

WM2HA040120L

N-Channel SiC Power MOSFET

G2 MOSFET Technology

V_{DS}	=	1200	V
$R_{DS(on)}$	=	40	mΩ
$I_D@25^{\circ}C$	=	67	A

Features

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

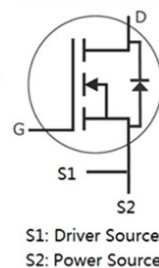
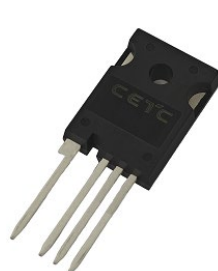
Benefits

- 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



Part Number	Package	Marking
WM2HA040120L	TO-247-4	WM2HA040120L

Maximum Ratings ($T_c=25^{\circ}C$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	1200	V	$V_{GS}=0V, I_D=100\mu A$	
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	67	A	$V_{GS}=18V, T_c=25^{\circ}C$	Fig.19
		47		$V_{GS}=18V, T_c=100^{\circ}C$	
$I_{D(pulse)}$	Pulsed Drain Current	201	A	Pulse width t_p limited by T_{Jmax}	Fig.22
P_D	Power Dissipation	375	W	$T_c=25^{\circ}C, T_J=175^{\circ}C$	Fig.20
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to +175	$^{\circ}C$		
T_L	Solder Temperature, 1.6mm from case for 10s	260	$^{\circ}C$		
M_d	Mounting Torque, (M3 or 6-32 screw)	1	Nm		
		8.8	lbf-in		

Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200	/	/	V	$V_{GS}=0V, I_D=100\mu A$	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.8	4.0	V	$V_{DS}=V_{GS}, I_D=9.2mA$	Fig.11
		/	2.0	/		$V_{DS}=V_{GS}, I_D=9.2mA, T_J=175^{\circ}\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current	/	1	100	μA	$V_{DS}=1200V, V_{GS}=0V$	
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	m Ω	$V_{GS}=18V, I_D=33.3A$	Fig. 4,5,6
		/	60	/		$V_{GS}=18V, I_D=33.3A, T_J=175^{\circ}\text{C}$	
g_{fs}	Transconductance	/	21	/	S	$V_{DS}=20V, I_D=33.3A$	Fig.7
		/	20.5	/		$V_{DS}=20V, I_D=33.3A, T_J=175^{\circ}\text{C}$	
C_{iss}	Input Capacitance	/	2320	/	pF	$V_{GS}=0V$	Fig. 17,18
C_{oss}	Output Capacitance	/	89	/		$V_{DS}=1000V$	
C_{rss}	Reverse Transfer Capacitance	/	8	/		$f=1MHz$	
E_{oss}	C_{oss} Stored Energy	/	45	/	μJ	$V_{AC}=25mV$	Fig.16
E_{ON}	Turn-On Switching Energy	/	600	/	μJ	$V_{DS}=800V, V_{GS}=-5V/18V$	
E_{OFF}	Turn-Off Switching Energy	/	60	/		$I_D=30A, R_{G(ext)}=2.5\Omega, L=100\mu H$	
$t_{d(on)}$	Turn-On Delay Time	/	14	/	ns	$V_{DS}=800V, V_{GS}=-5V/18V, I_D=33.3A$ $R_{G(ext)}=2.5\Omega, R_L=24\Omega$	
t_r	Rise Time	/	19	/			
$t_{d(off)}$	Turn-Off Delay Time	/	28	/			
t_f	Fall Time	/	7.4	/			
$R_{G(int)}$	Internal Gate Resistance	/	3.1	/	Ω	$f=1MHz, V_{AC}=25mV$	
Q_{GS}	Gate to Source Charge	/	32	/	nC	$V_{DS}=800V$	Fig.12
Q_{GD}	Gate to Drain Charge	/	20	/		$V_{GS}=-5V/18V$	
Q_G	Total Gate Charge	/	108	/		$I_D=33.3A$	

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.2	/	V	$V_{GS}=-5V, I_{SD}=16.5A$	Fig. 8,9,10
		3.6	/		$V_{GS}=-5V, I_{SD}=16.5A, T_J=175^{\circ}\text{C}$	
I_S	Continuous Diode Forward Current	/	67	A	$T_c=25^{\circ}\text{C}$	
t_{rr}	Reverse Recover Time	23	/	ns	$V_R=800V, I_{SD}=33.3A$	
Q_{rr}	Reverse Recovery Charge	279	/	nC		
I_{rrm}	Peak Reverse Recovery Current	16	/	A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.40	/	$^{\circ}\text{C/W}$		Fig.21
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	/	40			

