中电国基南方集团有限公司

WM3A040065Y

N-Channel SiC Power MOSFET

G3 MOSFET Technology

V_{DS}	=	650	V
$R_{DS(on)}$	=	40	mΩ
I_D@25℃	=	52	A

Features

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

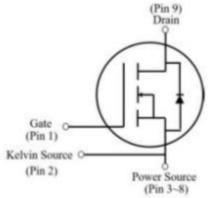
Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

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

Package



RoHS

Part Number	Package	Marking
WM3A040065Y	TOLL	WM3A040065Y

Maximum Ratings (T_C=25℃ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	650	V	V_{GS}=0V, I_D=100μA	
V_{GSmax}	Gate-Source Voltage	-10/+23	V	Absolute maximum values	
V_{GSop}	Gate-Source Voltage	-5/+18	V	Recommended operational values	
I_D	Continuous Drain Current	52	A	V_{GS}=18V, T_c=25℃	Fig.19
		37		V_{GS}=18V, T_c=100℃	
$I_{D(pulse)}$	Pulsed Drain Current	153	A	Pulse width t_p limited by T_{Jmax}	Fig.22
P_D	Power Dissipation	187.5	W	T_c=25℃, T_J=175℃	Fig.20
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to +175	℃		
T_L	Solder Temperature, 1.6mm from case for 10s	260	℃		
M_d	Mounting Torque, (M3 or 6-32 screw)	1 8.8	Nm lbf-in		

Electrical Characteristics (T_C=25℃ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	650	/	/	V	V_{GS}=0V, I_D=1mA	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.9	4.0	V	V_{DS}=V_{GS}, I_D=7.5mA	Fig. 11
		/	2.1	/		V_{DS}=V_{GS}, I_D=7.5mA, T_J=175℃	
I_{DSS}	Zero Gate Voltage Drain Current	/	1	100	μA	V_{DS}=650V, V_{GS}=0V	
I_{GSS+}	Gate-Source Leakage Current	/	10	100	nA	V_{DS}=0V, V_{GS}=23V	
I_{GSS-}	Gate-Source Leakage Current	/	10	100	nA	V_{DS}=0V, V_{GS}=-10V	
$R_{DS(on)}$	Drain-Source On-State Resistance	/	40	52	mΩ	V_{GS}=18V, I_D=20A	Fig. 4,5,6
		/	48	/	mΩ	V_{GS}=18V, I_D=20A, T_J=175℃	
g_{fs}	Transconductance	/	22	/	S	V_{DS}=20V, I_{DS}=20A	Fig. 7
		/	20	/		V_{DS}=20V, I_{DS}=20A, T_J=175℃	
C_{iss}	Input Capacitance	/	1305	/	pF	V_{GS}=0V V_{DS}=400V f=1MHz	Fig. 17,18
C_{oss}	Output Capacitance	/	109	/			
C_{rss}	Reverse Transfer Capacitance	/	4.9	/			
E_{oss}	C_{oss} Stored Energy	/	9	/	μJ	V_{AC}=25mV	Fig. 16
E_{ON}	Turn-On Switching Energy	/	71	/	uJ	V_{DS}=400V, V_{GS}=-5V/18V	
E_{OFF}	Turn-Off Switching Energy	/	69	/		I_D=20A, $R_{G(ext)}$=2.5Ω, L=100μH	
$t_{d(on)}$	Turn-On Delay Time	/	6	/	ns	V_{DS}=400V, V_{GS}=-5V/18V, I_D=20A $R_{G(ext)}$=2.5Ω, R_L=20Ω	
t_r	Rise Time	/	8	/			
$t_{d(off)}$	Turn-Off Delay Time	/	15	/			
t_f	Fall Time	/	5	/			
$R_{G(int)}$	Internal Gate Resistance	/	2.0	/	Ω	f=1MHz, V_{AC}=25mV	
Q_{GS}	Gate to Source Charge	/	14	/	nC	V_{DS}=400V V_{GS}=-5V/18V I_D=20A	Fig. 12
Q_{GD}	Gate to Drain Charge	/	12	/			
Q_G	Total Gate Charge	/	40	/			

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	3.9	/	V	V_{GS}=-5V, I_{SD}=10A, T_J=25℃	Fig. 8,9,10
		3.6	/		V_{GS}=-5V, I_{SD}=10A, T_J=175℃	
I_S	Continuous Diode Forward Current	/	51	A	T_C=25℃	
t_{rr}	Reverse Recover Time	13	/	ns	V_R=400V, I_{SD}=10A	
Q_{rr}	Reverse Recovery Charge	98	/	nC		
I_{rrm}	Peak Reverse Recovery Current	5	/	A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.9	/	℃/W		Fig. 21
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	/	40			

