Features

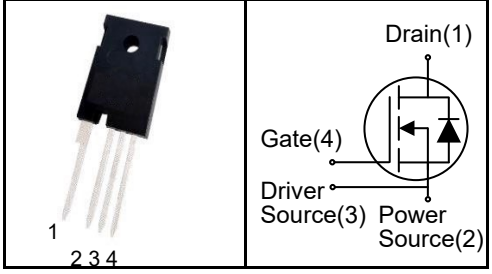
- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(on)}$
- Easy to Parallel
- Simple to Drive
- RoHS Compliant

Part NO.		MS1M013120T4
V_{DS}	=	1200 V
$I_D(T_c=25℃)$	=	175 A
$R_{DS(on)}$	=	13 mΩ

Benefits

- Increased Power Density
- Faster Operating Freequency
- Reduction of Heat Sink Requirements
- Higher Efficiency
- Reduced EMI

TO-247-4



Applications

- Power Factor Correction Modules
- Switch Mode Power Supplies
- DC-AC Inverters
- High Voltage DC/DC Converters

Halogen

RoHS

Maximum ratings (T_j=25℃ unless otherwise specified)

Symbol	Parameter	Test conditions	Value	Unit
V_{DS}	Drain-Source Voltage		1200	V
I_D	Continuous Drain Current	T_c=25°C T_c=100°C	175 125	A
I_{DM}	Peak Drain Current	Pulse width t_p limited by T_{jmax}	360	A
V_{GSmax}	Gate-Source Voltage		-8/+22	V
V_{GSop}	Recommend Gate-Source Voltage		-4/+18	V
P_{tot}	Power Dissipation	T_c=25°C T_c=100°C	833 416	W
T_j	Operating Junction Temperature		-40~175	°C
T_{stg}	Storage Temperature		-40~175	°C

Electrical Characteristics

Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	I_D=100μA, V_{GS}=0V	1200			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1200V, V_{GS}=0V		1		μA
I_{GSS}	Gate-Source Leakage Current	V_{DS}=0V, V_{GS}=18V			250	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=35mA T_j=25°C T_j=175°C	2	2.8 1.9	4	V
$R_{DS(on)}$	Drain-Source On-State Resistance	V_{GS}=18V, I_D=75A T_j=25°C T_j=175°C		13 23	19	mΩ

Thermal Characteristics

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance from Junction to Case		0.18		°C/W

Dynamic Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{DS}=1000V, f=100KHz, V_{GS}=0V		6893		pF
C_{oss}	Output Capacitance			249		pF
C_{rss}	Reverse Transfer Capacitance			19		pF
$R_{G(int)}$	Internal Gate Resistance	f=1MHz		2.4		Ω
Q_g	Total Gate Charge	V_{DS}=800V, I_D=75A, V_{GS}=-4/18V		306		nC
Q_{gs}	Gate to Source Charge			87		nC
Q_{gd}	Gate to Drain Charge			80		nC

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	V_{DD}=800V, I_D=75A, V_{GS}=-4V/18V, $R_{G(ext)}$=2.5Ω, L=200μH		25		ns
t_r	Rise Time			37		ns
$t_{d(off)}$	Turn-Off Delay Time			57		ns
t_f	Fall Time			17		ns
E_{on}	Turn-On Energy			1043		μJ
E_{off}	Turn-Off Energy			828		μJ

Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode Forward Voltage	V_{GS}=-4V, I_{SD}=37.5A T_j=25°C T_j=175°C		 4.6 3.9		V
I_S	Continuous Diode Forward Current	V_{GS}=-4V T_c=25°C T_c=100°C		 150 82		A
t_{rr}	Reverse Recovery Time	V_{GS}=-4V, I_{SD}=75A, V_R=800V, di/dt=7000A/μs		15		ns
Q_{rr}	Reverse Recovery Charge			434		nC
I_{rrm}	Peak Reverse Recovery Current			51		A

