

WM2HA020120K

N-Channel SiC Power MOSFET

G2 MOSFET Technology

V_{DS}	=	1200	V
$R_{DS(on)}$	=	20	mΩ
$I_D@25^{\circ}C$	=	100	A

Features

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

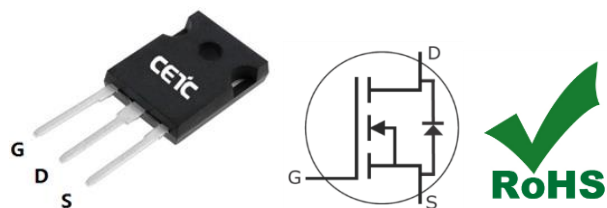
Benefits

- 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
WM2HA020120K	TO-247-3	WM2HA020120K

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	100	A	$V_{GS}=18V, T_c=25^{\circ}C$	Fig.19
		79		$V_{GS}=18V, T_c=100^{\circ}C$	
$I_{D(pulse)}$	Pulsed Drain Current	300	A	Pulse width t_p limited by T_{Jmax}	Fig.22
P_D	Power Dissipation	517	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	$V_{DS}=V_{GS}, I_D=20mA$	Fig.11
		/	2.0	/		$V_{DS}=V_{GS}, I_D=20mA, T_J=175^{\circ}\text{C}$	
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	/	20	27.4	m Ω	$V_{GS}=18V, I_D=60A$	Fig. 4,5,6
		/	30	/		$V_{GS}=18V, I_D=60A, T_J=175^{\circ}\text{C}$	
g_{fs}	Transconductance	/	33	/	S	$V_{DS}=20V, I_D=60A$	Fig.7
		/	28	/		$V_{DS}=20V, I_D=60A, T_J=175^{\circ}\text{C}$	
C_{iss}	Input Capacitance	/	4500	/	pF	$V_{GS}=0V$	Fig. 17,18
C_{oss}	Output Capacitance	/	180	/		$V_{DS}=1000V$	
C_{rss}	Reverse Transfer Capacitance	/	16	/		$f=100kHz$	
E_{oss}	C_{oss} Stored Energy	/	90	/	μJ	$V_{AC}=25mV$	Fig.16
E_{ON}	Turn-On Switching Energy	/	0.9	/	mJ	$V_{DS}=800V, V_{GS}=-5V/18V$	
E_{OFF}	Turn-Off Switching Energy	/	0.25	/		$I_D=60A, R_{G(ext)}=2.5\Omega, L=100\mu H$	
$t_{d(on)}$	Turn-On Delay Time	/	26	/	ns	$V_{DS}=800V, V_{GS}=-5V/18V, I_D=32A$ $R_{G(ext)}=2.5\Omega, R_L=25\Omega$	
t_r	Rise Time	/	11	/			
$t_{d(off)}$	Turn-Off Delay Time	/	49	/			
t_f	Fall Time	/	8	/			
$R_{G(int)}$	Internal Gate Resistance	/	2.1	/	Ω	$f=1MHz, V_{AC}=25mV$	
Q_{GS}	Gate to Source Charge	/	53	/	nC	$V_{DS}=800V$	Fig.12
Q_{GD}	Gate to Drain Charge	/	42	/		$V_{GS}=-5V/18V$	
Q_G	Total Gate Charge	/	217	/		$I_D=32A$	

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.1	/	V	$V_{GS}=-5V, I_{SD}=25A$	Fig. 8,9,10
		3.4	/		$V_{GS}=-5V, I_{SD}=25A, T_J=175^{\circ}\text{C}$	
I_S	Continuous Diode Forward Current	/	100	A	$T_c=25^{\circ}\text{C}$	
t_{rr}	Reverse Recover Time	28	/	ns	$V_R=800V, I_{SD}=32A$	
Q_{rr}	Reverse Recovery Charge	500	/	nC		
I_{rrm}	Peak Reverse Recovery Current	25	/	A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta jc}$	Thermal Resistance from Junction to Case	0.29	/	$^{\circ}\text{C/W}$		Fig.21

