Features

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

Benefits

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

Applications

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

Description

Pin 1 - Gate

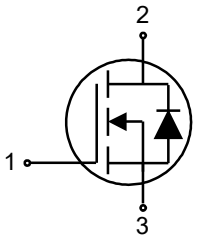
Pin 2 - Drain

Pin 3 - Source

Part NO.		MS2M160065F
V_{DS}	=	650 V
$I_D(T_c=25℃)$	=	15 A
$R_{DS(on)}$	=	154 mΩ

TO-220-Fullpack

1 2 3



Halogen

RoHS

Table of Contents

Maximum Ratings (T_j=25°C unless otherwise specified)

Symbol	Parameter	Test conditions	Value	Unit
V_{DS}	Drain-Source Voltage		650	V
I_D	Continuous Drain Current	V_{GS}=18V T_c=25°C T_c=100°C	 15 11	A
I_{DM}	Peak Drain Current	Pulse width t_p limited by T_{jmax}	30	A
V_{GSmax}	Gate-Source Voltage, max. Transient Voltage	t_p≤0.5μs, D<0.001	-8/+22	V
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	48 24	W
T_j	Operating Junction Temperature		-40~175	°C
T_{stg}	Storage Temperature		-40~150	°C
T_{sold}	Soldering Temperature	1.6mm (0.063″) from case for 10s	260	°C

Thermal Characteristics

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance from Junction to Case		3.14		°C/W

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	650			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V, V_{GS}=0V		1	10	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=2.5mA T_j=25°C T_j=175°C	2	2.8 2.0	4	V
$R_{DS(on)}$	Drain-Source On-State Resistance	V_{GS}=15V, I_D=10A T_j=25°C T_j=175°C		200 208	290	mΩ
		V_{GS}=18V, I_D=10A T_j=25°C T_j=175°C		154 188	208	mΩ
g_{fs}	Forward Transconductance	V_{DS}=20V, I_D=10A		7.2		S

Dynamic Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{DS}=600V, f=1MHz, V_{GS}=0V		308		pF
C_{oss}	Output Capacitance			32		pF
C_{rss}	Reverse Transfer Capacitance			4.2		pF
E_{oss}	C_{oss} Stored Energy			5.3		μJ
$R_{G(int)}$	Internal Gate Resistance	f=1MHz		3.9		Ω
Q_g	Total Gate Charge	V_{DS}=400V, I_D=10A, V_{GS}=-4V/18V		14		nC
Q_{gs}	Gate to Source Charge			2.8		nC
Q_{gd}	Gate to Drain Charge			6.4		nC

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	V_{DD}=400V, I_D=10A, V_{GS}=-4V/18V, $R_{G(ext)}$=2.5Ω, L=200μH, T_j=25°C		6		ns
t_r	Rise Time			9		ns
$t_{d(off)}$	Turn-Off Delay Time			8		ns
t_f	Fall Time			11		ns
E_{on}	Turn-On Energy			27		μJ
E_{off}	Turn-Off Energy			6		μJ

Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode Forward Voltage	V_{GS}=-4V, I_{SD}=5A T_j=25°C T_j=175°C		 4.0 3.7		V
I_S	Continuous Diode Forward Current	V_{GS}=-4V T_c=25°C T_c=100°C		 15 8		A

Reverse Diode Characteristics (Continued)

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
t_{rr}	Reverse Recovery Time	V_{GS}=-4V, I_{SD}=5A, V_R=400V, di/dt=1400A/μs, T_j=25°C		12		ns
Q_{rr}	Reverse Recovery Charge			62		nC
I_{rrm}	Peak Reverse Recovery Current			5		A

