

### Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	$I_D@25^{\circ}C$
650V	30mΩ@18V	92A

### Feature

- High Blocking Voltage With Low On-Resistance
- High Speed Switching With Low Capacitance
- Easy to Parallel and Simple to Drive

### Application

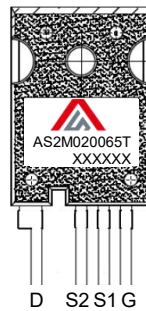
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Renewable Energy
- EV Battery Chargers

### Package



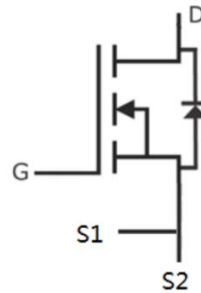
TO-247-4

### Marking



D S2 S1 G

### Circuit diagram



### Absolute maximum ratings ( $T_c=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GSmax}$	-8/+22	V
Recommend Gate-Source Voltage	$V_{GSop}$	-4/+18	V
Continuous Drain Current ( $T_c=25^{\circ}C$ )	$I_D$	92	A
Continuous Drain Current ( $T_c=100^{\circ}C$ )	$I_D$	64	A
Pulsed Drain Current	$I_{DM}$	257	A
Power Dissipation ( $T_c=25^{\circ}C$ )	$P_D$	312	W
Thermal Resistance, Junction-to-Case(Typ.)	$R_{\theta JC}$	0.48	$^{\circ}C/W$
Junction Temperature	$T_J$	175	$^{\circ}C$
Storage Temperature	$T_{STG}$	-55~ +175	$^{\circ}C$

### Electrical characteristics (T<sub>c</sub>=25°C, unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 100μA	650			V
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V		1	100	μA
Gate-Source leakage current	I <sub>GSS+</sub>	V <sub>GS</sub> = 22V, V <sub>DS</sub> = 0V		10	250	nA
Gate-Source leakage current	I <sub>GSS-</sub>	V <sub>GS</sub> = -8V, V <sub>DS</sub> = 0V		10	250	nA
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 15mA	1.9	2.6	4	V
		V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 15mA, T <sub>j</sub> = 175°C		1.8		V
Drain-source on-resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 18V, I <sub>D</sub> = 50A		20	30	mΩ
		V <sub>GS</sub> = 18V, I <sub>D</sub> = 50A, T <sub>j</sub> = 175°C		28		mΩ
<b>Dynamic characteristics<sup>1)</sup></b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V, f = 1MHz V <sub>AC</sub> = 25mV		3180		pF
Output Capacitance	C <sub>oss</sub>			281		
Reverse Transfer Capacitance	C <sub>rss</sub>			33		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 400V, V <sub>GS</sub> = -4/18V, I <sub>D</sub> = 40A		187		nC
Gate-Source Charge	Q <sub>gs</sub>			49		
Gate-Drain Charge	Q <sub>gd</sub>			31		
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DS</sub> = 400V, V <sub>GS</sub> = -4/18V, I <sub>D</sub> = 40A, R <sub>G(ext)</sub> = 2.5Ω, R <sub>L</sub> = 20Ω		17		nS
Turn-on rise time	t <sub>r</sub>			15		
Turn-off delay time	t <sub>d(off)</sub>			65		
Turn-off fall time	t <sub>f</sub>			14		
Turn-On Energy	E <sub>on</sub>	V <sub>DS</sub> = 400V, V <sub>GS</sub> = -4/18V, I <sub>D</sub> = 40A, R <sub>G(ext)</sub> = 2.5Ω, L = 100μH		0.52		mJ
Turn-Off Energy	E <sub>off</sub>			0.7		
<b>Source-Drain Diode characteristics</b>						
Diode Forward Current	I <sub>S</sub>				92	A
Diode Forward voltage	V <sub>SD</sub>	V <sub>GS</sub> = -4V, I <sub>SD</sub> = 25A		4.2		V
		V <sub>GS</sub> = -4V, I <sub>SD</sub> = 25A, T <sub>j</sub> = 175°C		3.9		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>SD</sub> = 40A, V <sub>R</sub> = 400V		26		nS
Reverse Recovery Charge	Q <sub>rr</sub>			58		nC
Peak Reverse Recovery Current	I <sub>rrm</sub>			3.4		A

Notes:

1) Guaranteed by design, not subject to production.

