

WM3HA080120N

N-Channel SiC Power MOSFET

G3 MOSFET Technology

V_{DS}	=	1200	V
$R_{DS(on)}$	=	70	mΩ
$I_D@25^{\circ}C$	=	36	A

Features

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

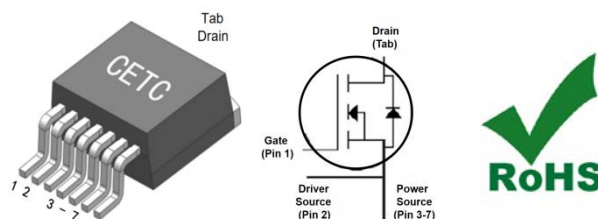
Benefits

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

Applications

- Solar and UPS inverters
- EV motor drive
- High voltage DC/DC converters
- Switched mode power supplies
- Load switch

Package



Part Number	Package	Marking
WM3HA080120N	TO-263-7	WM3HA080120N

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	36	A	$V_{GS}=18V, T_c=25^{\circ}C$	Fig.19
		26		$V_{GS}=18V, T_c=100^{\circ}C$	
$I_{D(pulse)}$	Pulsed Drain Current	76	A	Pulse width t_p limited by T_{Jmax}	Fig.22
P_D	Power Dissipation	132	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	$^{\circ}C$		

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	$V_{GS}=0V, I_D=1mA$	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.8	4.0	V	$V_{DS}=V_{GS}, I_D=5mA$	Fig.11
		/	2.1	/		$V_{DS}=V_{GS}, I_D=5mA, T_J=175^{\circ}\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current	/	/	10	μA	$V_{DS}=1200V, V_{GS}=0V$	
I_{GSS+}	Gate-Source Leakage Current	/	/	100	nA	$V_{DS}=0V, V_{GS}=23V$	
I_{GSS-}	Gate-Source Leakage Current	/	/	100	nA	$V_{DS}=0V, V_{GS}=-10V$	
$R_{DS(on)}$	Drain-Source On-State Resistance	/	70	90	m Ω	$V_{GS}=18V, I_D=15A$	Fig. 4,5,6
		/	120	/		$V_{GS}=18V, I_D=15A, T_J=175^{\circ}\text{C}$	
g_{fs}	Transconductance	/	12	/	S	$V_{DS}=20V, I_D=15A$	Fig.7
		/	11	/		$V_{DS}=20V, I_D=15A, T_J=175^{\circ}\text{C}$	
C_{iss}	Input Capacitance	/	928	/	pF	$V_{GS}=0V$	Fig. 17,18
C_{oss}	Output Capacitance	/	42	/		$V_{DS}=1000V$	
C_{rss}	Reverse Transfer Capacitance	/	4	/		$f=100kHz$	
E_{oss}	C_{oss} Stored Energy	/	21	/	μJ	$V_{AC}=25mV$	Fig.16
E_{ON}	Turn-On Switching Energy	/	219	/	μJ	$V_{DS}=800V, V_{GS}=-5V/18V$	
E_{OFF}	Turn-Off Switching Energy	/	43	/		$I_D=15A, R_{G(ext)}=3\Omega, L=100\mu\text{H}$	
$t_{d(on)}$	Turn-On Delay Time	/	7.3	/	ns	$V_{DS}=800V, V_{GS}=-5V/18V, I_D=15A$ $R_{G(ext)}=3\Omega, R_L=53.3\Omega$	
t_r	Rise Time	/	13	/			
$t_{d(off)}$	Turn-Off Delay Time	/	19	/			
t_f	Fall Time	/	7.1	/			
$R_{G(int)}$	Internal Gate Resistance	/	2.5	/	Ω	$f=1MHz, V_{AC}=25mV$	
Q_{GS}	Gate to Source Charge	/	13.8	/	nC	$V_{DS}=800V$	Fig.12
Q_{GD}	Gate to Drain Charge	/	6.7	/		$V_{GS}=-5V/18V$	
Q_G	Total Gate Charge	/	53.4	/		$I_D=15A$	

