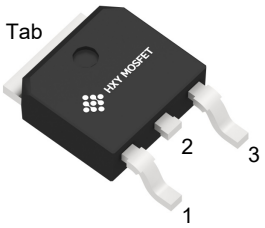
MSJU11N65A-TP

SiC Power MOSFET N-Channel Enhancement Mode

Features

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



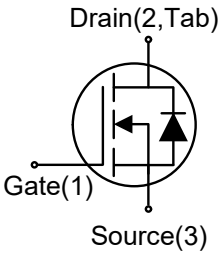
TO-252-2L

Benefits

- Increased Power Density
- Faster Operating Freequency
- 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



Ordering Part Number	Package	Brand
MSJU11N65A-TP	TO-252-2L	HXY MOSFET

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	650	V	V_{GS} = 0 V, I_D = 100 μA	
V_{GSmax}	Gate - Source Voltage (dynamic)	-8/+22	V	AC (f >1 Hz)	Note 1
V_{GSop}	Gate - Source Voltage (static)	-4/+18	V	Static	Note 2
I_D	Continuous Drain Current	13	A	T_C = 25°C	Fig. 19 Note 3
		9.2		T_C = 100°C	
$I_{D(pulse)}$	Pulsed Drain Current	24	A	Pulse width t_P limited by T_{jmax}	
P_D	Power Dissipation	57	W	T_C = 25°C	Fig. 20
		28.5		T_C = 100°C	
T_J , T_{stg}	Operating Junction and Storage Temperature	-40 to +175	°C		

Electrical Characteristics (T_C = 25°C unless otherwise specified)

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		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=1.33mA T_j=25°C T_j=175°C	2	3.1 2.3	4	V
$R_{DS(on)}$	Drain-Source On-State Resistance	V_{GS}=18V, I_D=4.5A T_j=25°C T_j=175°C		270 298		mΩ

Thermal Characteristics

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance from Junction to Case		2.63		°C/W

Dynamic Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{DS}=600V, f=1MHz, V_{GS}=0V		203		pF
C_{oss}	Output Capacitance			26		pF
C_{rss}	Reverse Transfer Capacitance			3.5		pF
$R_{G(int)}$	Internal Gate Resistance	f=1MHz		3.6		Ω
Q_g	Total Gate Charge	V_{DS}=400V, I_D=4.5A, V_{GS}=-4/18V		11.2		nC
Q_{gs}	Gate to Source Charge			2		nC
Q_{gd}	Gate to Drain Charge			5.2		nC

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	V_{DD}=400V, I_D=4.5A, V_{GS}=-4V/18V, R_G=2.5Ω, L=200μH		5		ns
t_r	Rise Time			23		ns
$t_{d(off)}$	Turn-Off Delay Time			6		ns
t_f	Fall Time			8		ns
E_{on}	Turn-On Energy			34		μJ
E_{off}	Turn-Off Energy			4		μJ

Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode Forward Voltage	V_{GS}=-4V, I_{SD}=2.5A T_j=25°C T_j=175°C V_{GS}=-4V, I_{SD}=4.5A T_j=25℃ T_j=175℃		 4.0 3.6 4.5 4.0		V
I_S	Continuous Diode Forward Current	V_{GS}=-4V T_c=25°C T_c=100°C		 13 6.5		A
t_{rr}	Reverse Recovery Time	V_{GS}=-4V, I_{SD}=4.5A, V_R=400V, di/dt=1000A/μs		22		ns
Q_{rr}	Reverse Recovery Charge			68		nC
I_{rrm}	Peak Reverse Recovery Current			4		A