Typical Performance

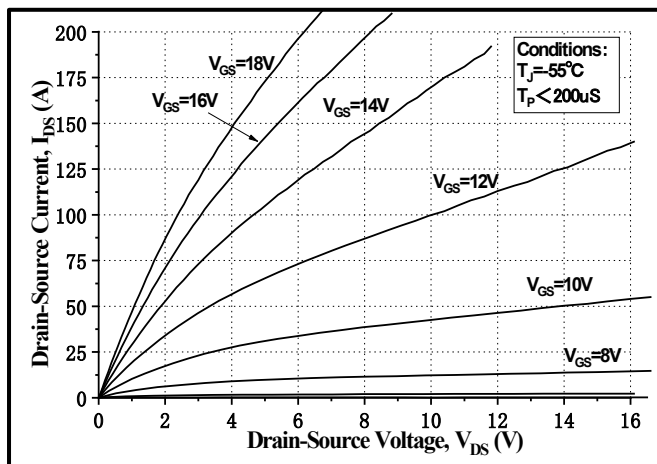


Figure 1. Output Characteristics $T_j = -55^\circ\text{C}$

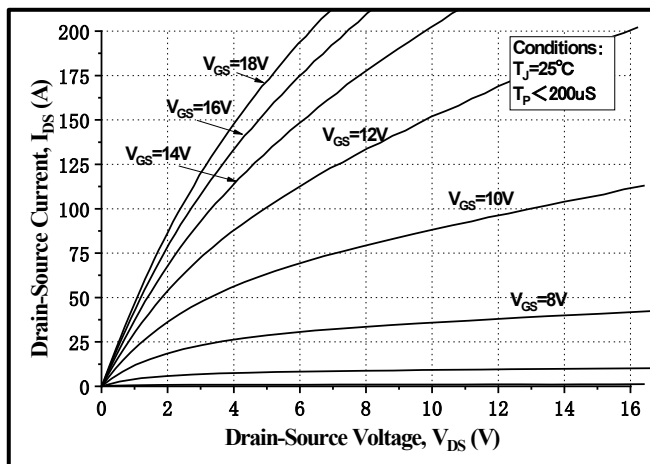


Figure 2. Output Characteristics $T_j = 25^\circ\text{C}$

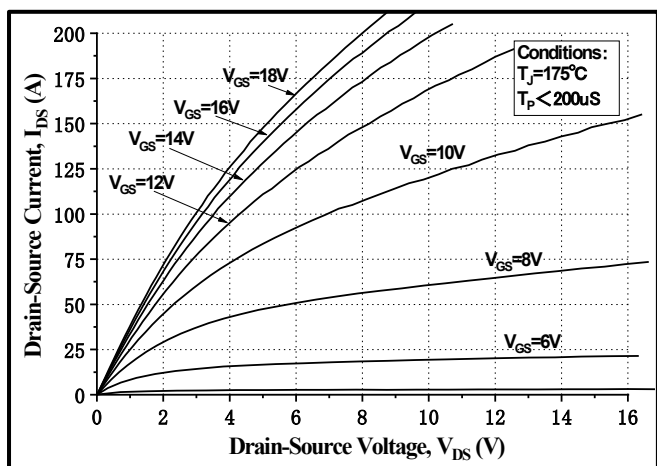


Figure 3. Output Characteristics $T_j = 175^\circ\text{C}$

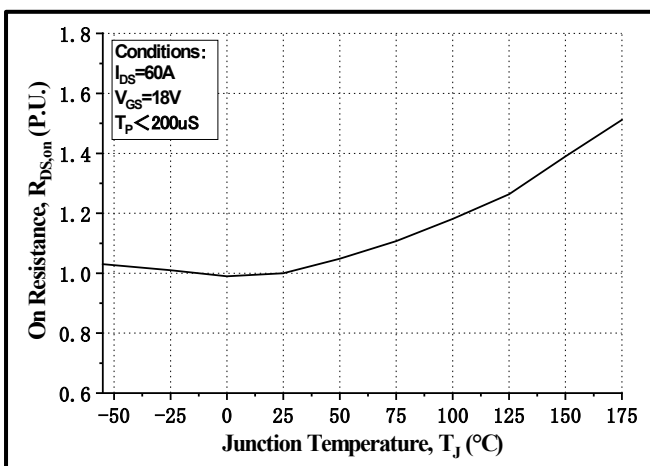