## Typical Characteristics

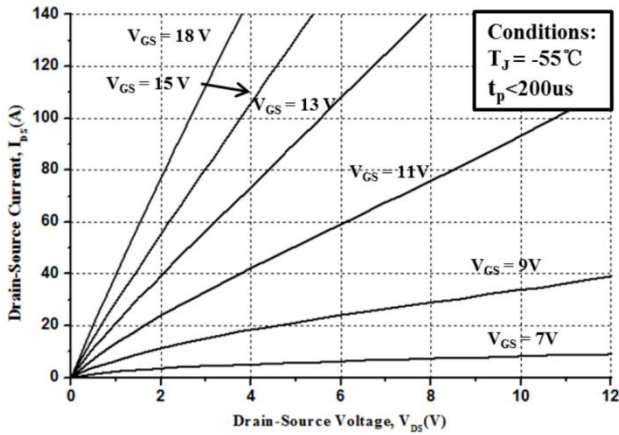


Figure 1. Output Characteristics  $T_J = -55^\circ\text{C}$

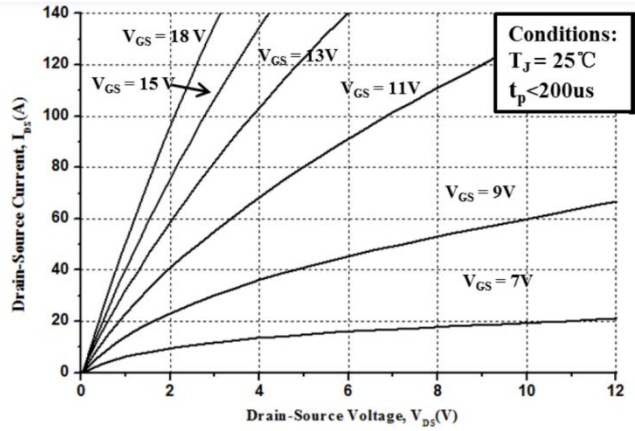


Figure 2. Output Characteristics  $T_J = 25^\circ\text{C}$

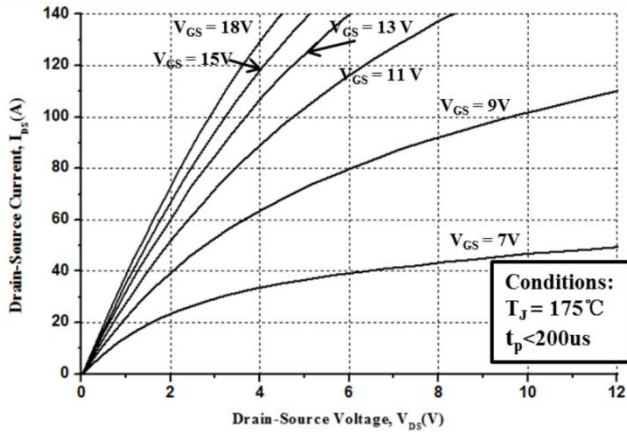


Figure 3. Output Characteristics  $T_J = 175^\circ\text{C}$

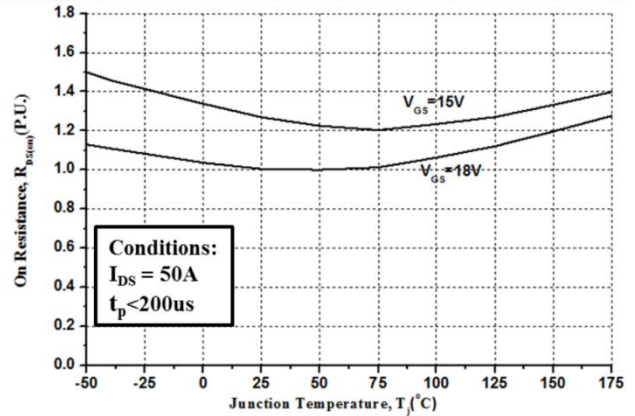


Figure 4. Normalized On-Resistance vs. Temperature

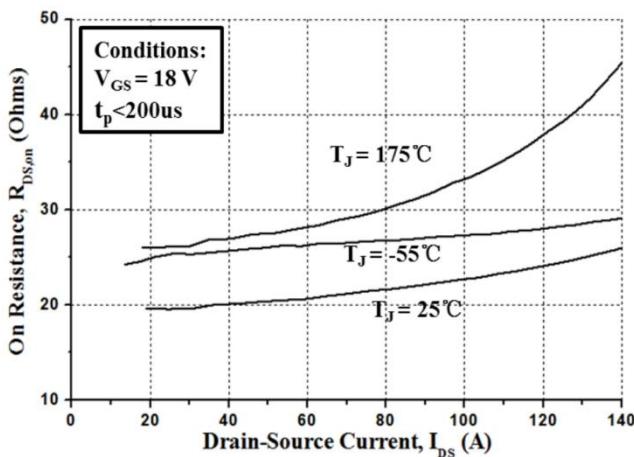