Typical Performance

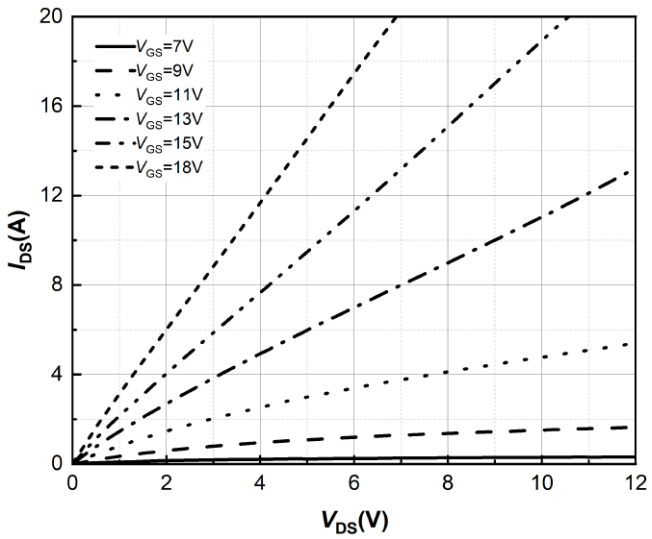


Figure 1. **Output Characteristics T_j=-40°C**

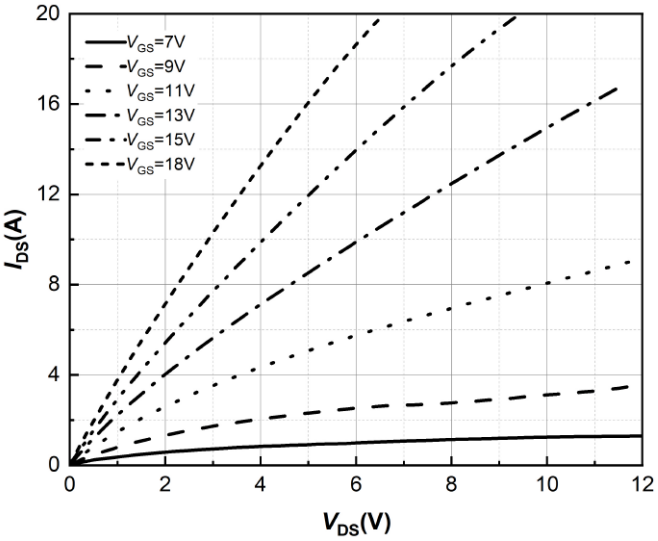


Figure 2 **Output Characteristics**

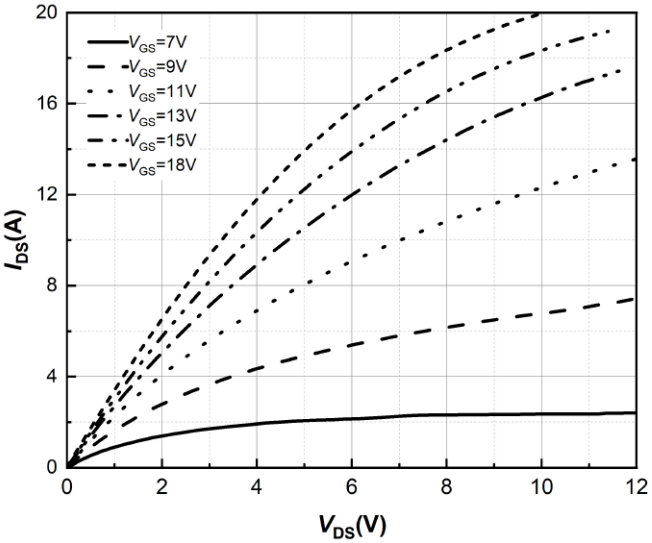


Figure 3. **Output Characteristics T_j=175°C**

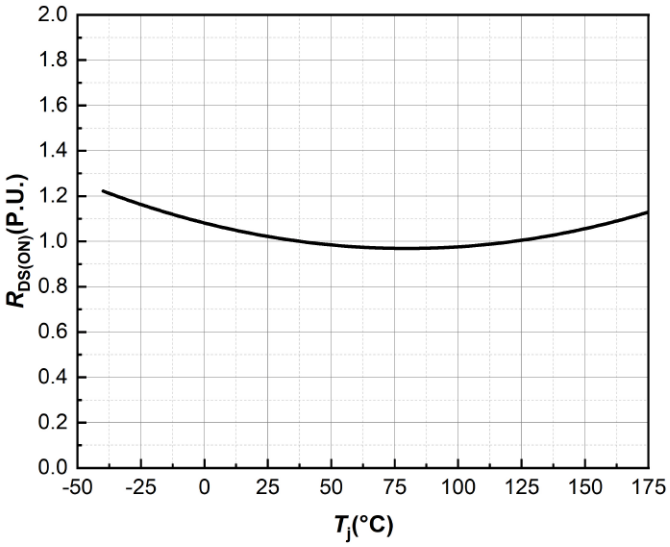


Figure 4. **Normalized On-Resistance vs. Temperature**

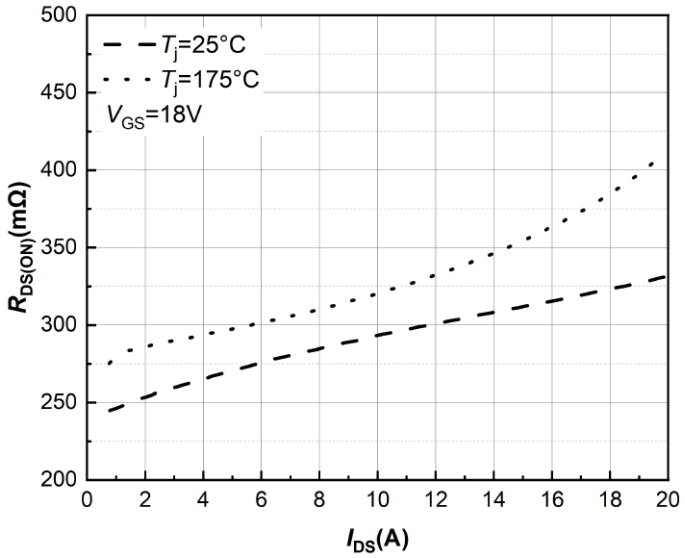