Figure 4. Normalized On-Resistance vs. Temperature

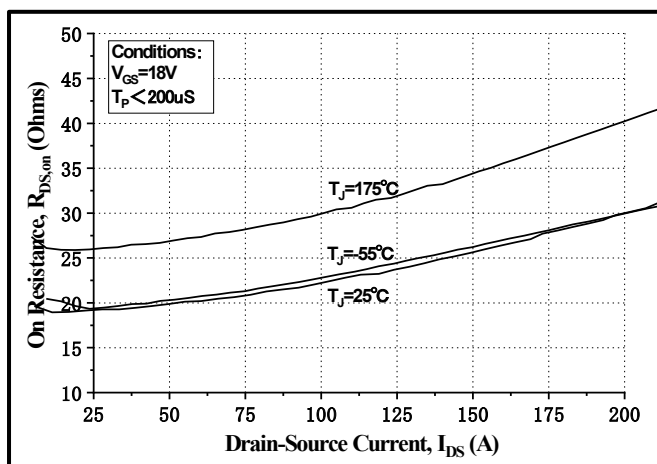


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

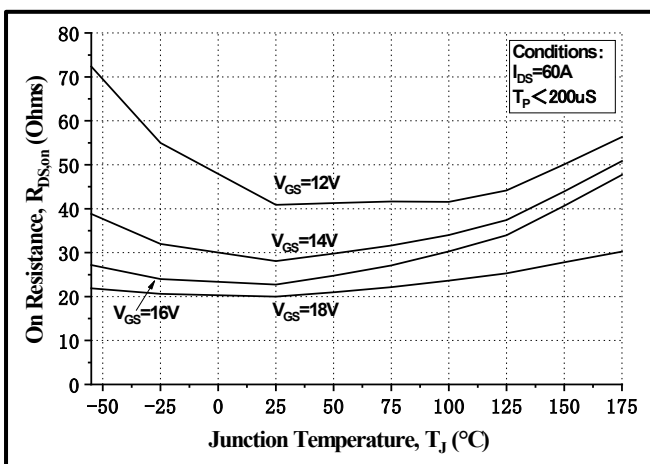


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

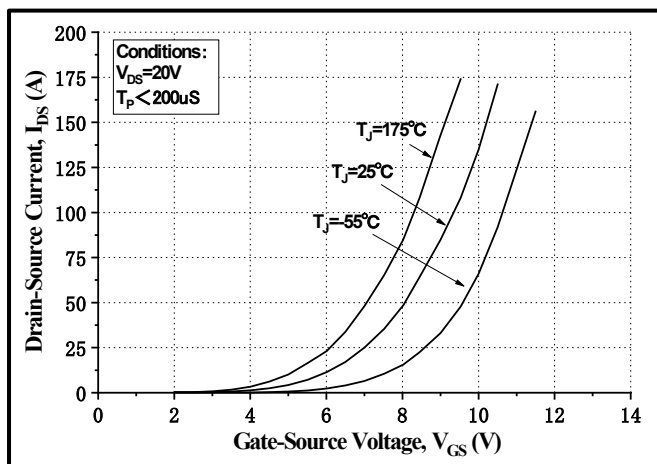


Figure 7. Transfer Characteristic for Various Junction Temperatures

