

SM2004NSD-VB Datasheet

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

PRODUCT SUMMARY

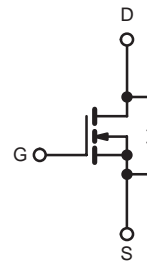
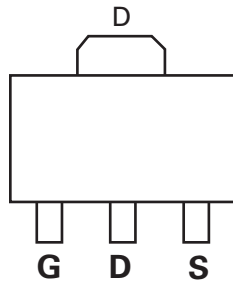
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
30	0.022 at $V_{GS} = 4.5$ V	6.8	10 nC
	0.030 at $V_{GS} = 2.5$ V	6.0	

FEATURES

- Halogen-free
- Trench Power MOSFET

APPLICATIONS

- Load Switches for Portable Devices


RoHS
 COMPLIANT


N-Channel MOSFET

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 ($T_J = 150^\circ\text{C}$)	I_D	6.8^a	A
		6^a	
		$6.8^{a,b,c}$	
		$6^{a,b,c}$	
Pulsed Drain Current	I_{DM}	30	
Continuous Source-Drain Diode Current	I_S	5.2	
		$2.1^{b,c}$	
Maximum Power Dissipation	P_D	6.3	W
		4	
		$2.5^{b,c}$	
		$1.6^{b,c}$	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature) ^{e, f}		260	

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{a, c, d}	R_{thJA}	40	50	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Drain)	R_{thJF}	15	20	

Notes:

 a. Package limited, $T_C = 25^\circ\text{C}$.

b. Surface Mounted on 1" x 1" FR4 board.

 c. $t = 10$ s.

 d. Maximum under Steady State conditions is 95°C/W .

e. See Reliability Manual for profile. The ChipFET is a leadless package. 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.

f. Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.

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	ΔV _{DS} /T _J	I _D = 250 μA		25		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 4.0		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	0.6		1.5	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} = 30 V, V _{GS} = 0 V			1	μA
		V _{DS} = 30 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 4.5 V	30			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 6.3 A		0.022		Ω
		V _{GS} = 2.5 V, I _D = 4.5 A		0.030		
Forward Transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 6.3 A		45		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz		1200		pF
Output Capacitance	C _{oss}			220		
Reverse Transfer Capacitance	C _{rss}			100		
Total Gate Charge	Q _g	V _{DS} = 10 V, V _{GS} = 10 V, I _D = 6.3 A		22	33	nC
		V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 6.3 A		10	15	
Gate-Source Charge	Q _{gs}			2.5		
Gate-Drain Charge	Q _{gd}			1.7		
Gate Resistance	R _g	f = 1 MHz		2.4		Ω
Turn-on Delay Time	t _{d(on)}	V _{DD} = 10 V, R _L = 1.5 Ω I _D ≅ 6.7 A, V _{GEN} = 4.5 V, R _g = 1 Ω		15	25	ns
Rise Time	t _r			10	15	
Turn-Off Delay Time	t _{d(off)}			35	55	
Fall Time	t _f			12	20	
Turn-on Delay Time	t _{d(on)}	V _{DD} = 10 V, R _L = 1.5 Ω I _D ≅ 6.7 A, V _{GEN} = 10 V, R _g = 1 Ω		10	15	
Rise Time	t _r			12	20	
Turn-Off Delay Time	t _{d(off)}			25	40	
Fall Time	t _f			10	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			5.2	A
Pulse Diode Forward Current	I _{SM}				30	
Body Diode Voltage	V _{SD}	I _S = 6.7 A, V _{GS} = 0 V		0.8	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 6.7 A, dI/dt = 100 A/μs, T _J = 25 °C		20	40	ns
Body Diode Reverse Recovery Charge	Q _{rr}			10	20	nC
Reverse Recovery Fall Time	t _a			10		ns
Reverse Recovery Rise Time	t _b			10		