Typical Performance

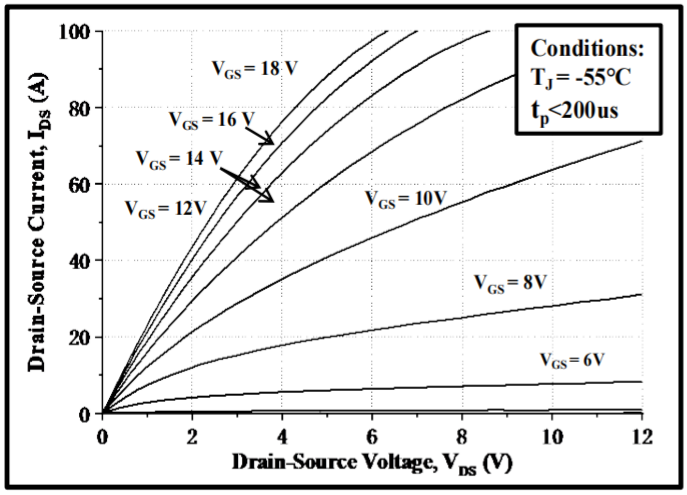


Figure 1. Output Characteristics T_J = -55℃

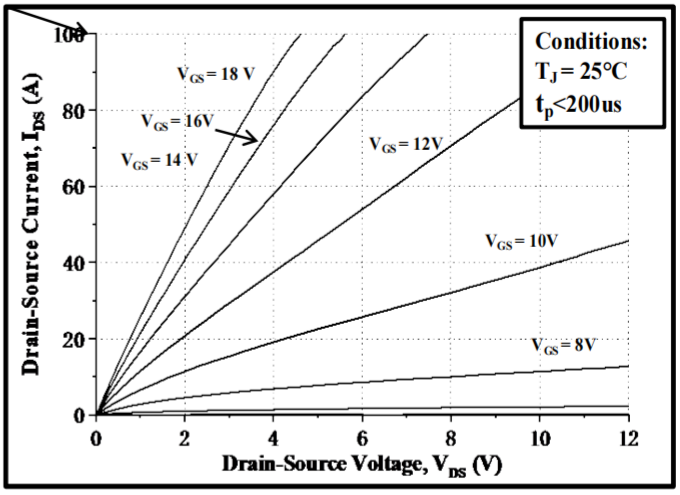


Figure 2. Output Characteristics T_J = 25℃

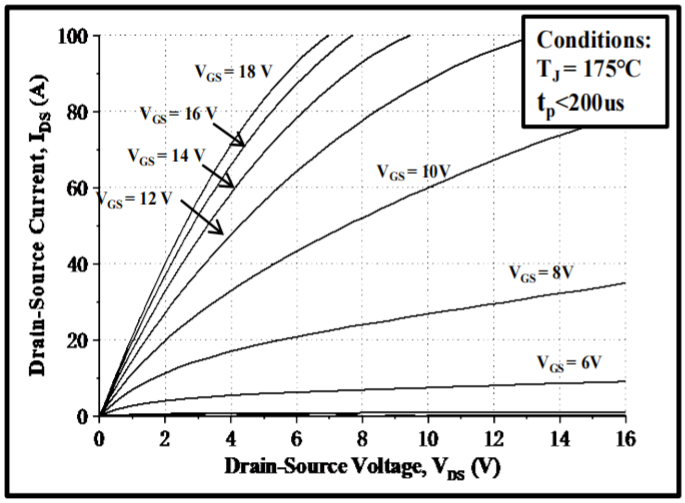


Figure 3. Output Characteristics T_J = 175℃

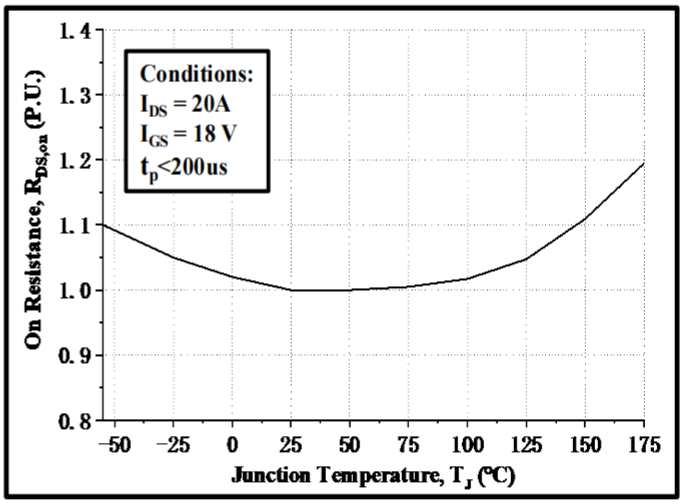