Figure 5. On-Resistance vs. Drain Current  
For Various Temperatures

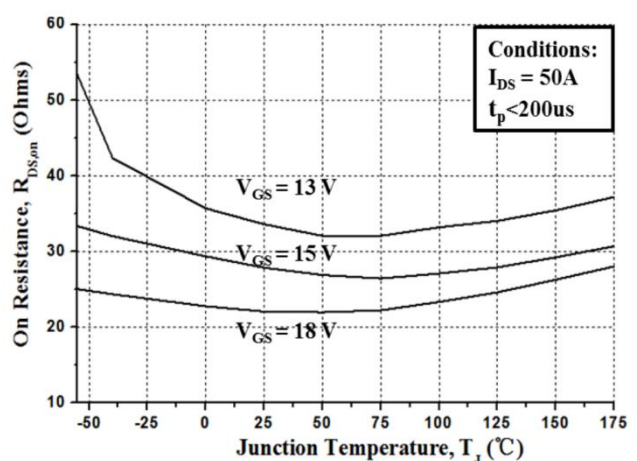


Figure 6. On-Resistance vs. Temperature  
For Various Gate Voltage

## Typical Characteristics

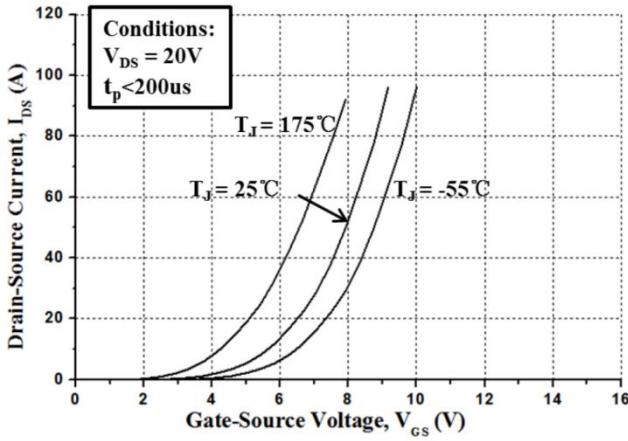


Figure 7. Transfer Characteristic for Various Junction Temperatures

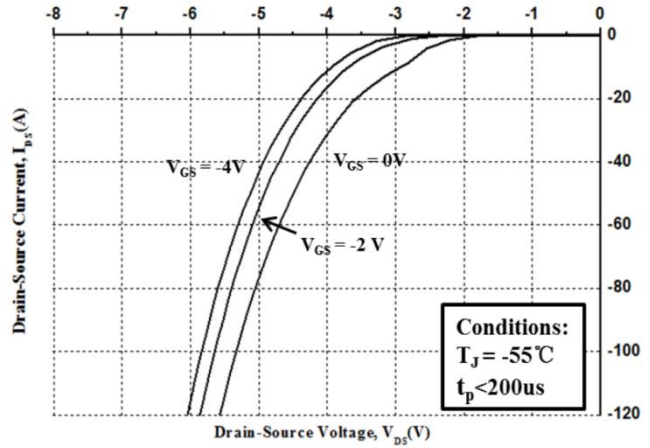


Figure 8. Body Diode Characteristic at -55°C

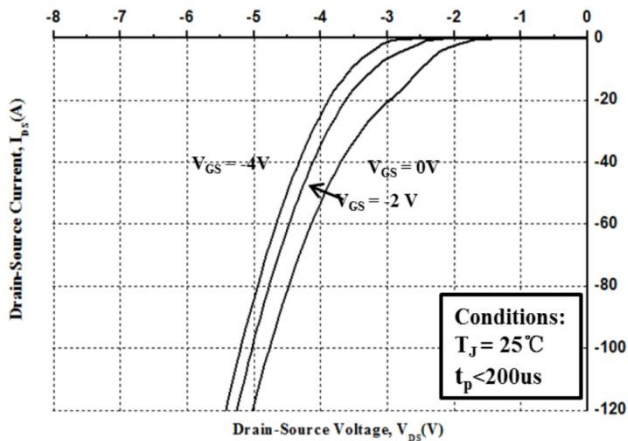