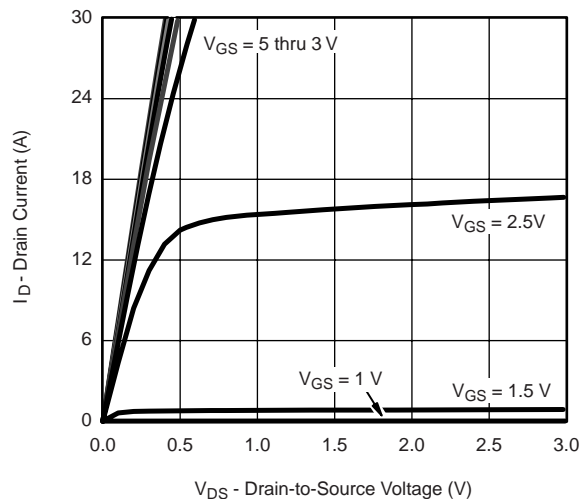
Notes:

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

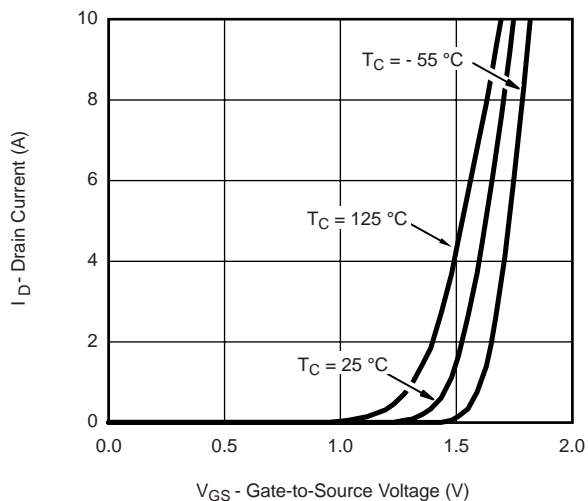
b. Guaranteed by design, not subject to production testing.

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.

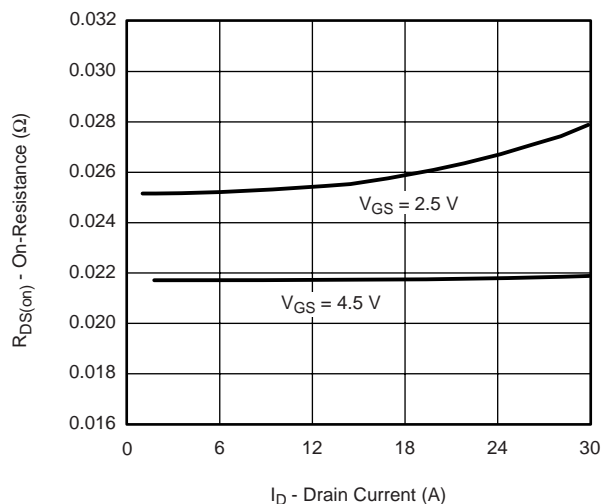
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