Figure 4. Normalized On-Resistance vs. Temperature

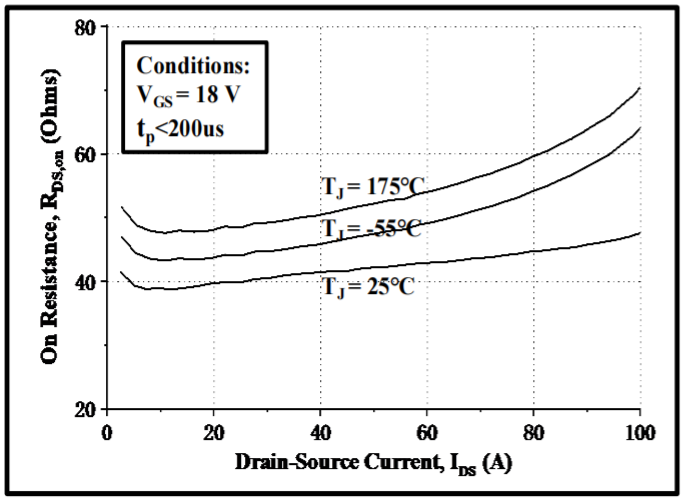


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

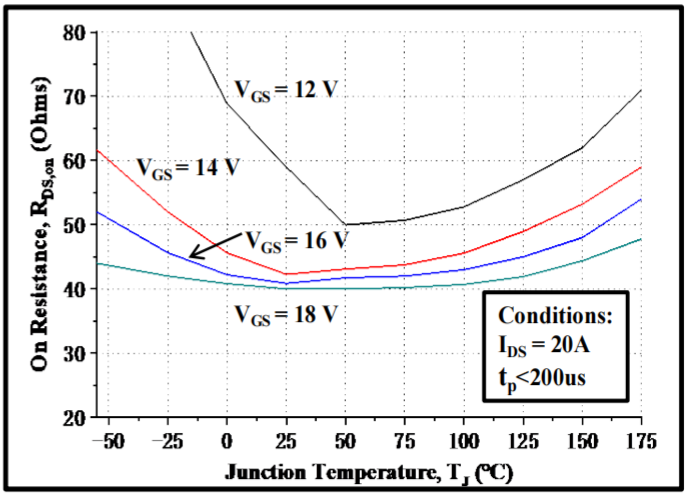


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

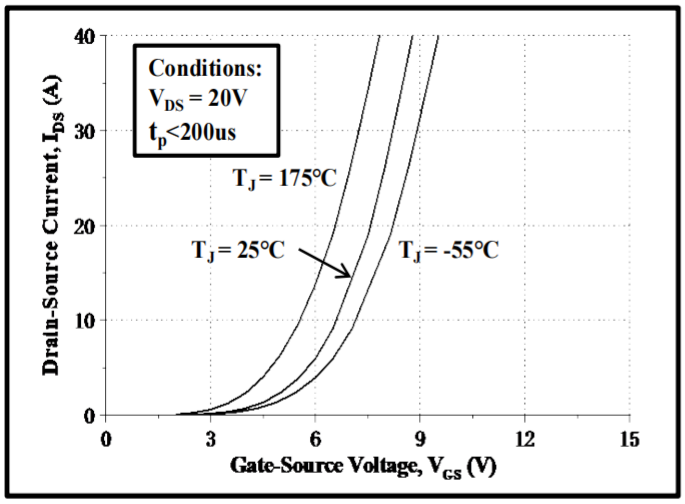


Figure 7. Transfer Characteristic for Various Junction Temperatures

