω I _D ≡ 5 A, V _{GEN} = 10 V, R _g = 1 Ω		14	21	ns
Rise Time	t _r			12	18	
Turn-Off Delay Time	t _{d(off)}			22	33	
Fall Time	t _f			6	10	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 50 V, R _L = 10 Ω I _D ≡ 5 A, V _{GEN} = 8 V, R _g = 1 Ω		16	24	
Rise Time	t _r			12	18	
Turn-Off Delay Time	t _{d(off)}			20	30	
Fall Time	t _f			7	12	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			7.7	A
Pulse Diode Forward Current ^a	I _{SM}				50	
Body Diode Voltage	V _{SD}	I _S = 2.6 A		0.77	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 5 A, di/dt = 100 A/μs, T _J = 25 °C		63	95	ns
Body Diode Reverse Recovery Charge	Q _{rr}			110	165	nC
Reverse Recovery Fall Time	t _a			49		ns
Reverse Recovery Rise Time	t _b			14		

Notes:

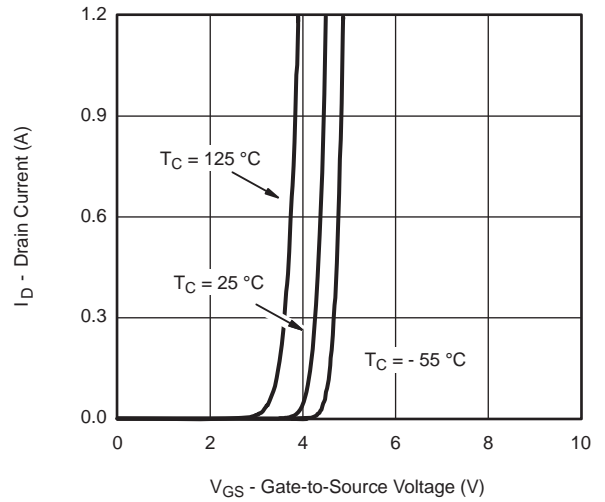
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
 a. Guaranteed by design, not subject to production testing.

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.

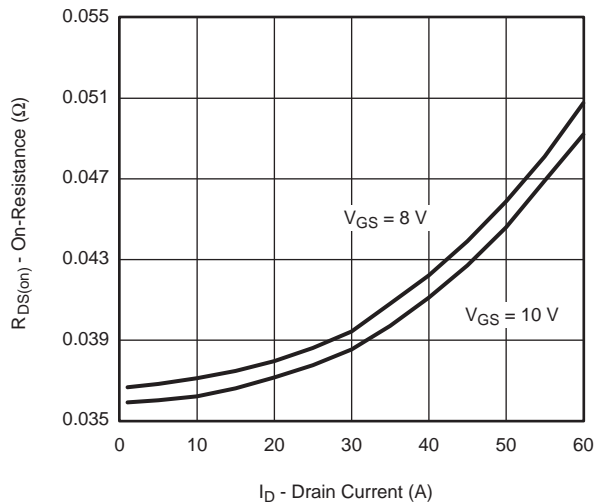
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



