

### Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	$I_D@25^{\circ}C$
750V	25mΩ@15V	108A

### Feature

- Wide bandgap SiC MOSFET technology
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed switching
- Low reverse recovery (Qrr)

### Application

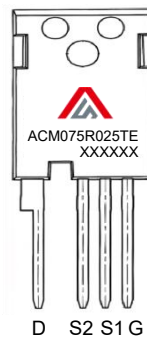
- Switch mode power supplies
- Renewable Energy
- On Board Charger
- High voltage DC/DC Converters

### Package



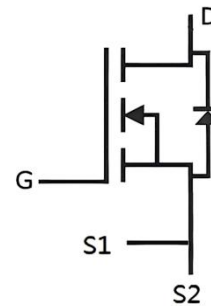
TO-247-4L

### Marking



D S2 S1 G

### Circuit diagram



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

Parameter	Symbol	Test Condition	Value	Unit
Drain-Source Voltage	$V_{DSmax}$	$V_{GS} = 0V, I_D = 100\mu A$	750	V
Gate-Source Voltage	$V_{GSmax}$	AC ( $f > 1 \text{ Hz}$ )	-10/+25	V
Gate-Source Voltage	$V_{GSOP}$	Static	-4/+15 -4/+18	V
Continuous Drain Current	$I_D$	$V_{GS} = 18V$	108	A
	$I_D$	$V_{GS} = 18V, T_c = 100^{\circ}C$	76	A
Pulsed Drain Current	$I_{D,pulse}$	Pulse with $t_p$ limited by $T_{jmax}$	193	A
Power Dissipation	$P_D$		341	W
Thermal Resistance (Typ)	$R_{\theta JC}$	Junction to Case	0.44	$^{\circ}C/W$
Operating Junction Temperature	$T_J$		-55~ +175	$^{\circ}C$
Storage Temperature	$T_{STG}$		-55~ +175	$^{\circ}C$

### Electrical characteristics (T<sub>J</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	750			V	
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = 750V, V <sub>GS</sub> = 0V			50	μA	
Gate-Source leakage current	I <sub>GSS</sub>	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 18V			250	nA	
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 20mA		2.6		V	
		V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 20mA, T <sub>J</sub> = 175°C		1.8			
Drain-source on-resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 15V, I <sub>D</sub> = 40A		25		mΩ	
		V <sub>GS</sub> = 18V, I <sub>D</sub> = 40A		20	30		
		V <sub>GS</sub> = 15V, I <sub>D</sub> = 40A, T <sub>J</sub> = 175°C		30			
		V <sub>GS</sub> = 18V, I <sub>D</sub> = 40A, T <sub>J</sub> = 175°C		28			
Transconductance	g <sub>fs</sub>	V <sub>GS</sub> = 15V, I <sub>D</sub> = 40A		25		S	
		V <sub>GS</sub> = 15V, I <sub>D</sub> = 40A, T <sub>J</sub> = 175°C		25			
<b>Dynamic characteristics</b>							
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V V <sub>AC</sub> = 25mV, f = 100KHz		2935		pF	
Output Capacitance	C <sub>oss</sub>			221			
Reverse Transfer Capacitance	C <sub>rss</sub>			16.6			
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 400V, V <sub>GS</sub> = -4V/18V I <sub>D</sub> = 40A		142		nC	
Gate-Source Charge	Q <sub>gs</sub>			35			
Gate-Drain Charge	Q <sub>gd</sub>			17			
Internal Gate Resistance	R <sub>G(int)</sub>	V <sub>AC</sub> = 25mV, f = 1MHz		1.2		Ω	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DS</sub> = 400V, V <sub>GS</sub> = -4V/+18V I <sub>D</sub> = 40A, R <sub>G(ext)</sub> = 5Ω, L = 200μH		3		nS	
Turn-on rise time	t <sub>r</sub>			18			
Turn-off delay time	t <sub>d(off)</sub>			24			
Turn-off fall time	t <sub>f</sub>			5			
Turn-on Switching Energy	E <sub>on</sub>				58		μJ
Turn-off Switching Energy	E <sub>off</sub>				65		
Total switching energy	E <sub>tot</sub>				123		
<b>Source-Drain Diode characteristics</b>							
Diode Forward Current	I <sub>S</sub>	V <sub>GS</sub> = -4V, T <sub>C</sub> = 25°C		81		A	
Diode Forward voltage	V <sub>SD</sub>	V <sub>GS</sub> = -4V, I <sub>SD</sub> = 20A		3.7		V	
		V <sub>GS</sub> = -4V, I <sub>SD</sub> = 20A, T <sub>J</sub> = 175°C		3.2			
Reverse Recovery Time	T <sub>rr</sub>	V <sub>GS</sub> = -4V, I <sub>SD</sub> = 40A, V <sub>R</sub> = 400V dif/dt = 3800 A/μs		16		nS	
Reverse Recovery Charge	Q <sub>rr</sub>			184		nC	
Peak Reverse Recovery Current	I <sub>rrm</sub>				27		A