Typical Performance

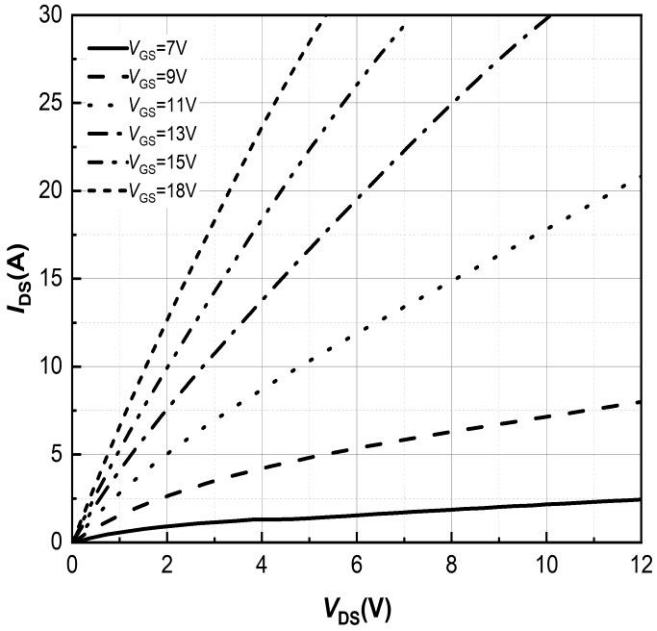


Figure 1. **Output Characteristics T_j=25°C**

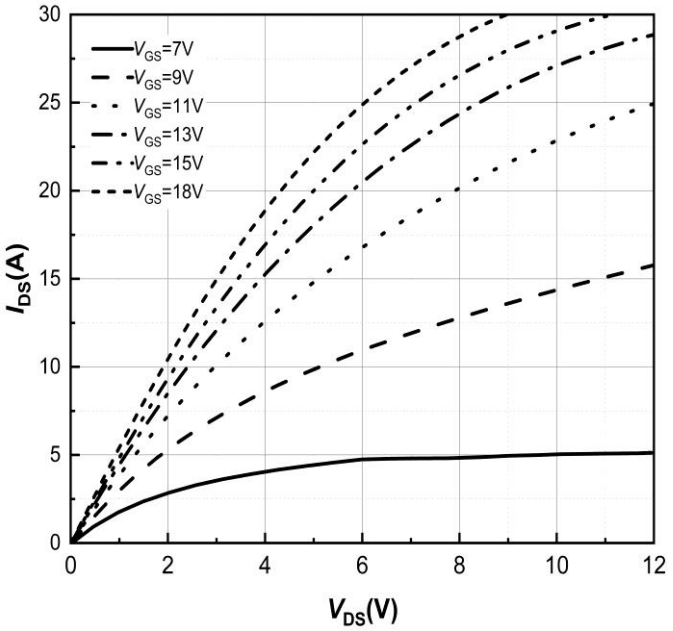


Figure 2. **Output Characteristics T_j=175°C**

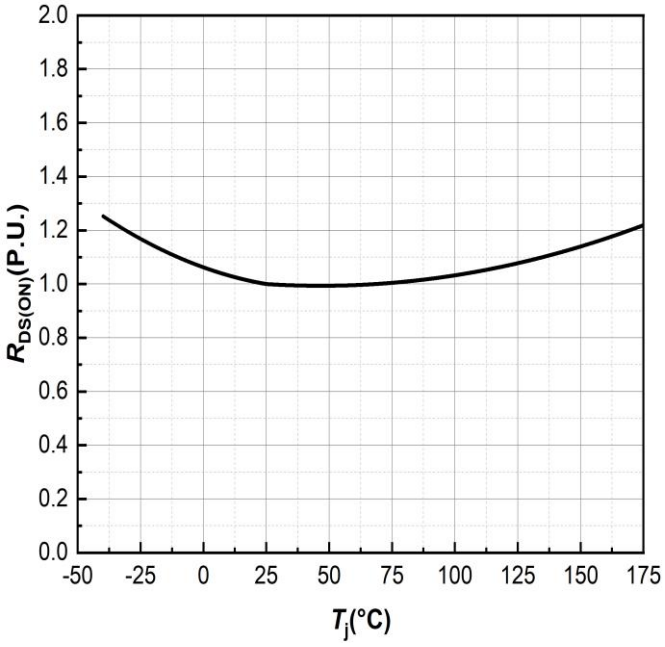


Figure 3. **Normalized On-Resistance vs. Temperature**

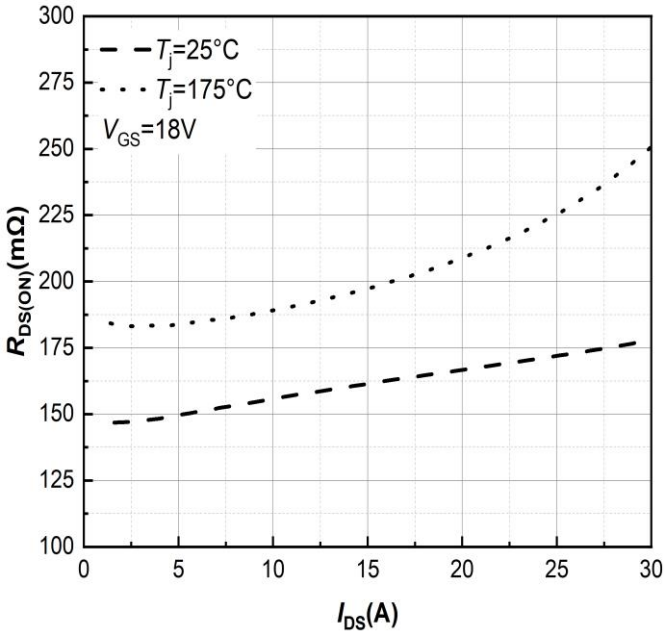