Typical Performance

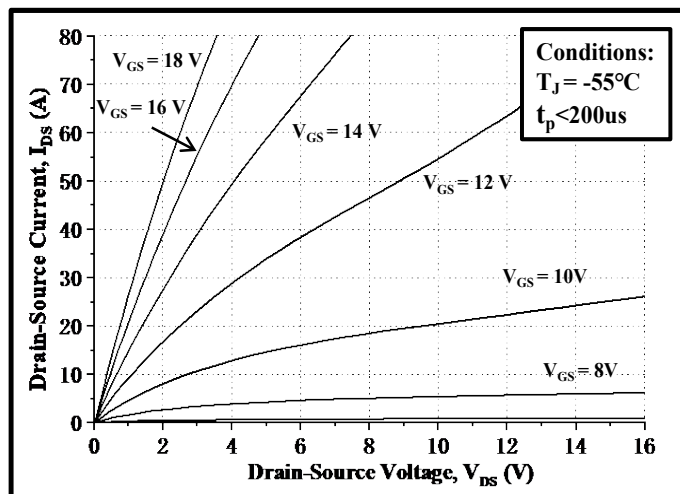


Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$

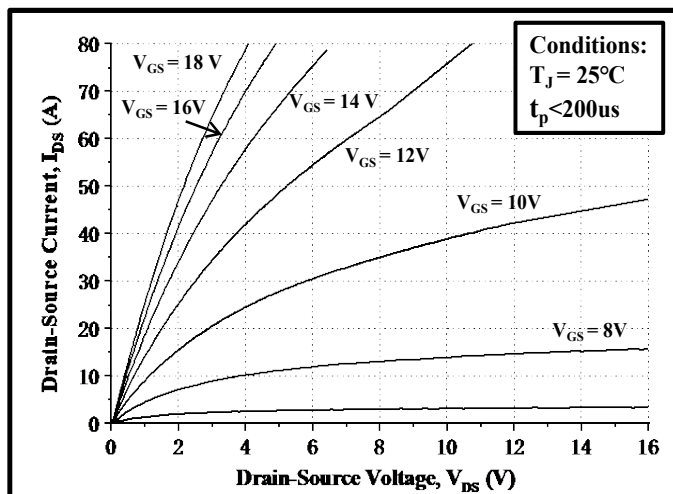


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

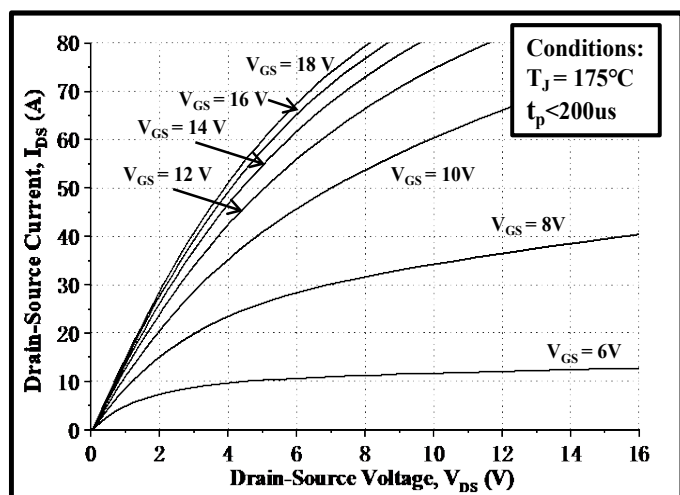


Figure 3. Output Characteristics $T_J = 175^\circ\text{C}$

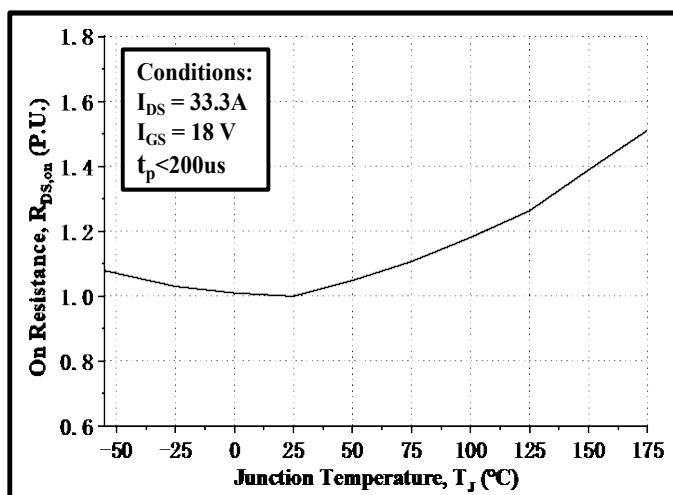