Typical Performance

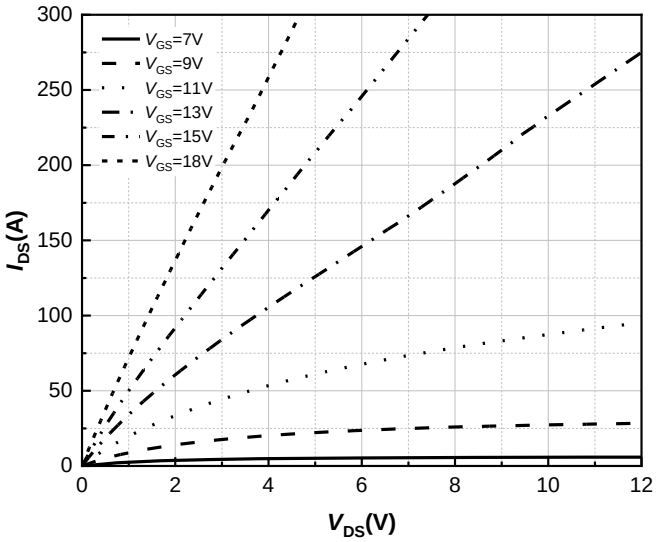


Figure 1. **Output Characteristics T_j=-40°C**

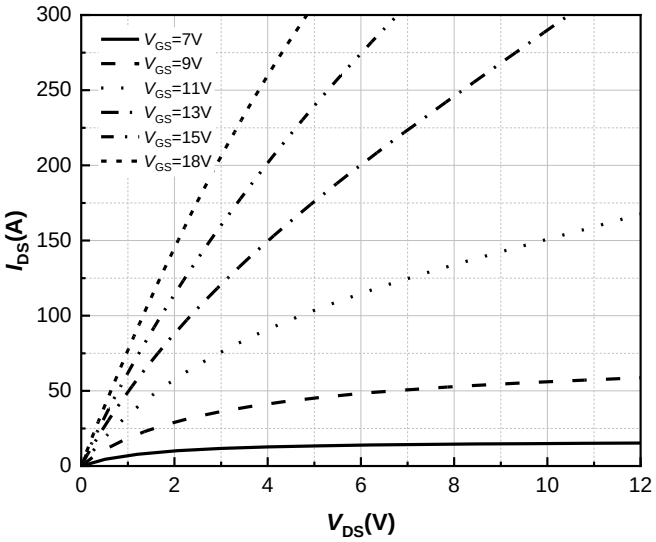


Figure 2. **Output Characteristics T_j=25°C**

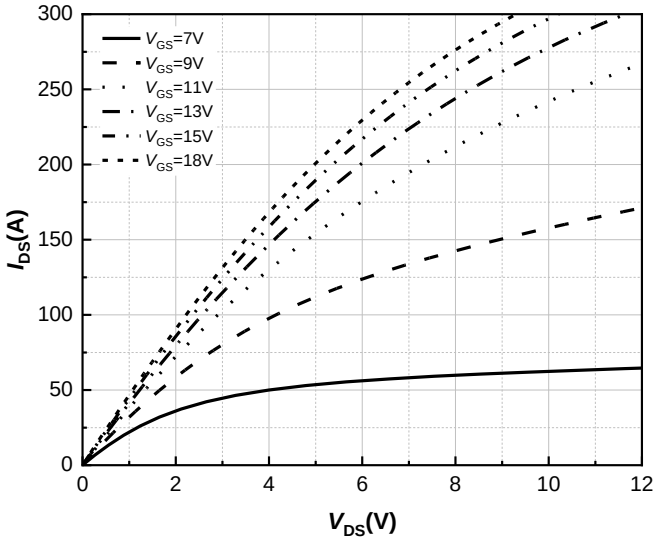


Figure 3. **Output Characteristics T_j=175°C**

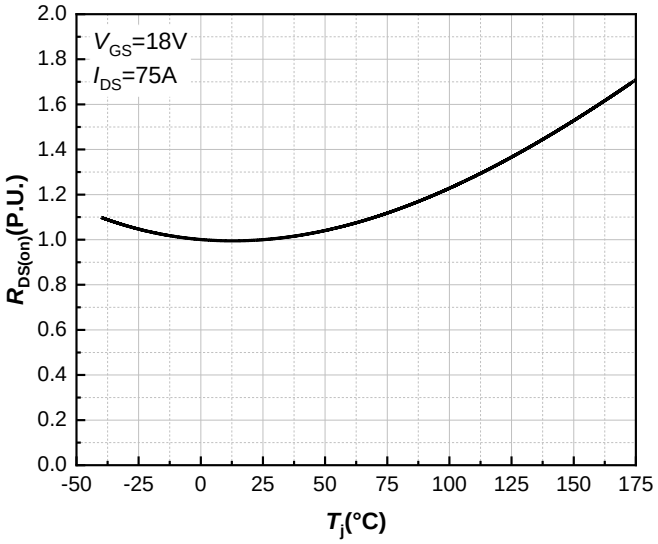


Figure 4. **Normalized On-Resistance vs. Temperature**

Typical Performance