Figure 4. **On-Resistance vs. Drain Current For Various Temperatures**

Typical Performance

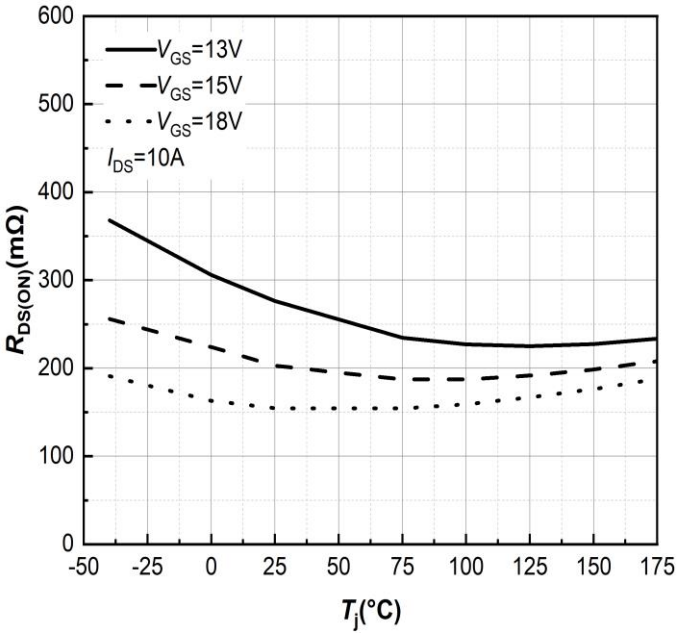


Figure 5. **On-Resistance vs. Temperature For Various Gate Voltage**

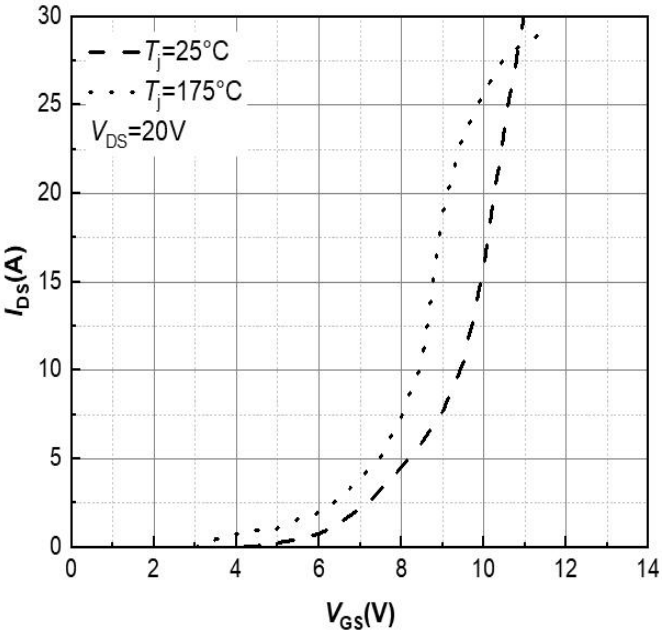


Figure 6. **Transfer Characteristic for Various Junction Temperatures**

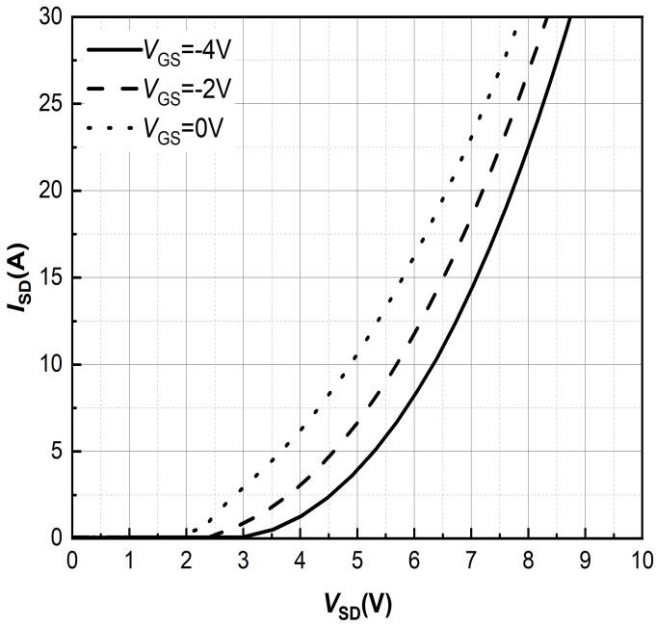


Figure 7. **Body Diode Characteristic T_j=25°C**