Figure 9. Body Diode Characteristic at 25°C

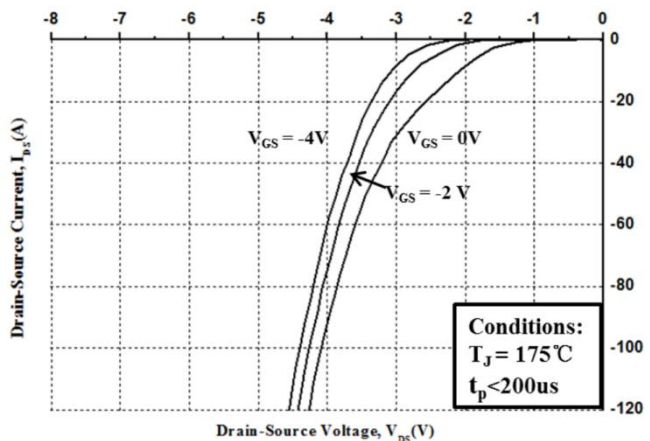


Figure 10. Body Diode Characteristic at 175°C

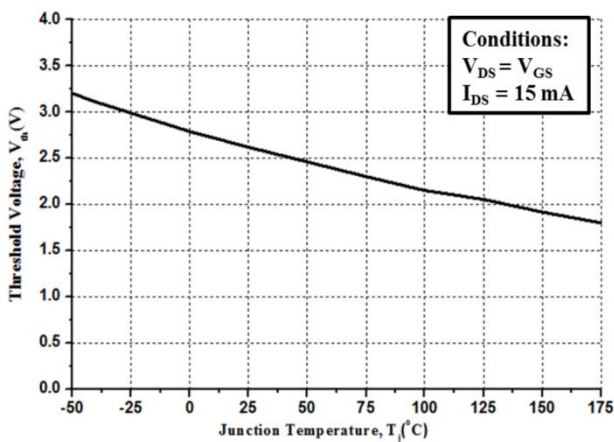


Figure 11. Threshold Voltage vs. Temperature

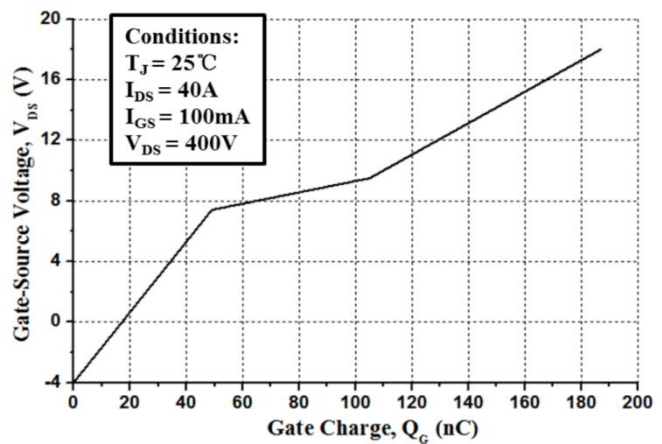


Figure 12. Gate Charge Characteristics



## Typical Characteristics

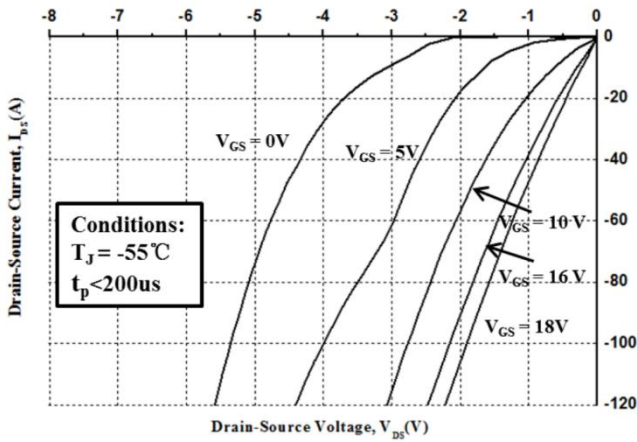


Figure 13. 3rd Quadrant Characteristic at -55°C

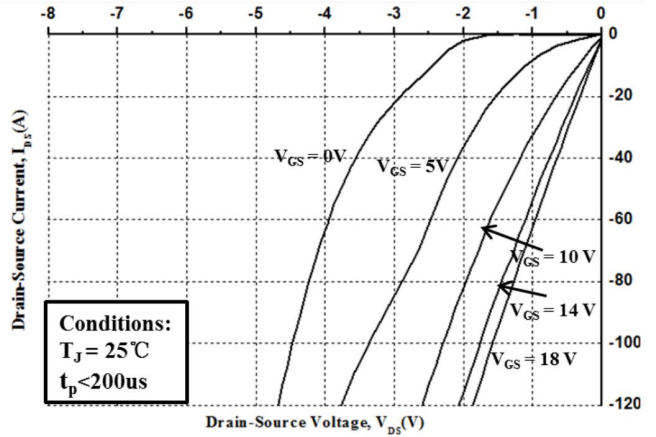


Figure 14. 3rd Quadrant Characteristic at 25°C

