

VBL2403 Datasheet

P-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
- 40	0.003 at $V_{GS} = -10$ V	- 150	205 nC

FEATURES

- TrenchFET® Power MOSFET

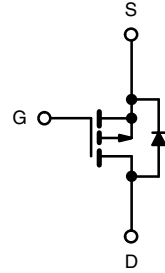


RoHS
COMPLIANT

TO263



Top View



P-Channel MOSFET

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

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	- 40	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current ($T_J = 175^\circ\text{C}$)	$T_C = 25^\circ\text{C}$	I_D	- 150	A
	$T_C = 70^\circ\text{C}$		- 120 ^a	
	$T_A = 25^\circ\text{C}$		39 ^{b, c}	
	$T_A = 70^\circ\text{C}$		33 ^{b, c}	
Pulsed Drain Current		I_{DM}	450	
Continuous Source-Drain Diode Current	$T_C = 25^\circ\text{C}$	I_S	110	
	$T_A = 25^\circ\text{C}$		10 ^{b, c}	
Avalanche Current	L = 0.1 mH	I_{AS}	75	mJ
Single-Pulse Avalanche Energy		E_{AS}	281	
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	425	W
	$T_C = 70^\circ\text{C}$		282	
	$T_A = 25^\circ\text{C}$		15 ^{b, c}	
	$T_A = 70^\circ\text{C}$		10.5 ^{b, c}	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature) ^{d, e}			260	

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, d}	$t \leq 10$ s	R_{thJA}	8	10	$^\circ\text{C/W}$
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	0.33	0.4	

Notes:

a. Package limited.

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

c. $t = 10$ s.

d. Maximum under Steady State conditions is 40°C/W .

