

VBA2305 Datasheet

P-Channel 30 V (D-S) MOSFET

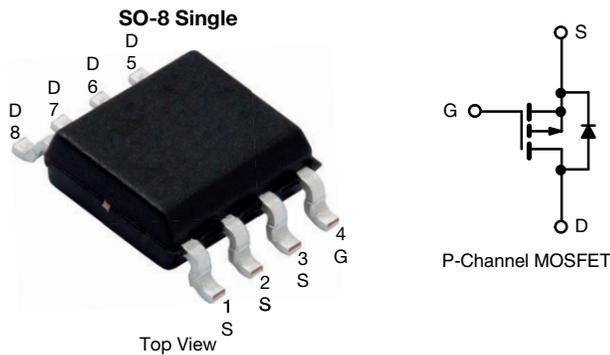
PRODUCT SUMMARY	
V_{DS} (V)	-30
$R_{DS(on)}$ (Ω) at $V_{GS} = 10$ V	0.0050
$R_{DS(on)}$ (Ω) at $V_{GS} = 4.5$ V	0.0080
Q_g typ. (nC)	27
I_D (A)	18
Configuration	Single

FEATURES

- TrenchFET® Gen IV p-channel power MOSFET
- Enables higher power density
- 100 % R_g and UIS tested



RoHS
COMPLIANT
HALOGEN
FREE



APPLICATIONS

- Battery management in mobile devices
- Adapter and charger switch
- Battery switch
- Load switch

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	-30	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current ($T_J = 150$ °C)	$T_C = 25$ °C	I_D	-18	A
	$T_C = 70$ °C		-13	
	$T_A = 25$ °C		-11	
	$T_A = 70$ °C		-8	
Pulsed drain current ($t = 100$ μ s)		I_{DM}	-145	A
Continuous source-drain diode current	$T_C = 25$ °C	I_S	-5	
	$T_A = 25$ °C		-2.8 ^{b, c}	
Single pulse avalanche current		I_{AS}	-25	mJ
Single pulse avalanche energy	$L = 0.1$ mH	E_{AS}	31.2	
Maximum power dissipation	$T_C = 25$ °C	I_p	5.6	W
	$T_C = 70$ °C		3.6	
	$T_A = 25$ °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
Soldering recommendations (peak temperature) ^c			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^b	$t \leq 10$ s	R_{thJA}	34	40	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJF}	18	22	

Notes

- Package limited
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s
- The SO-8 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
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- Maximum under steady state conditions is 85 °C/W
- $T_C = 25$ °C

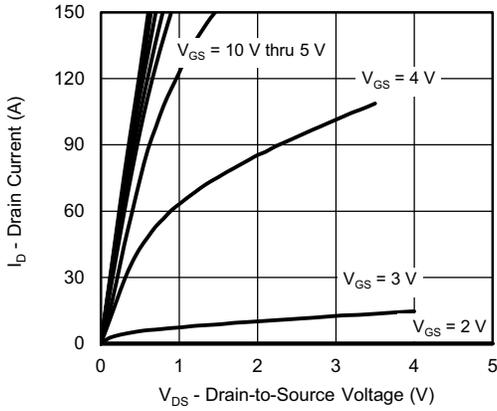
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-30	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = -10\text{ mA}$	-	-17	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = -250\text{ }\mu\text{A}$	-	5.5	-	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	-1	-	-2.2	V
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = +16 / -20\text{ V}$	-	-	100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$	-	-	-1	μA
		$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ }^\circ\text{C}$	-	-	-15	
On-state drain current ^a	$I_{D(on)}$	$V_{DS} \geq -10\text{ V}, V_{GS} = -10\text{ V}$	-40	-	-	A
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -15\text{ A}$	-	0.0050	-	Ω
		$V_{GS} = -4.5\text{ V}, I_D = -10\text{ A}$	-	0.0080	-	
Forward transconductance ^a	g_{fs}	$V_{DS} = -15\text{ V}, I_D = -15\text{ A}$	-	81	-	S
Dynamic ^b						
Input capacitance	C_{ISS}	$V_{DS} = -15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	3490	-	pF
Output capacitance	C_{OSS}		-	1420	-	
Reverse transfer capacitance	C_{RSS}		-	70	-	
Total gate charge	Q_g	$V_{DS} = -15\text{ V}, V_{GS} = -10\text{ V}, I_D = -10\text{ A}$	-	56	84	nC
		$V_{DS} = -15\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -10\text{ A}$	-	27	41	
Gate-source charge	Q_{gs}		-	9.4	-	
Gate-drain charge	Q_{gd}		-	8.2	-	
Gate resistance	R_g	$f = 1\text{ MHz}$	1.5	3.5	6	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 1.5\text{ }\Omega, I_D \cong -10\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$	-	15	30	ns
Rise time	t_r		-	6	12	
Turn-off delay time	$t_{d(off)}$		-	39	78	
Fall time	t_f		-	10	20	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 1.5\text{ }\Omega, I_D \cong -10\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$	-	34	68	
Rise time	t_r		-	86	172	
Turn-off delay time	$t_{d(off)}$		-	31	62	
Fall time	t_f		-	22	44	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	-5	A
Pulse diode forward current	I_{SM}		-	-	-150	
Body diode voltage	V_{SD}	$I_S = -5\text{ A}, V_{GS} = 0\text{ V}$	-	-0.73	-1.1	V
Body diode reverse recovery time	t_{rr}	$I_F = -10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	44	88	ns
Body diode reverse recovery charge	Q_{rr}		-	41	82	nC
Reverse recovery fall time	t_a		-	19	-	ns
Reverse recovery rise time	t_b		-	25	-	