Figure 4. Normalized On-Resistance vs. Temperature

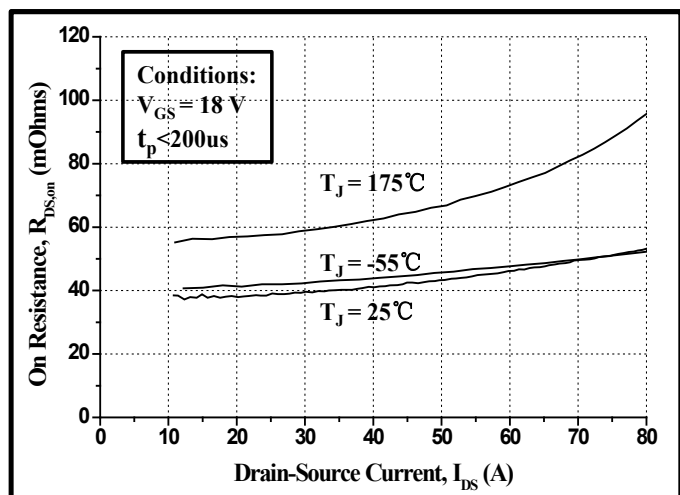


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

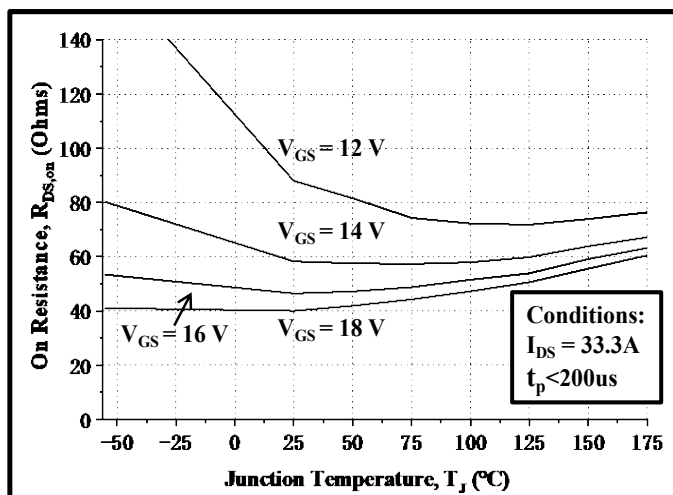


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

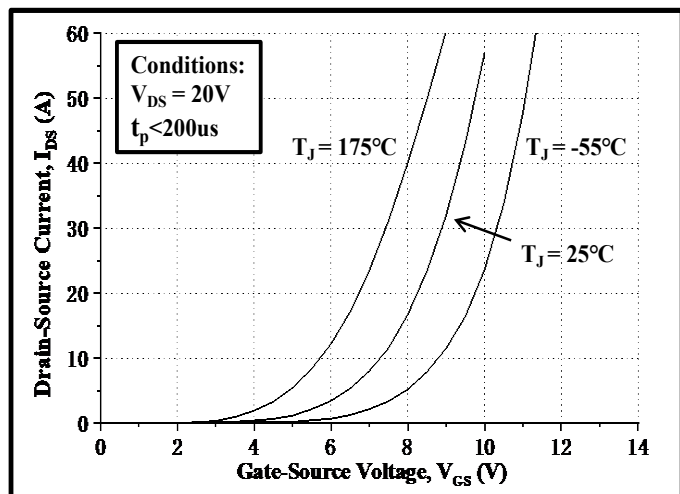


Figure 7. Transfer Characteristic for Various Junction Temperatures