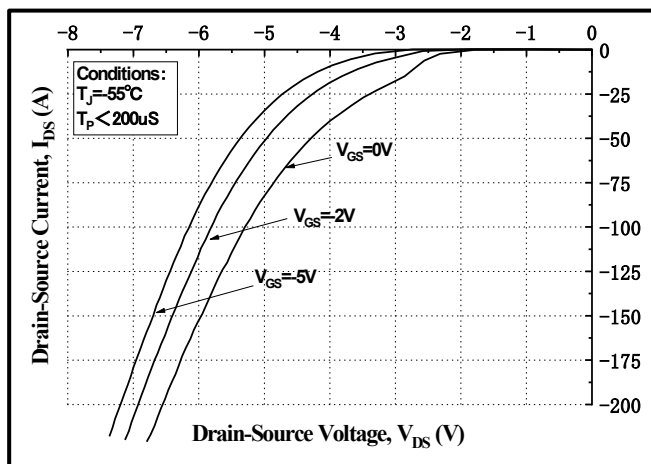


Figure 8. Body Diode Characteristic at -55°C

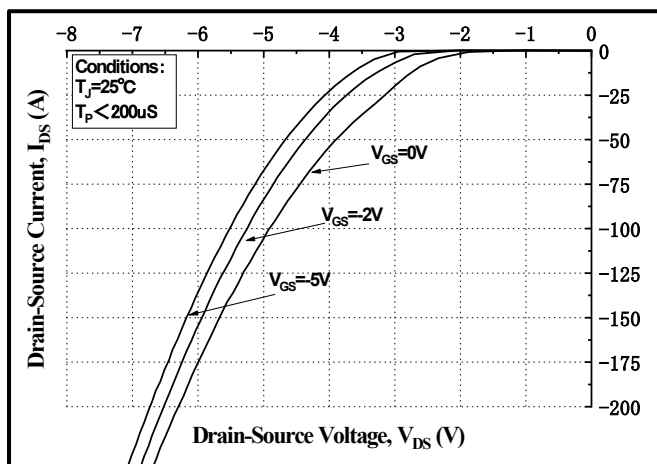


Figure 9. Body Diode Characteristic at 25°C

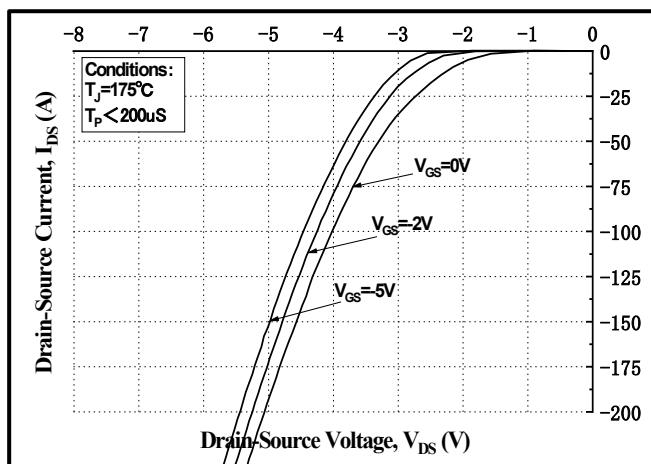


Figure 10. Body Diode Characteristic at 175°C

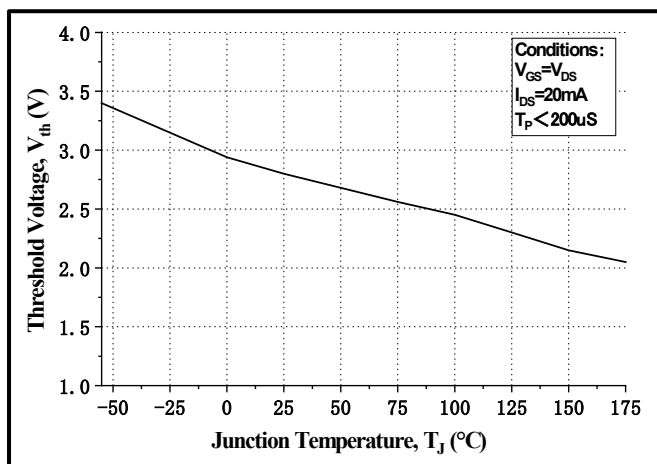