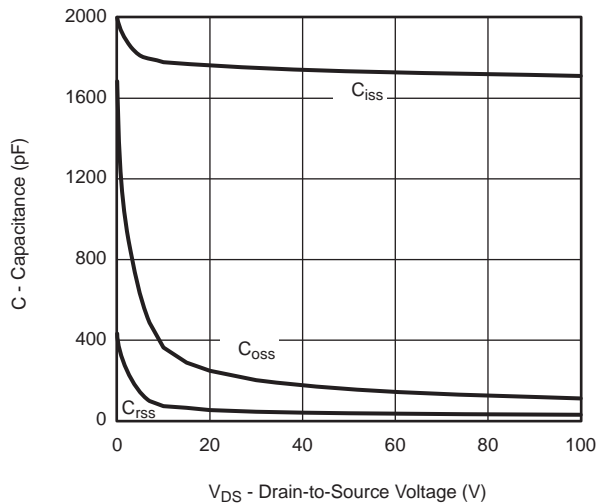
Output Characteristics



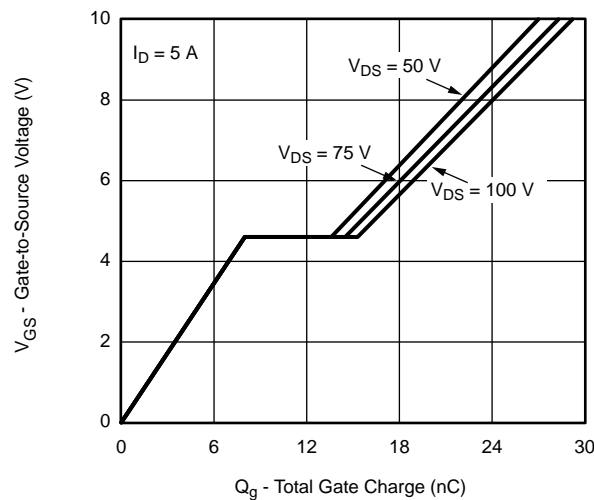
Transfer Characteristics



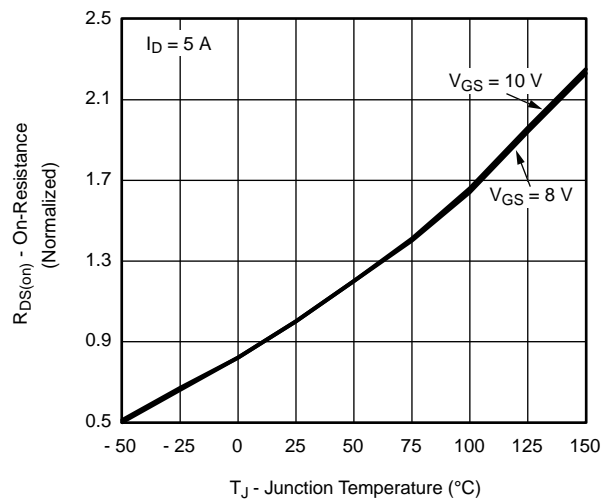
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