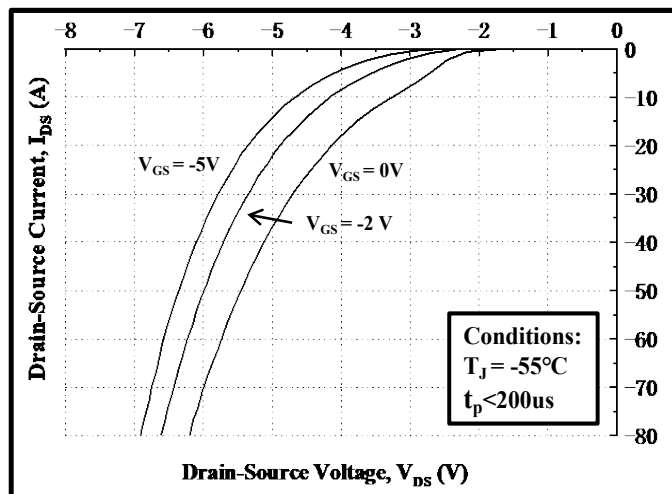


Figure 8. Body Diode Characteristic at -55°C

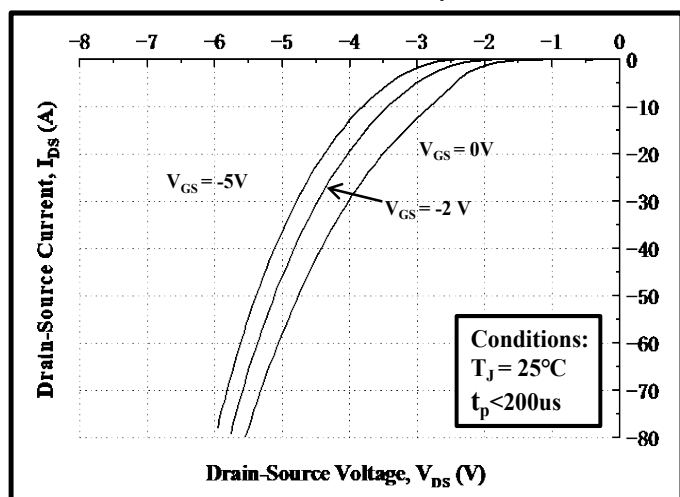


Figure 9. Body Diode Characteristic at 25°C

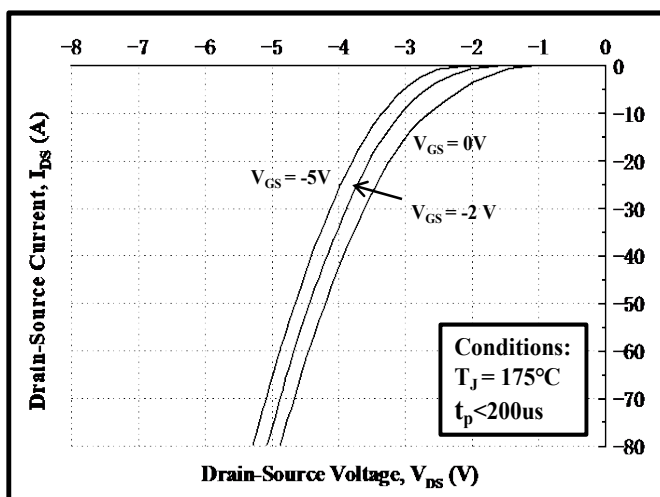


Figure 10. Body Diode Characteristic at 175°C

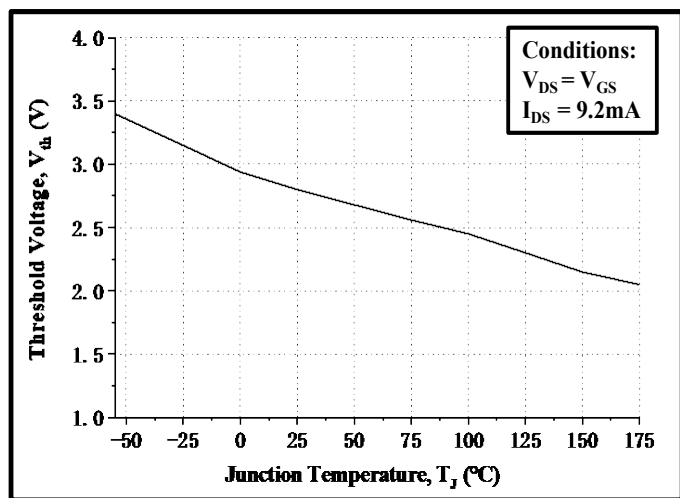