Figure 5. **On-Resistance vs. Drain Current For Various Temperatures**

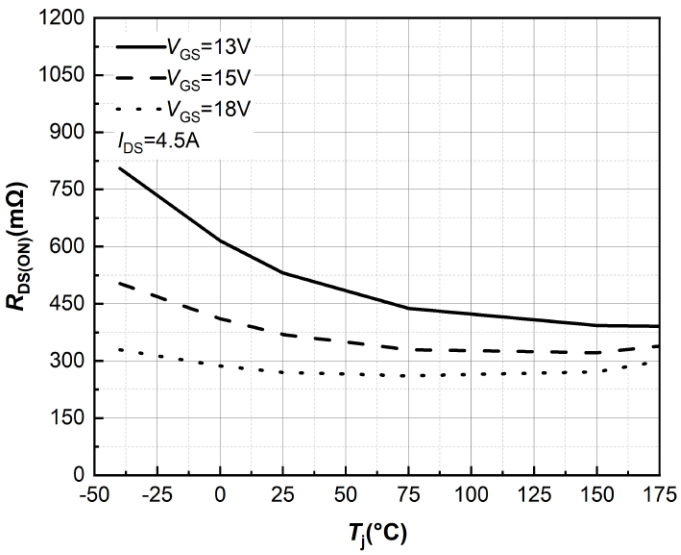


Figure 6. **On-Resistance vs. Temperature For Various Gate Voltage**

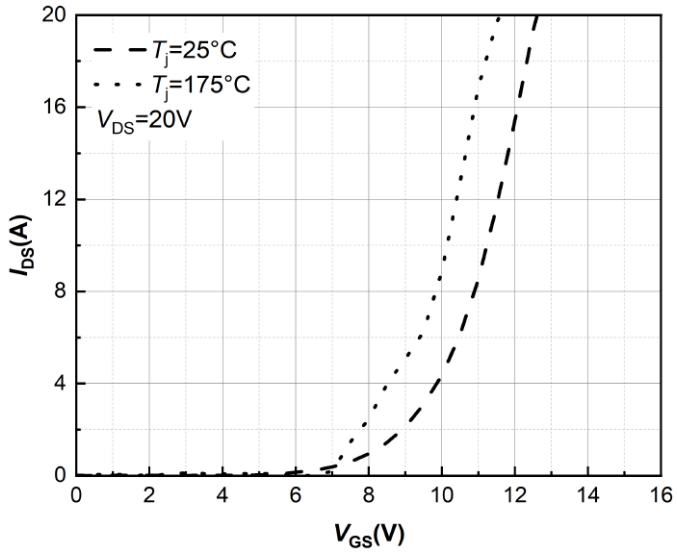


Figure 7. **Transfer Characteristic for Various Junction Temperatures**

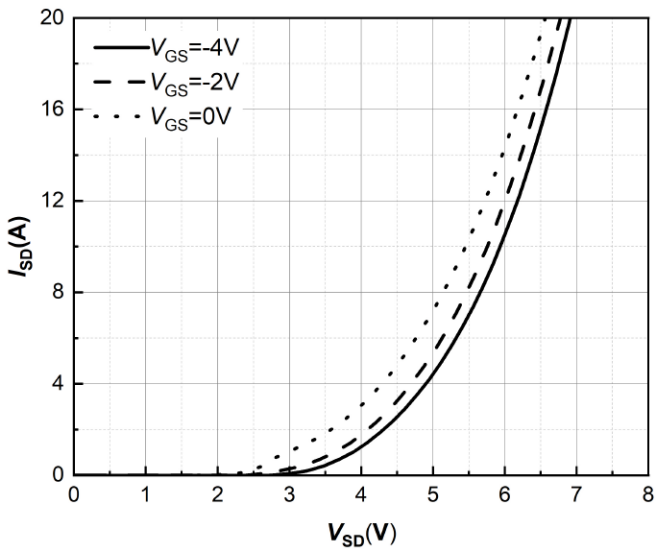


Figure 8. **Body Diode Characteristic T_j=-40°C**