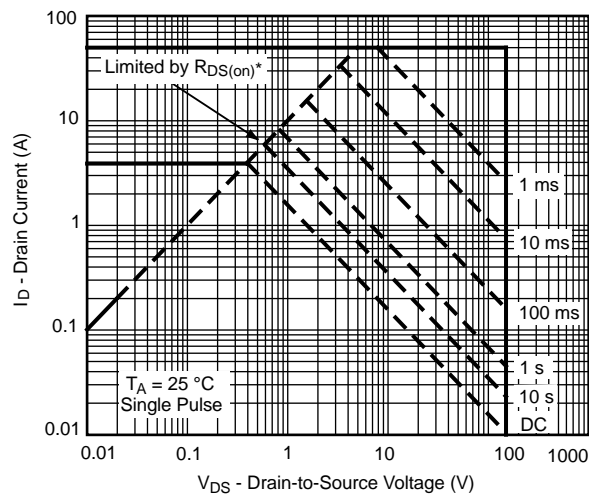
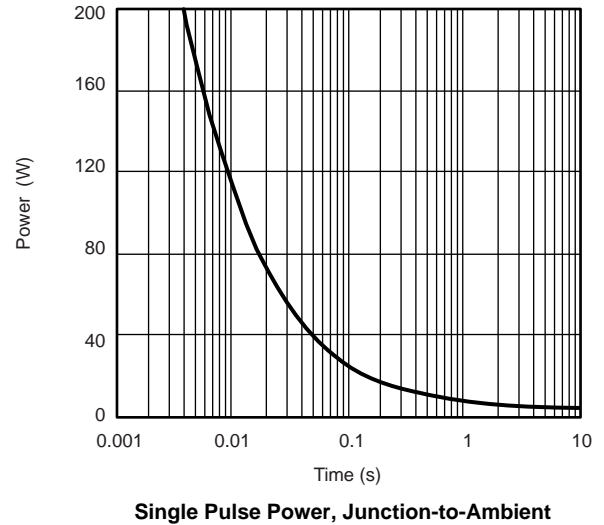
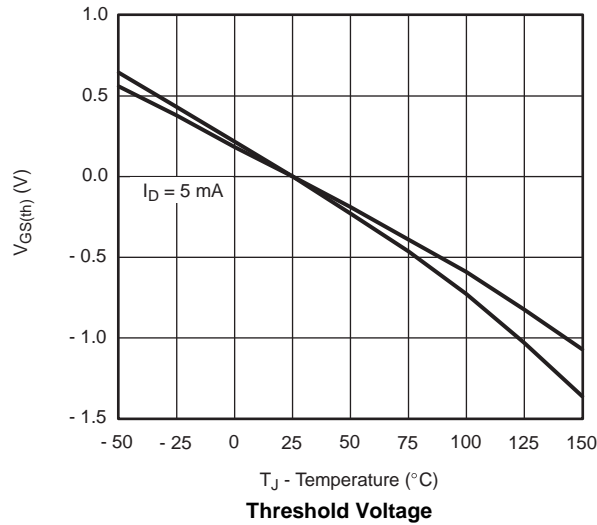
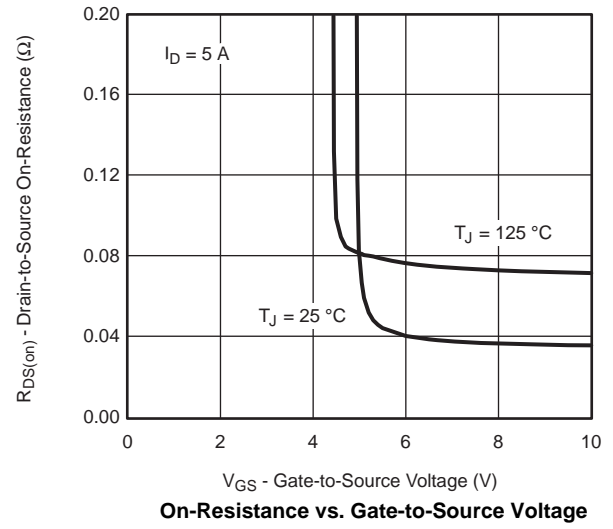
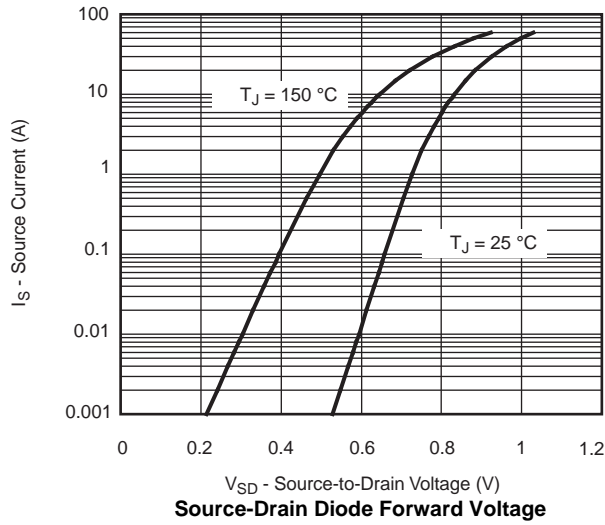


Gate Charge

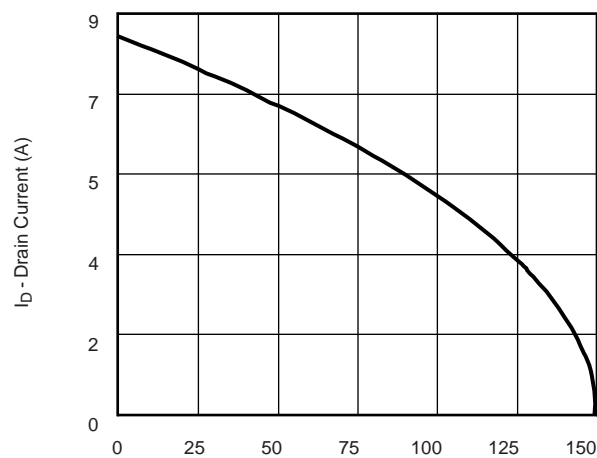


On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)