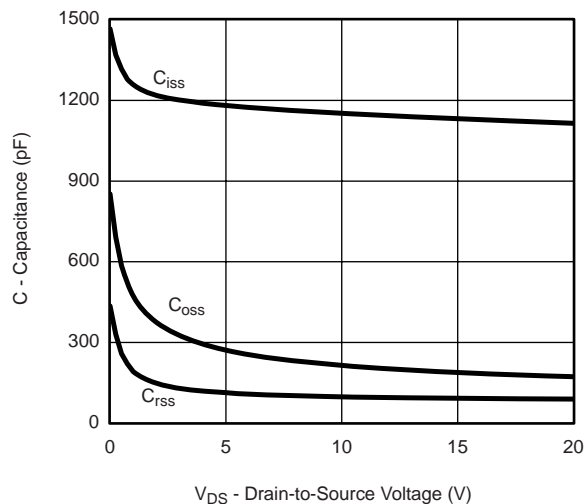
Output Characteristics



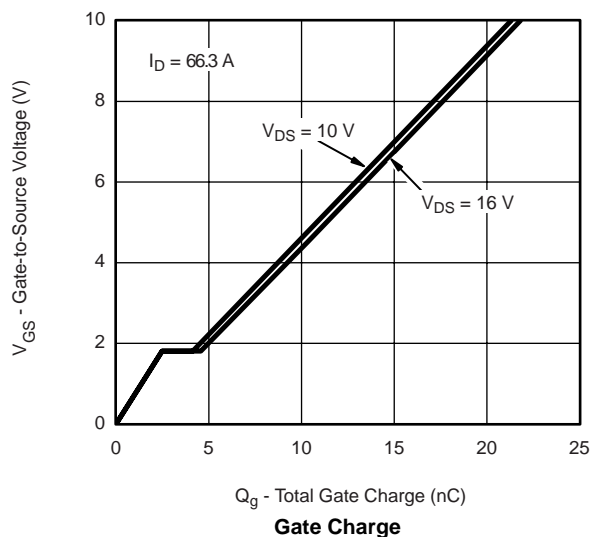
Transfer Characteristics



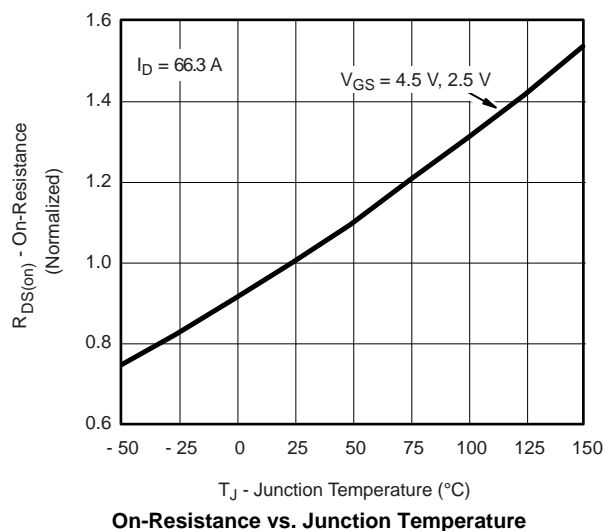
On-Resistance vs. Drain Current