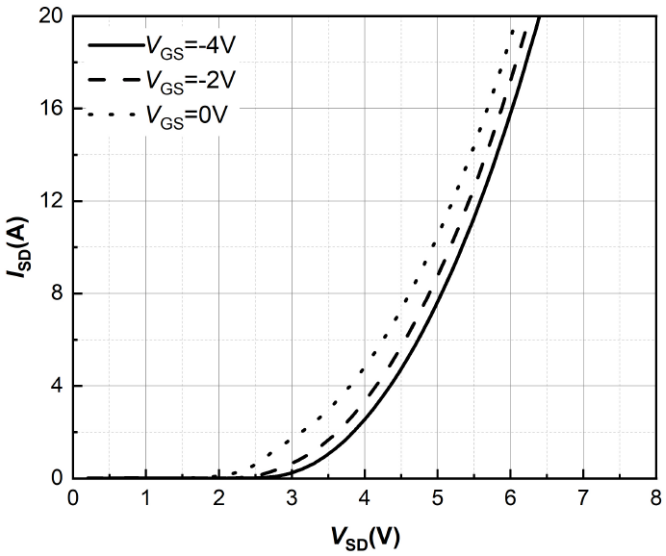


Figure 9. **Body Diode Characteristic T_j=25°C**

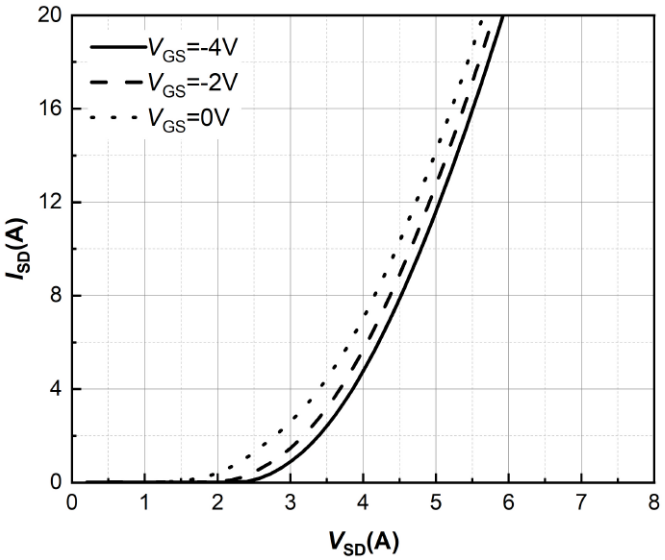


Figure 10. **Body Diode Characteristic T_j=175°C**

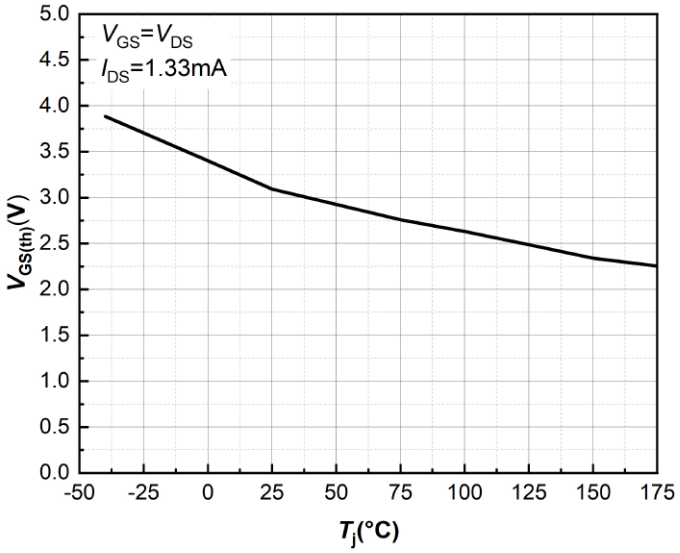


Figure 11. **Threshold Voltage vs. Temperature**

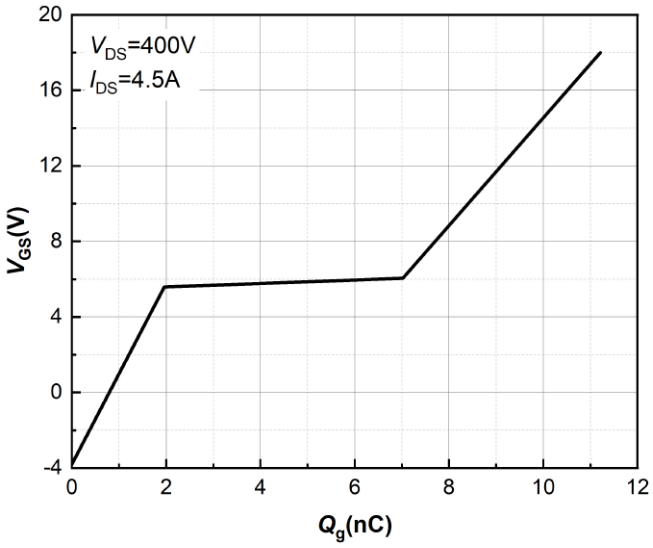


Figure 12. **Gate Charge Characteristics**

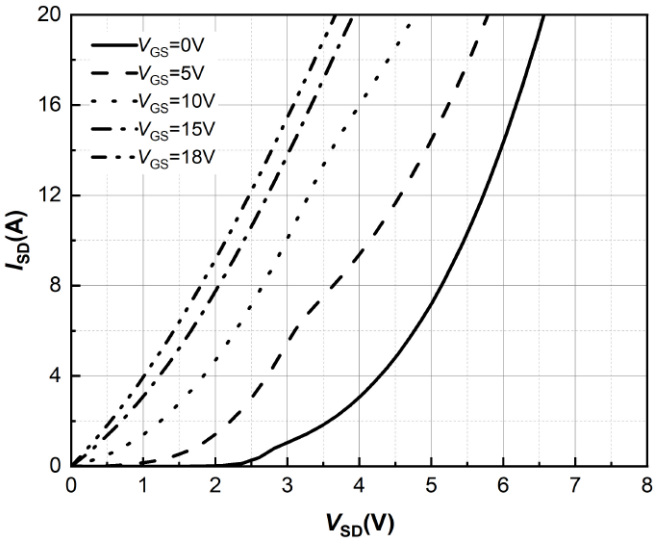


