

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

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^{a, g}	Q _g (Typ.)
20	0.0095 at V _{GS} = 10 V	12	7.3 nC
	0.0105 at V _{GS} = 4.5 V	10	

FEATURES

- DT-Trench Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC

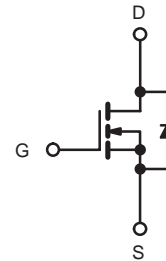
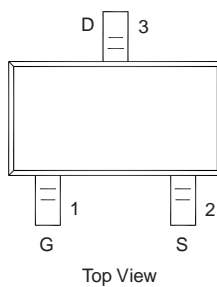


RoHS
COMPLIANT

APPLICATIONS

- DC/DC Conversion
- POL

(SOT-23-3L)



N-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)	I _D	T _C = 25 °C	12 ^{a, g}	A
		T _C = 70 °C	10 ^g	
		T _A = 25 °C	11.3 ^{b, c}	
		T _A = 70 °C	10.3 ^{b, c}	
Pulsed Drain Current	I _{DM}	36 ^g		
Avalanche Current	I _{AS}	15		
Avalanche Energy	E _{AS}	11.25	mJ	
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	12 ^{a, g}	A
		T _A = 25 °C	2.9 ^{b, c}	
Maximum Power Dissipation	P _D	T _C = 25 °C	27.7	W
		T _C = 70 °C	17.7	
		T _A = 25 °C	3.5 ^{b, c}	
		T _A = 70 °C	2.2 ^{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}	29	36	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R _{thJC}	3.6	4.5	

Notes:

- Based on T_C = 25 °C.
- Surface Mounted on 1" x 1" FR4 board.
- t = 10 s.
- The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under Steady State conditions is 81 °C/W.
- Package limited.

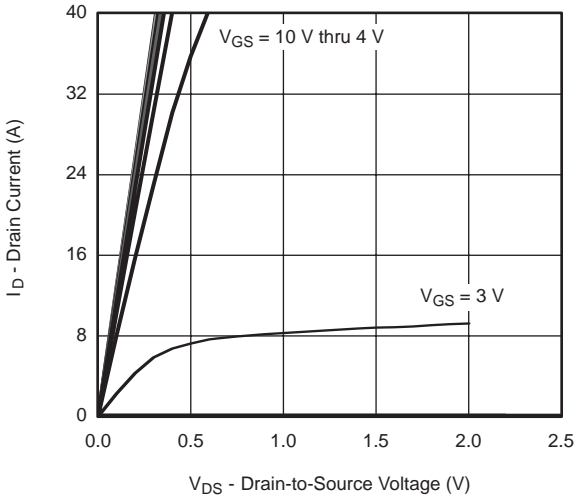
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		22		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.0		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.5		1.0	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	12			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		0.0095	0.0105	Ω
		$V_{GS} = 4.5\text{ V}, I_D = 7\text{ A}$		0.0105	0.0120	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 10\text{ A}$		26		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		880		pF
Output Capacitance	C_{oss}			310		
Reverse Transfer Capacitance	C_{rss}			125		
Total Gate Charge	Q_g	$V_{DS} = 10\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		15	23	nC
		$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		7.3	11	
Gate-Source Charge	Q_{gs}			2.2		
Gate-Drain Charge	Q_{gd}			2.1		
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.2	0.9	1.8	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 2\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		15	30	ns
Rise Time	t_r			11	22	
Turn-Off Delay Time	$t_{d(off)}$			16	30	
Fall Time	t_f			8	16	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 2\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		10	20	
Rise Time	t_r			8	16	
Turn-Off Delay Time	$t_{d(off)}$			16	30	
Fall Time	t_f			7	14	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			12	A
Pulse Diode Forward Current	I_{SM}				36	
Body Diode Voltage	V_{SD}	$I_S = 3\text{ A}, V_{GS} = 0\text{ V}$		0.77	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 10\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		14	28	ns
Body Diode Reverse Recovery Charge	Q_{rr}			4.5	9	nC
Reverse Recovery Fall Time	t_a			5.5		ns
Reverse Recovery Rise Time	t_b			8.5		

Notes:

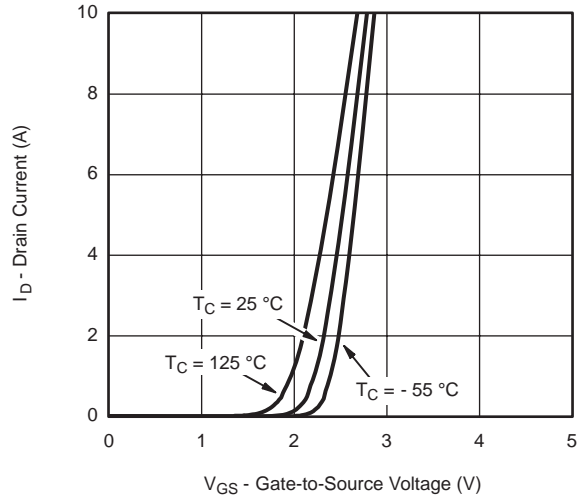
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

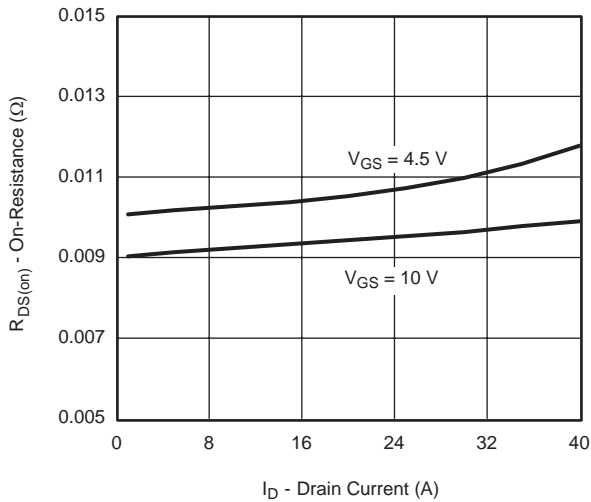
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