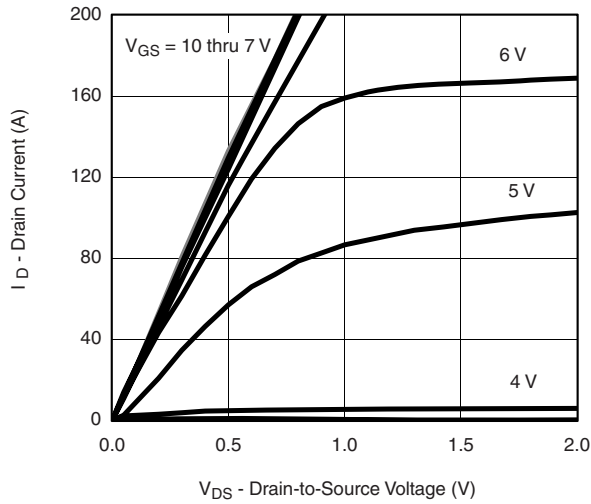
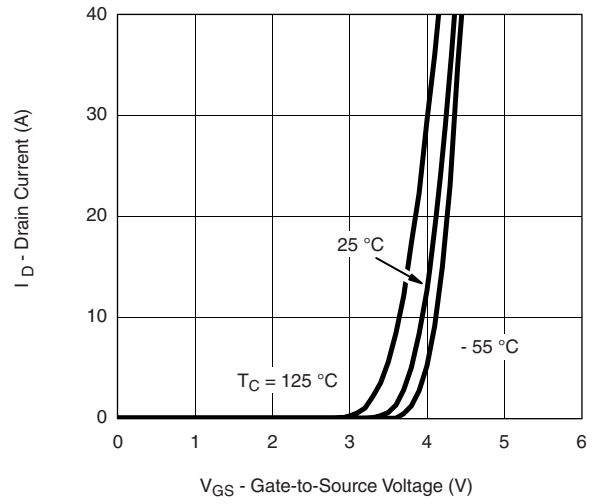
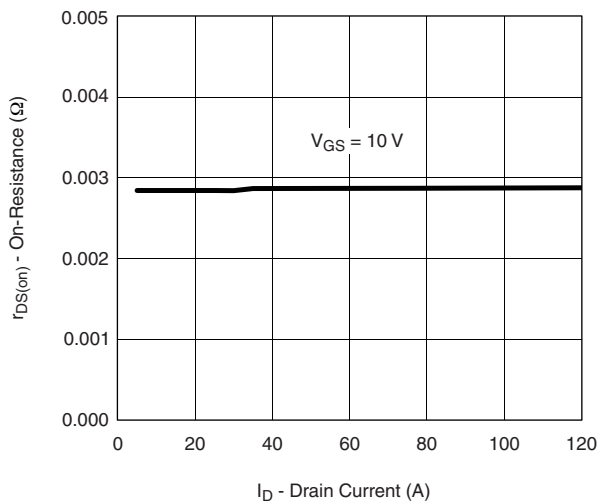
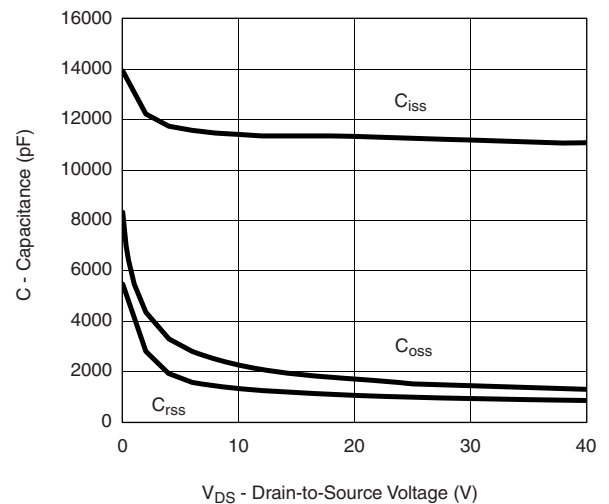
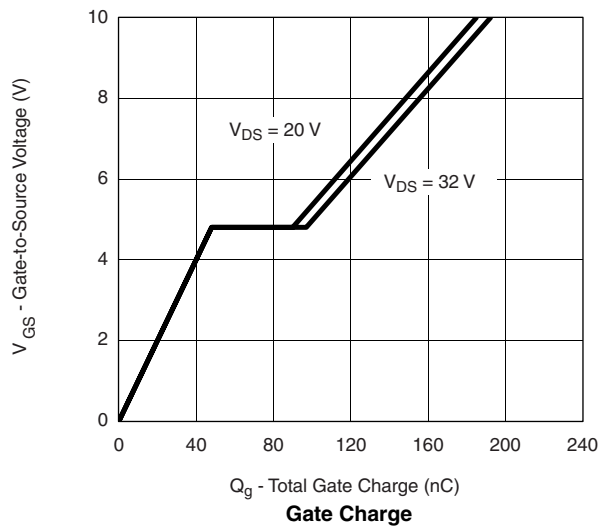
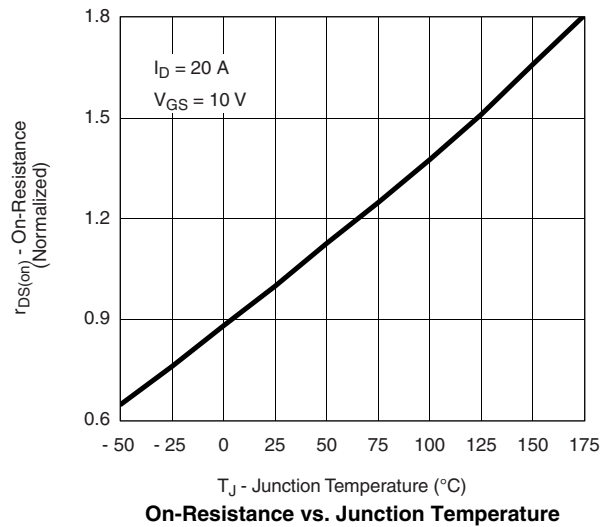
SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	- 40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 40		mV/ $^{\circ}\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	- 2	- 3	- 4	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}	$V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$			- 10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = -10\text{ V}$	- 120			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -20\text{ A}$		0.003		Ω
Forward Transconductance ^a	g_{fs}	$V_{DS} = -15\text{ V}, I_D = -20\text{ A}$		75		S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		8900		pF
Output Capacitance	C_{oss}			1610		
Reverse Transfer Capacitance	C_{rss}			1100		
Total Gate Charge	Q_g	$V_{DS} = -20\text{ V}, V_{GS} = -10\text{ V}, I_D = -110\text{ A}$		205	315	nC
Gate-Source Charge	Q_{gs}			58		
Gate-Drain Charge	Q_{gd}			52		
Gate Resistance	R_g	$f = 1\text{ MHz}$		4.0		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -20\text{ V}, R_L = 0.18\text{ }\Omega$ $I_D \cong -110\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		25	40	ns
Rise Time	t_r			20	50	
Turn-Off Delay Time	$t_{d(off)}$			110	160	
Fall Time	t_f			35	55	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$			- 150	A
Pulse Diode Forward Current ^a	I_{SM}				- 450	
Body Diode Voltage	V_{SD}	$I_S = -20\text{ A}$		- 0.8	- 1.5	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^{\circ}\text{C}$		40	60	ns
Body Diode Reverse Recovery Charge	Q_{rr}			130	200	nC
Reverse Recovery Fall Time	t_a			37		ns
Reverse Recovery Rise Time	t_b			33		