Figure 13. **3rd Quadrant Characteristic T_j=-40°C**

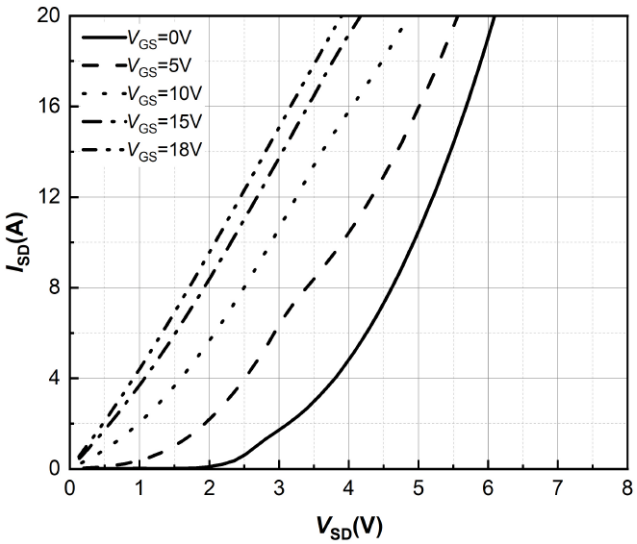


Figure 14. **3rd Quadrant Characteristic T_j=25°C**

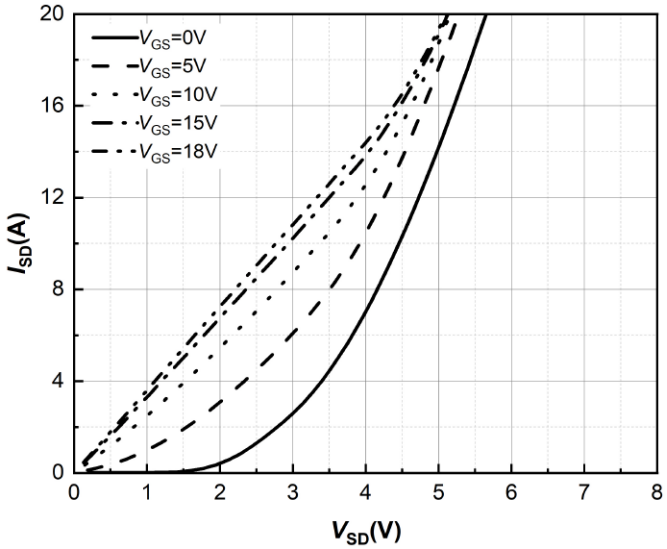


Figure 15. **3rd Quadrant Characteristic T_j=175°C**

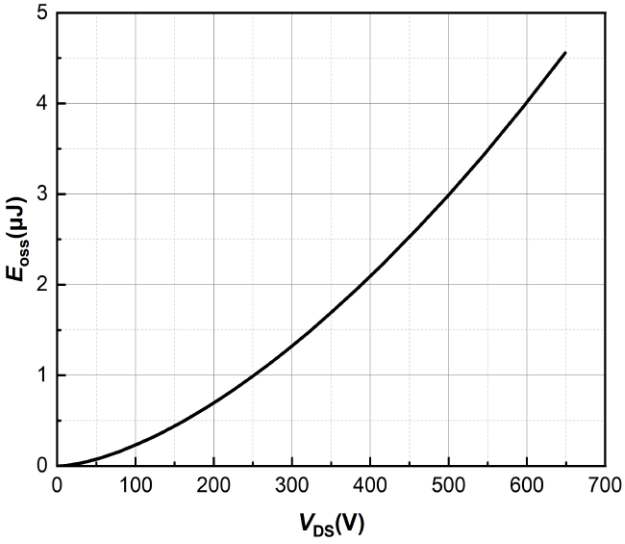


Figure 16. **Output Capacitor Stored Energy**

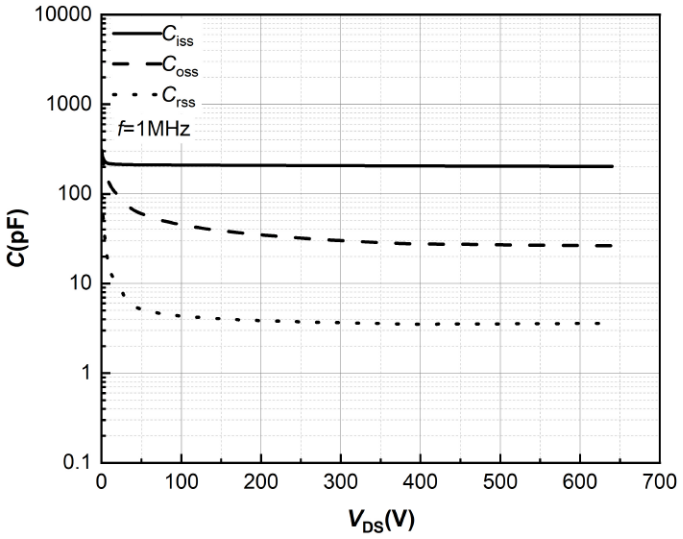


Figure 17. **Capacitances vs. Drain-Source**