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.2	/	V	$V_{GS}=-5V, I_{SD}=7.5A$	Fig. 8,9,10
		3.9	/		$V_{GS}=-5V, I_{SD}=7.5A, T_J=175^{\circ}\text{C}$	
I_S	Continuous Diode Forward Current	/	28	A	$T_c=25^{\circ}\text{C}$	
t_{rr}	Reverse Recover Time	24	/	ns	$V_R=800V, I_{SD}=15A$	
Q_{rr}	Reverse Recovery Charge	252	/	nC		
I_{rrm}	Peak Reverse Recovery Current	17	/	A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	1.13	/	$^{\circ}\text{C/W}$		Fig.21
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	/	40			

Typical Performance

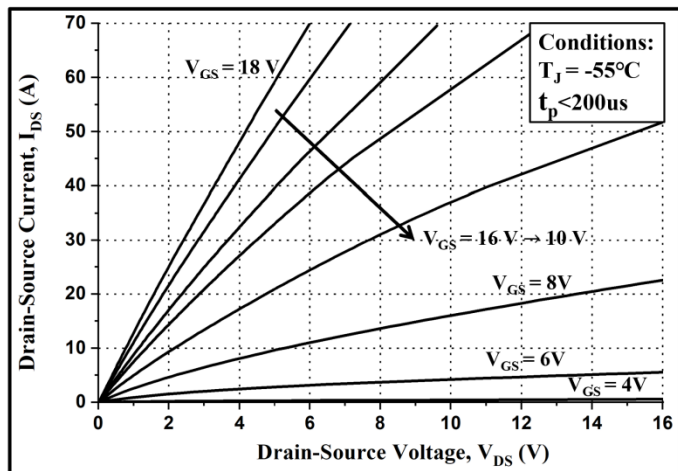


Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$

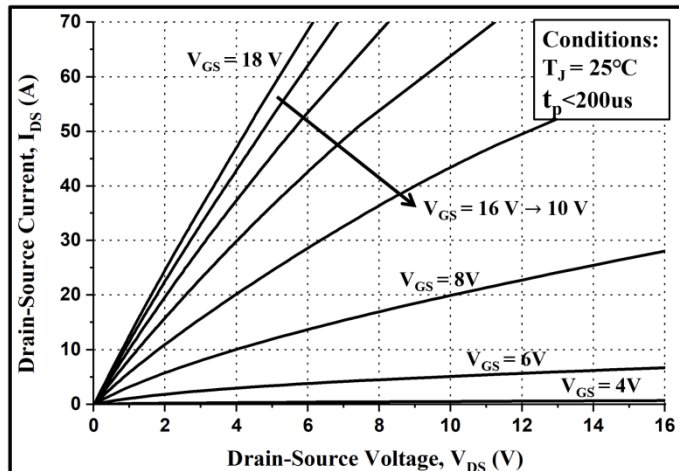


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

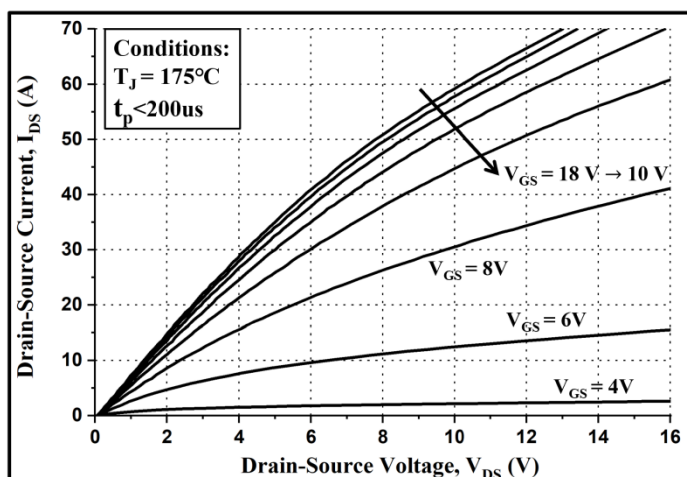


Figure 3. Output Characteristics $T_J = 175^\circ\text{C}$

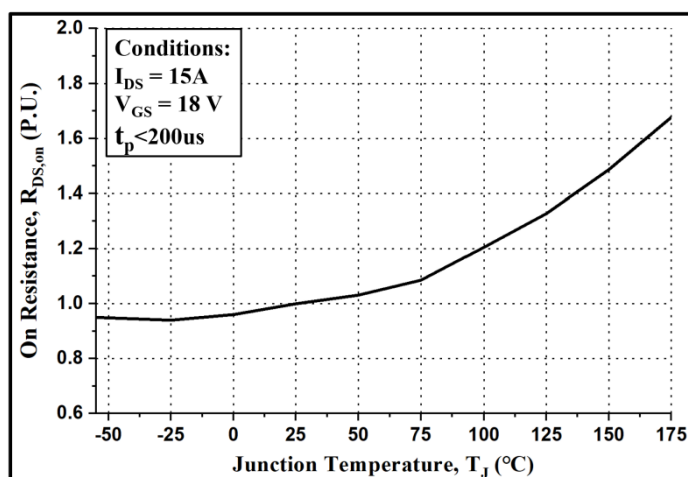