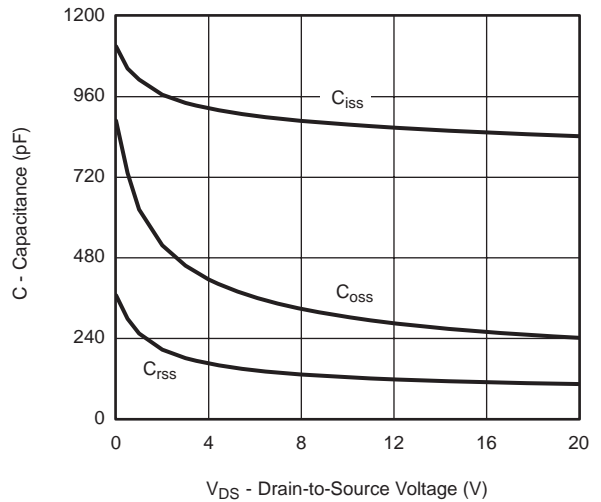
Output Characteristics



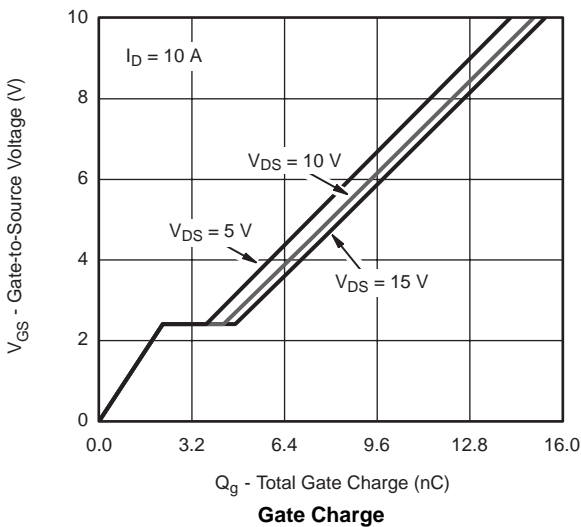
Transfer Characteristics



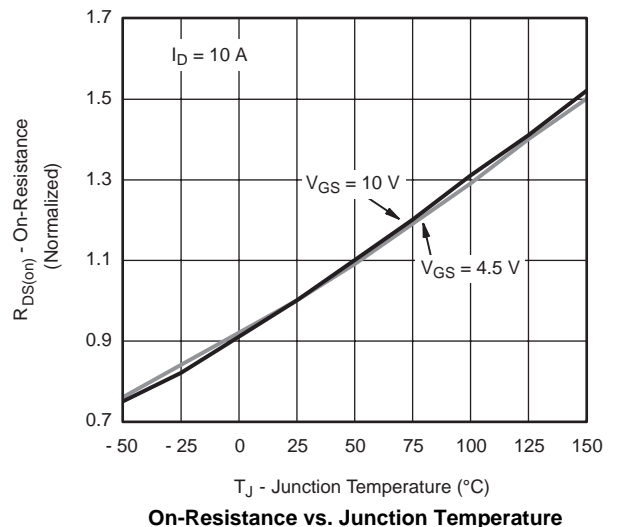
On-Resistance vs. Drain Current



Capacitance

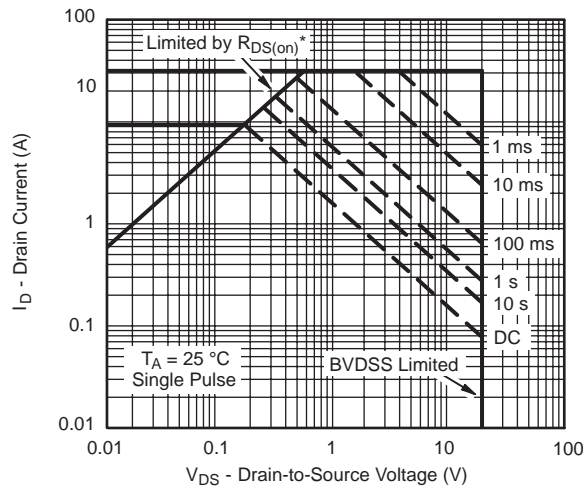
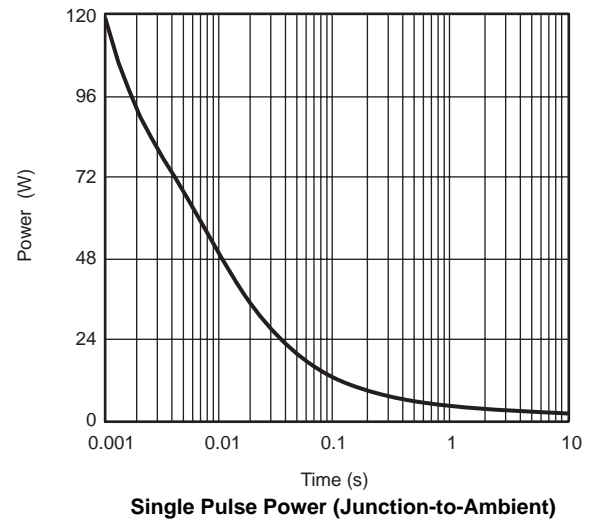
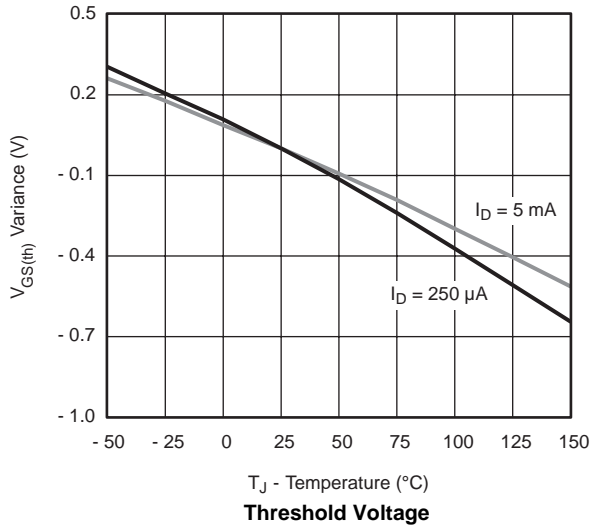
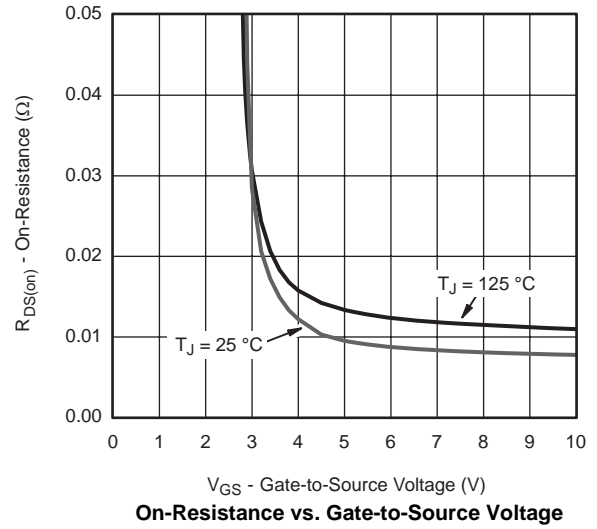
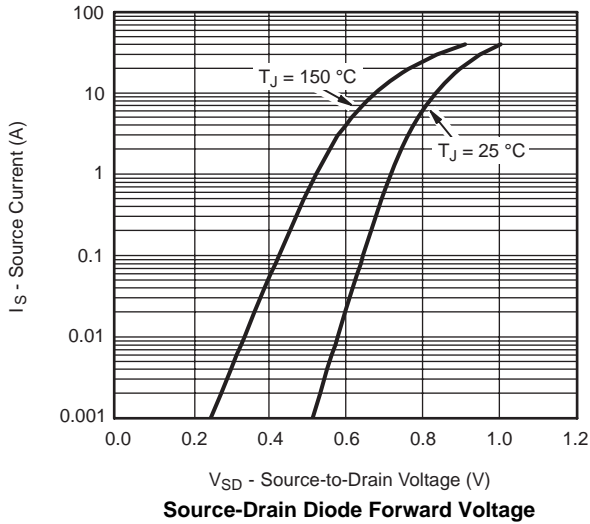