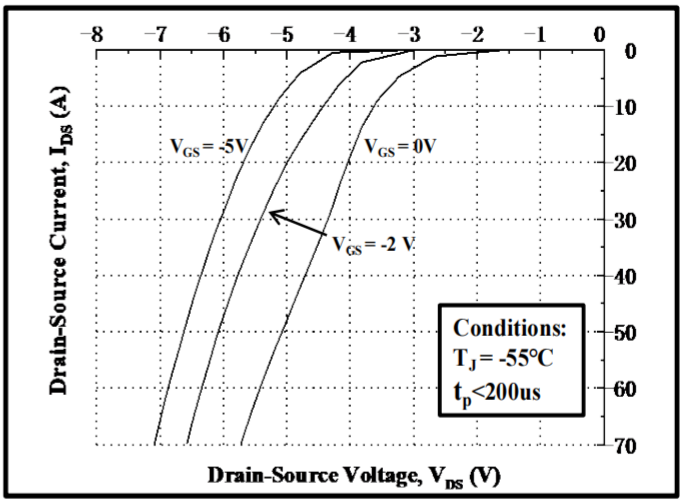


Figure 8. Body Diode Characteristic at -55℃

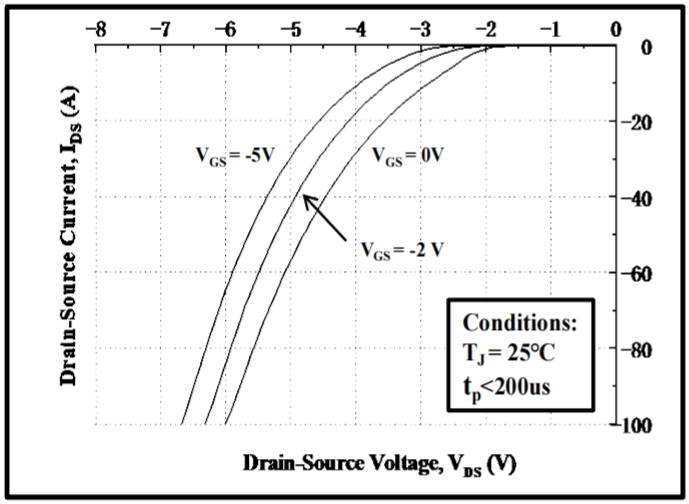


Figure 9. Body Diode Characteristic at 25℃

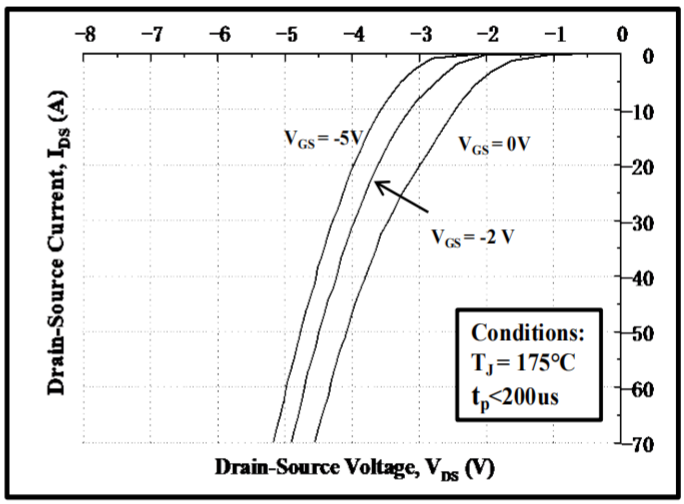


Figure 10. Body Diode Characteristic at 175℃

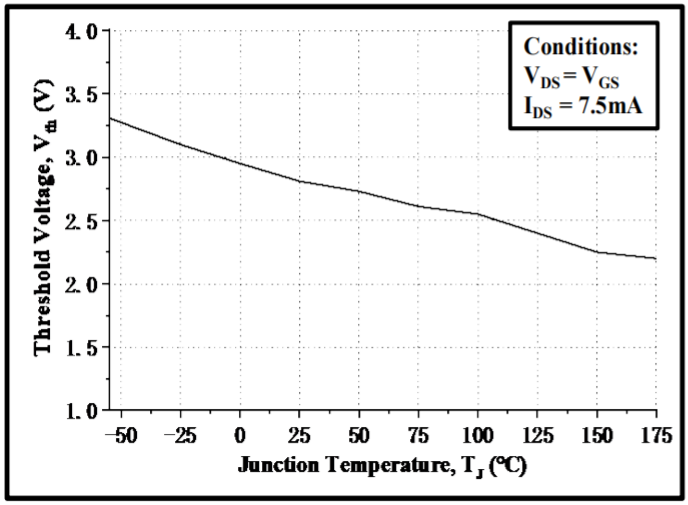


Figure 11. Threshold Voltage vs. Temperature