Figure 4. Normalized On-Resistance vs. Temperature

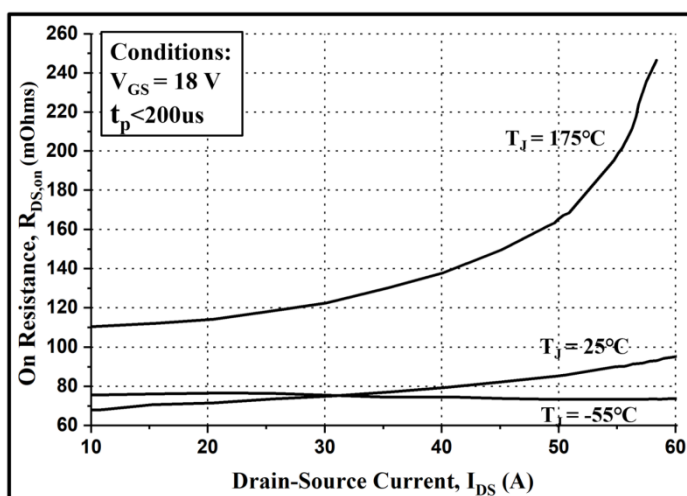


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

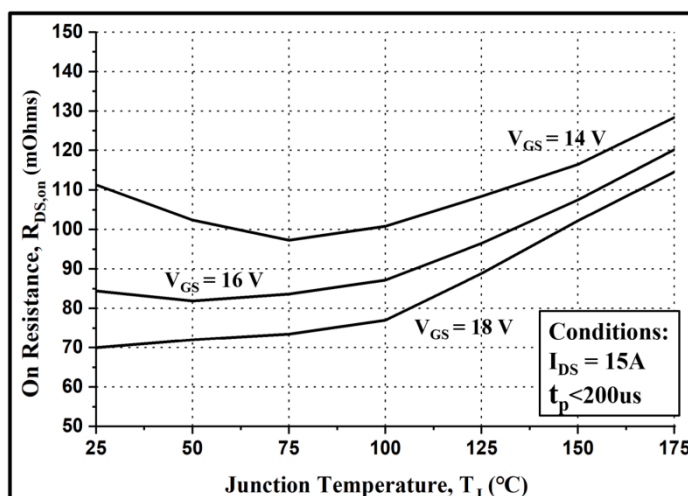


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

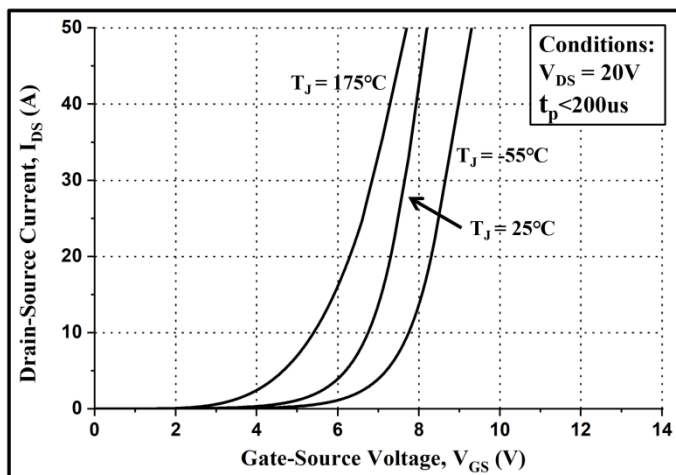


Figure 7. Transfer Characteristic for Various Junction Temperatures

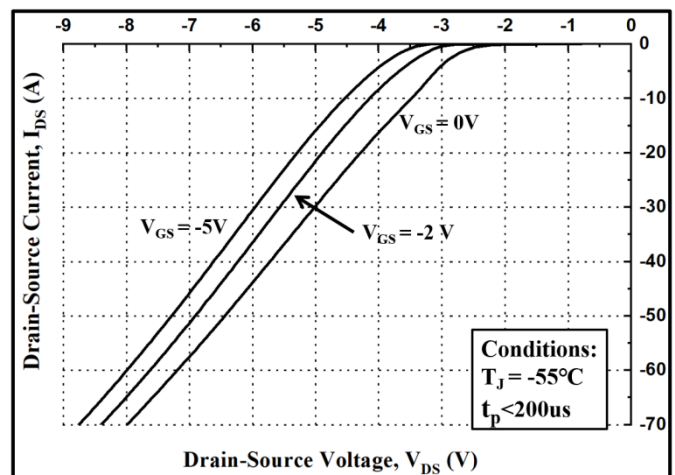


Figure 8. Body Diode Characteristic at -55°C