Notes

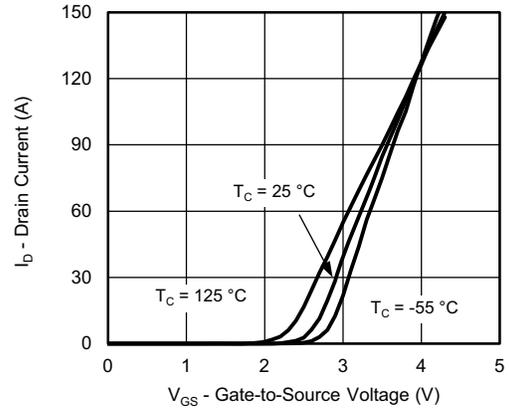
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
 b. Guaranteed by design, not subject to production testing

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.

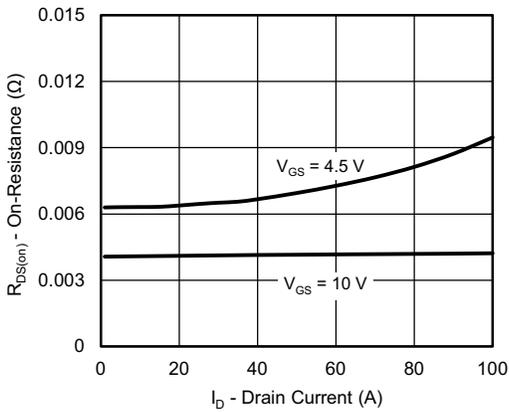
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



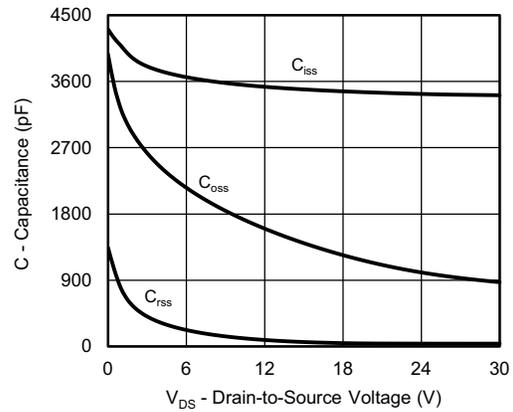
Output Characteristics



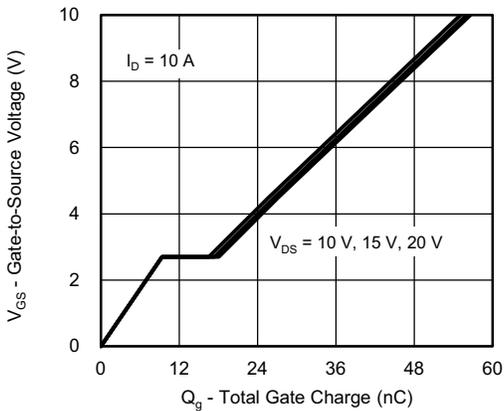
Transfer Characteristics



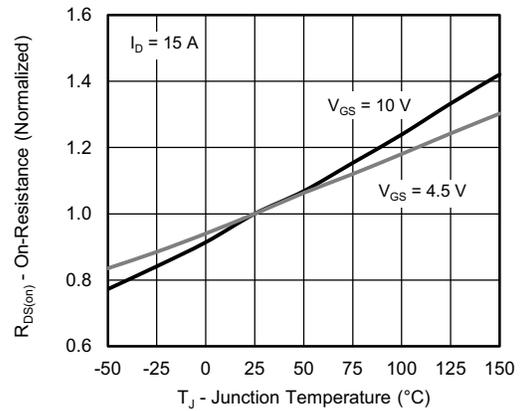
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

