

AP9435J-VB Datasheet

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

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^d	Q_g (Typ.)
- 30	0.056 at $V_{GS} = -10$ V	- 20	19 nC
	0.072 at $V_{GS} = -4.5$ V	- 15	

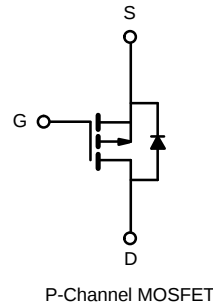
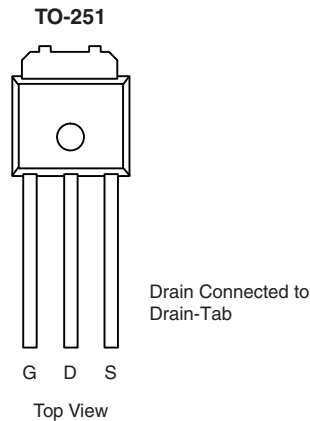
FEATURES

- Halogen-free
- Trench Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested


RoHS
 COMPLIANT

APPLICATIONS

- Load Switch
- Notebook Adaptor Switch



ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$, unless otherwise noted

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	- 30	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	$T_C = 25^\circ\text{C}$	I_D	- 20	A
	$T_C = 70^\circ\text{C}$		- 15	
	$T_A = 25^\circ\text{C}$		- 7.9 ^{a, b}	
	$T_A = 70^\circ\text{C}$		- 5.6 ^{a, b}	
Pulsed Drain Current		I_{DM}	- 60	
Continuous Source-Drain Diode Current	$T_C = 25^\circ\text{C}$	I_S	- 20	
	$T_A = 25^\circ\text{C}$		- 7.9 ^{a, b}	
Avalanche Current		I_{AS}	- 20	mJ
Single-Pulse Avalanche Energy		E_{AS}	20	
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	20	W
	$T_C = 70^\circ\text{C}$		15	
	$T_A = 25^\circ\text{C}$		2.7 ^{a, b}	
	$T_A = 70^\circ\text{C}$		1.7 ^{a, b}	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{a, c}	$t \leq 10$ s	R_{thJA}	38	46	$^\circ\text{C/W}$
Maximum Junction-to-Foot	Steady State	R_{thJF}	20	25	

Notes:

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

 b. $t = 10$ s.

 c. Maximum under Steady State conditions is 85°C/W .

 d. Based on $T_C = 25^\circ\text{C}$.

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	- 30			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 34		mV/ $^{\circ}\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			5.3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	- 1.4		- 2.5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 25\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -30\text{ V}$, $V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -30\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 55\text{ }^{\circ}\text{C}$			- 5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq -10\text{ V}$, $V_{GS} = -10\text{ V}$	- 20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$, $I_D = -6\text{ A}$		0.056		Ω
		$V_{GS} = -4.5\text{ V}$, $I_D = -4\text{ A}$		0.072		
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}$, $I_D = -6\text{ A}$		28		S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{DS} = -15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		1150		pF
Output Capacitance	C_{oss}			205		
Reverse Transfer Capacitance	C_{rss}			140		
Total Gate Charge	Q_g	$V_{DS} = -15\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -6\text{ A}$		27	43	nC
Gate-Source Charge	Q_{gs}	$V_{DS} = -15\text{ V}$, $V_{GS} = -4.5\text{ V}$, $I_D = -6\text{ A}$		19	25	
Gate-Drain Charge	Q_{gd}			6		
Gate Resistance	R_g		$f = 1\text{ MHz}$	0.5	2.2	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}$, $R_L = 1.5\text{ }\Omega$ $I_D \cong -10\text{ A}$, $V_{GEN} = -10\text{ V}$, $R_g = 1\text{ }\Omega$		13	25	ns
Rise Time	t_r			12	24	
Turn-Off DelayTime	$t_{d(off)}$			40	70	
Fall Time	t_f			9	18	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}$, $R_L = 1.5\text{ }\Omega$ $I_D \cong -6\text{ A}$, $V_{GEN} = -4.5\text{ V}$, $R_g = 1\text{ }\Omega$		48	80	
Rise Time	t_r			92	160	
Turn-Off DelayTime	$t_{d(off)}$			34	60	
Fall Time	t_f			19	35	
Drain-Source Body Diode Characteristics						
Continous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$			- 4.1	A
Pulse Diode Forward Current	I_{SM}				- 60	
Body Diode Voltage	V_{SD}	$I_S = -3\text{ A}$, $V_{GS} = 0\text{ V}$		- 0.75	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -6\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^{\circ}\text{C}$		27	45	ns
Body Diode Reverse Recovery Charge	Q_{rr}			16	27	nC
Reverse Recovery Fall Time	t_a			12		ns
Reverse Recovery Rise Time	t_b			15		