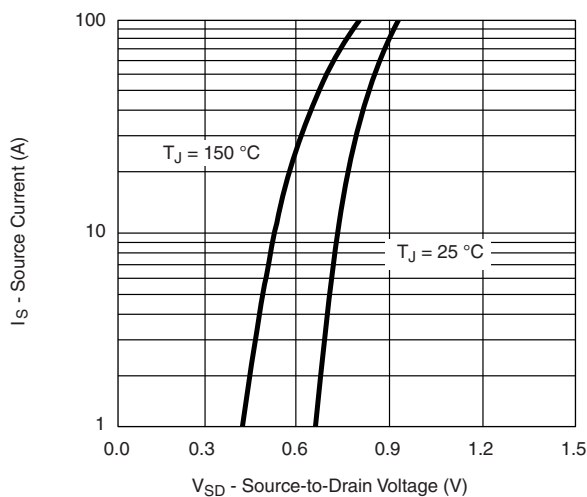
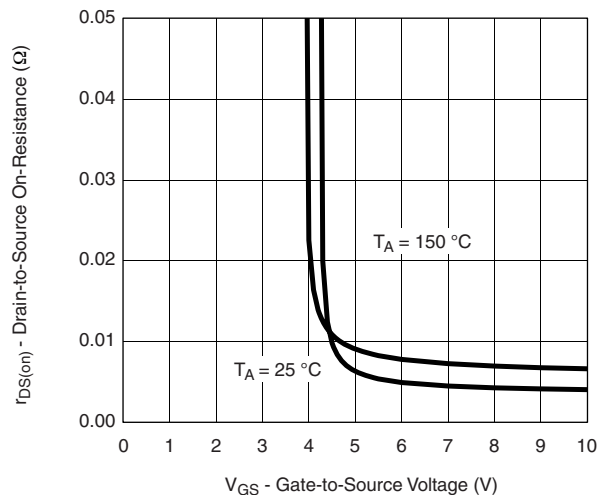
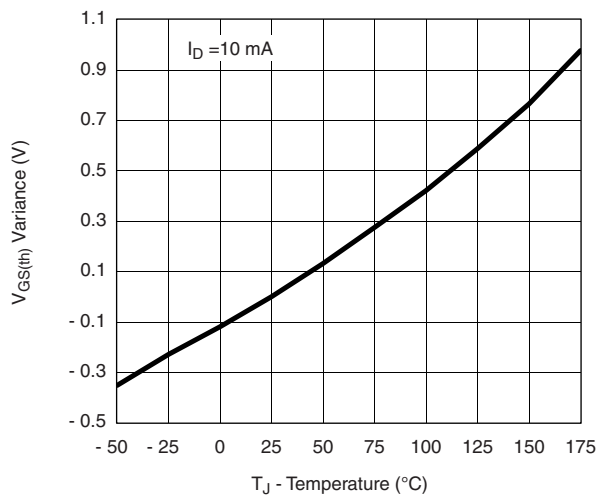
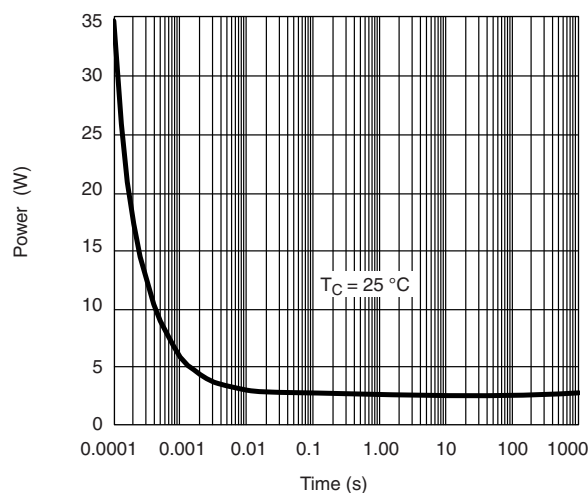
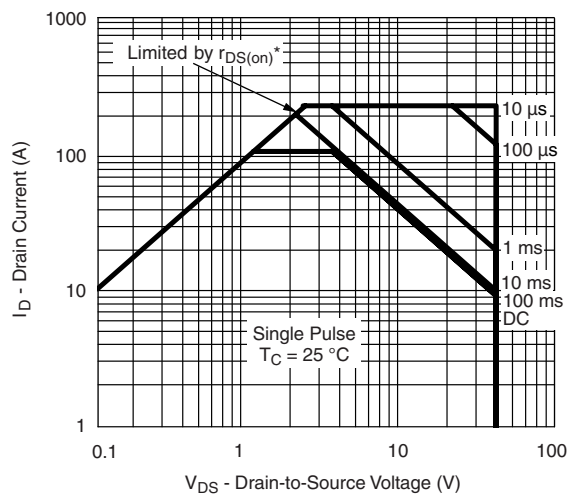
Notes:

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.

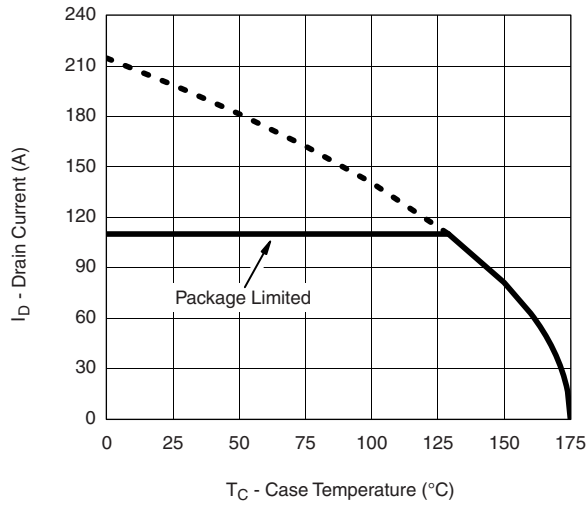
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

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


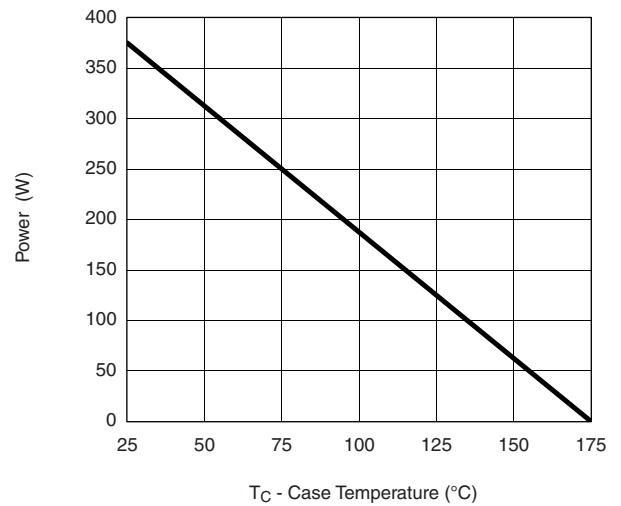
* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

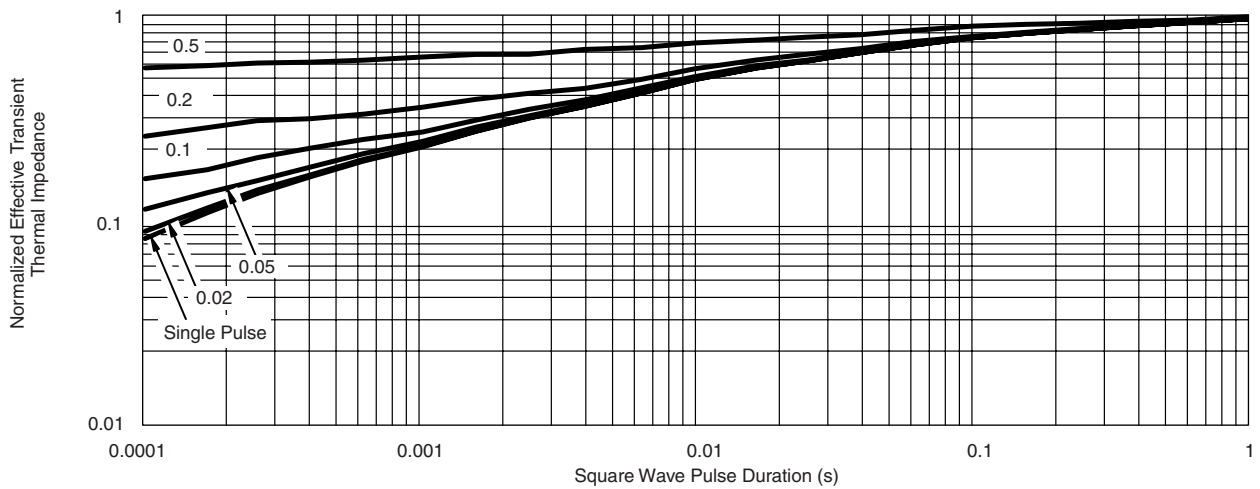
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Max. Avalanche and Drain Current vs. Case Temperature*