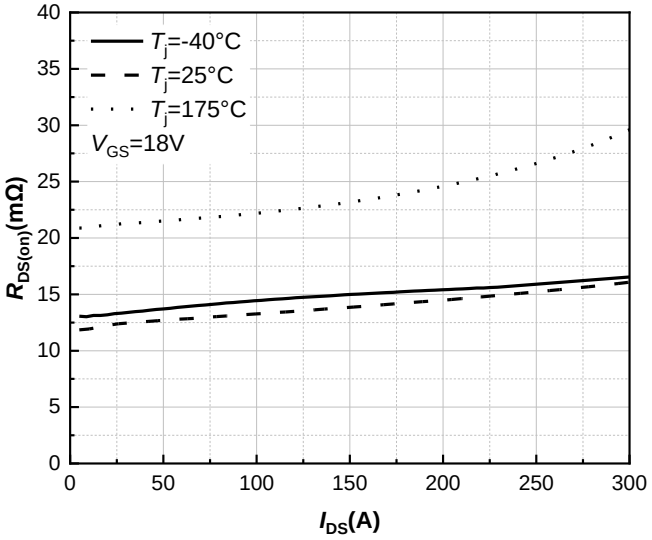


Figure 5. **On-Resistance vs. Drain Current For Various Temperatures**

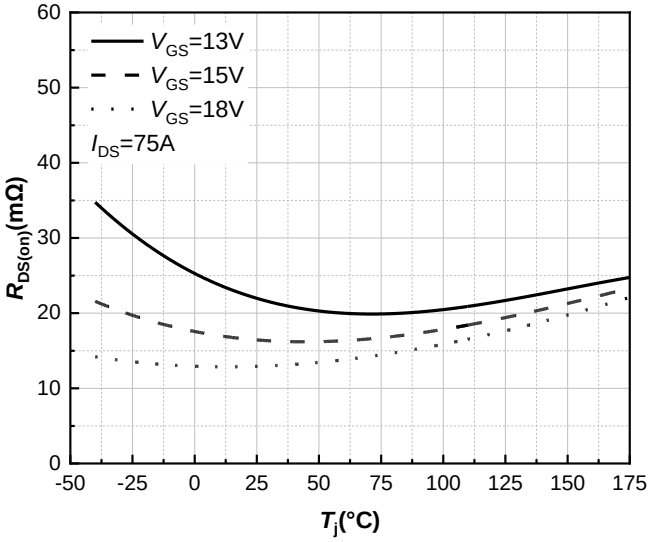


Figure 6. **On-Resistance vs. Temperature For Various Gate Voltage**

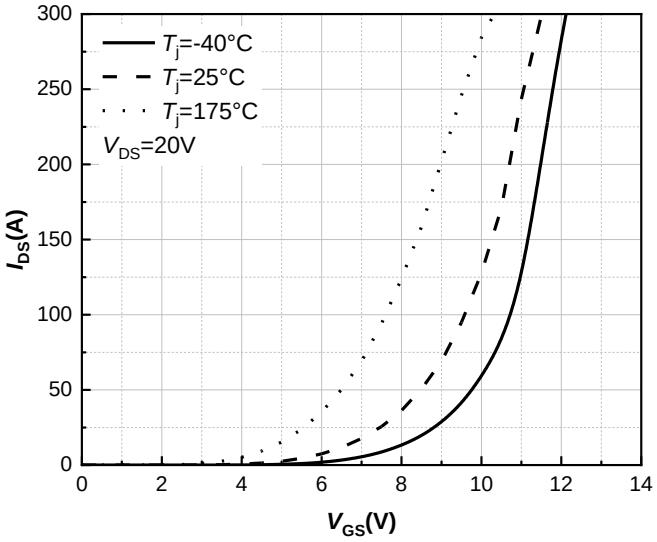


Figure 7. **Transfer Characteristic for Various Junction Temperatures**

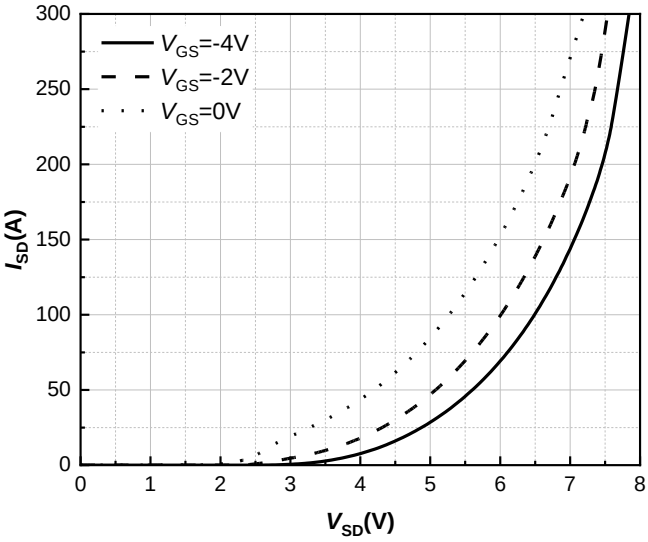


Figure 8. **Body Diode Characteristic T_j=-40°C**