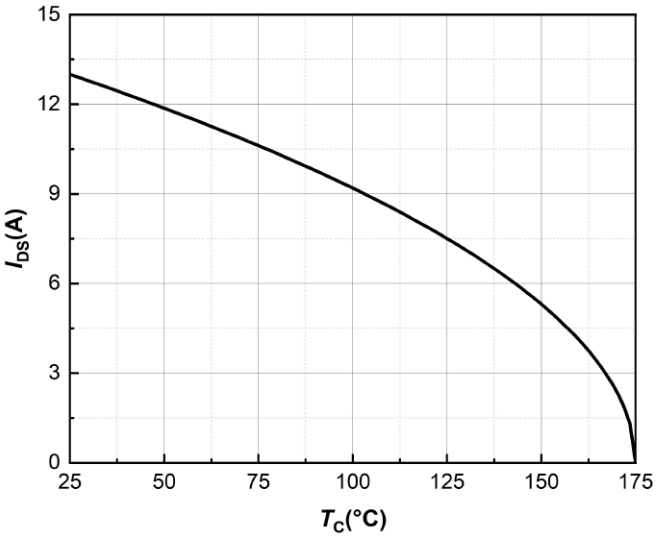


Figure 18. **Continuous Drain Current Derating vs. Case Temperature**

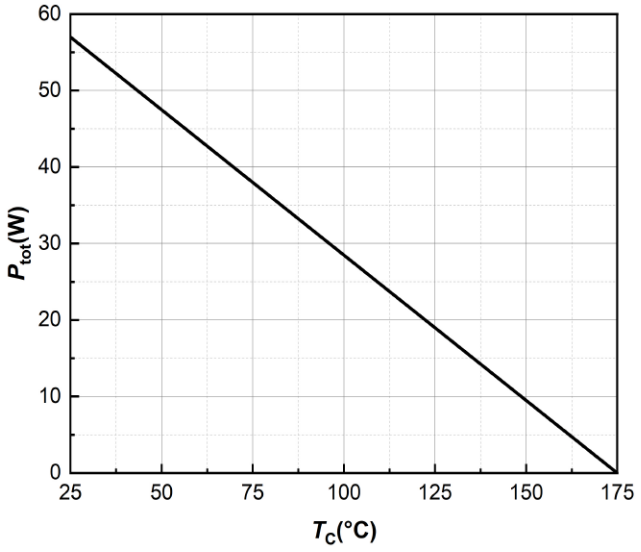


Figure 19. **Maximum Power Dissipation Derating vs. Case Temperature**

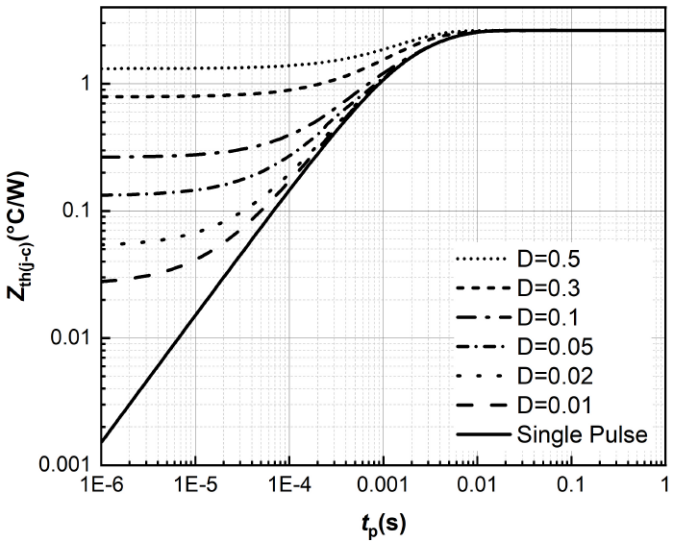


Figure 20. **Transient Thermal Impedance**

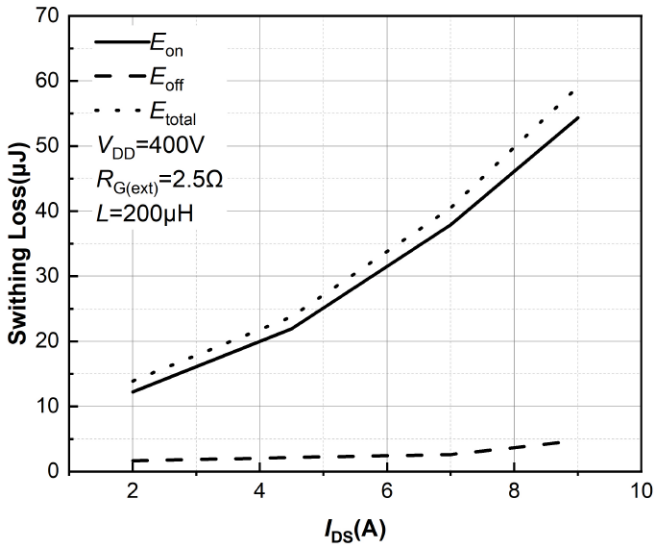


Figure 21. **Clamped Inductive Switching Energy vs. Drain Current**