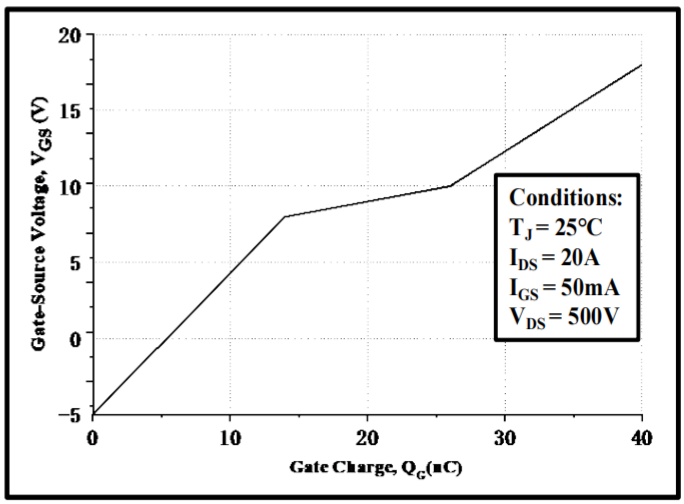


Figure 12. Gate Charge Characteristics

Typical Performance

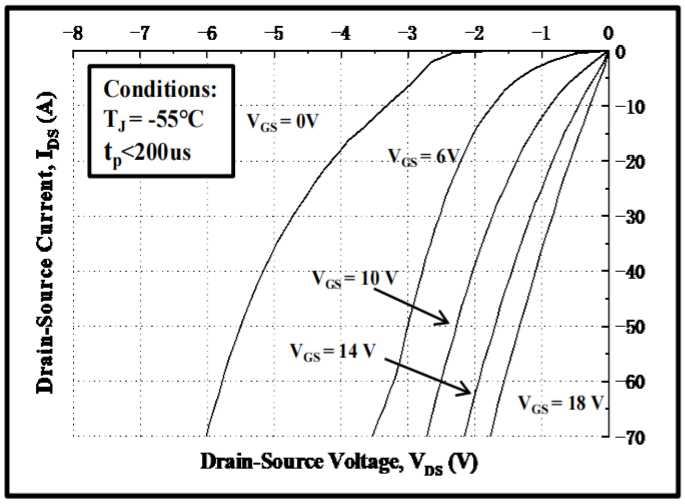


Figure 13. 3rd Quadrant Characteristic at -55℃

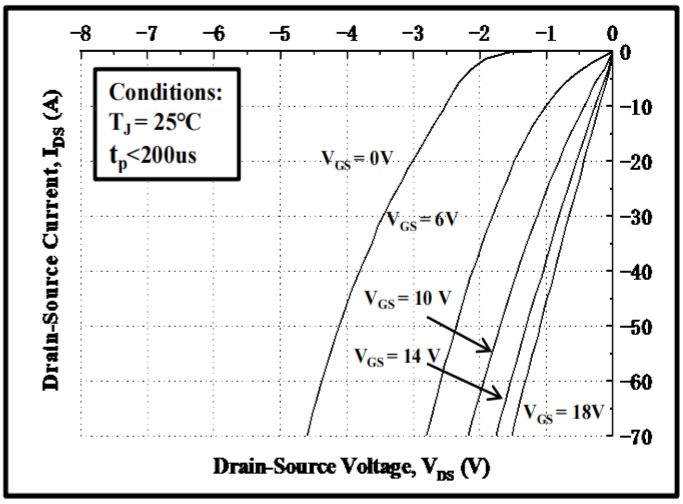


Figure 14. 3rd Quadrant Characteristic at 25℃

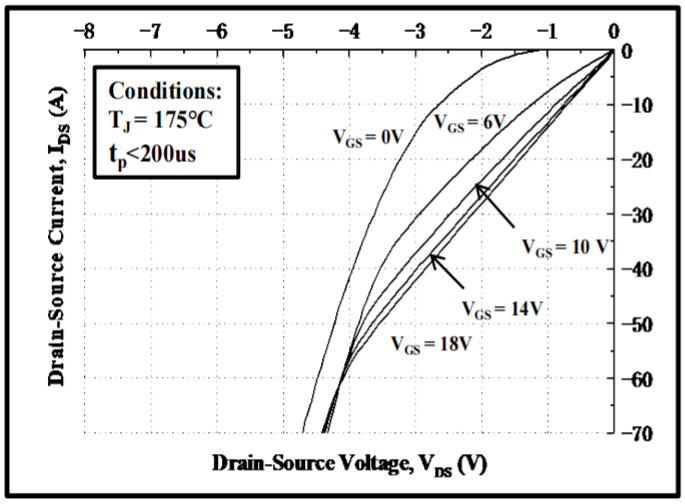