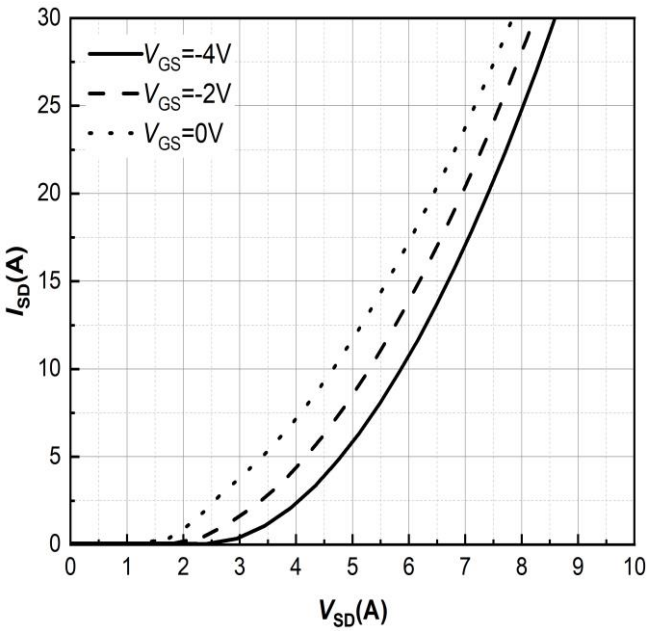


Figure 8. **Body Diode Characteristic T_j=175°C**

Typical Performance

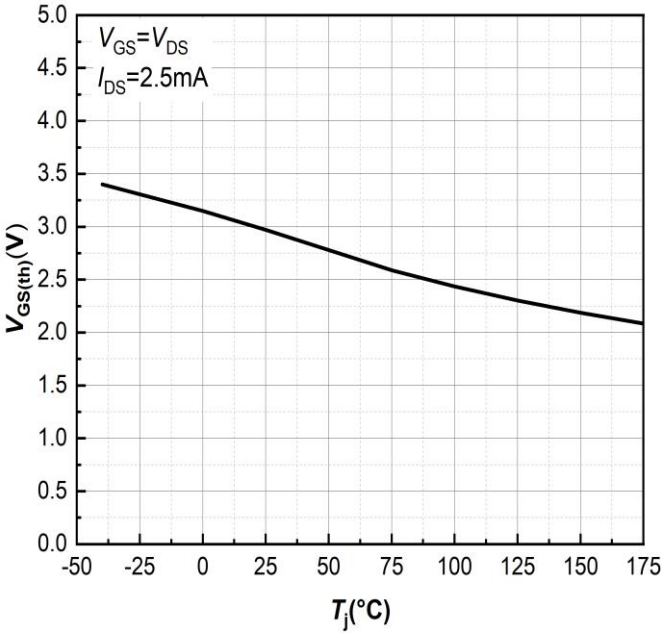


Figure 9. **Threshold Voltage vs. Temperature**

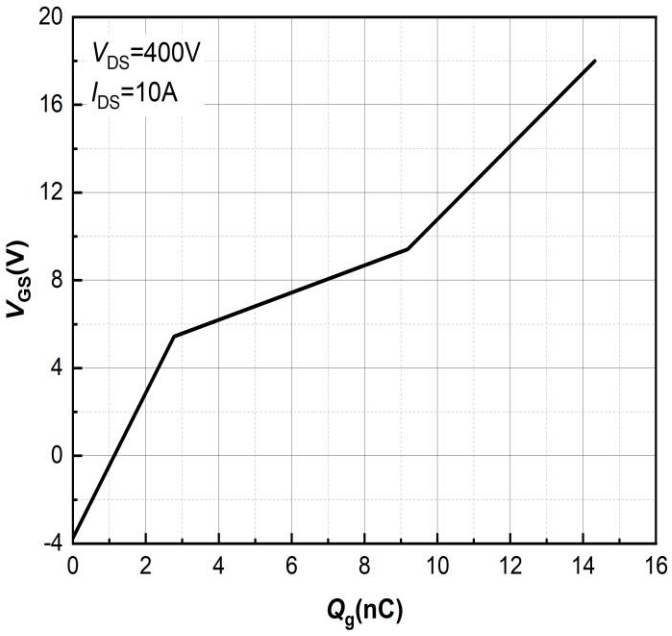


Figure 10. **Gate Charge Characteristics**

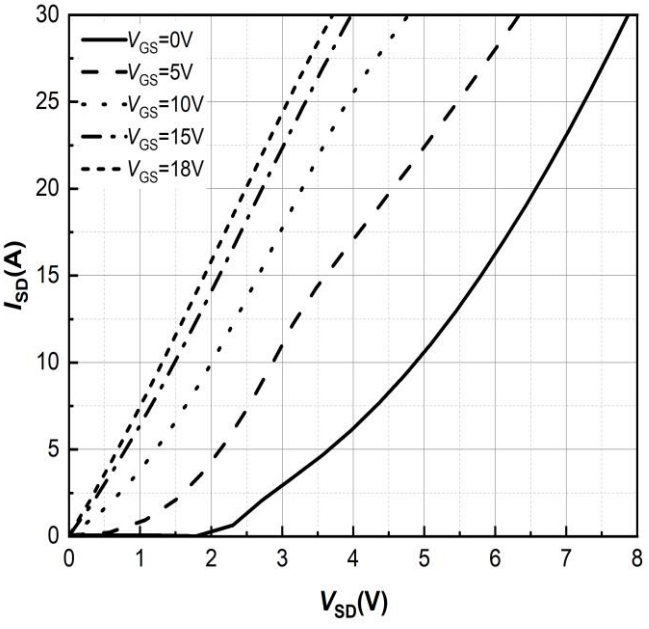