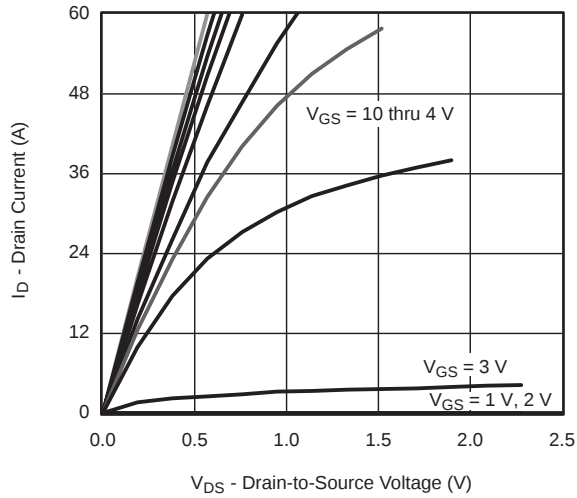
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

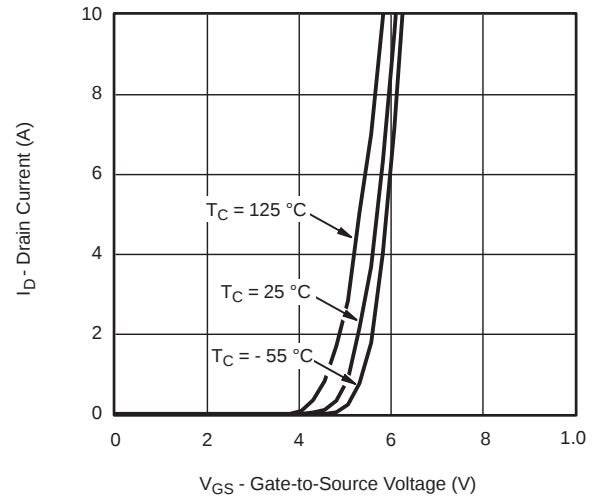
b. Guaranteed by design, not subject to production testing.

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.

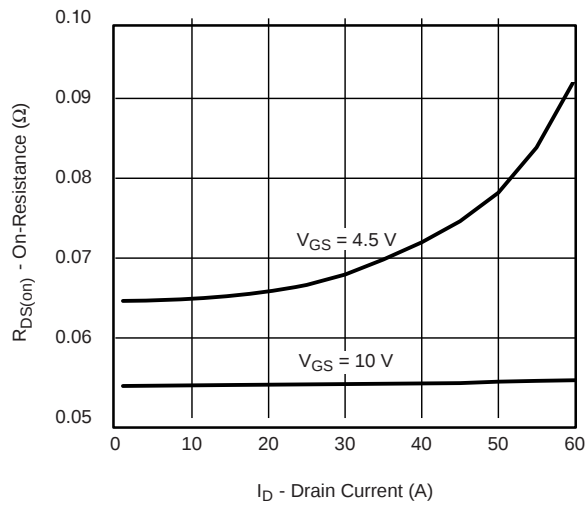
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