Figure 11. Threshold Voltage vs. Temperature

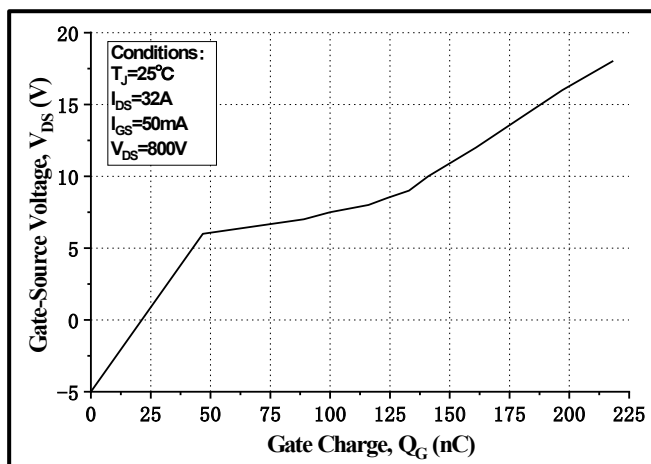


Figure 12. Gate Charge Characteristics

Typical Performance

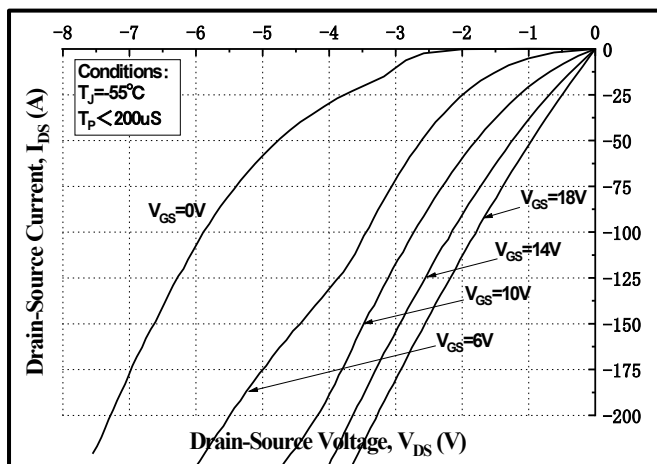


Figure 13. 3rd Quadrant Characteristic at -55°C

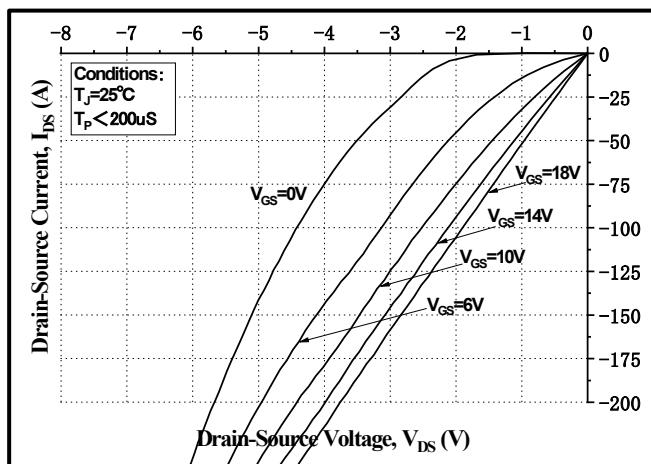


Figure 14. 3rd Quadrant Characteristic at 25°C

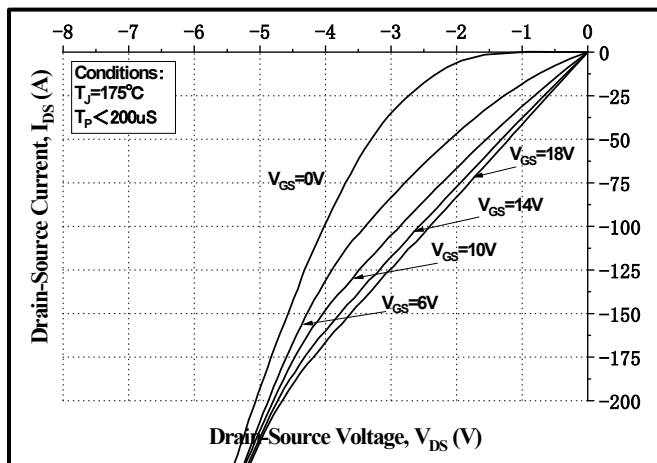