## Typical Characteristics

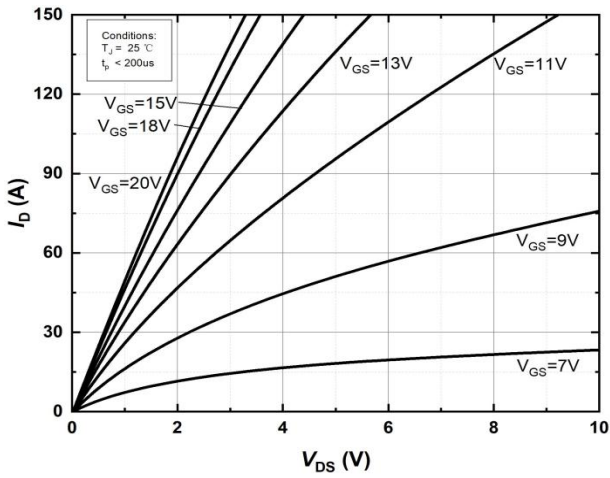


Figure 1. Output characteristics at Tj=25°C

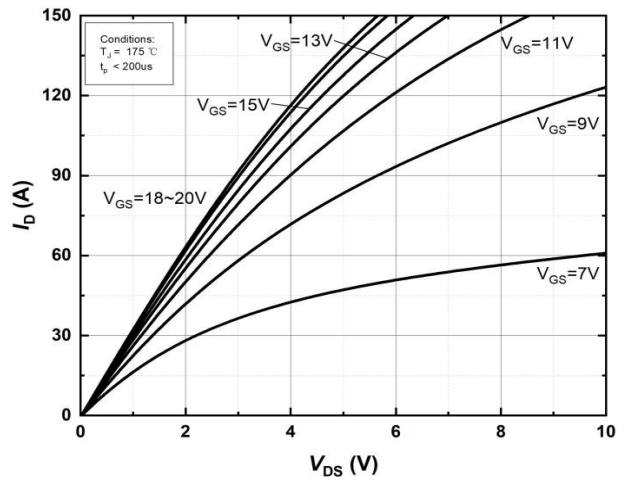


Figure 2. Output characteristics at Tj=175°C

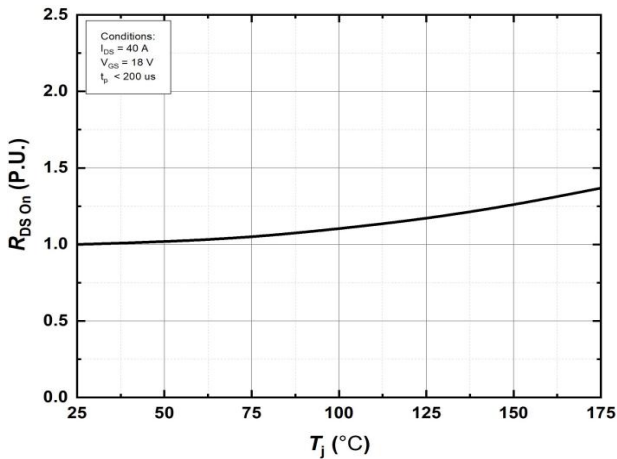


Figure 3. Normalized On-Resistance vs. Temperature

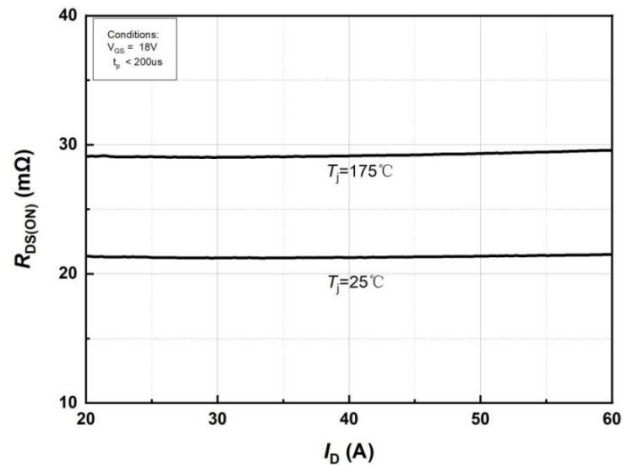