Figure 15. 3rd Quadrant Characteristic at 175 ℃

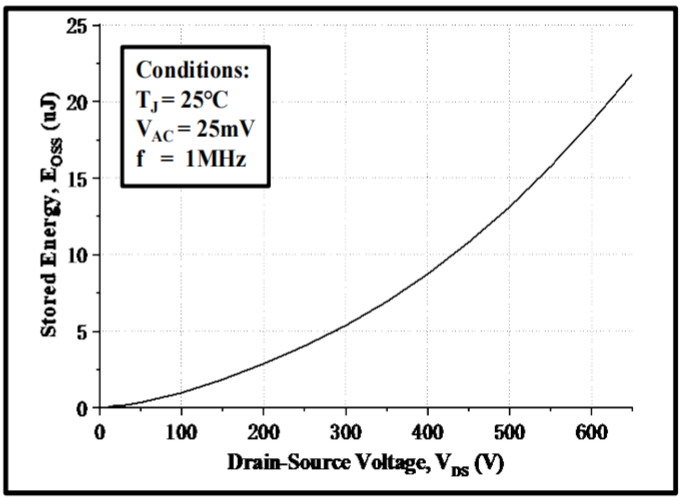


Figure16. Output Capacitor Stored Energy

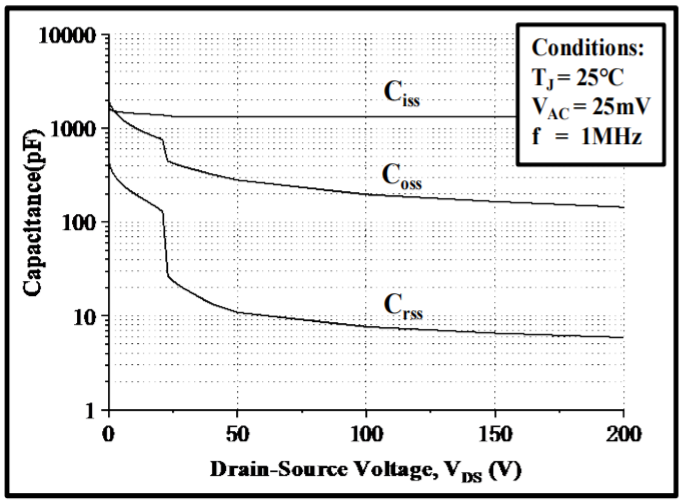


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

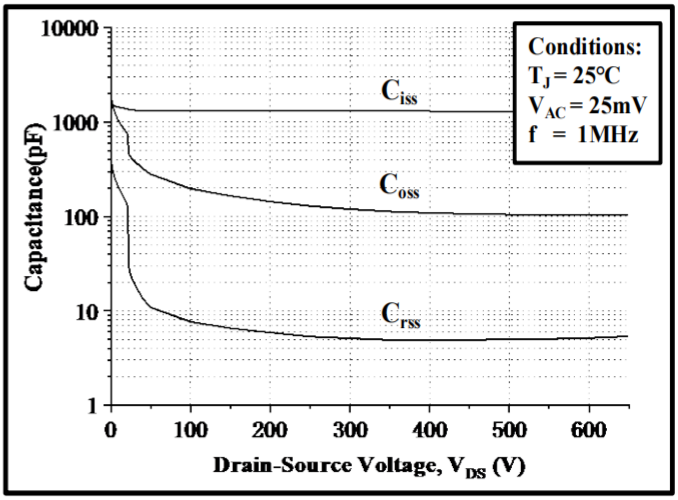


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 650V)