Figure 15. 3rd Quadrant Characteristic at 175°C

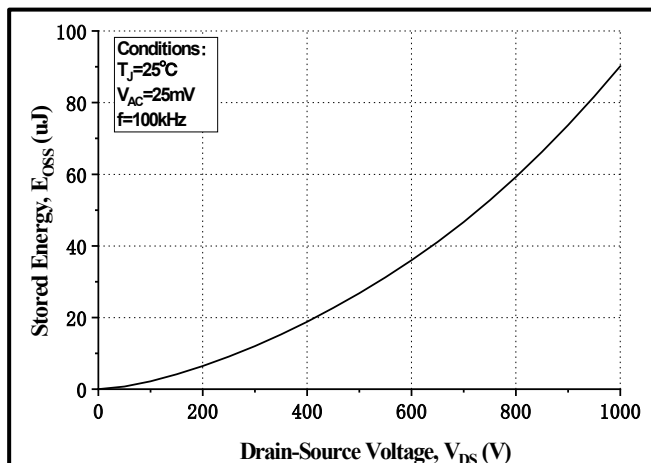


Figure 16. Output Capacitor Stored Energy

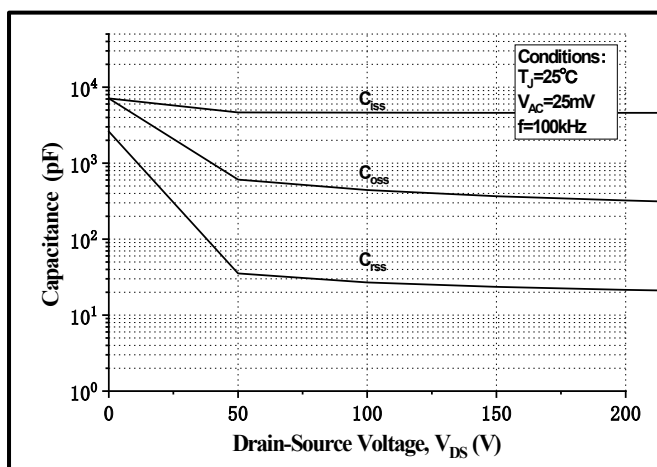


Figure 17. Capacitances vs. Drain-Source Voltage
(0 - 200V)

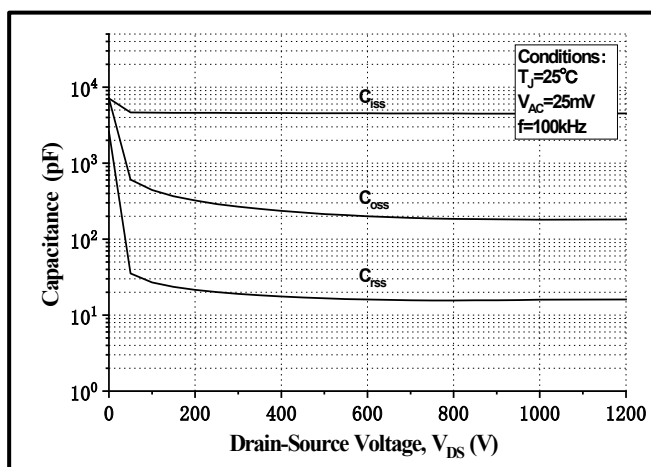


Figure 18. Capacitances vs. Drain-Source Voltage
(0 - 1200V)