Figure 11. Threshold Voltage vs. Temperature

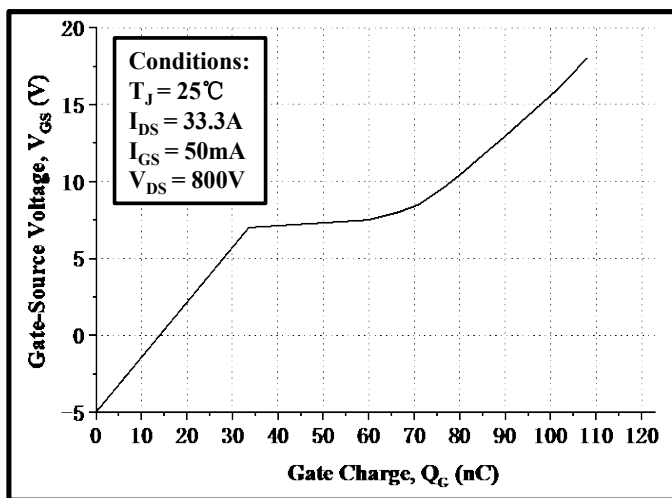


Figure 12. Gate Charge Characteristics

Typical Performance

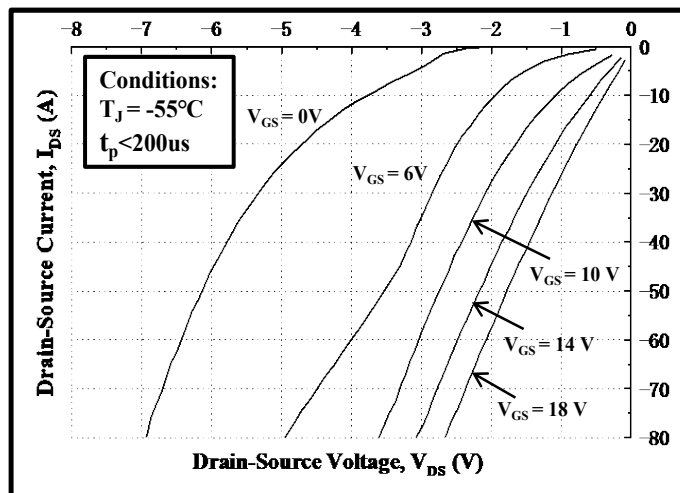


Figure 13. 3rd Quadrant Characteristic at -55°C

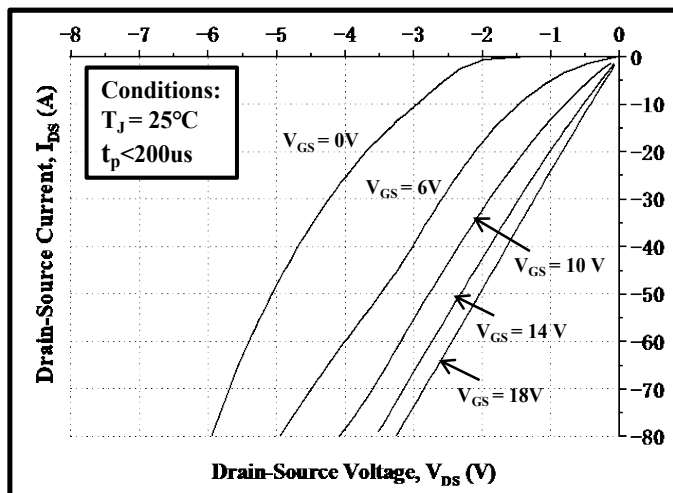


Figure 14. 3rd Quadrant Characteristic at 25°C

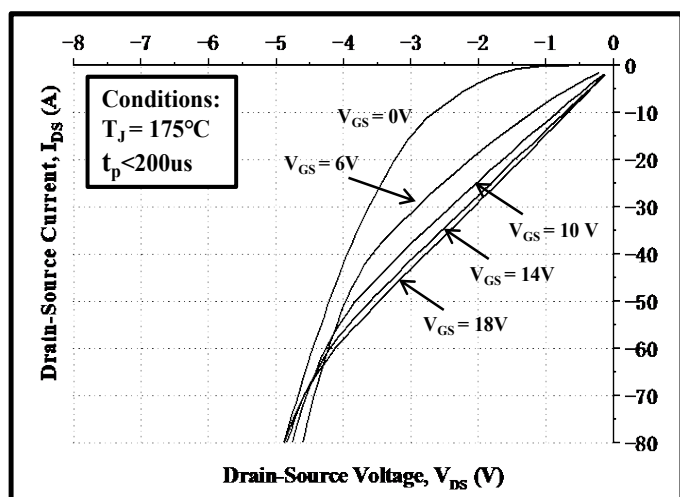