Typical Performance

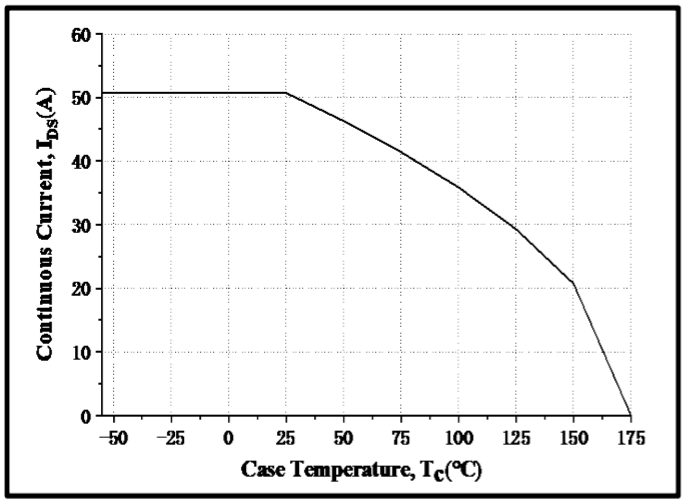


Figure 19. Continuous Drain Current Derating vs. Case Temperature

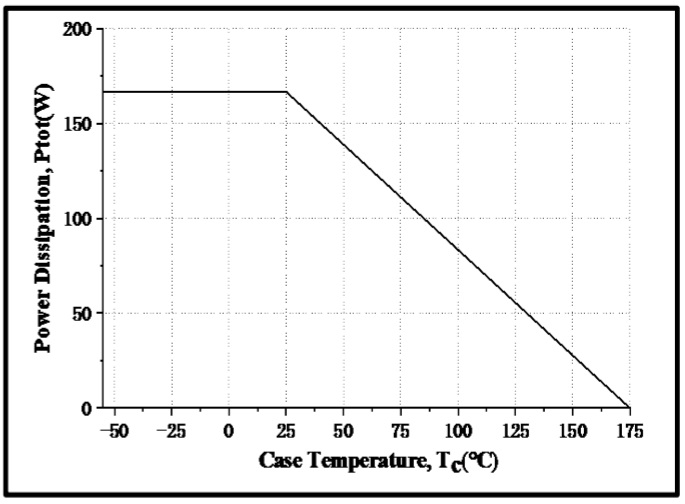


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

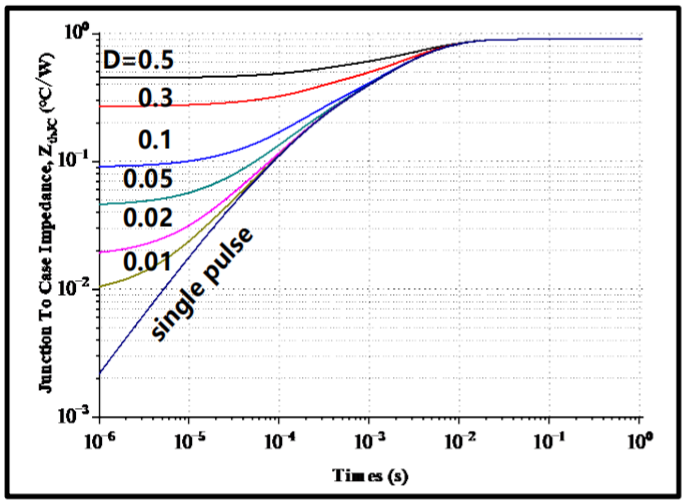


Figure 21. Transient Thermal Impedance (Junction - Case)