Figure 11. **3rd Quadrant Characteristic T_j=25°C**

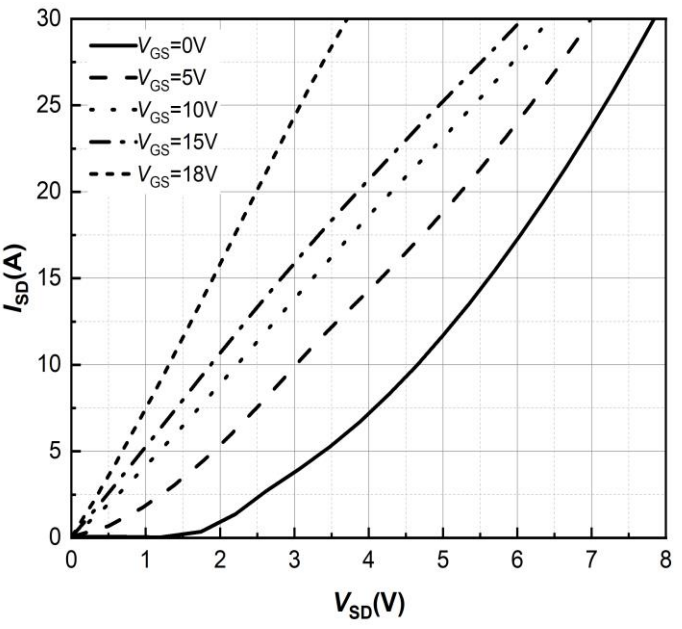


Figure 12. **3rd Quadrant Characteristic T_j=175°C**

Typical Performance

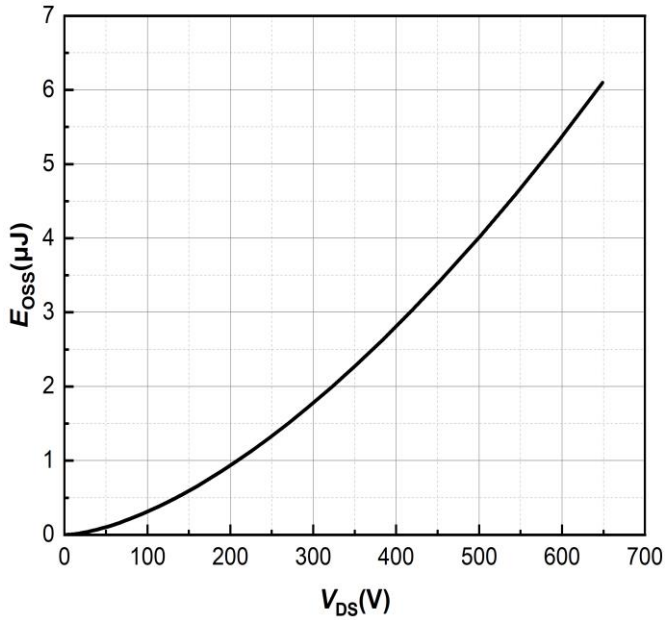


Figure 12. **Output Capacitor Stored Energy**

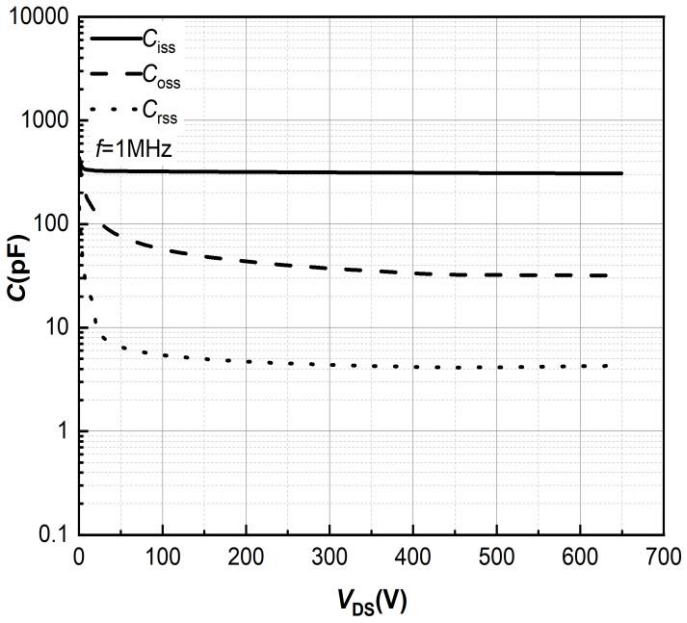


Figure 14. **Capacitances vs. Drain-Source**

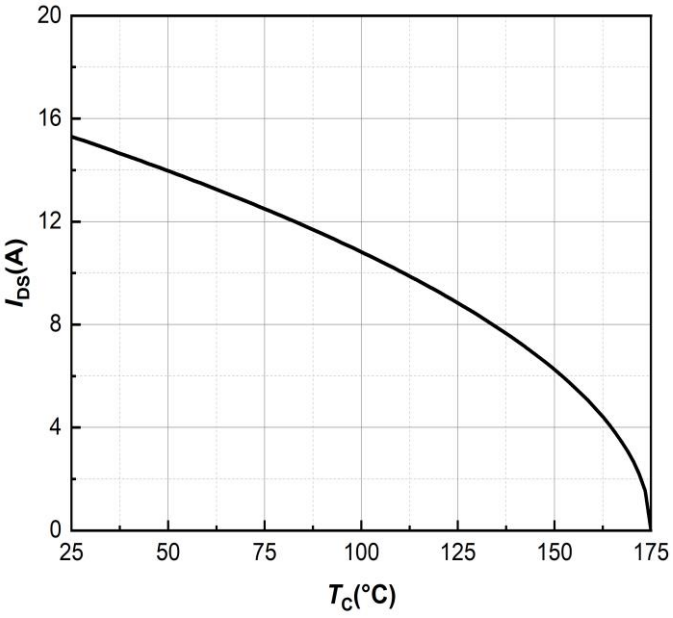