Gate Charge



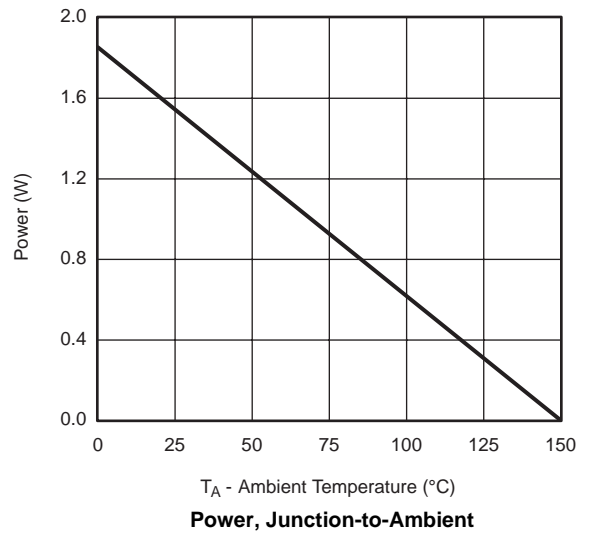
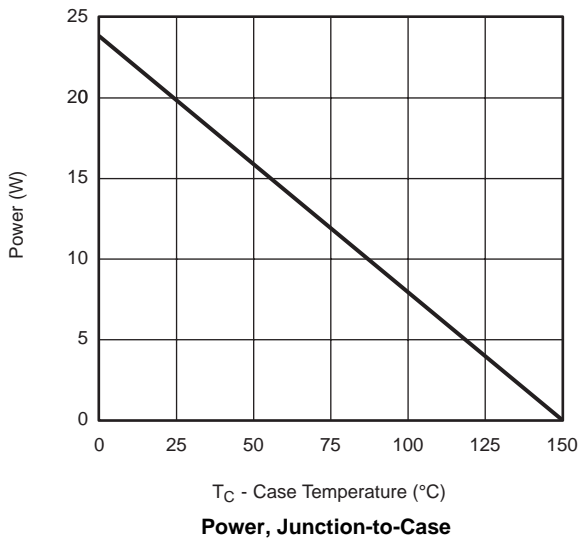
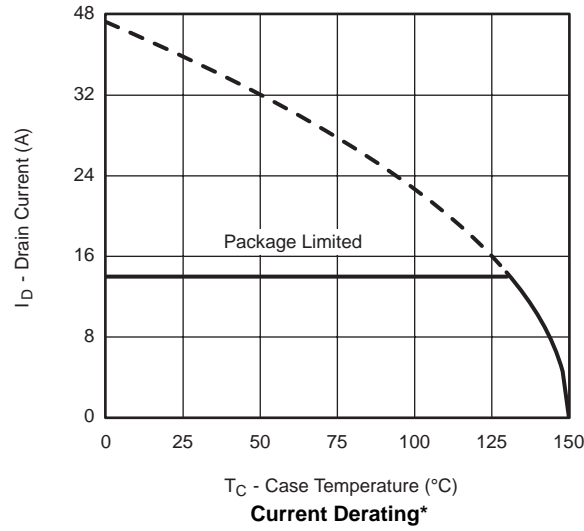
On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