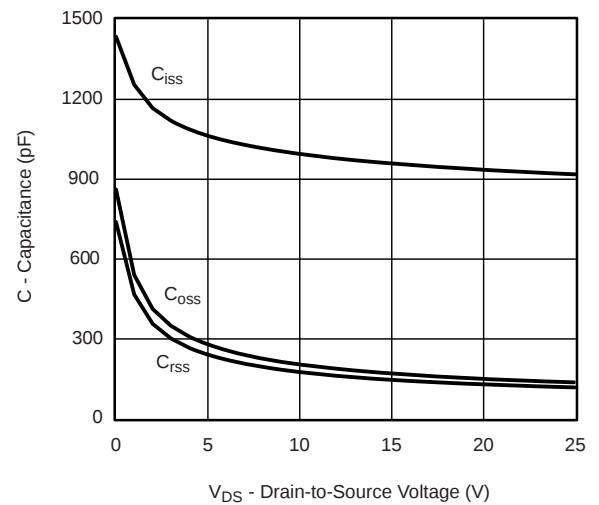
Output Characteristics



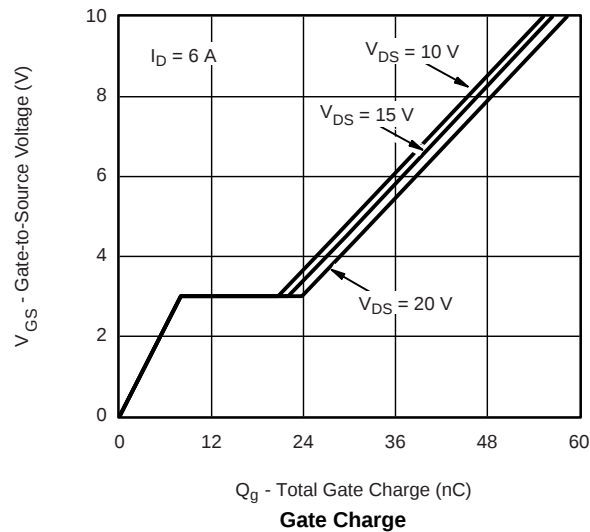
Transfer Characteristics



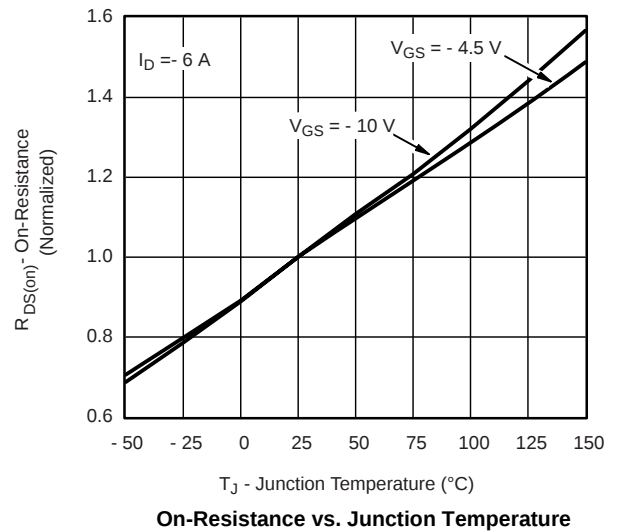
On-Resistance vs. Drain Current