Figure 15. **Continuous Drain Current Derating vs. Case Temperature**

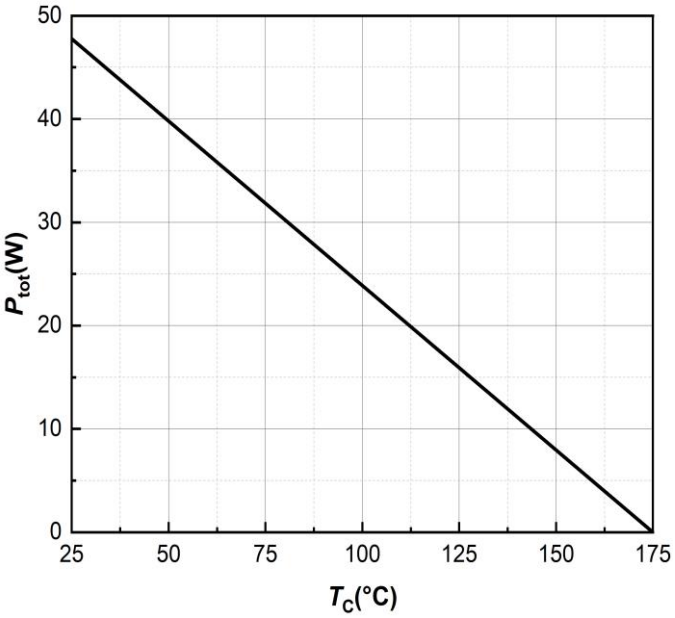


Figure 16. **Maximum Power Dissipation Derating vs. Case Temperature**

Typical Performance

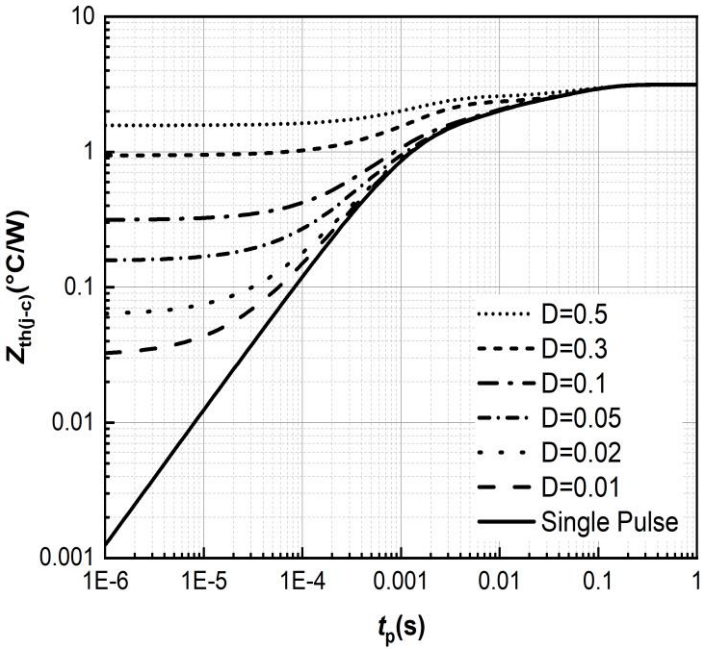


Figure 17. **Transient Thermal Impedance**

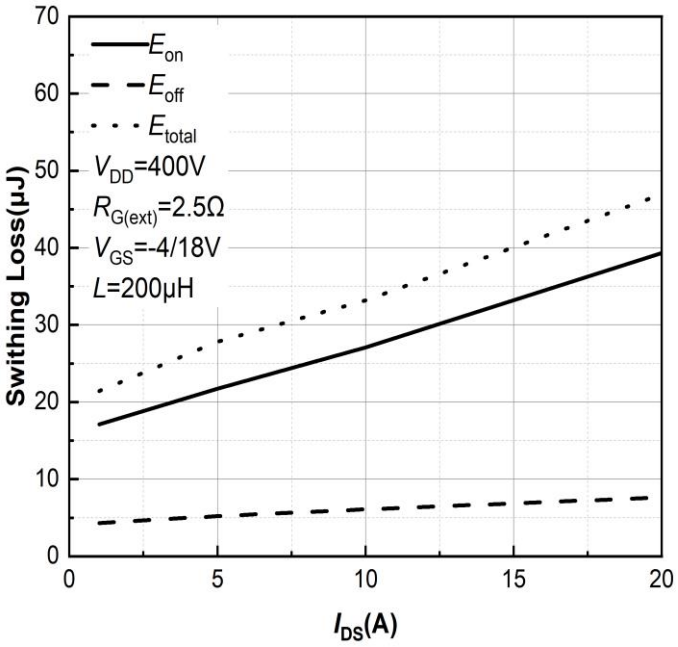