Capacitance

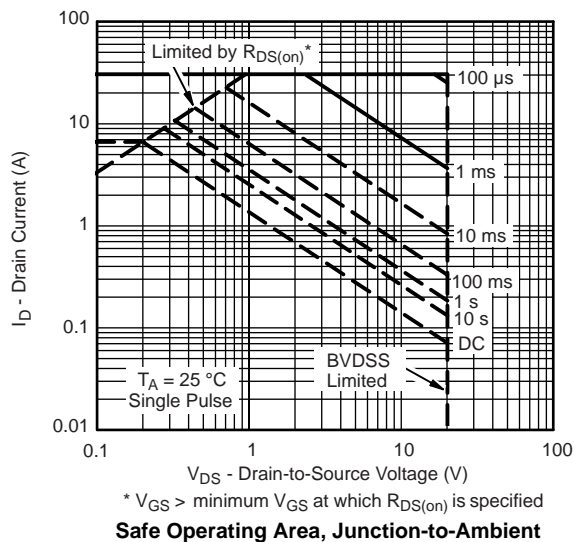
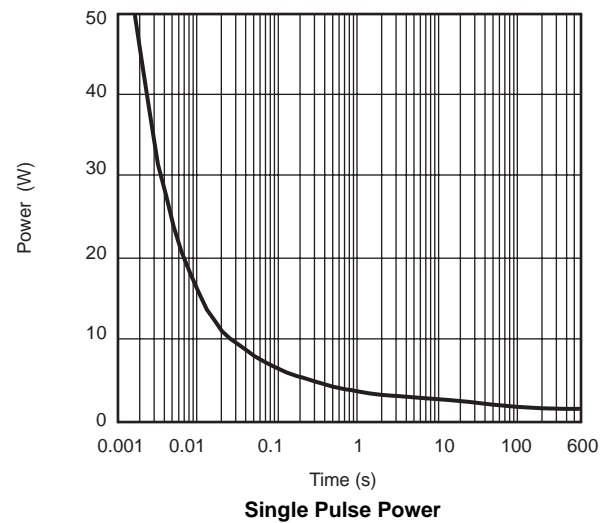
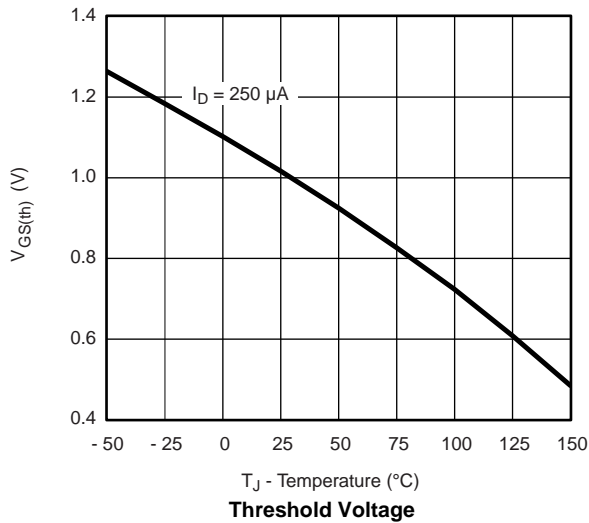
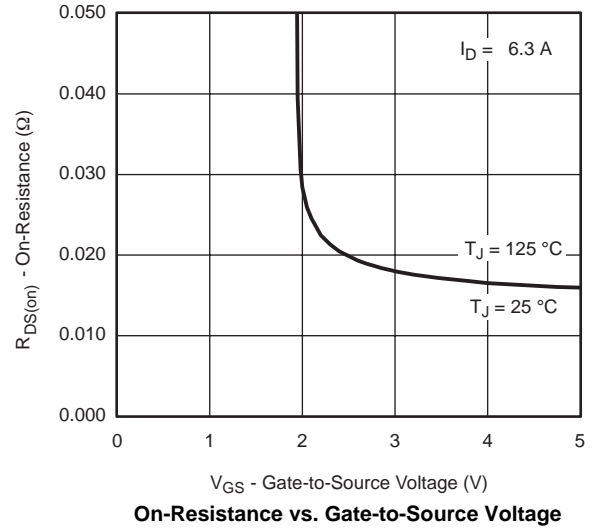
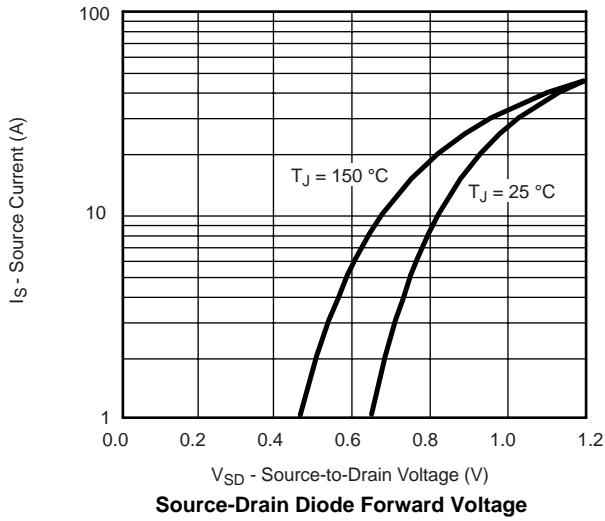