Figure 4. On-Resistance vs. Drain current for Various Temperature

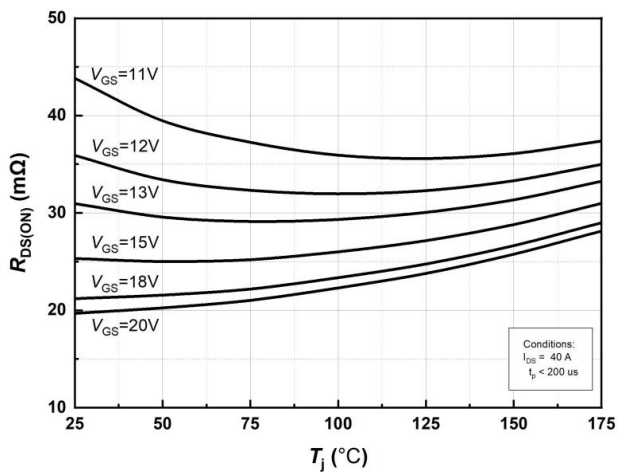


Figure 5. On-Resistance vs. Temperature for Various Gate Voltage

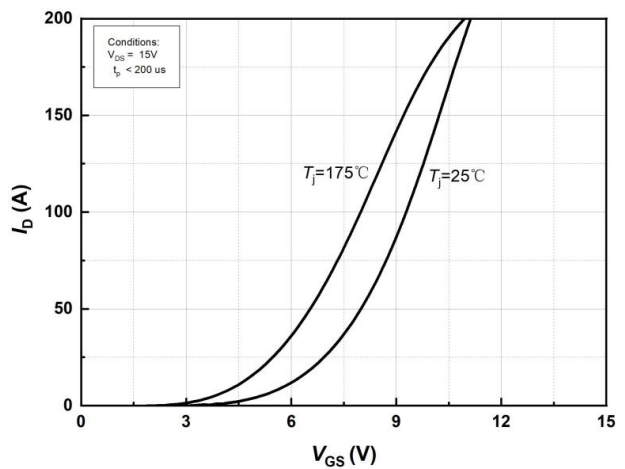


Figure 6. Transfer Characteristics for Various Junction Temperatures

## Typical Characteristics

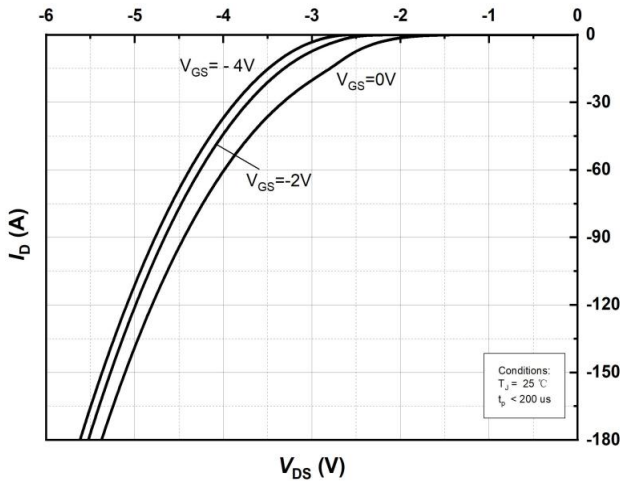