Typical Performance

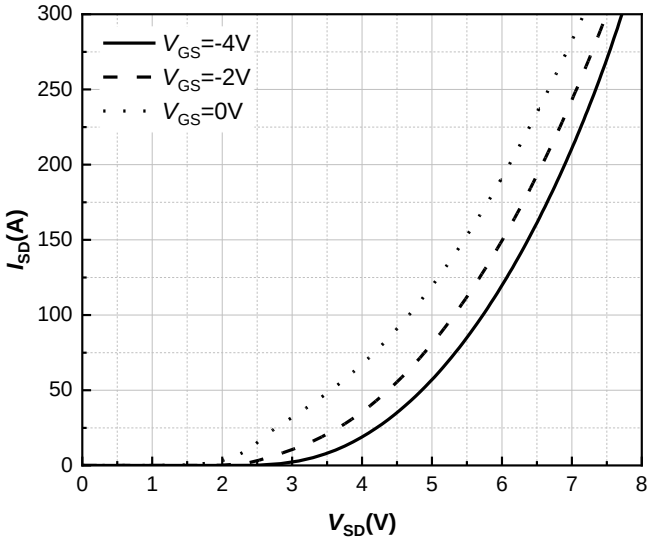


Figure 9. **Body Diode Characteristic T_j=25°C**

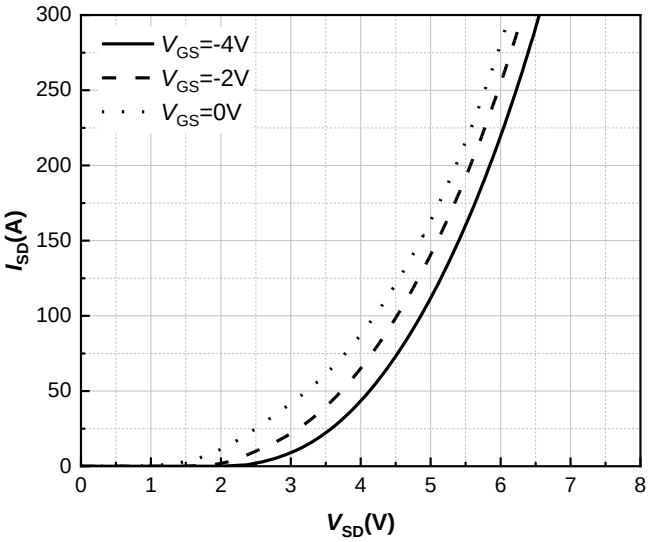


Figure 10. **Body Diode Characteristic T_j=175°C**

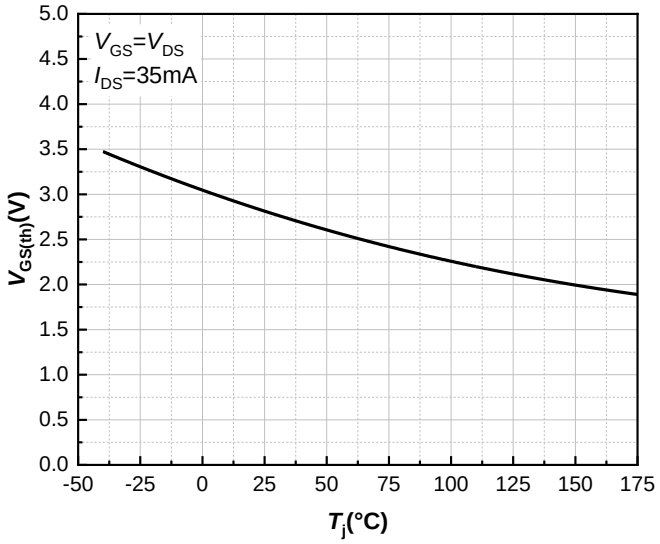


Figure 11. **Threshold Voltage vs. Temperature**

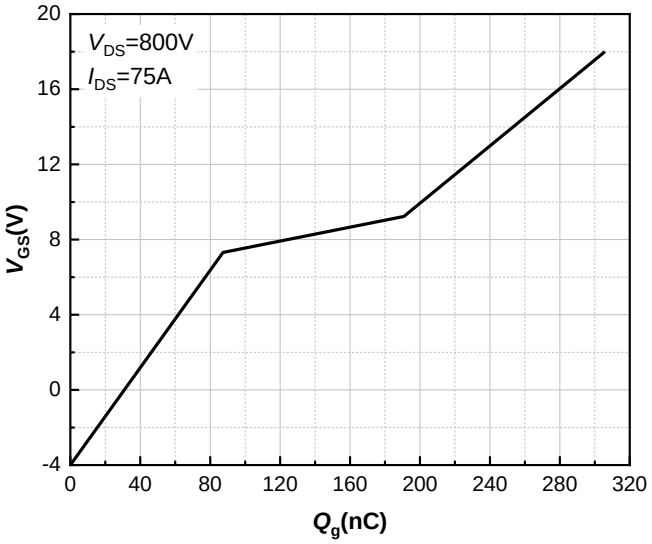


Figure 12. **Gate Charge Characteristics**