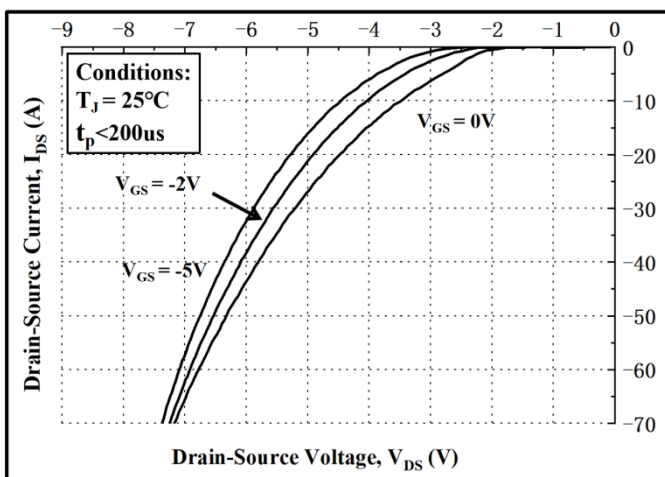


Figure 9. Body Diode Characteristic at 25°C

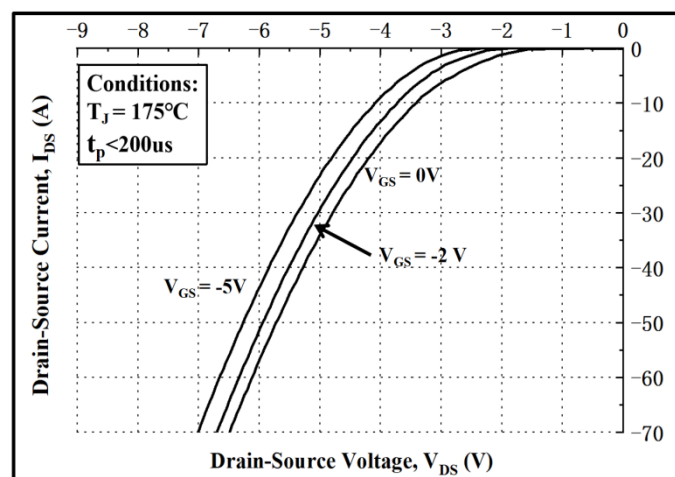


Figure 10. Body Diode Characteristic at 175°C

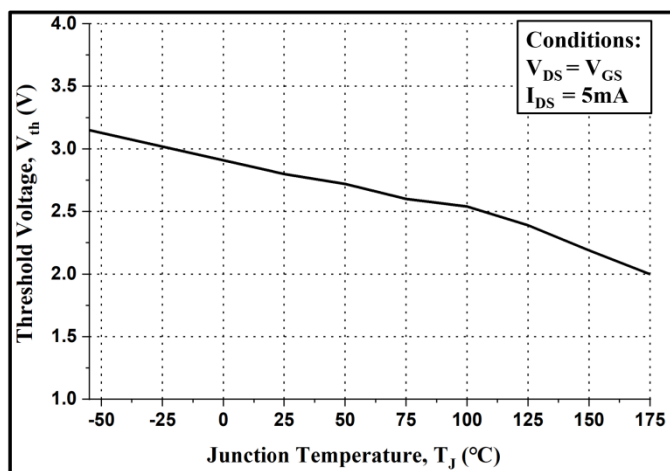


Figure 11. Threshold Voltage vs. Temperature

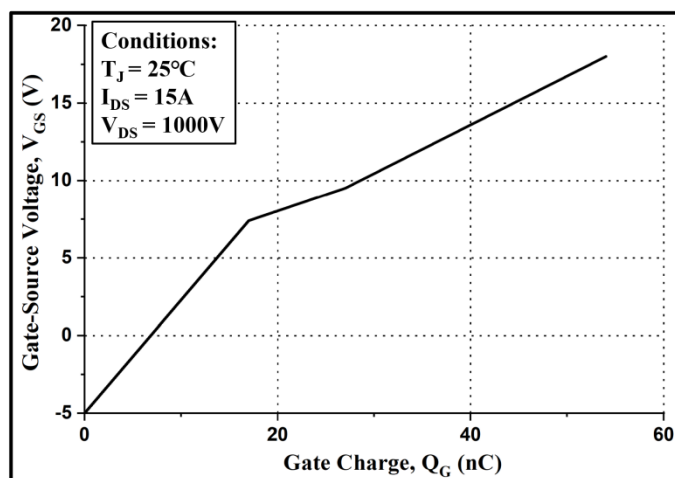


Figure 12. Gate Charge Characteristics

Typical Performance

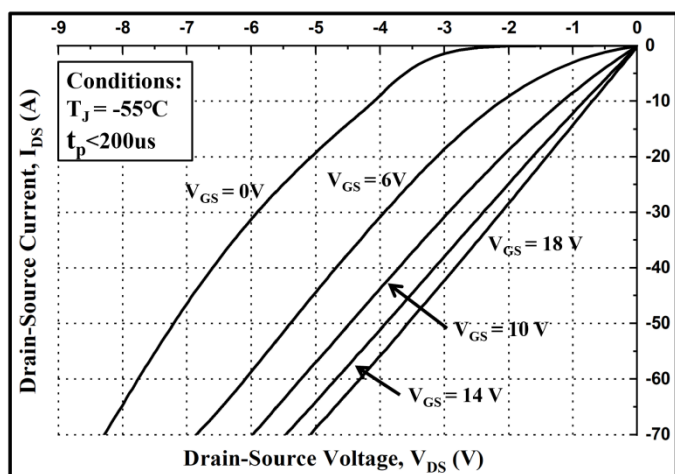


Figure 13. 3rd Quadrant Characteristic at -55°C