Figure 7. Body Diode Characteristics at  $T_j=25^\circ\text{C}$

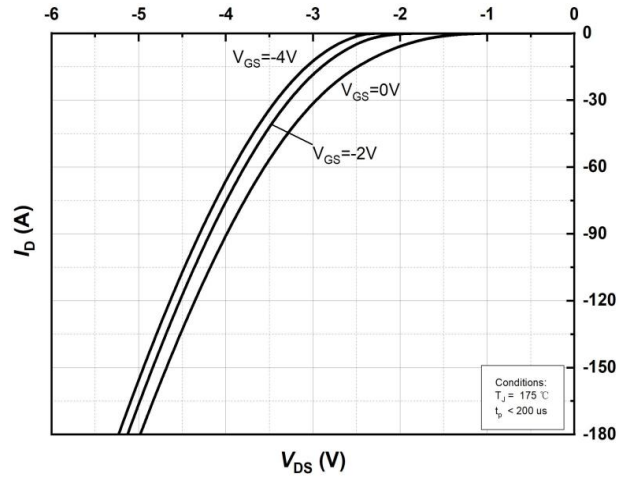


Figure 8. Body Diode Characteristics at  $T_j=175^\circ\text{C}$

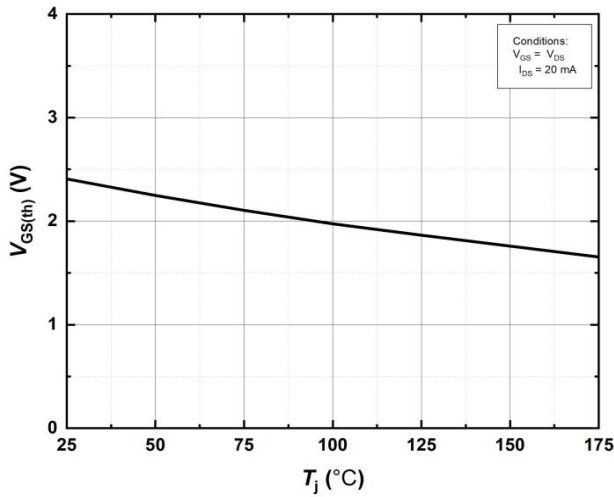


Figure 9. Threshold Voltage vs. Temperature

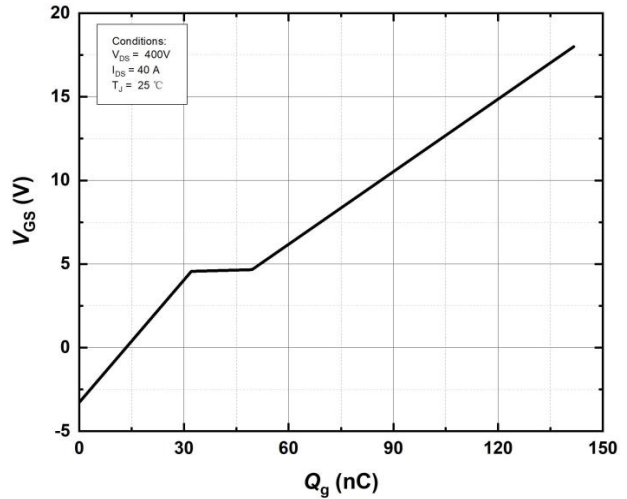


Figure 10. Gate Charge Characteristics