Gate Charge

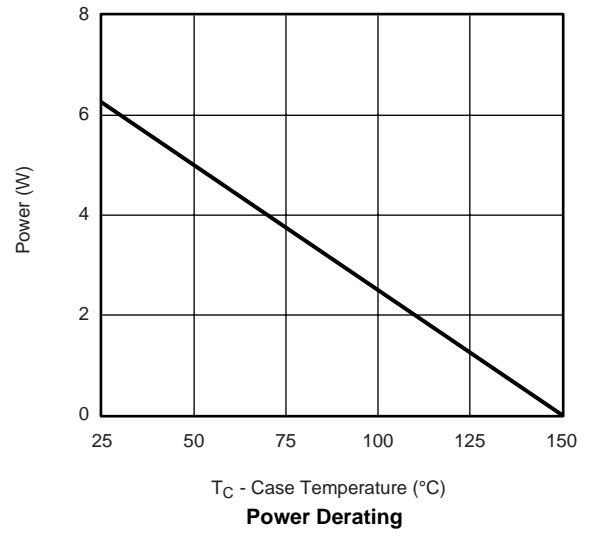
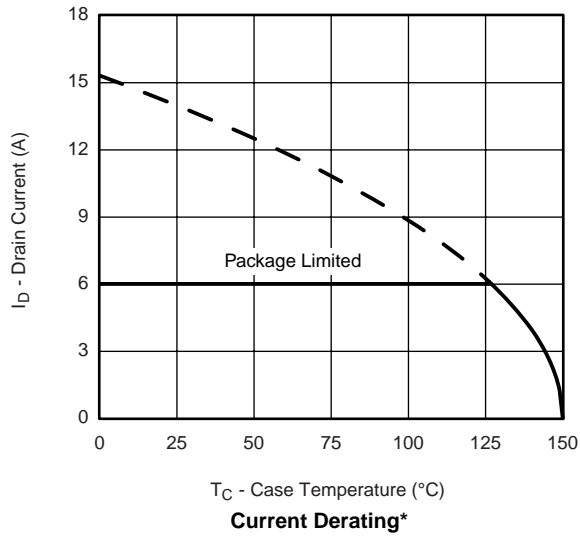


On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

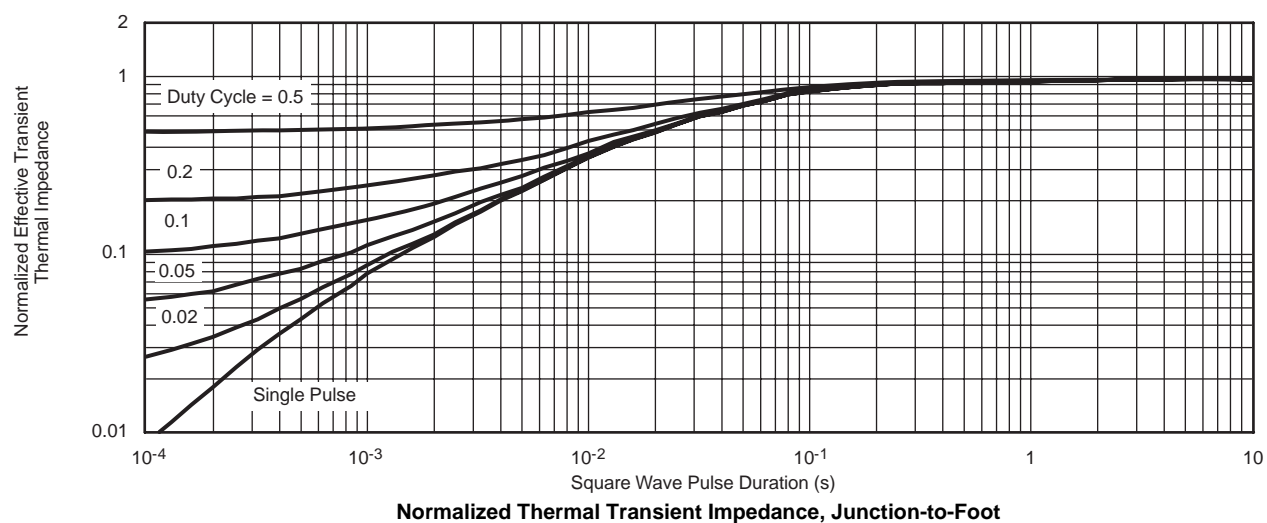
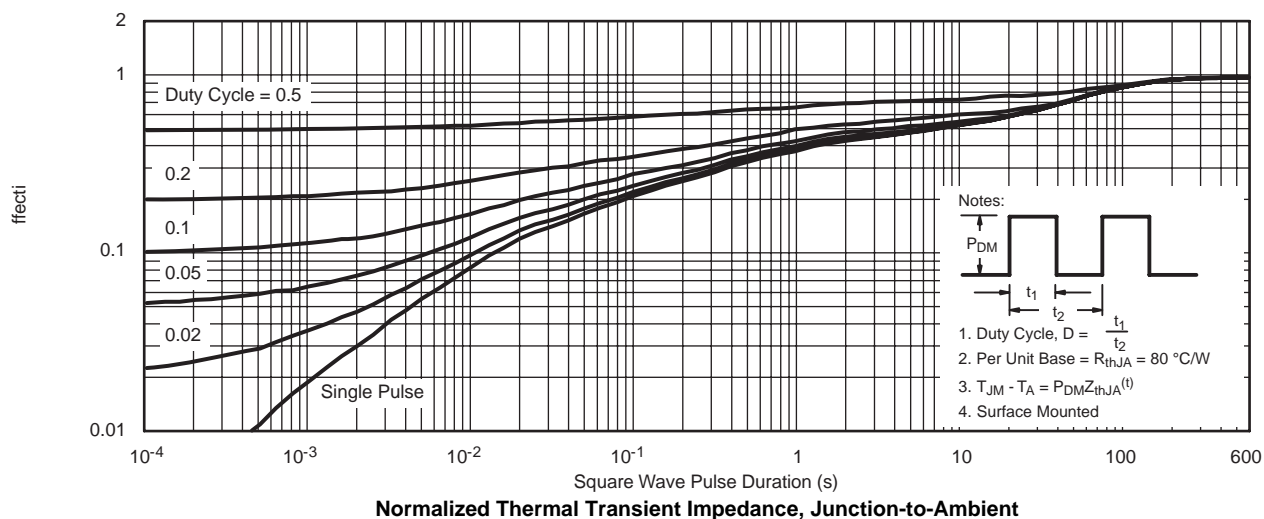