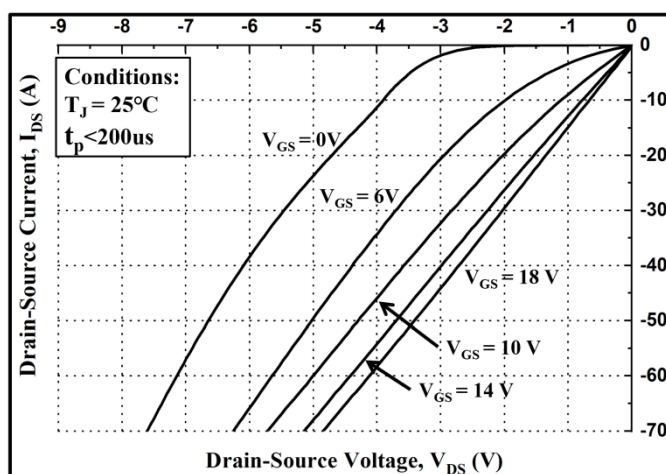


Figure 14. 3rd Quadrant Characteristic at 25°C

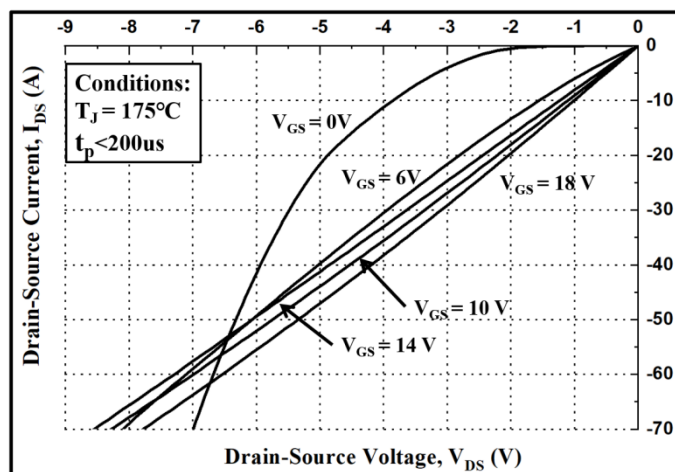


Figure 15. 3rd Quadrant Characteristic at 175°C

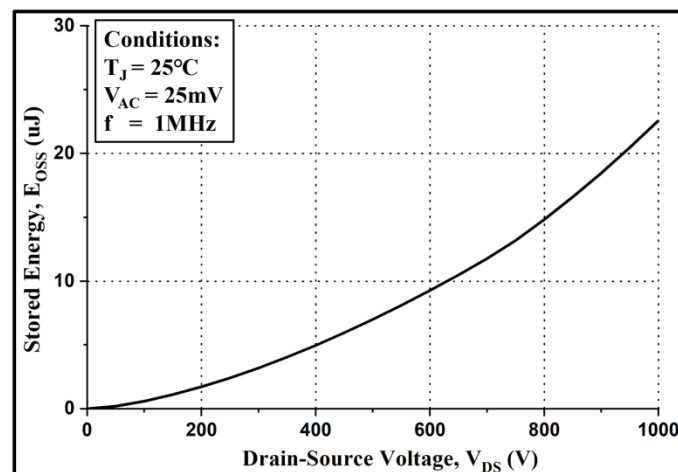


Figure 16. Output Capacitor Stored Energy

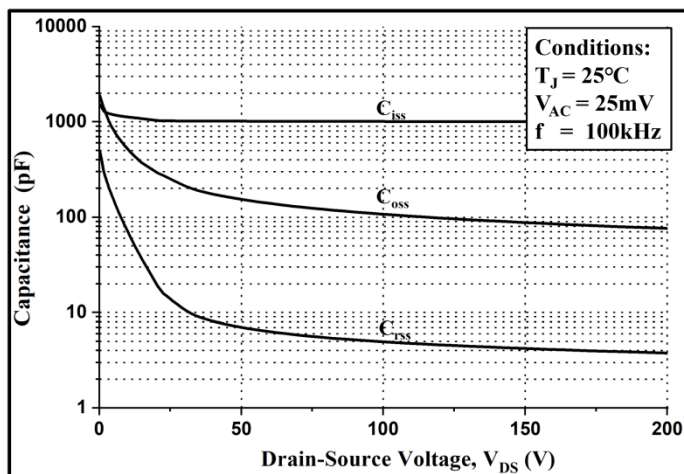


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

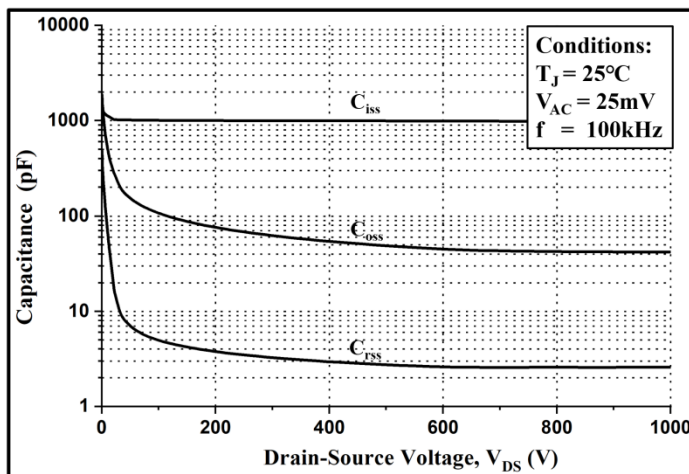


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