Typical Performance

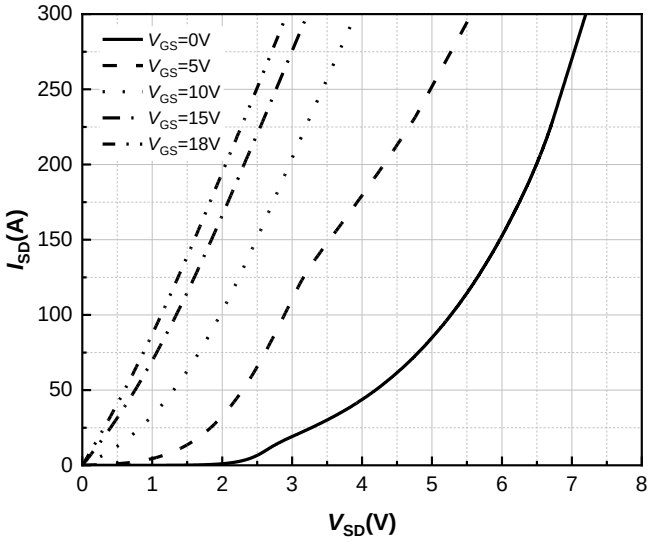


Figure 13. **3rd Quadrant Characteristic T_j=-40°C**

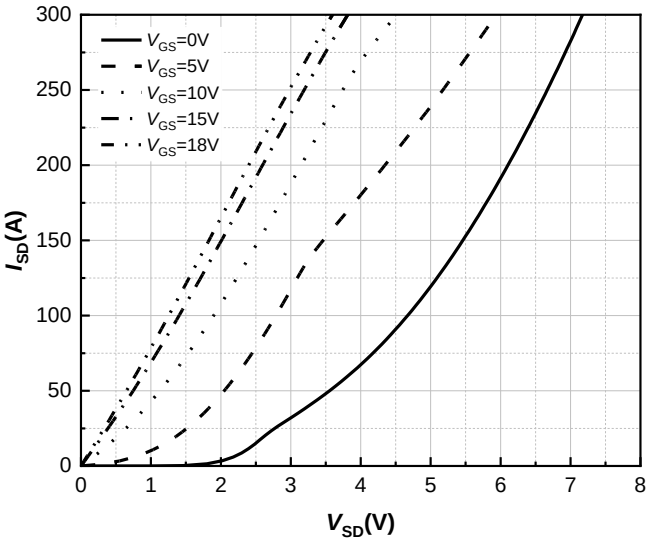


Figure 14. **3rd Quadrant Characteristic T_j=25°C**

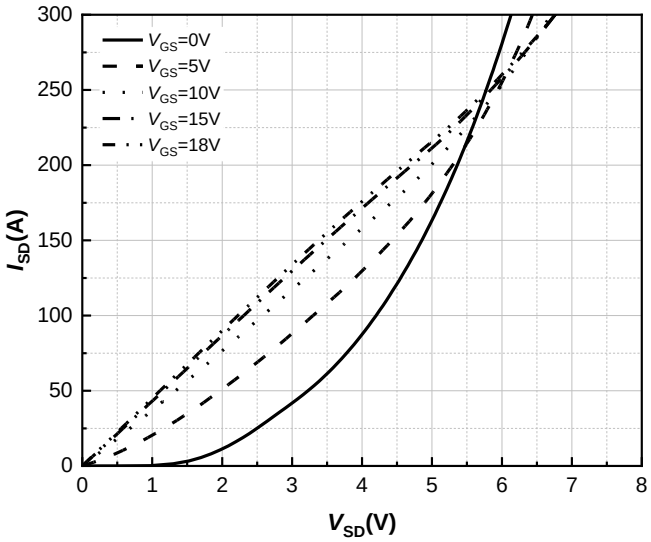


Figure 15. **3rd Quadrant Characteristic T_j=175°C**

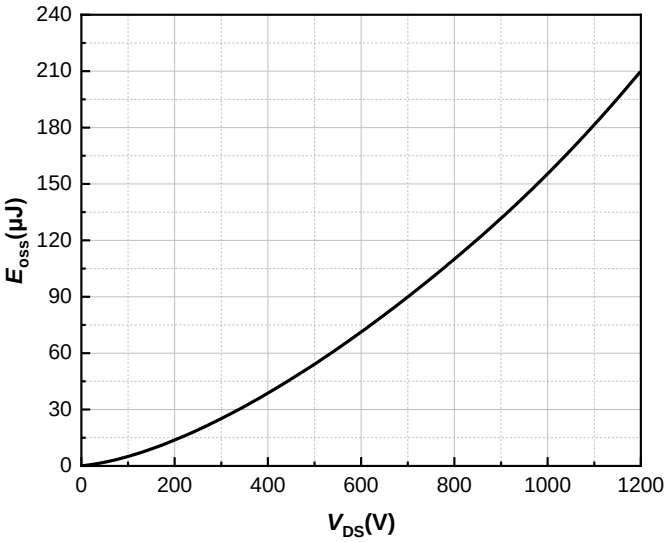


Figure 16. **Output Capacitor Stored Energy**