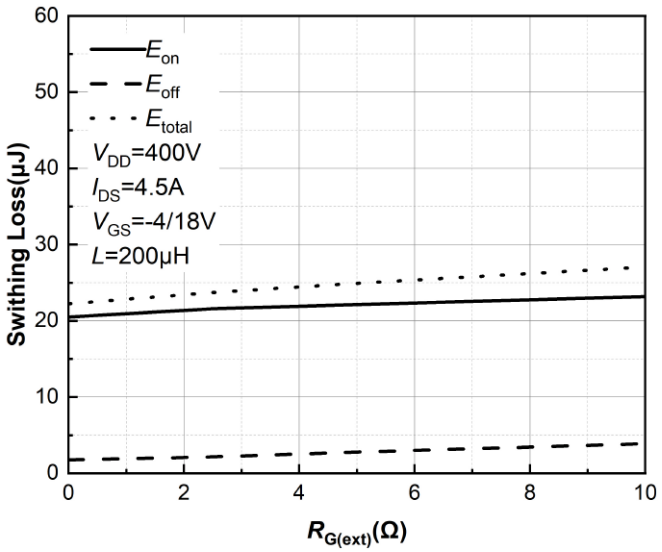


Figure 22. **Clamped Inductive Switching Energy vs. R_G**

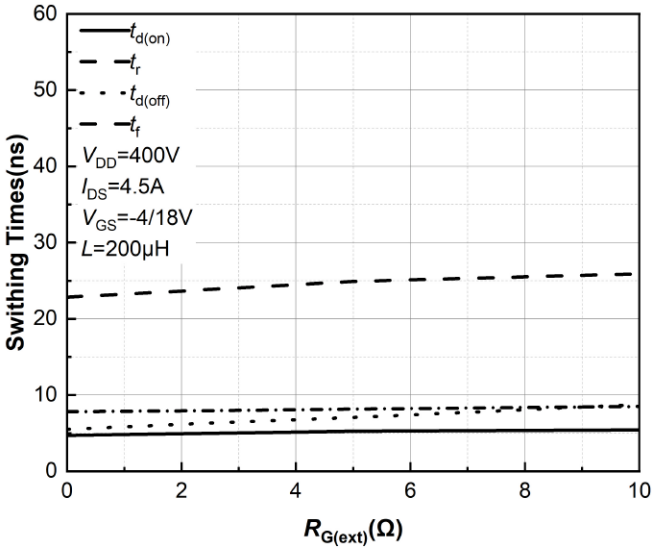


Figure 23. **Switching Times vs. R_G**

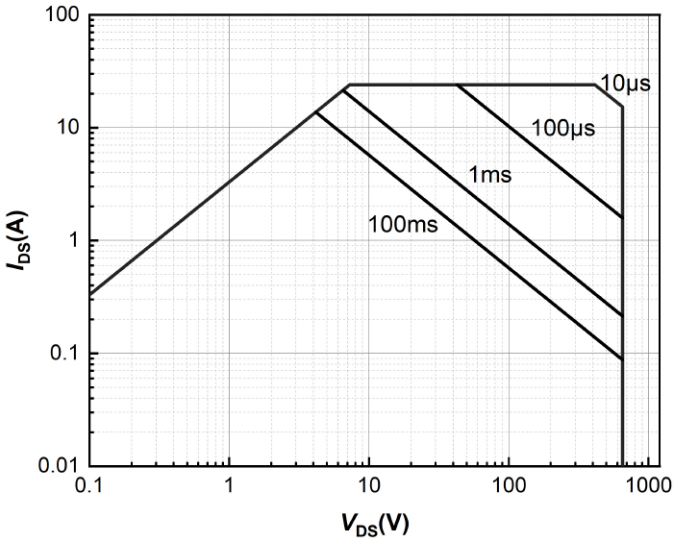
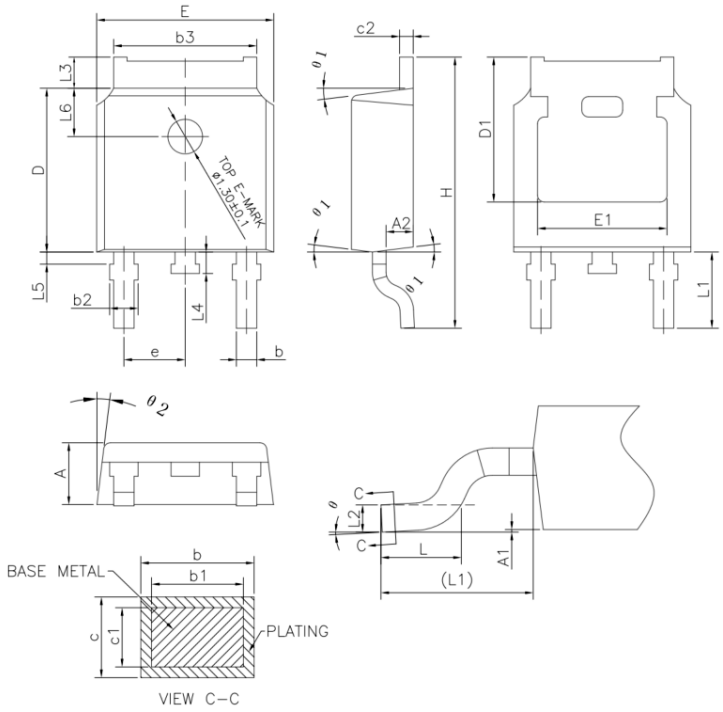


Figure 24. **Safe Operating Area**

Package Dimensions

Package TO-252-2L



SYMBOL	Unit: mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0	-	0.10
A2	0.90	1.01	1.10
b	0.72	-	0.85
b1	0.71	0.76	0.81
b2	0.72	-	0.90
b3	5.13	5.33	5.46
c	0.47	-	0.60
c1	0.46	0.51	0.56
c2	0.47	-	0.60
D	6.00	6.10	6.20
D1	5.25	-	-
E	6.50	6.60	6.70
E1	4.70	-	-
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.508 BSC		
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5	0.15	-	0.75
L6	1.80 REF		
θ	0°	-	8°
θ1	5°	7°	9°
θ2	5°	7°	9°

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