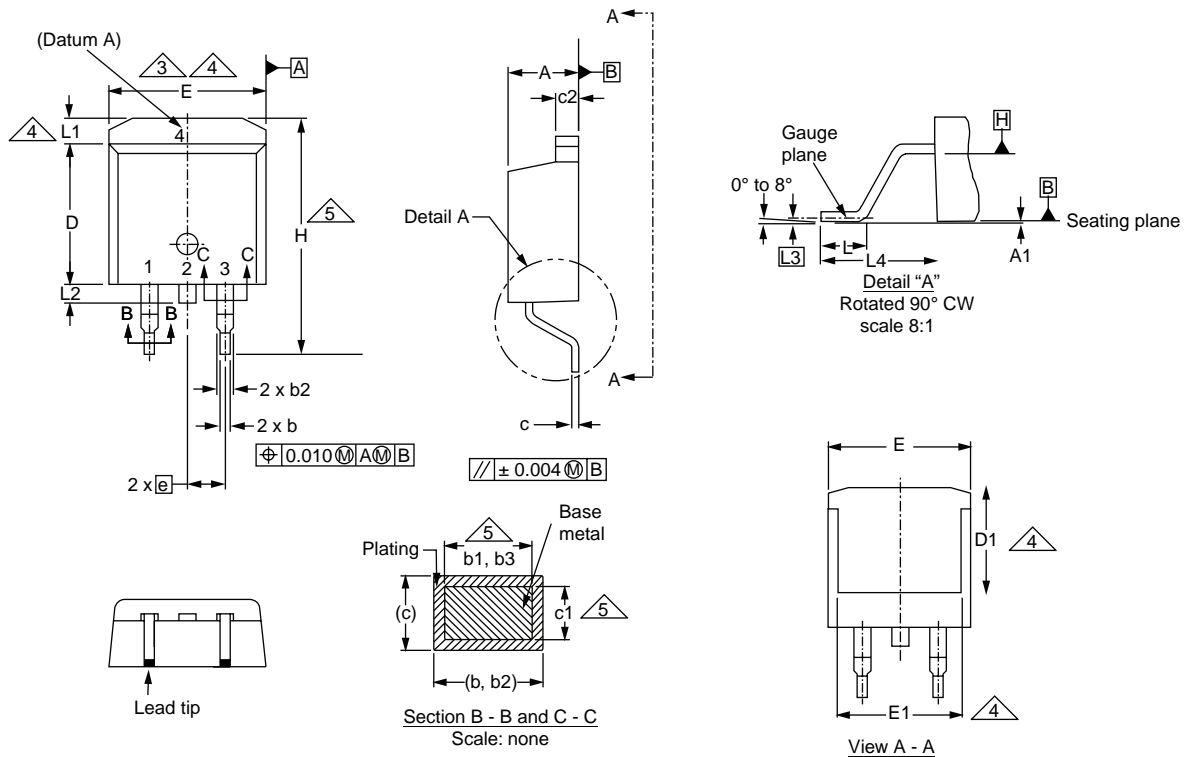


Power Derating, Junction-to-Case



Normalized Thermal Transient Impedance, Junction-to-Case

* The power dissipation P_D is based on $T_{J(max)} = 175$ °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.

TO-263AB (HIGH VOLTAGE)

	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

ECN: S-82110-Rev. A, 15-Sep-08
 DWG: 5970

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
5. Dimension b1 and c1 apply to base metal only.
6. Datum A and B to be determined at datum plane H.
7. Outline conforms to JEDEC outline to TO-263AB.

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