T_C - Case Temperature (°C)
Current Derating*



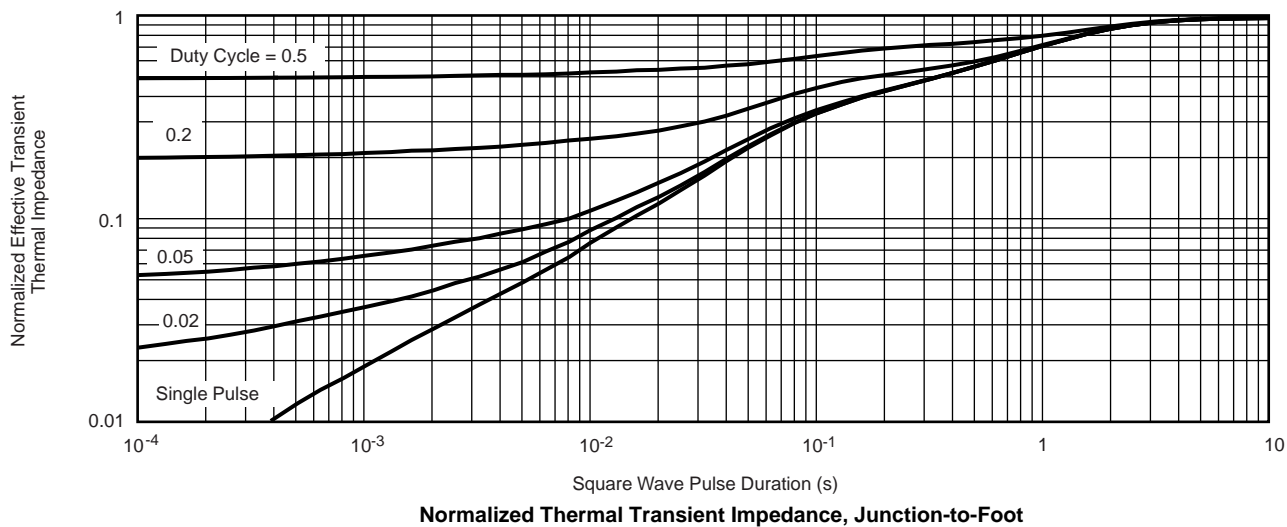
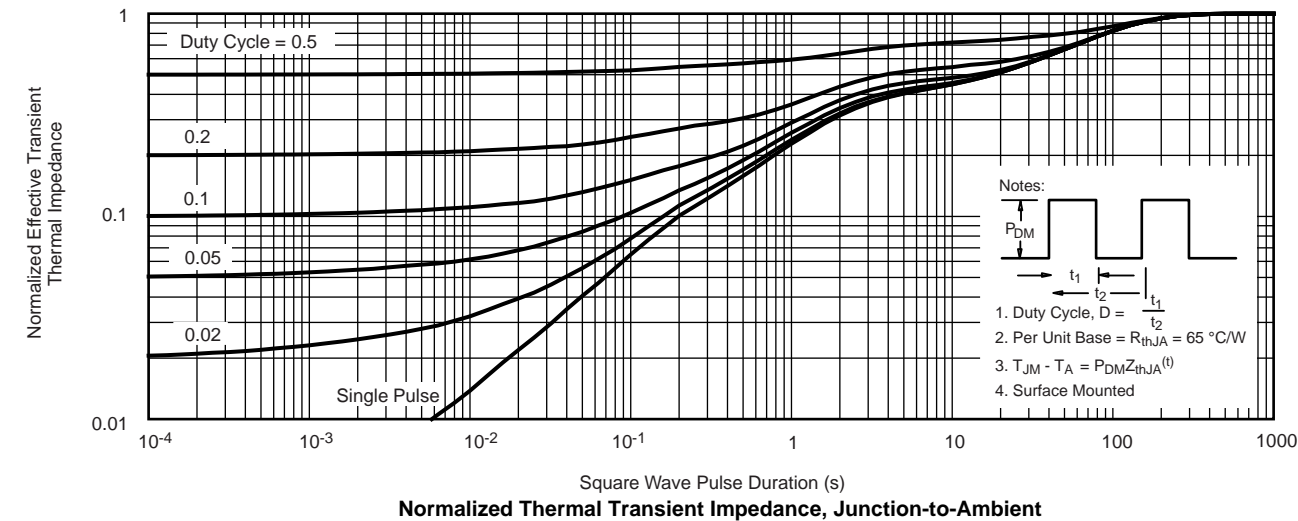
T_C - Case Temperature (°C)
Power, Junction-to-Case