Figure 18. **Clamped Inductive Switching Energy vs. Drain Current**
T_j=25°C

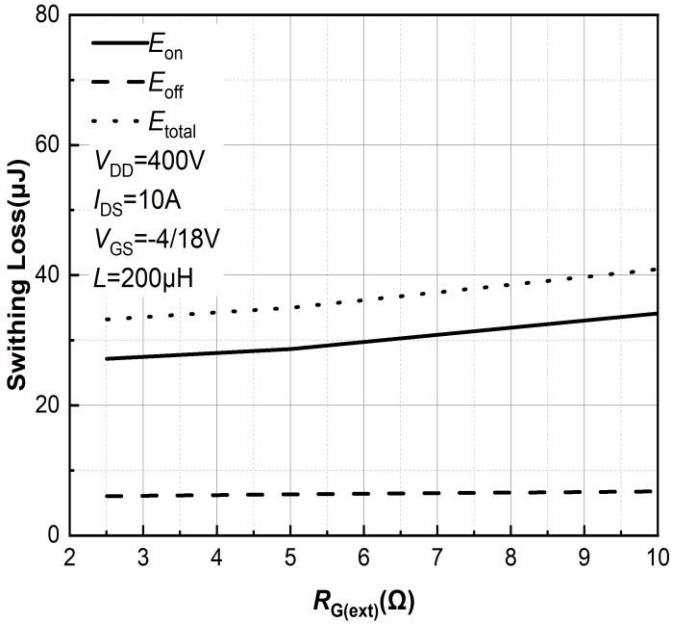


Figure 19. **Clamped Inductive Switching Energy vs. $R_{G(ext)}$**
T_j=25°C

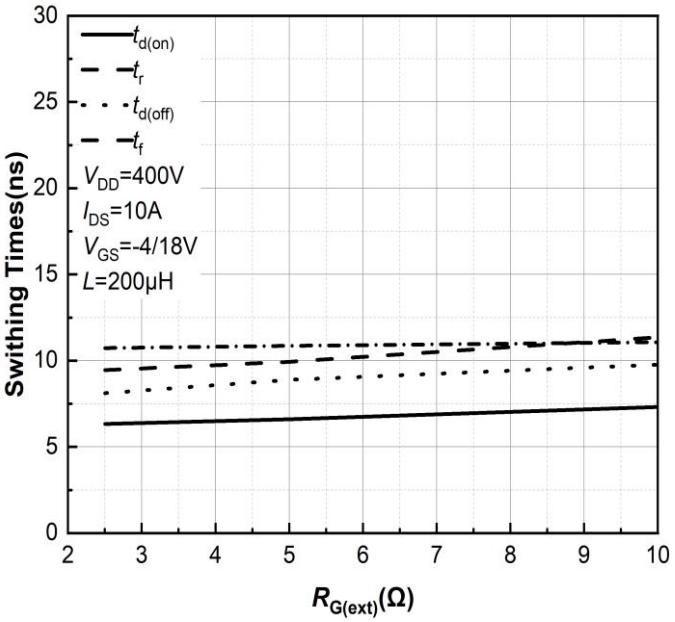


Figure 20. **Switching Times vs. $R_{G(ext)}$**
T_j=25°

Typical Performance

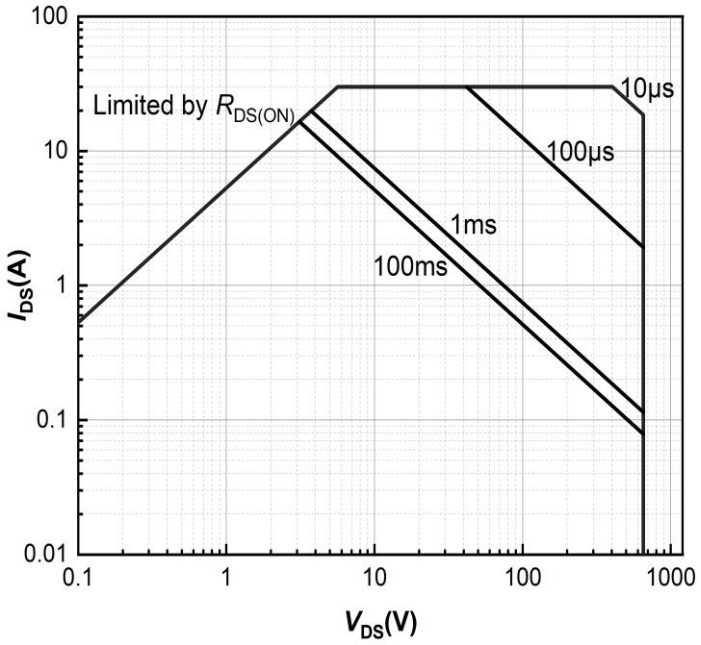
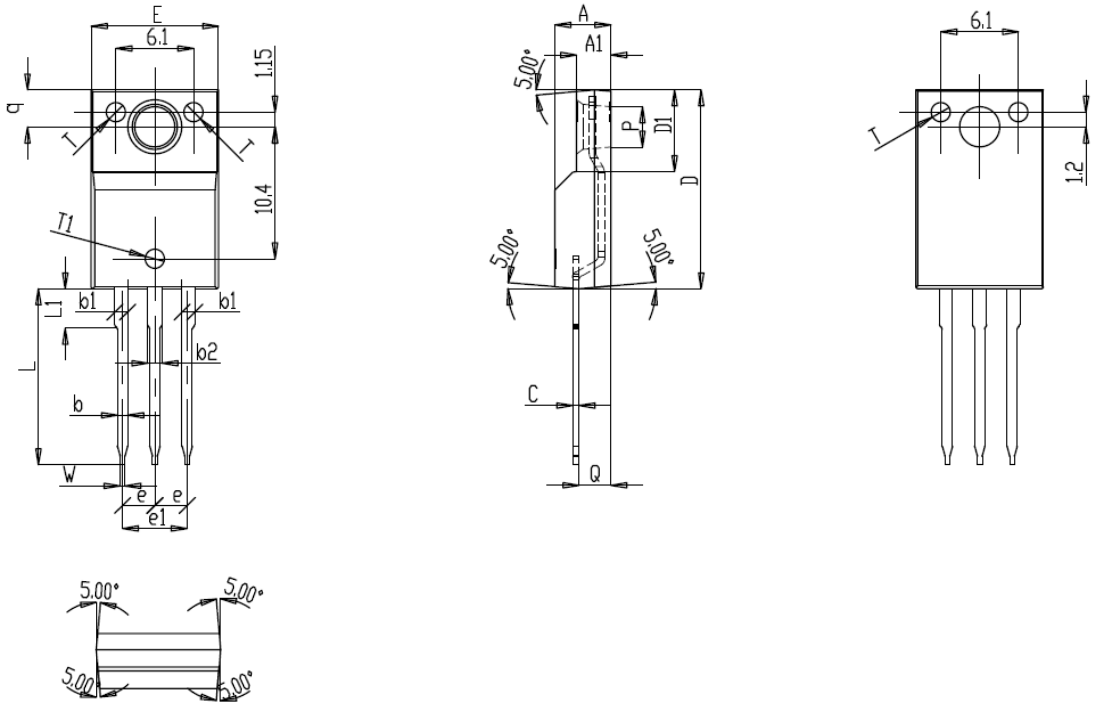


Figure 21. **Safe Operating Area**

Package Outlines



SYMBOL	Unit(mm)		
	MIN	NOM	MAX
A	4.2	4.4	4.6
A1	2.5	2.7	2.9
b	0.7	0.8	0.9
b1	0.9	1.07	1.3
b2	1	1.17	1.4
C	0.4	0.5	0.6
D	15.4	15.63	15.8
D1	6	6.22	6.4
E	9.7	10.06	10.3
e	2.5	2.54	2.58
e1	5	5.08	5.12
L	13.5	13.90	14.4
L1	2.8	3.12	3.3
P	3	3.14	3.20
Q	2.3	2.44	2.6
q	2.6	2.87	3
W	0.3	0.37	0.5
T	1.3	1.52	1.7
T1	1.1	1.20	1.3