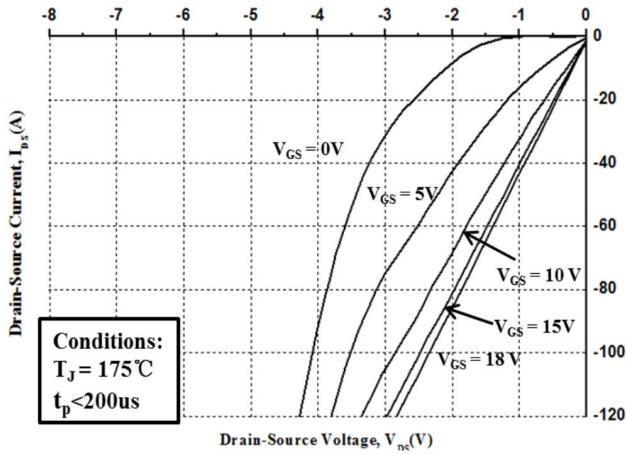


Figure 15. 3rd Quadrant Characteristic at 175 °C

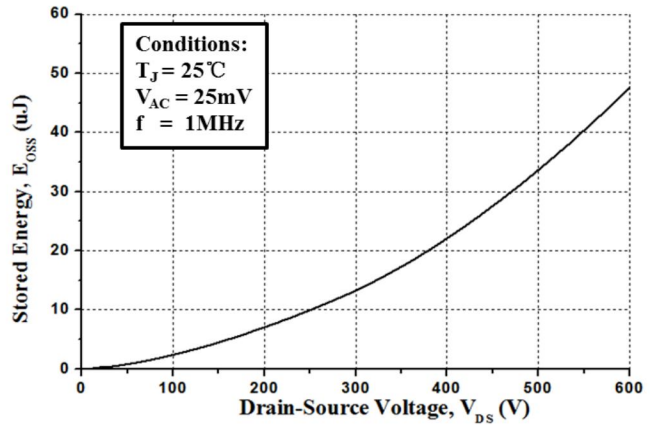


Figure 16. Output Capacitor Stored Energy

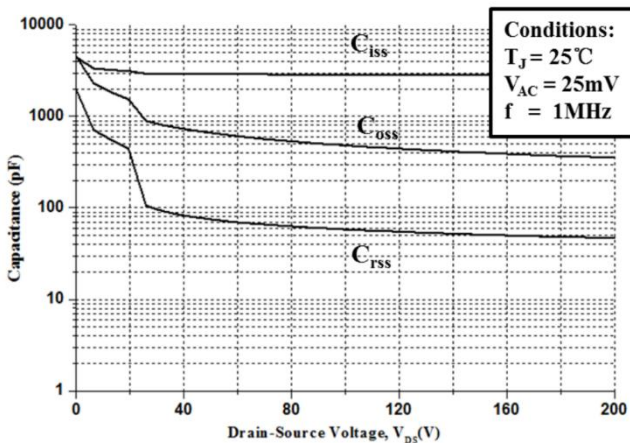


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

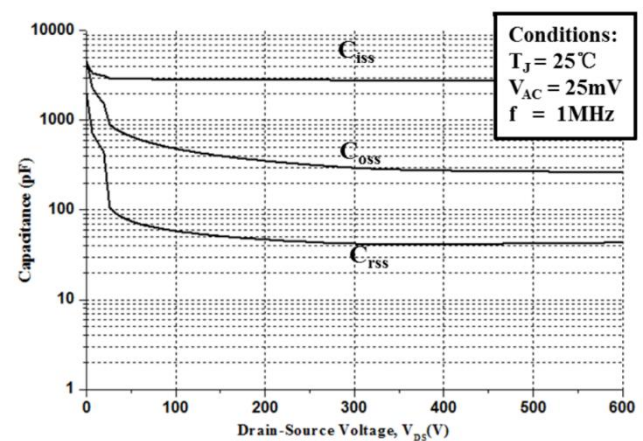


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

## Typical Characteristics

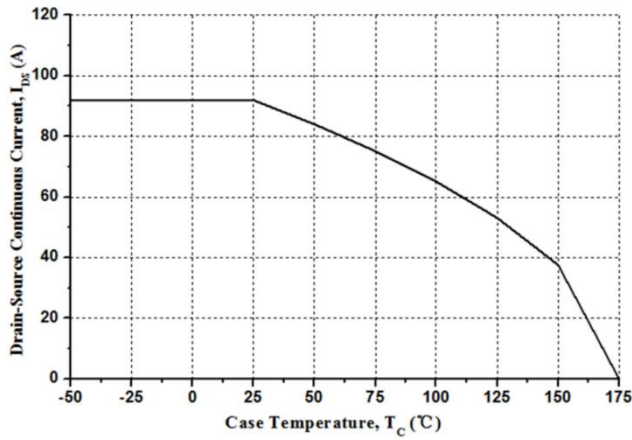