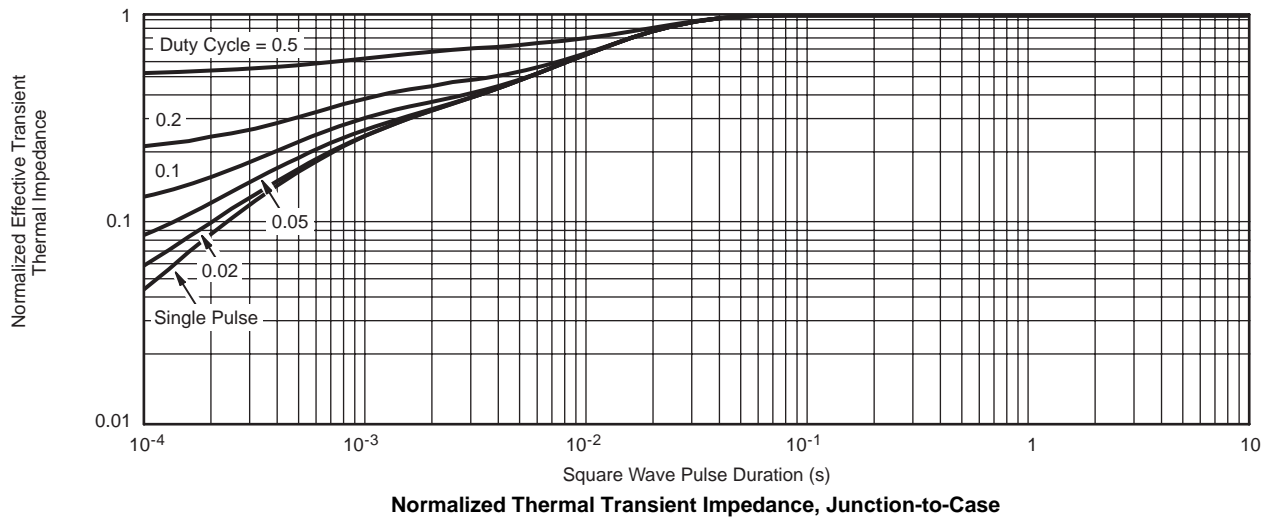
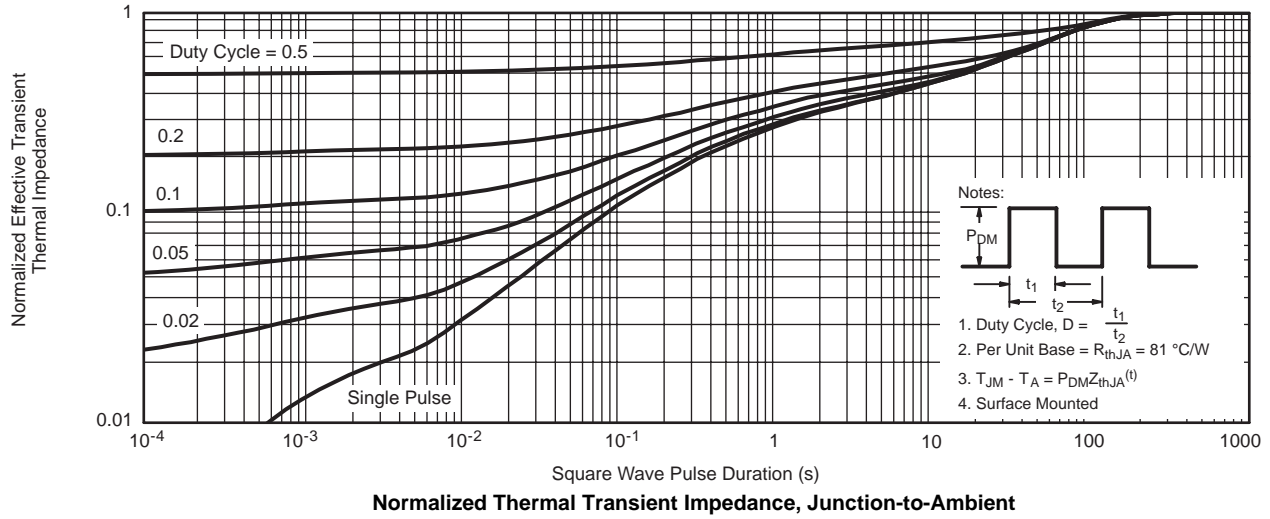
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