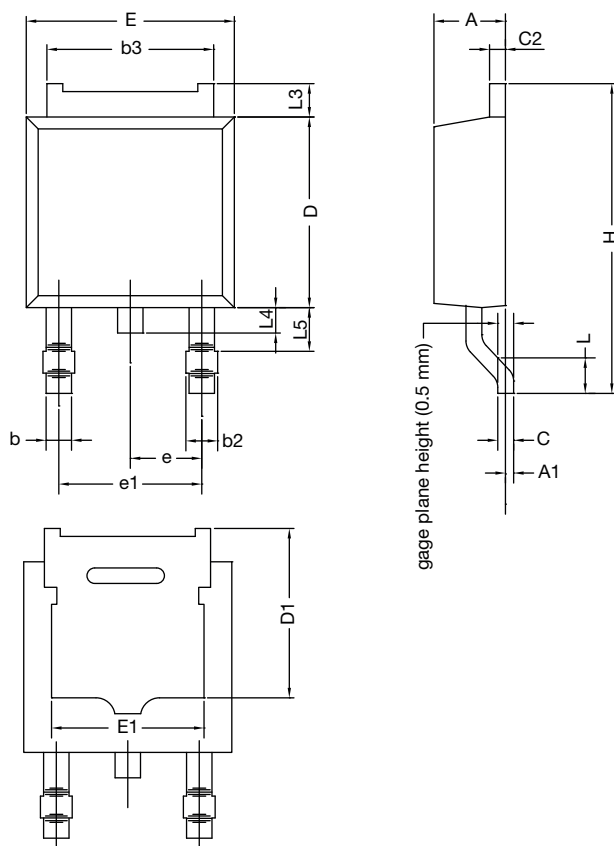
T_A - Ambient Temperature (°C)
Power, Junction-to-Ambient

* 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)



TO-252AA CASE OUTLINE

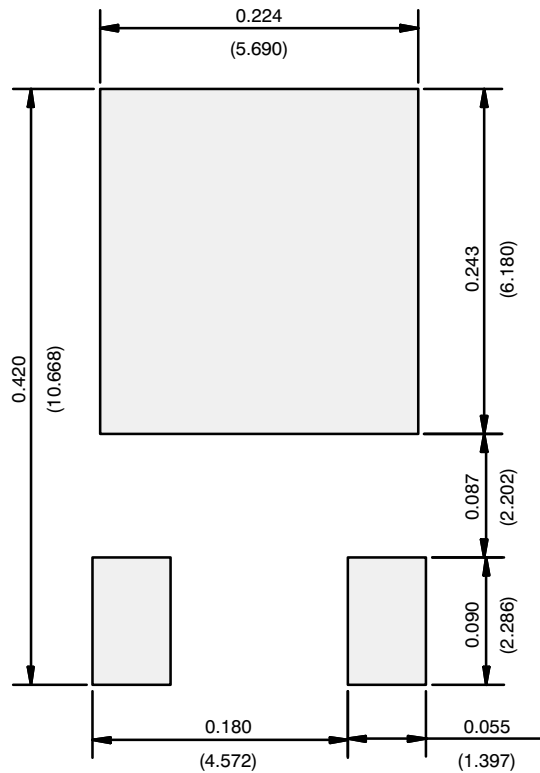


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	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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