Figure 19. Continuous Drain Current Derating vs. Case Temperature

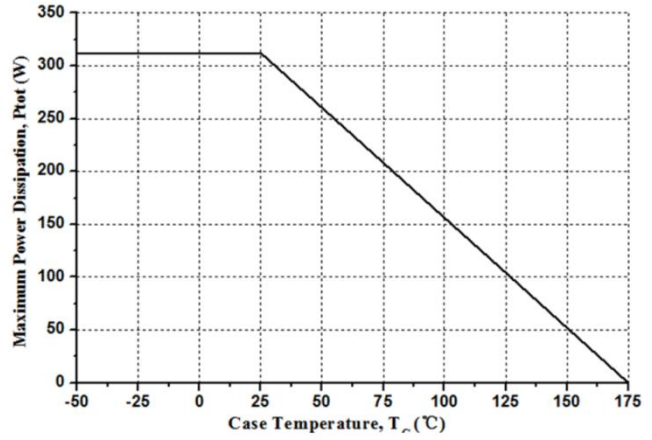


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

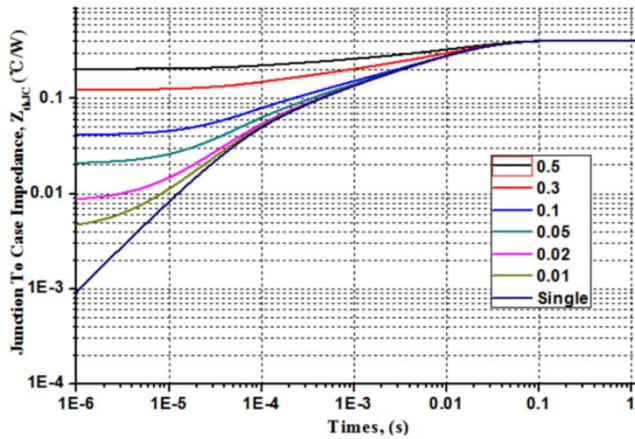


Figure 21. Transient Thermal Impedance (Junction - Case)

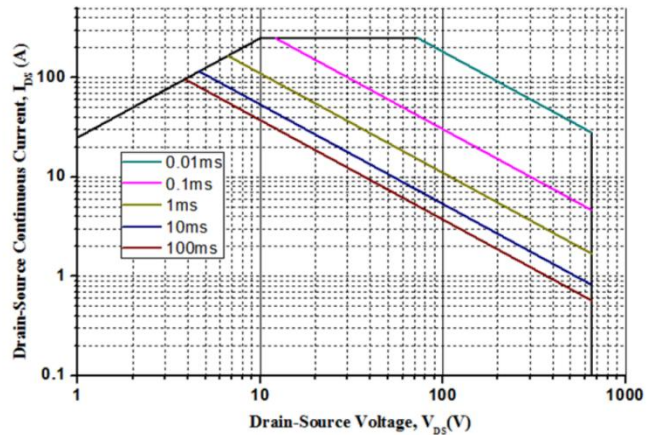
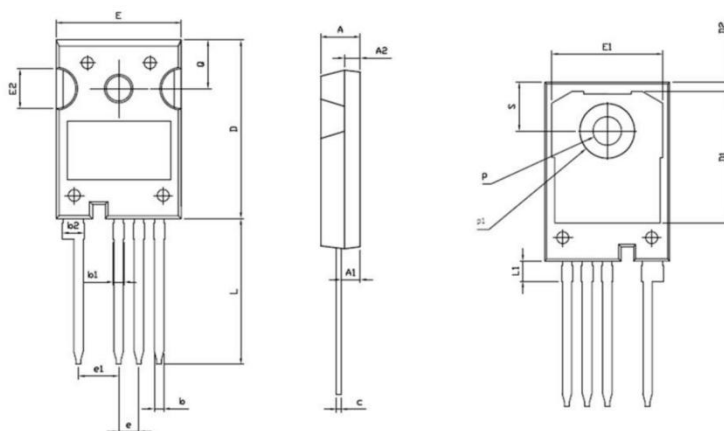


Figure 22. Safe Operating Area

### TO-247-4 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A2	1.850	2.150	0.073	0.085
b	1.050	1.350	0.041	0.053
b1	1.000	1.600	0.039	0.063
b2	2.350	2.950	0.093	0.116
c	0.500	0.700	0.020	0.028
D	22.340	22.740	0.880	0.895
D1	16.000	17.000	0.630	0.669
D2	0.970	1.370	0.038	0.054
e	2.340	2.740	0.092	0.108
e1	4.880	5.280	0.192	0.208
E	15.600	16.000	0.614	0.630
E1	13.500	14.500	0.531	0.571
E2	4.800	5.200	0.189	0.205
L	18.080	18.680	0.712	0.735
L1	2.380	2.780	0.094	0.109
P	3.500	3.700	0.138	0.146
p1	6.600	7.000	0.260	0.276
Q	6.000	6.300	0.236	0.248
S	6.000	6.300	0.236	0.248