Figure 15. 3rd Quadrant Characteristic at 175°C

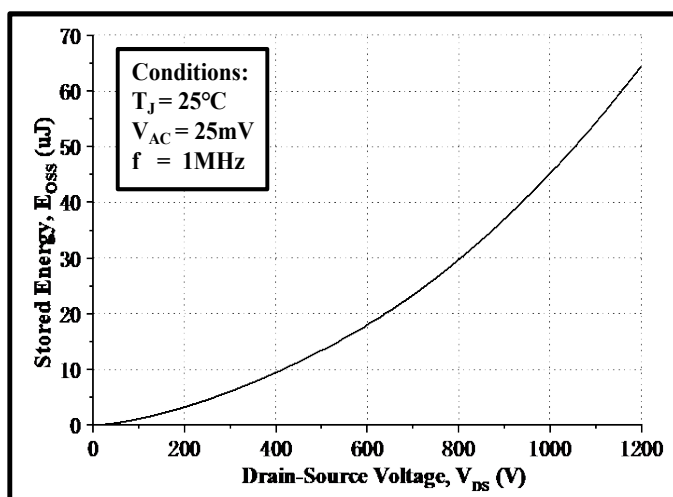


Figure 16. Output Capacitor Stored Energy

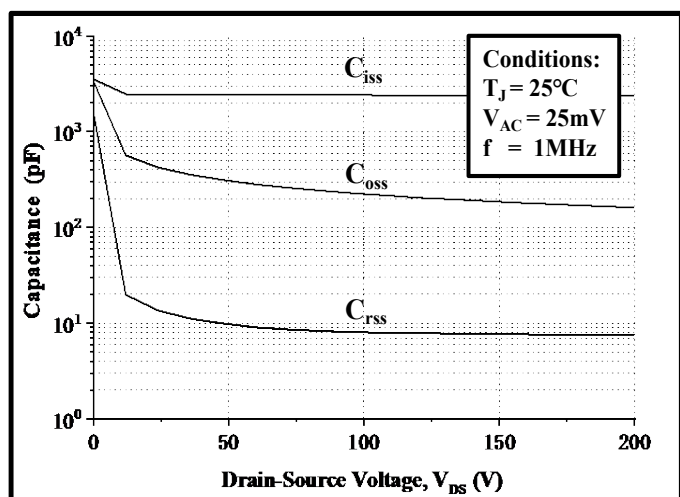


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

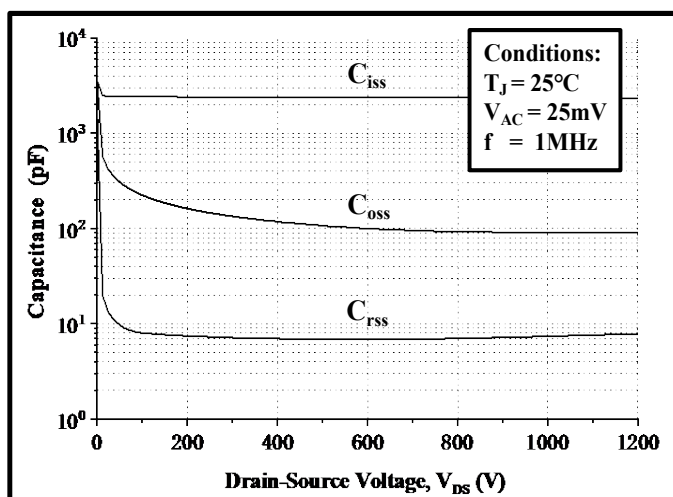


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1200V)