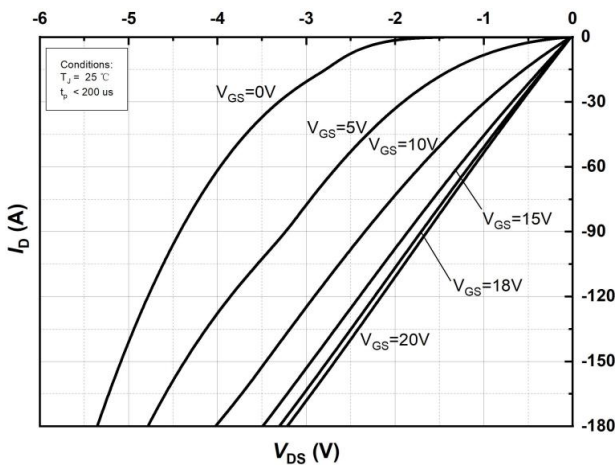


Figure 11. 3rd Quadrant Characteristic at  $T_j=25^\circ\text{C}$

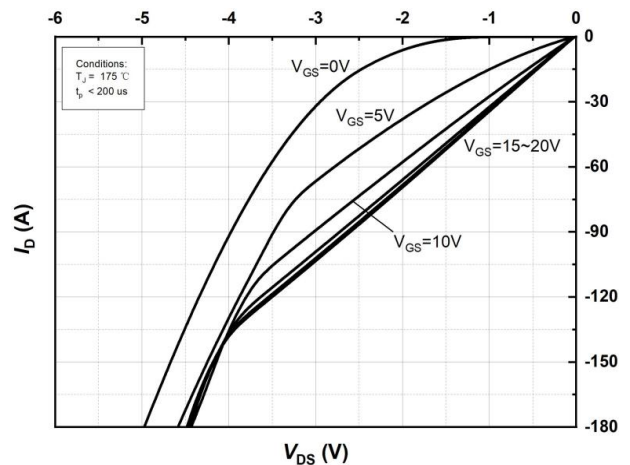


Figure 12. 3rd Quadrant Characteristic at  $T_j=175^\circ\text{C}$

## Typical Characteristics

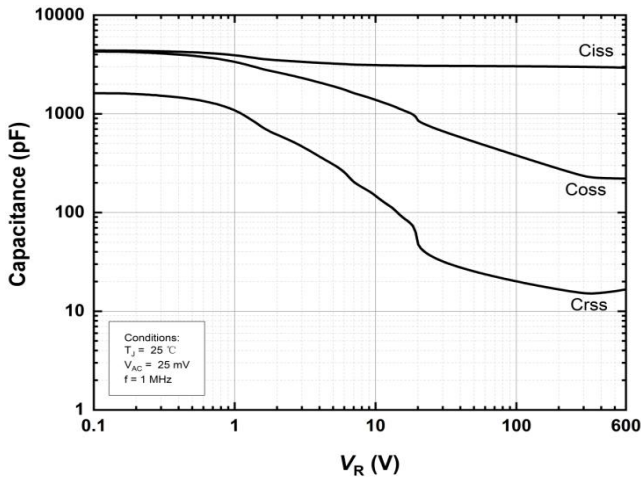


Figure 13. Capacitances vs. Drain-Source Voltage (0 – 600V)