Typical Performance

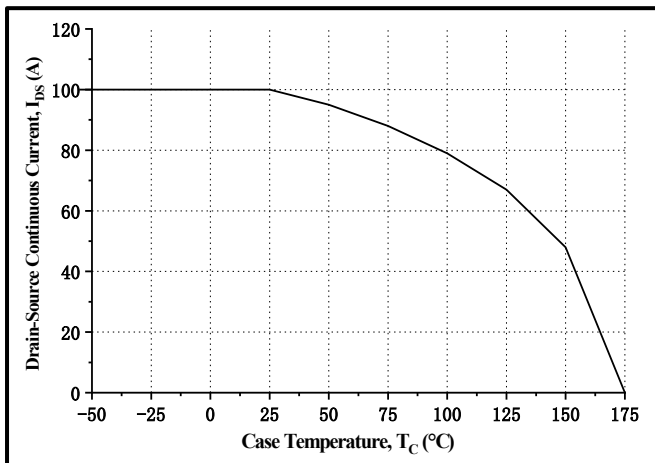


Figure 19. Continuous Drain Current vs. Case Temperature

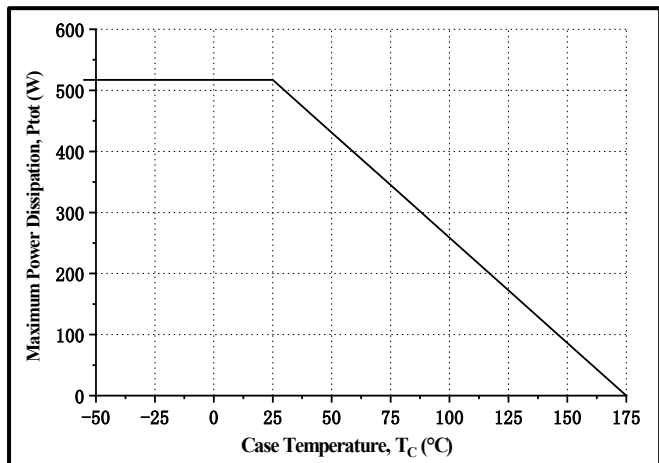


Figure 20. Maximum Power Dissipation vs. Case Temperature

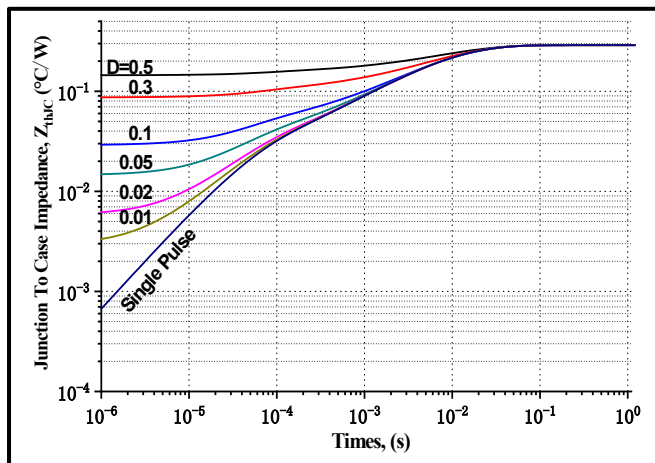


Figure 21. Continuous Drain Current vs. Case Temperature

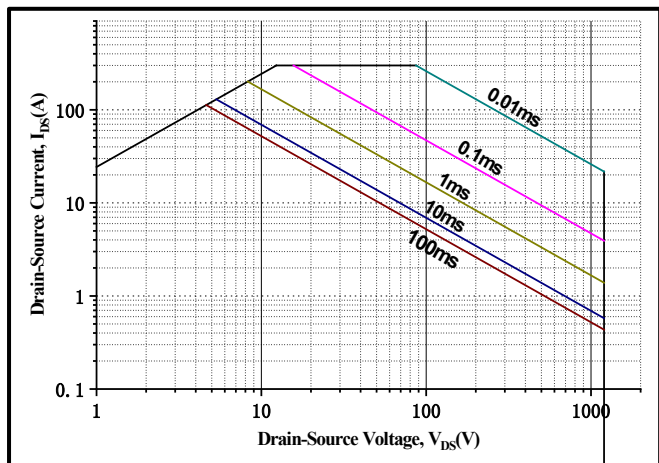


Figure 22. Maximum Power Dissipation vs. Case Temperature

Test Circuit Schematic

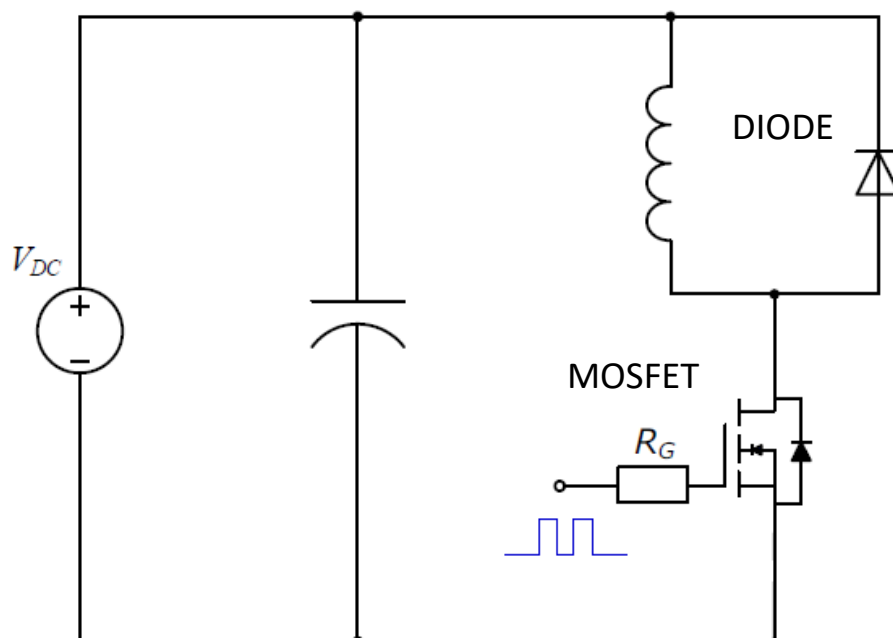
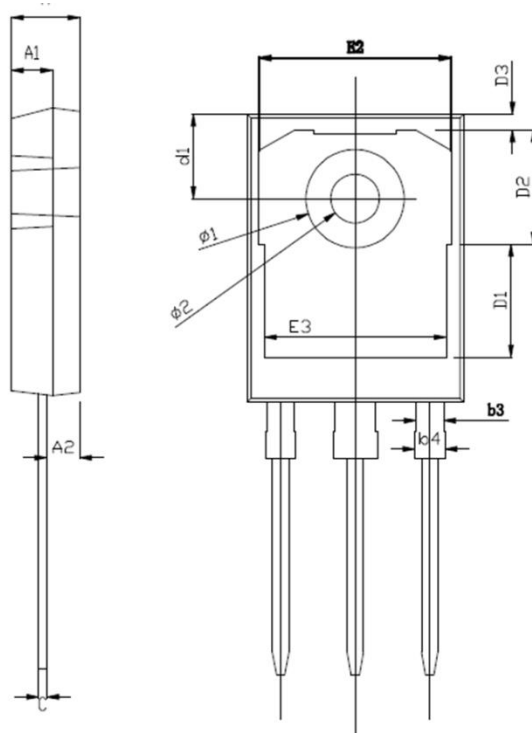
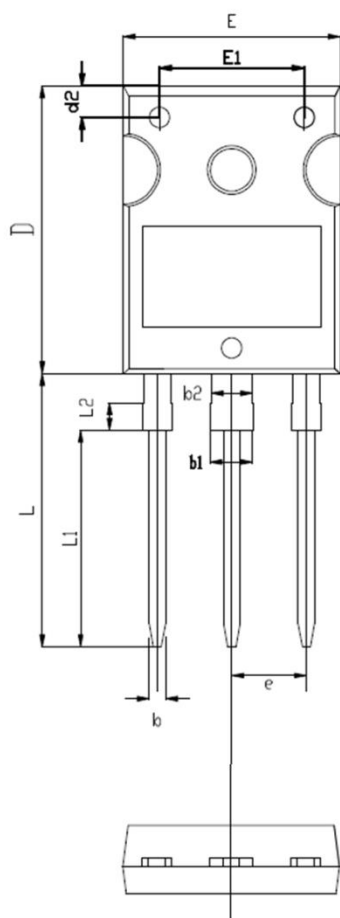
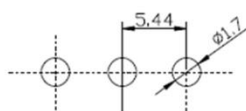


Figure 23. Clamped Inductive Switching
Waveform Test Circuit

Package Dimensions



RECOMMENDED LAND PATTERN



UNIT: mm

	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.80	3.00	3.20
A2	2.26	2.41	2.56
b	1.10	1.20	1.30
b1	2.90	-	3.20
b2	2.90	3.00	3.10
b3	1.90	2.00	2.10
b4	2.00	-	2.20
c	0.50	0.60	0.70
D	20.80	21.00	21.20
D1		8.23	
D2		8.32	
D3		1.17	
d1	6.00	6.15	6.30
d2	2.20	2.30	2.40
E	15.60	15.80	16.00
E1		10.50	
E2		14.02	
E3		13.50	
e	5.34	5.44	5.54
L	19.72	19.92	20.12
L1		15.79	
L2		1.98	
ø1	7.10	7.19	7.30
ø2	3.50	3.60	3.70

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