Typical Performance

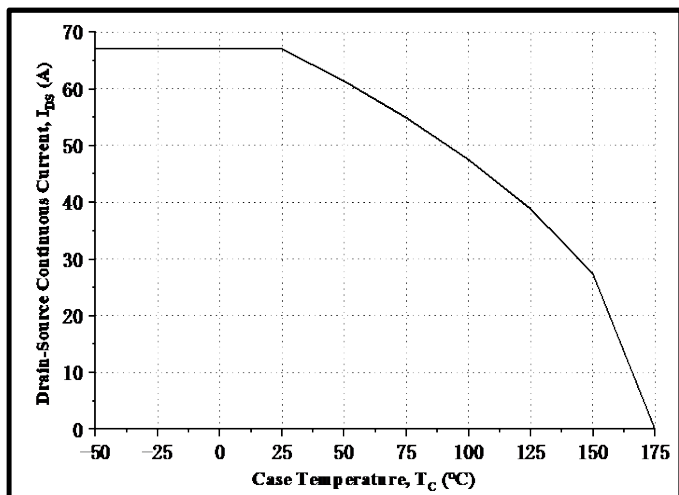


Figure 19. Continuous Drain Current Derating vs. Case Temperature

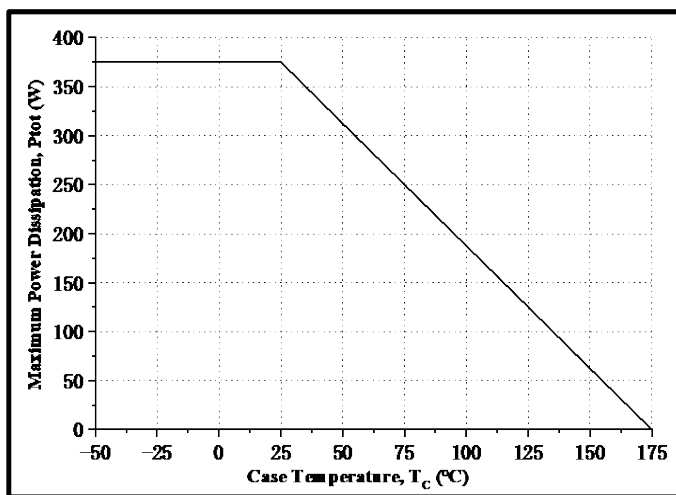


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

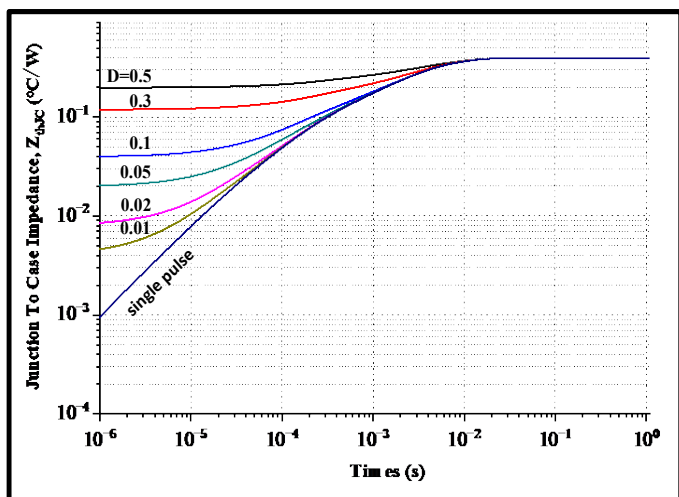


Figure 21. Transient Thermal Impedance (Junction - Case)