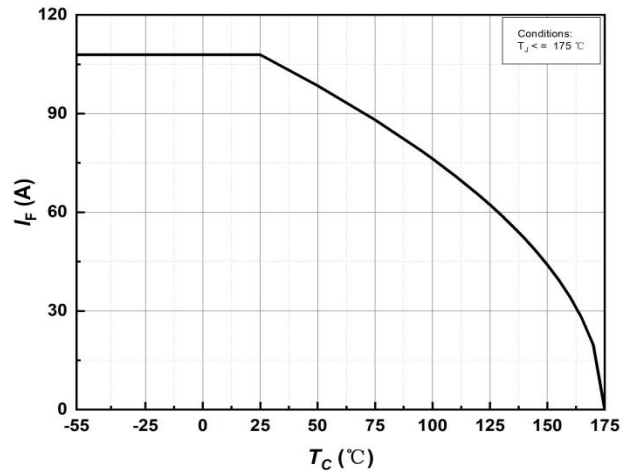


Figure 14. Continuous Drain Current Derating vs Case Temperature

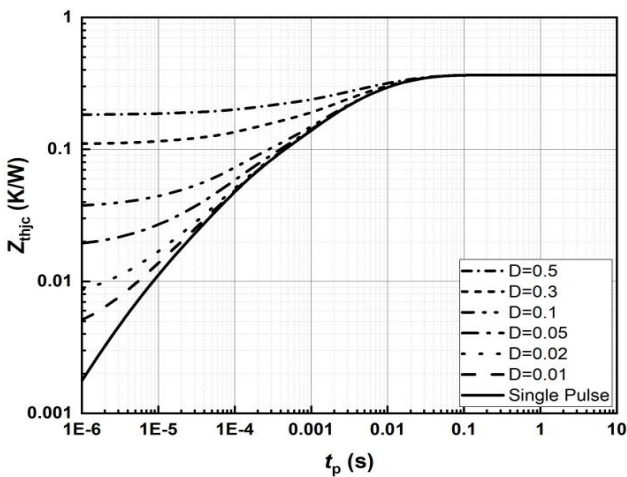


Figure 15. Transient Thermal Impedance (Junction – Case)