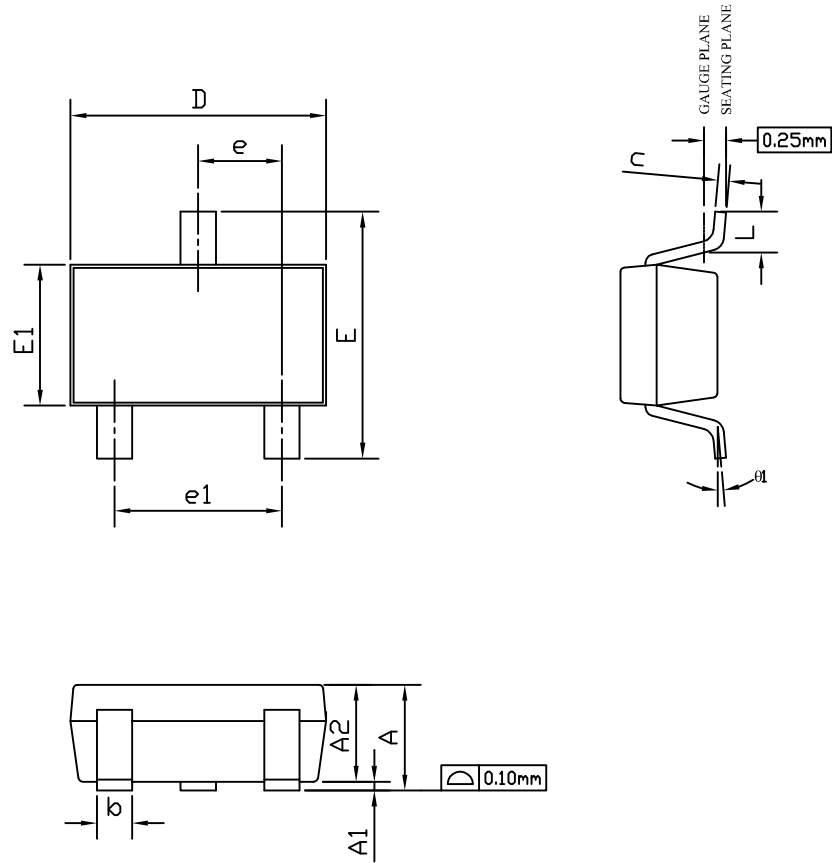


* The power dissipation P_D is based on $T_{J(max)} = 150\text{ °C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

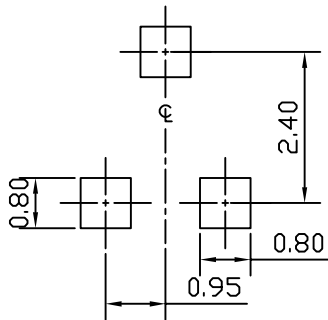
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



SOT-23-3L PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	—	1.25	0.033	—	0.049
A1	0.00	—	0.13	0.000	—	0.005
A2	0.70	1.00	1.15	0.028	0.039	0.045
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.08	0.13	0.20	0.003	0.005	0.008
D	2.80	2.90	3.10	0.110	0.114	0.122
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.40	1.60	1.80	0.055	0.063	0.071
e	0.95 BSC			0.037 BSC		
e1	1.90 BSC			0.075 BSC		
L	0.30	—	0.60	0.012	—	0.024
θ1	0°	5°	8°	0°	5°	8°

UNIT: mm

NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH OR GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 5 MILS EACH.
2. TOLERANCE ± 0.100 mm (4 mil) UNLESS OTHERWISE SPECIFIED.
3. DIMENSION L IS MEASURED IN GAUGE PLANE.
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. ALL DIMENSIONS ARE IN MILLIMETERS.

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