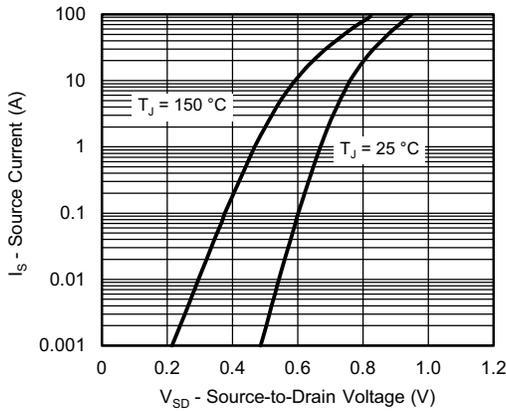


Gate Charge

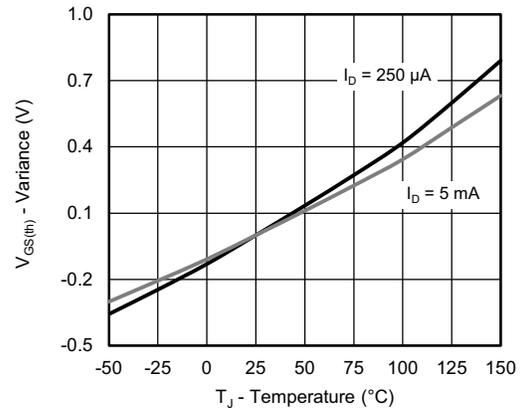


On-Resistance vs. Junction Temperature

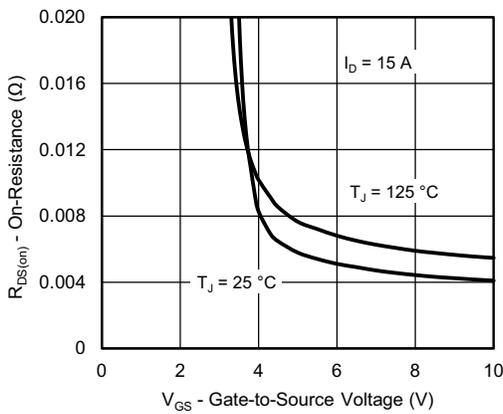
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



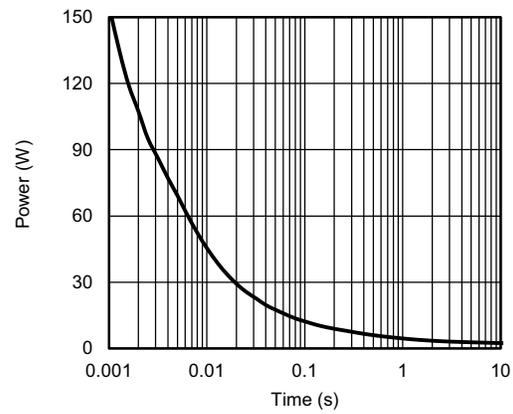
Source-Drain Diode Forward Voltage



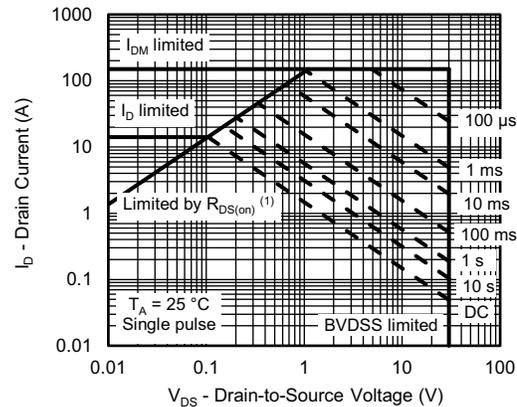
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage



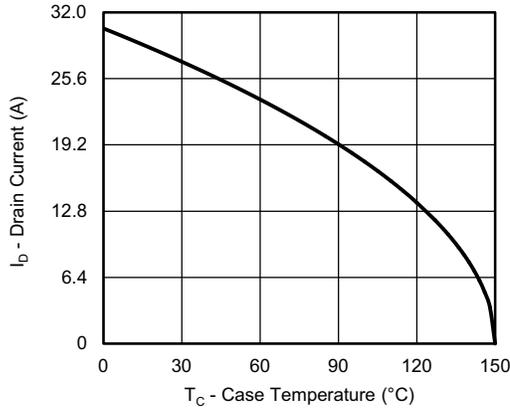
Single Pulse Power, Junction-to-Ambient



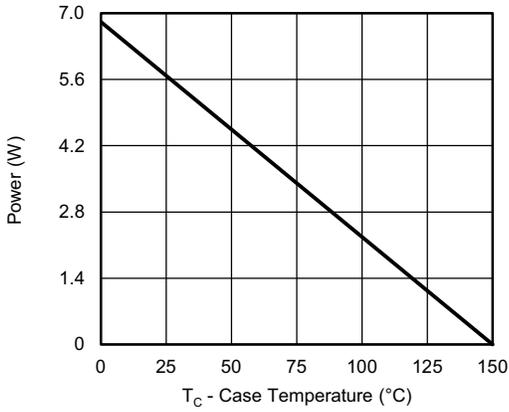
Safe Operating Area, Junction-to-Ambient

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

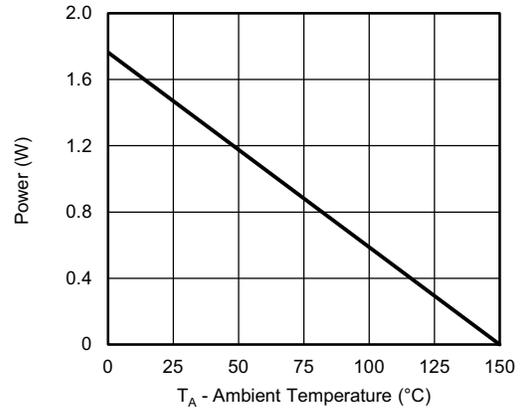
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Case

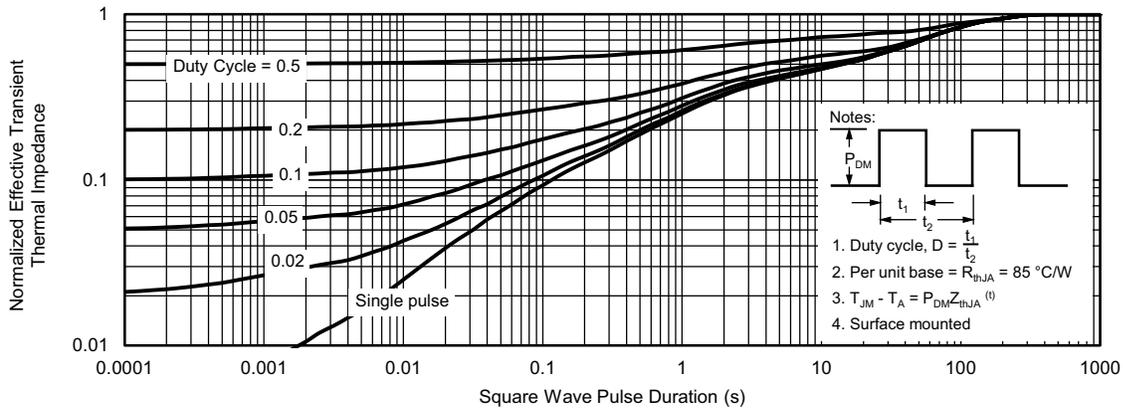


Power, Junction-to-Ambient

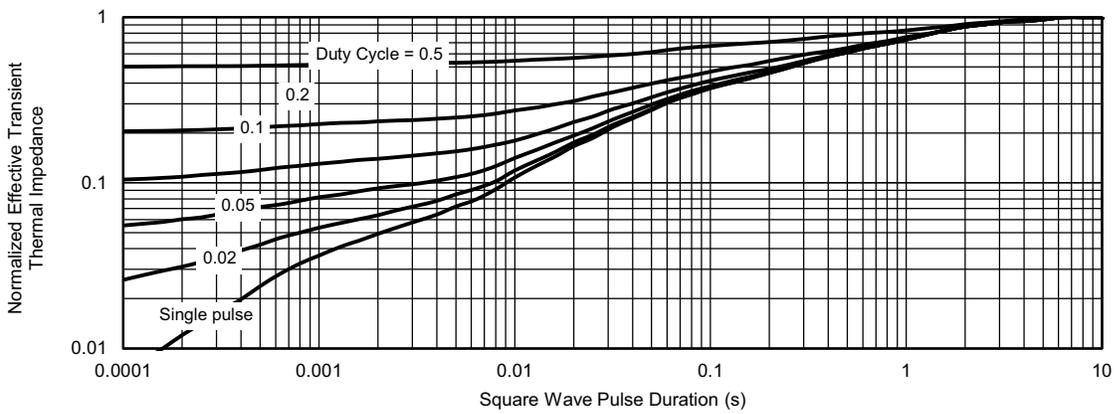
Note

- a. 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)