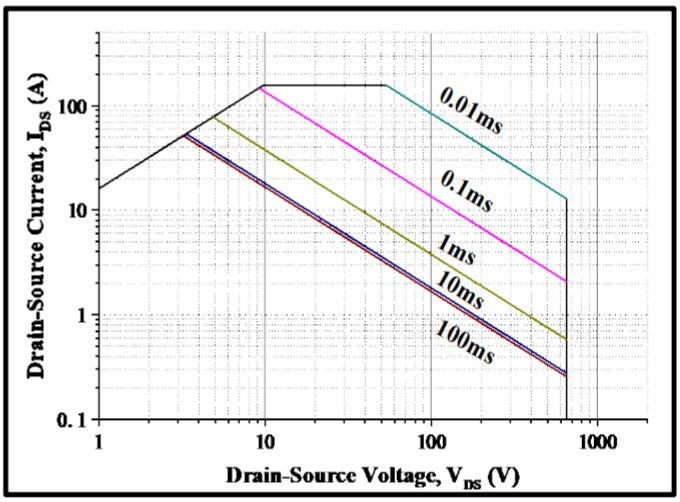


Figure22. Safe Operating Area

Test Circuit Schematic

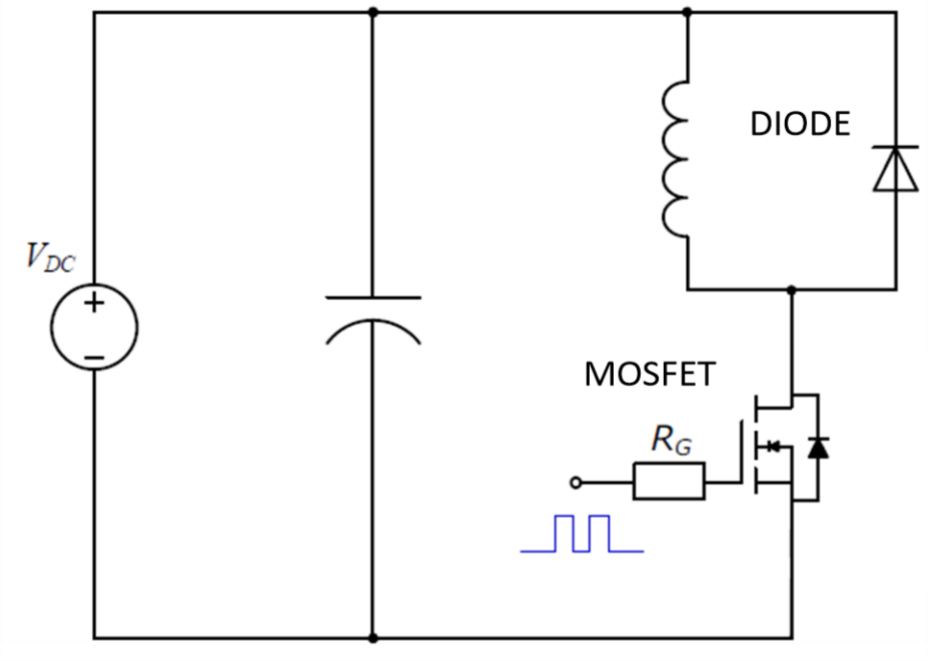
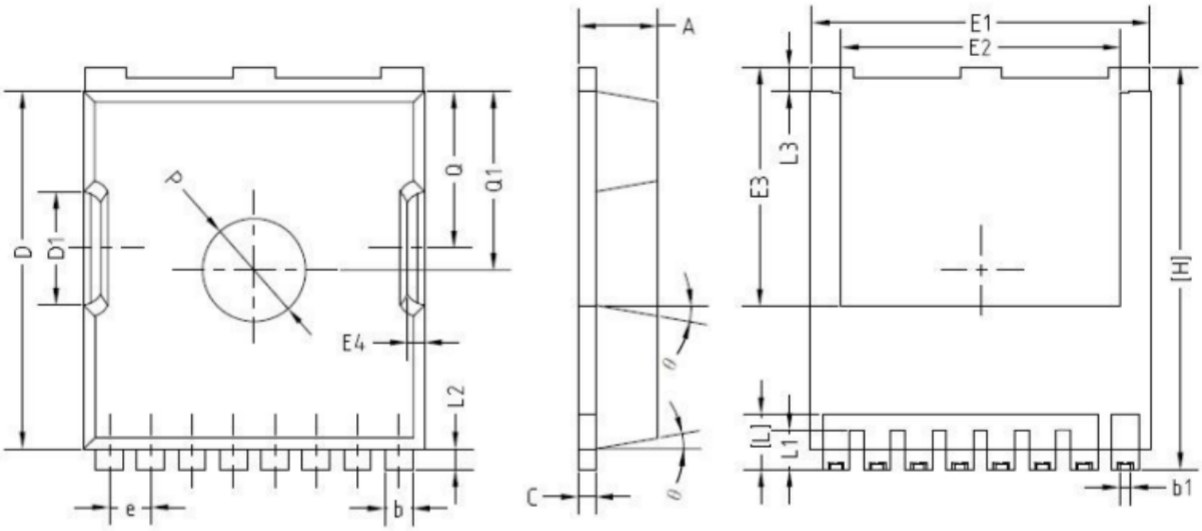
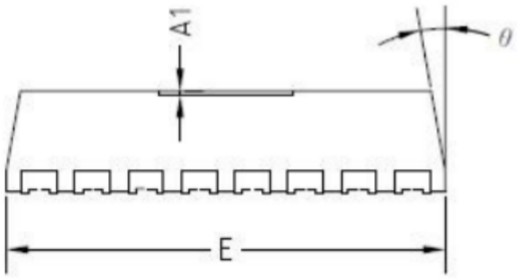


Figure 23. Clamped Inductive Switching Waveform Test Circuit

Package Dimensions

TOLL





COMMON DIMENSIONS			
DIM	MILLIMETERS		
	MIN	NOR	MAX
A	2.20	2.30	2.40
A1	0.05	0.10	0.15
b	0.70	0.80	0.90
b1	0.35	0.40	0.45
C	0.40	0.50	0.65
D	10.40	10.55	10.70
D1	3.20	3.30	3.40
E	9.80	9.90	10.00
E1	9.70	9.80	9.90
E2	7.95	8.10	8.25
E3	6.80	7.0	7.20
E4	0.30	0.50	0.75
e	1.15	1.20	1.25
L	1.40	1.60	1.80
L1	1.05	1.20	1.35
L2	0.50	0.60	0.70
L3	0.60	0.70	0.80
θ	8°	10°	12°
P	2.90	3.00	3.10
Q	4.50	4.60	4.70
Q1	5.10	5.20	5.30
H	11.55	11.70	11.90

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Notes

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