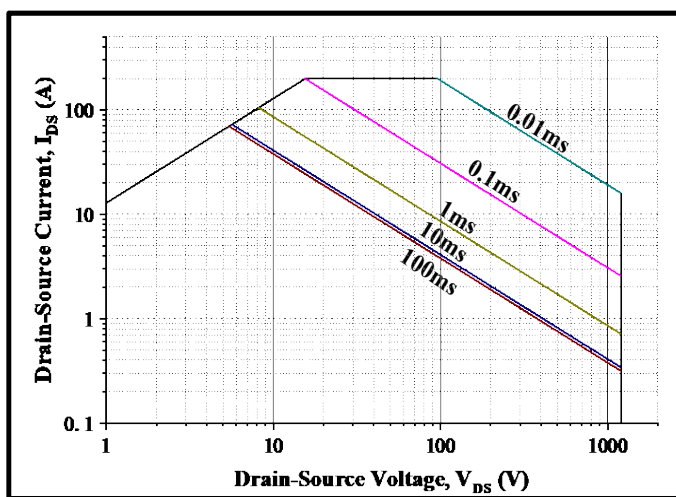


Figure 22. Safe Operating Area

Test Circuit Schematic

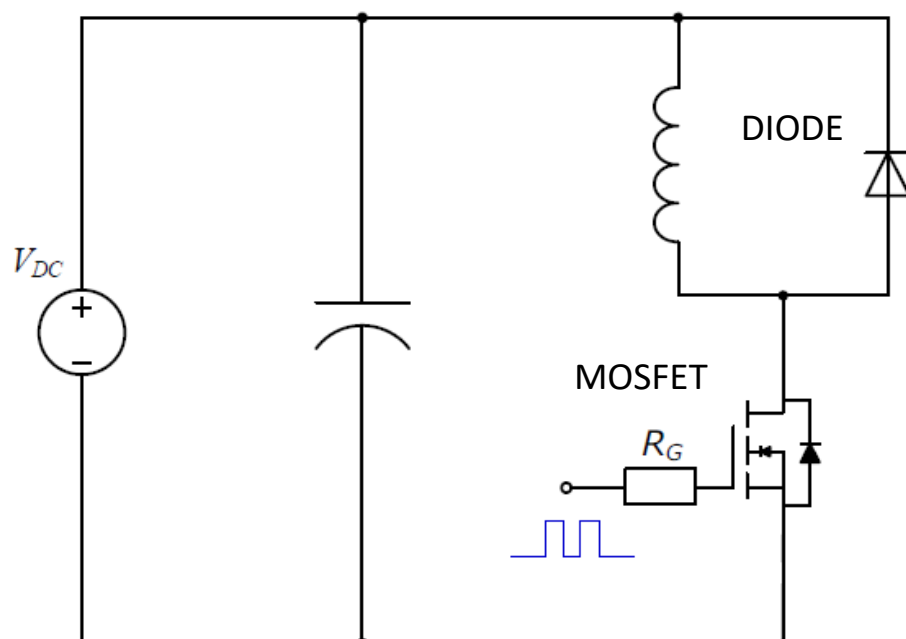
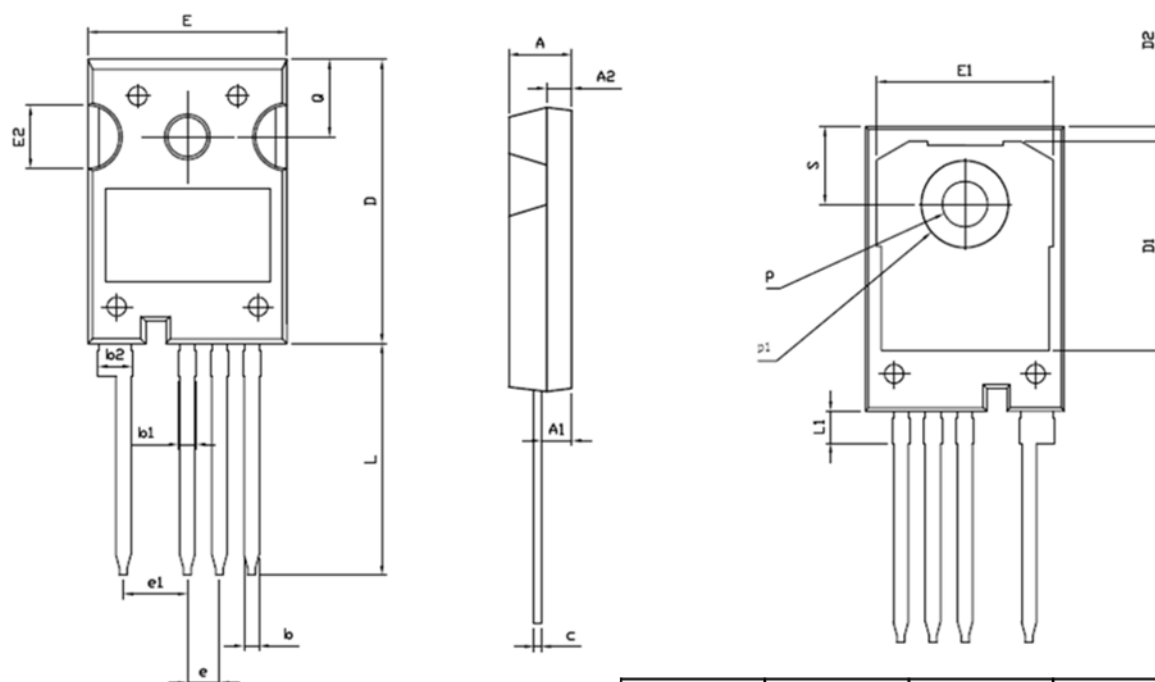
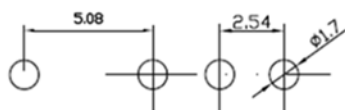


Figure 23. Clamped Inductive Switching
Waveform Test Circuit

Package Dimensions



RECOMMENDED LAND PATTERN



UNIT: mm

	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.25	2.40	2.55
A2	1.85	2.00	2.15
b	1.05	1.20	1.35
b1	1.00	1.30	1.60
b2	2.35	2.65	2.95
c	0.50	0.60	0.70
D	22.29	22.54	22.79
D1	16.00	16.50	17.00
D2	0.97	1.17	1.37
e	2.34	2.54	2.74
e1	4.88	5.08	5.28
E	15.60	15.80	16.00
E1	13.50	14.00	14.50
E2	4.80	5.00	5.20
L	18.08	18.38	18.68
L1	2.38	2.58	2.78
p	3.50	3.60	3.70
p1	6.60	7.10	7.60
Q	6.00	6.15	6.30
S	6.00	6.15	6.30

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