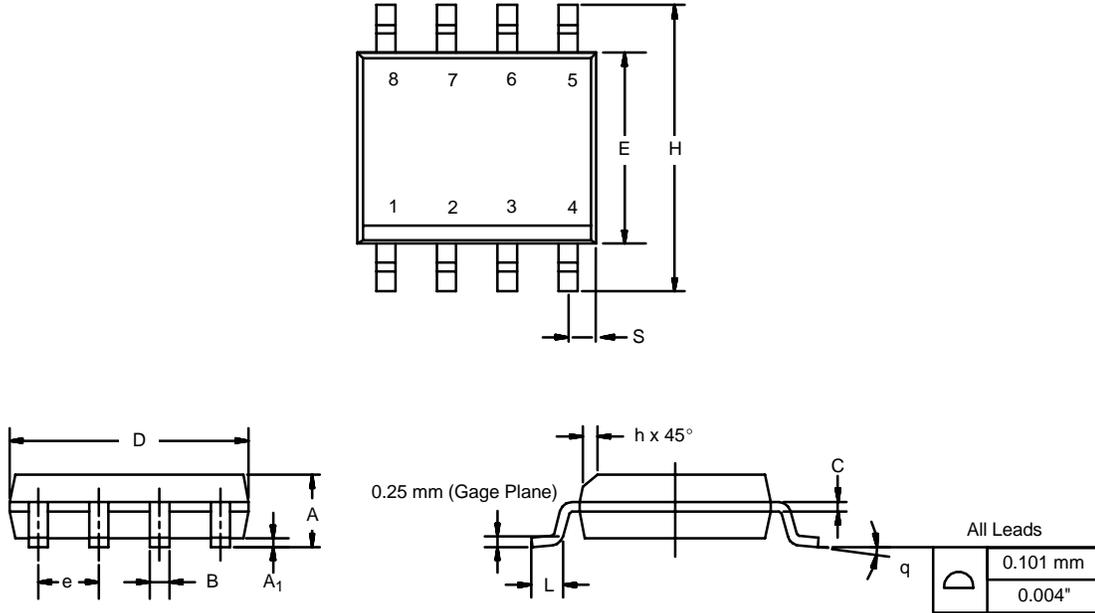


Normalized Thermal Transient Impedance, Junction-to-Ambient



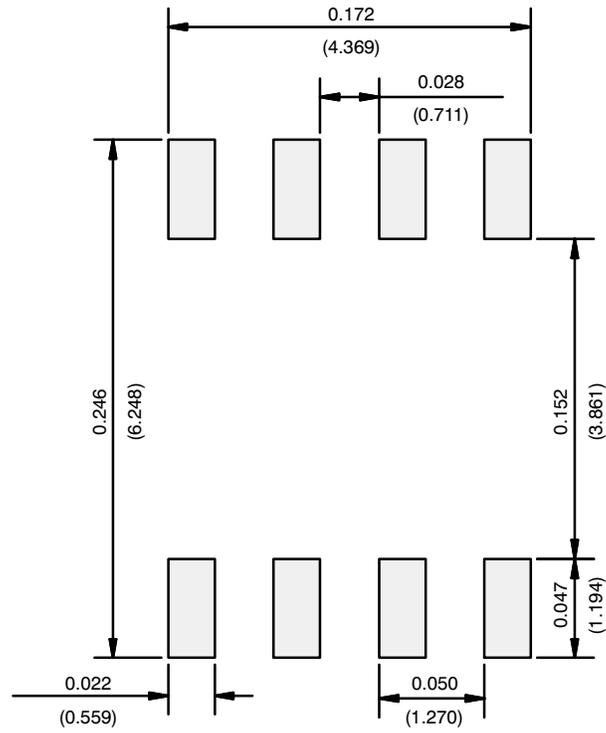
Normalized Thermal Transient Impedance, Junction-to-Case

SOIC (NARROW): 8-LEAD
JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A ₁	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026
ECN: C-06527-Rev. I, 11-Sep-06 DWG: 5498				

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

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