Typical Performance

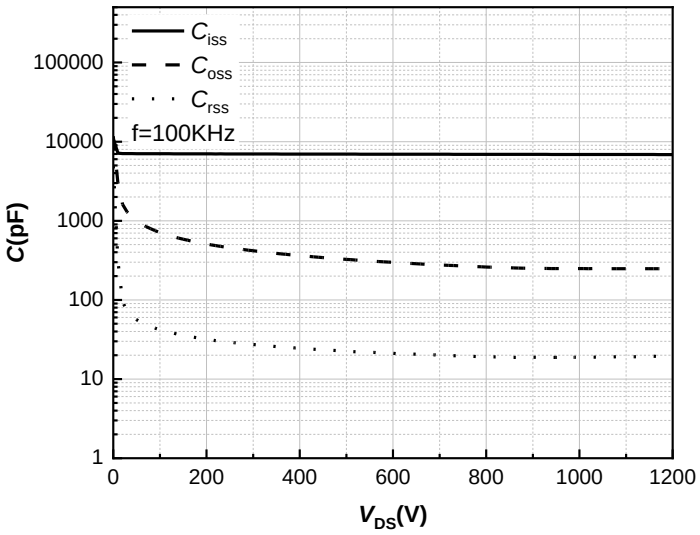


Figure 17. **Capacitances vs. Drain-Source**

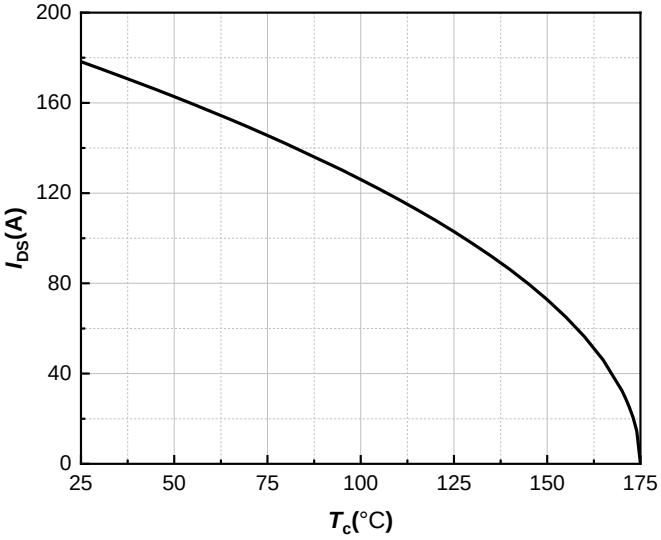


Figure 18. **Continuous Drain Current Derating vs. Case Temperature**

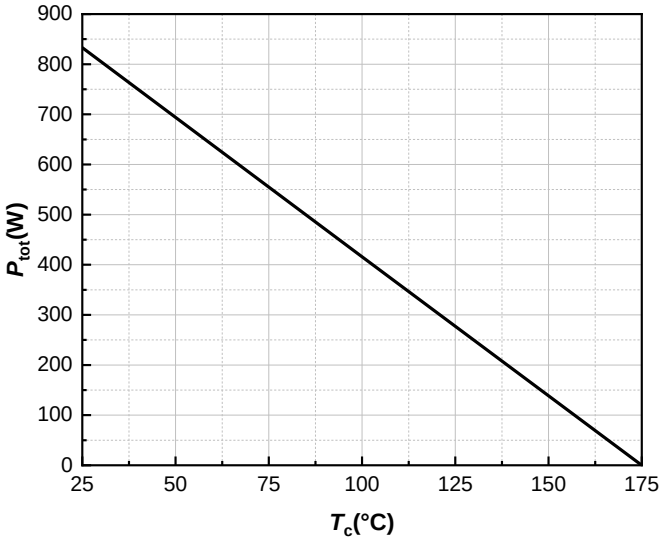


Figure 19. **Maximum Power Dissipation Derating vs. Case Temperature**

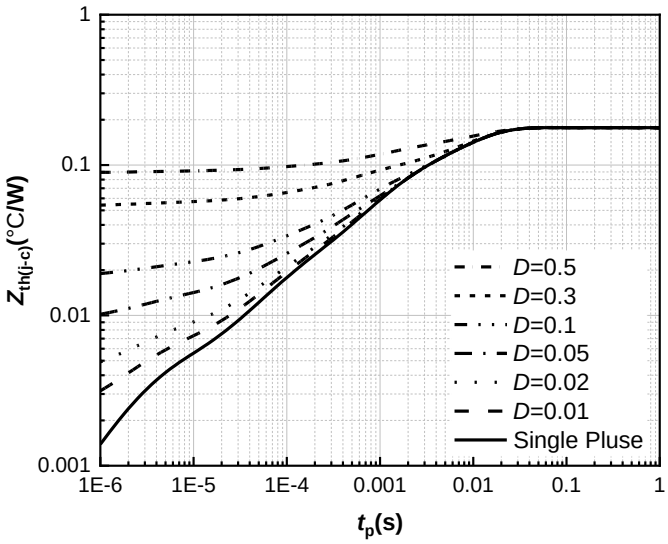


Figure 20. **Transient Thermal Impedance**