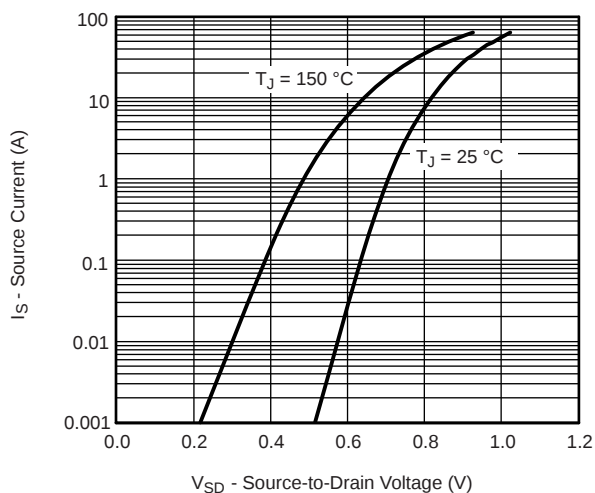
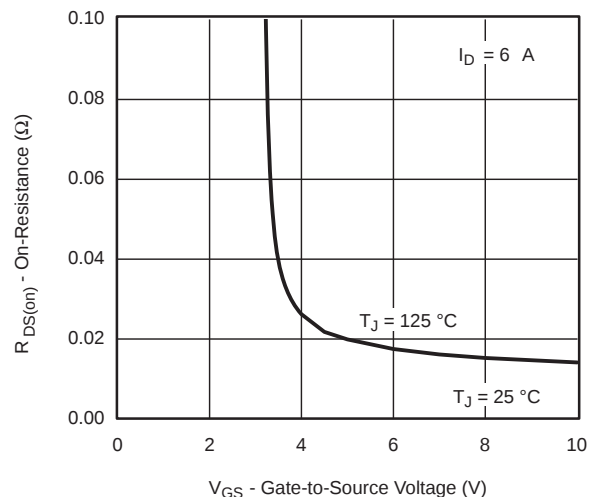
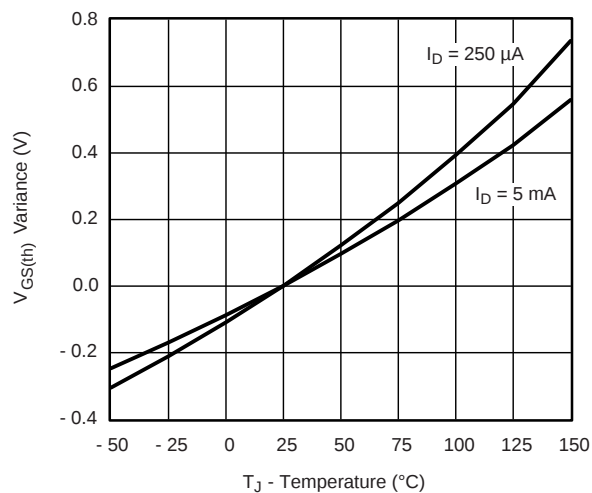
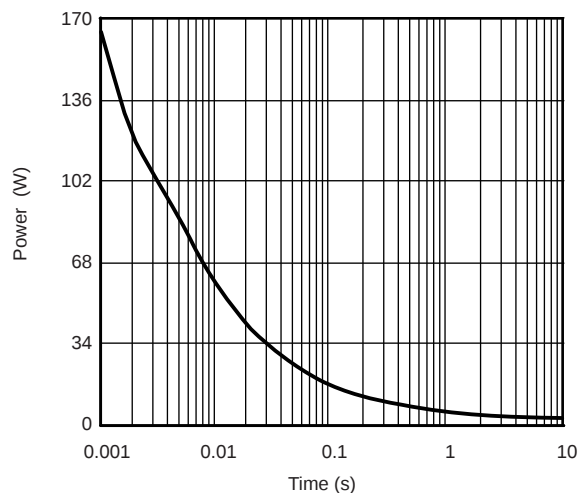
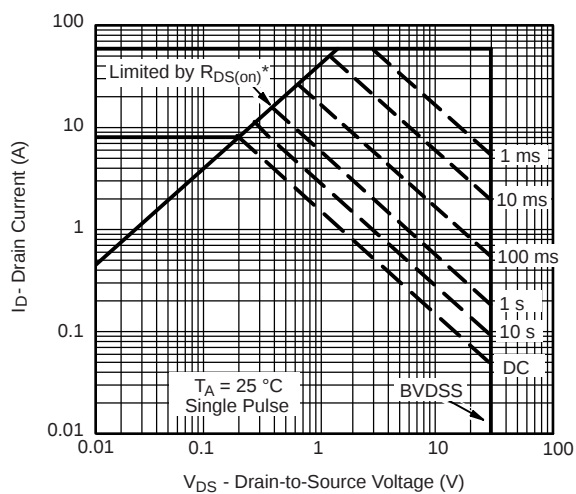
Capacitance