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

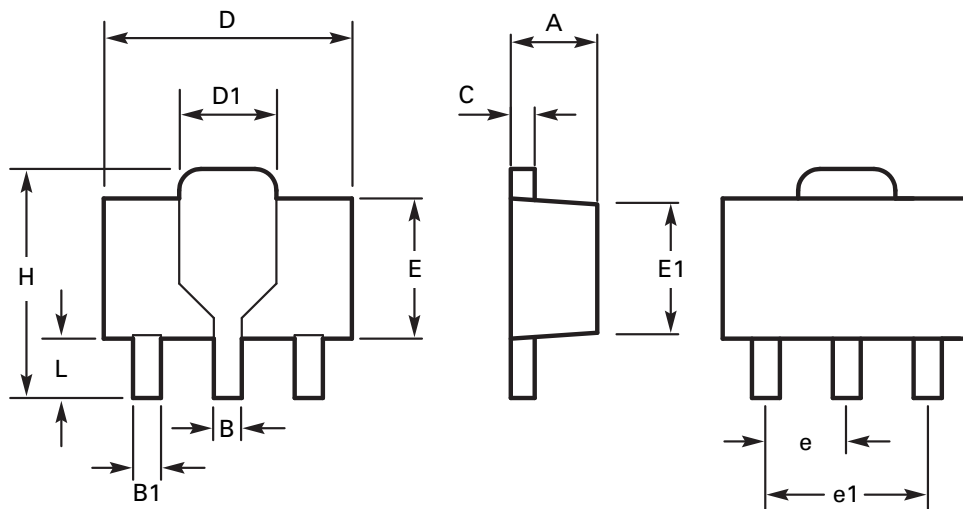


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Package outline - SOT89



DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	1.40	1.60	0.550	0.630	E	2.29	2.60	0.090	0.102
B	0.44	0.56	0.017	0.022	E1	2.13	2.29	0.084	0.090
B1	0.36	0.48	0.014	0.019	e	1.50 BSC		0.059 BSC	
C	0.35	0.44	0.014	0.017	e1	3.00 BSC		0.118 BSC	
D	4.40	4.60	0.173	0.181	H	3.94	4.25	0.155	0.167
D1	1.62	1.83	0.064	0.072	L	0.89	1.20	0.035	0.047

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

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