Typical Performance

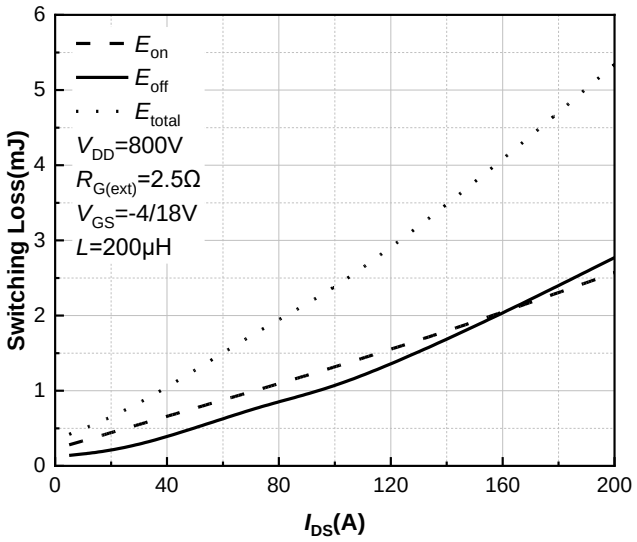


Figure 21. **Clamped Inductive Switching Energy vs. Drain Current**

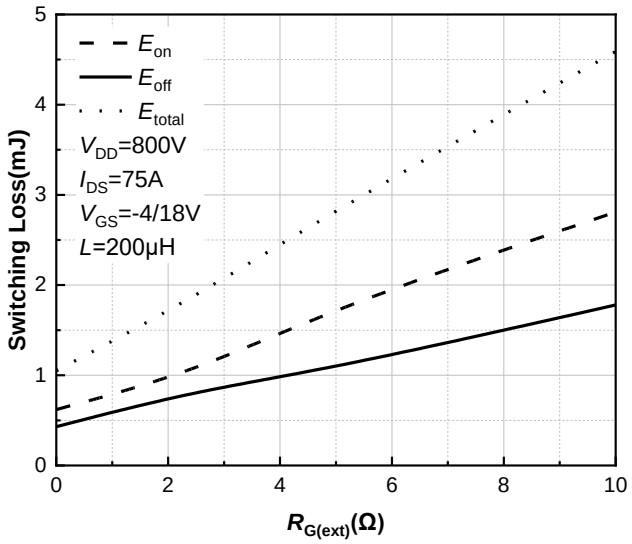


Figure 22. **Clamped Inductive Switching Energy vs. R_G**

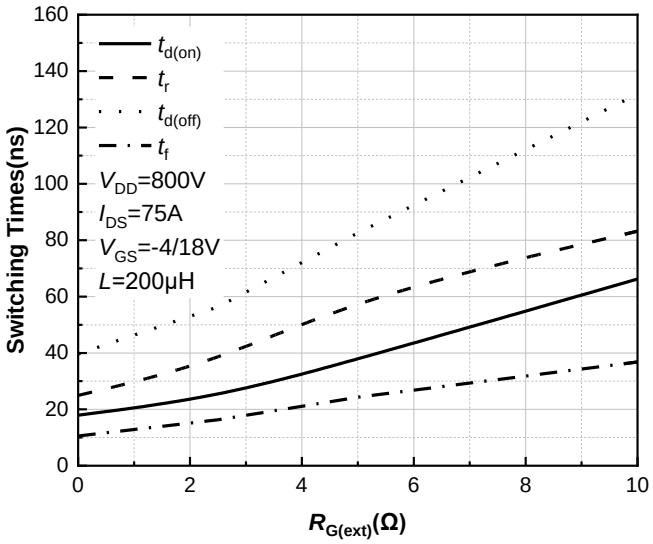


Figure 23. **Switching Times vs. R_G**

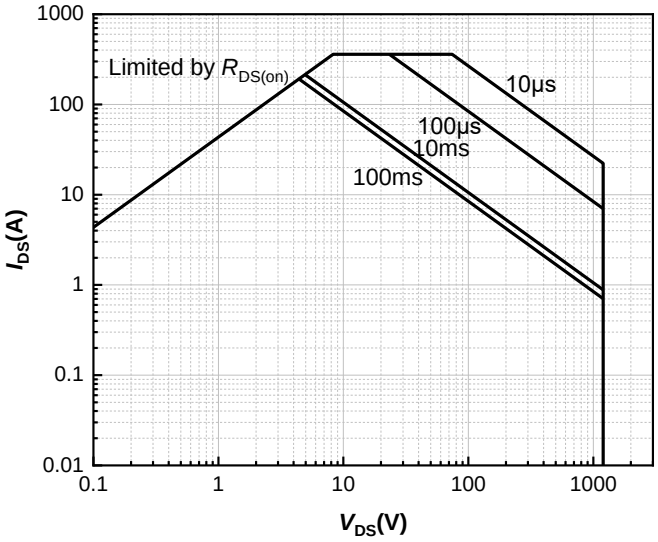
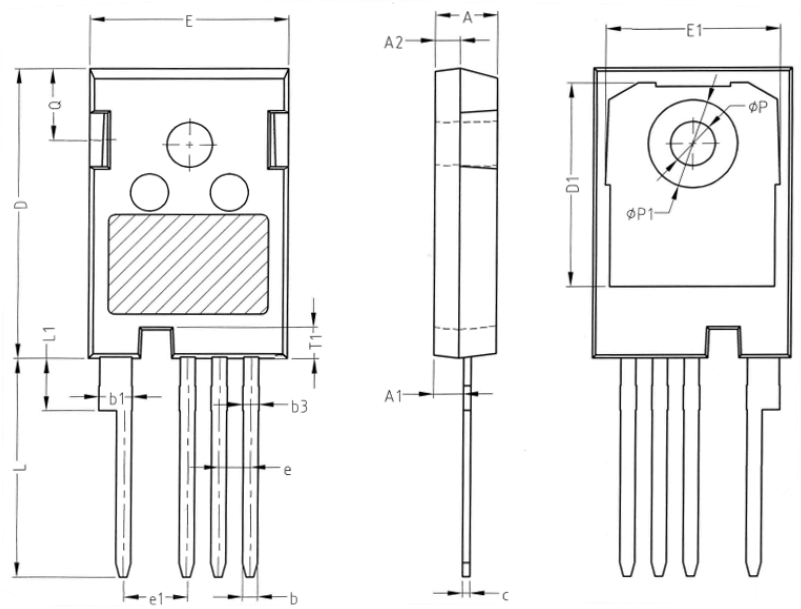


Figure 24. **Safe Operating Area**

Package Outlines



SYMBOL	Unit: mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.80	2.00	2.20
b	1.06	1.21	1.36
b1	2.33	2.63	2.93
b3	1.07	1.30	1.60
c	0.51	0.61	0.75
D	23.30	23.45	23.60
D1	16.25	16.55	16.85
E	15.74	15.94	16.14
E1	13.72	14.02	14.32
T1	2.35	2.50	2.65
e	2.54 BSC		
e1	5.08 BSC		
Q	5.49	5.79	6.09
L	17.27	17.57	17.87
L1	3.99	4.19	4.39
ΦP	3.40	3.60	3.80
ΦP1	7.19 REF		