Gate Charge

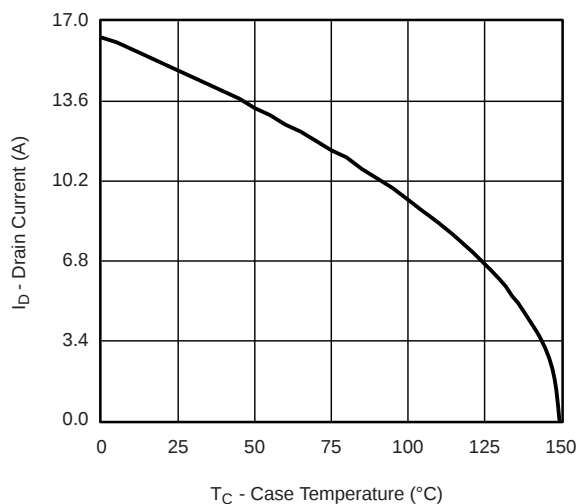
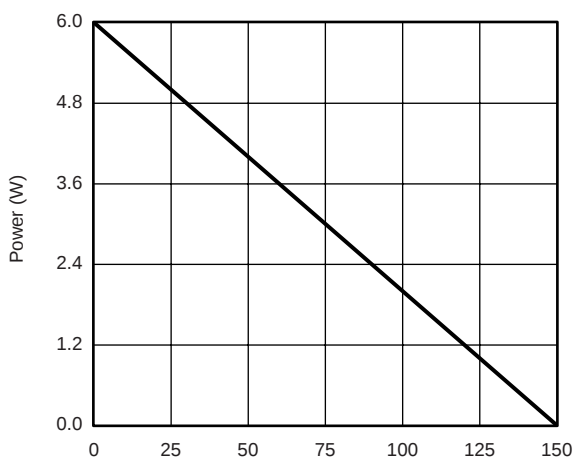
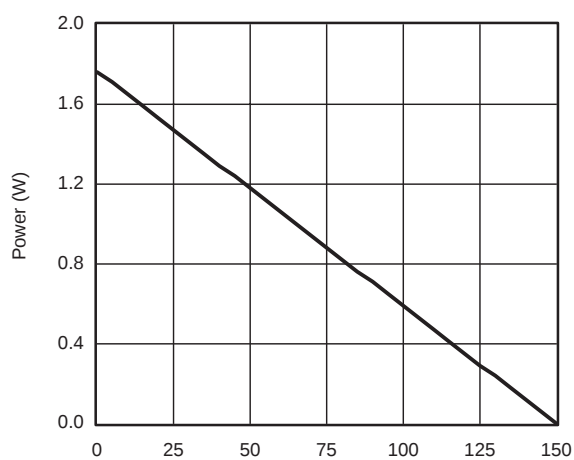