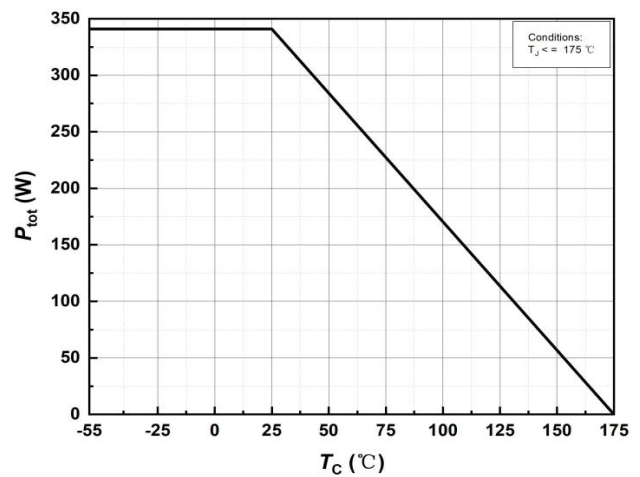


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

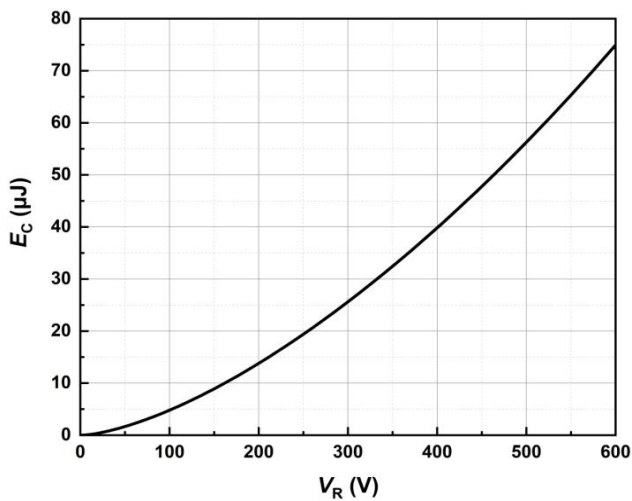


Figure 17. Output Capacitor Stored Energy

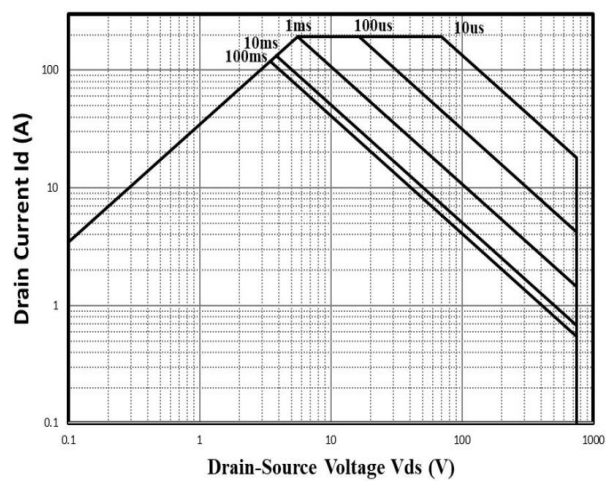


Figure 18. Safe Operating Area

## Typical Characteristics

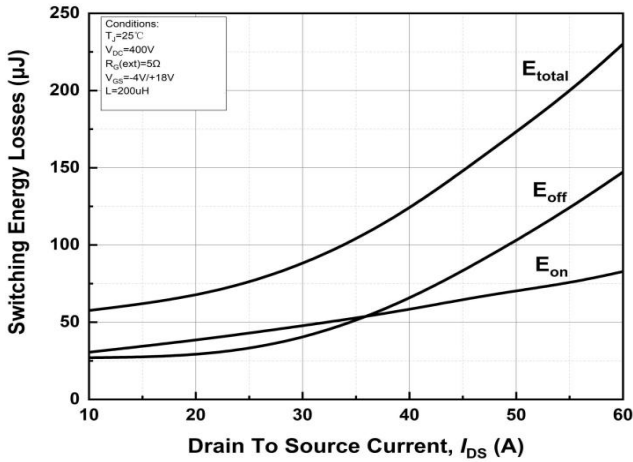


Figure 19. Clamped Inductive Switching Energy vs. Drain Current ( $V_{DS} = 400V$ )