On-Resistance vs. Junction Temperature

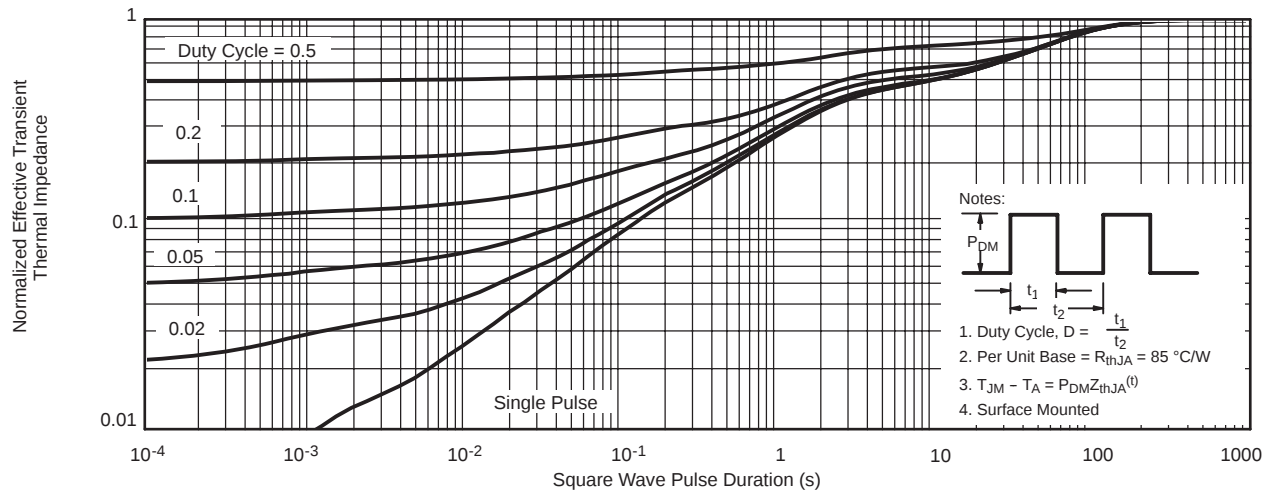
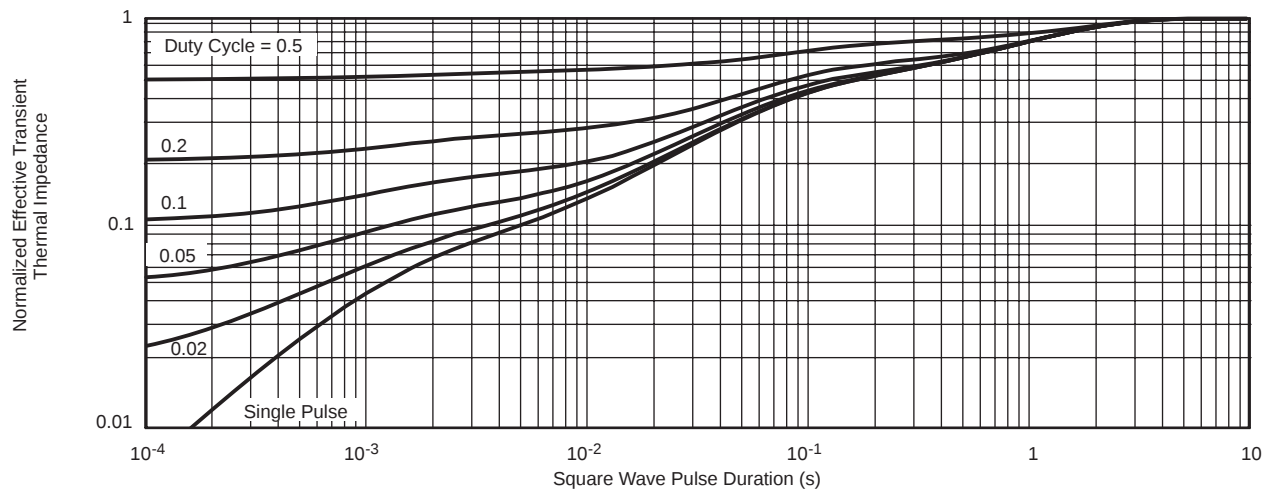
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Source-Drain Diode Forward Voltage

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

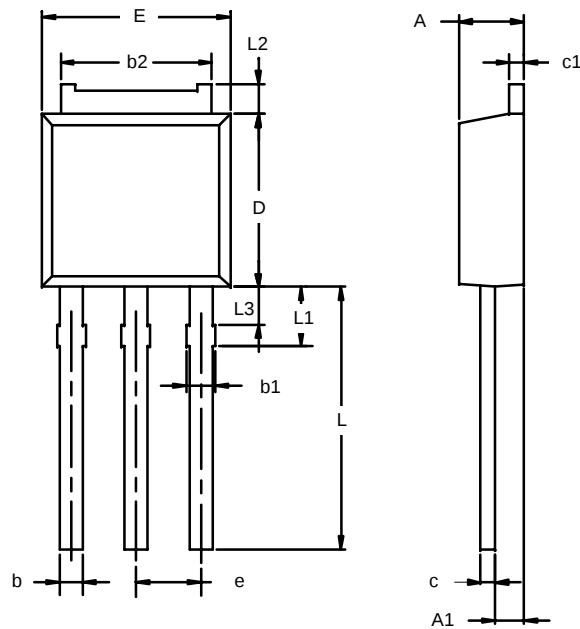
Safe Operating Area

MOSFET 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-251AA



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	3.89	9.53	0.153	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

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