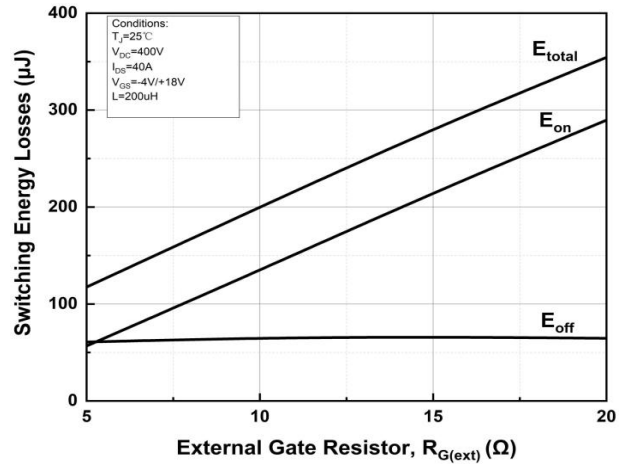


Figure 20. Clamped Inductive Switching Energy vs.  $R_{G(ext)}$

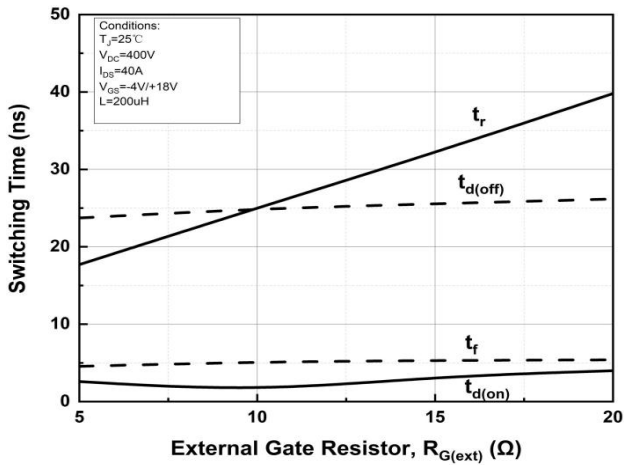
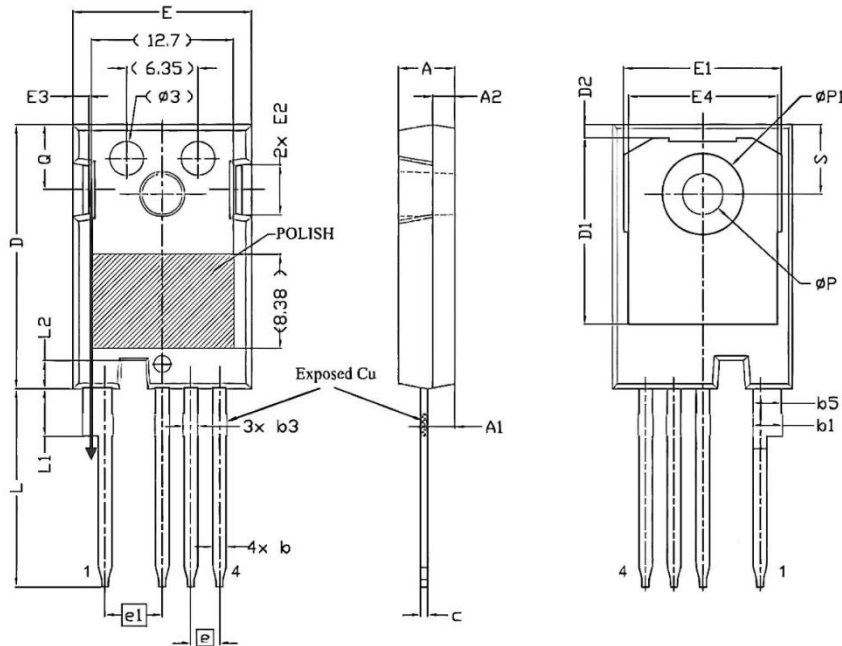


Figure 21. Switching Times vs.  $R_{G(ext)}$

### TO-247-4L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.800	5.210	0.189	0.205
A1	2.290	2.540	0.090	0.100
A2	1.910	2.160	0.075	0.085
b	1.070	1.330	0.042	0.052
b1	2.390	2.940	0.094	0.116
b3	1.070	1.600	0.042	0.063
b5	2.390	2.690	0.094	0.106
c	0.550	0.680	0.022	0.027
D	23.300	23.600	0.917	0.929
D1	16.250	17.650	0.640	0.695
D2	0.950	1.250	0.037	0.049
E	15.750	16.130	0.620	0.635
E1	13.100	14.150	0.516	0.557
E2	3.680	5.100	0.145	0.201
E3	1.000	1.900	0.039	0.075
E4	12.380	13.430	0.487	0.529
e	2.540 BSC.		0.100 BSC.	
e1	5.080 BSC.		0.200 BSC.	
L	17.310	17.820	0.681	0.702
L1	3.970	4.370	0.156	0.172
L2	2.350	2.650	0.093	0.104
ΦP	3.510	3.650	0.138	0.144
ΦP1	7.190 REF.		0.283 REF.	
Q	5.490	6.000	0.216	0.236
S	6.040	6.300	0.238	0.248