Typical Performance

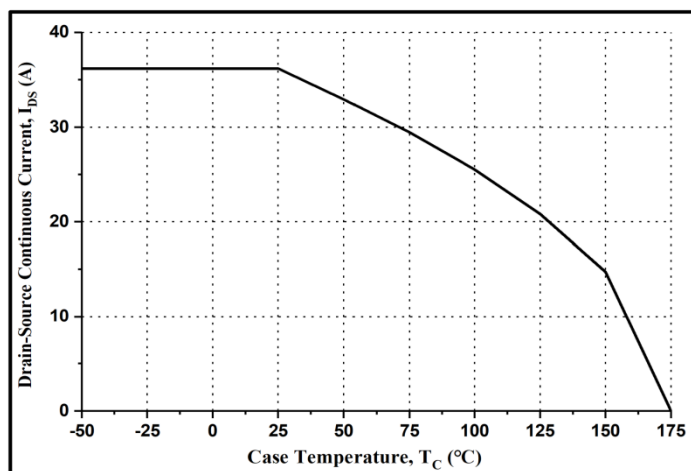


Figure 19. Continuous Drain Current Derating vs. Case Temperature

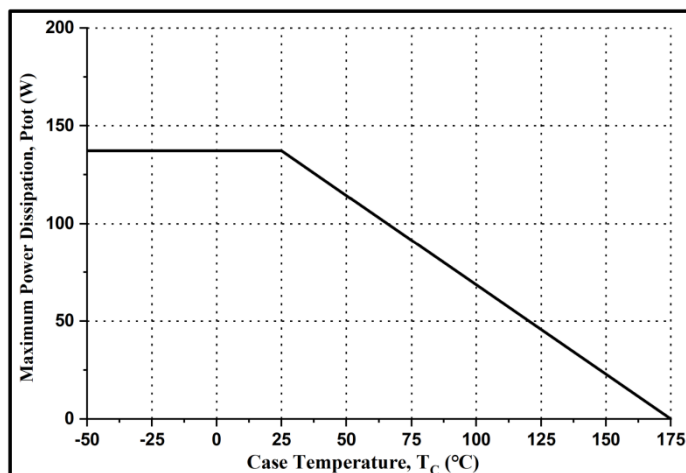


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

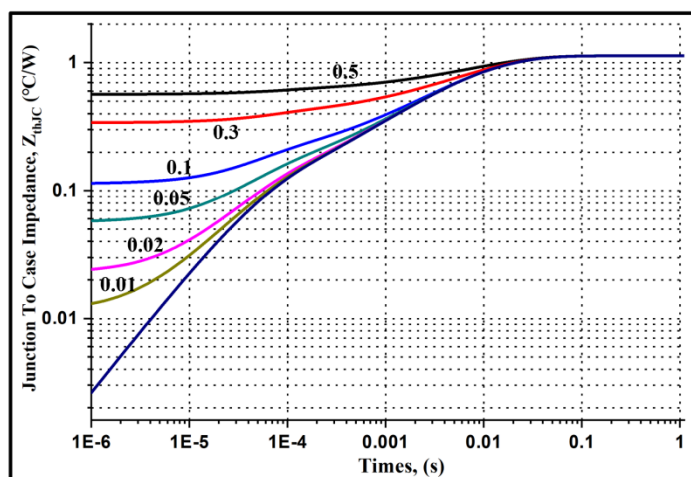


Figure 21. Transient Thermal Impedance (Junction - Case)

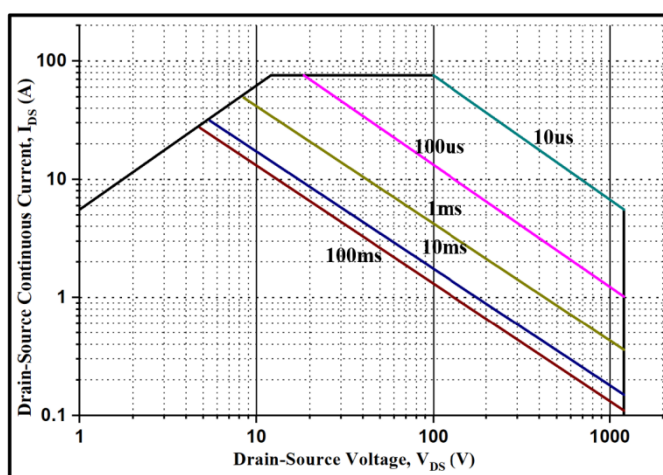


Figure 22. Safe Operating Area

Test Circuit Schematic

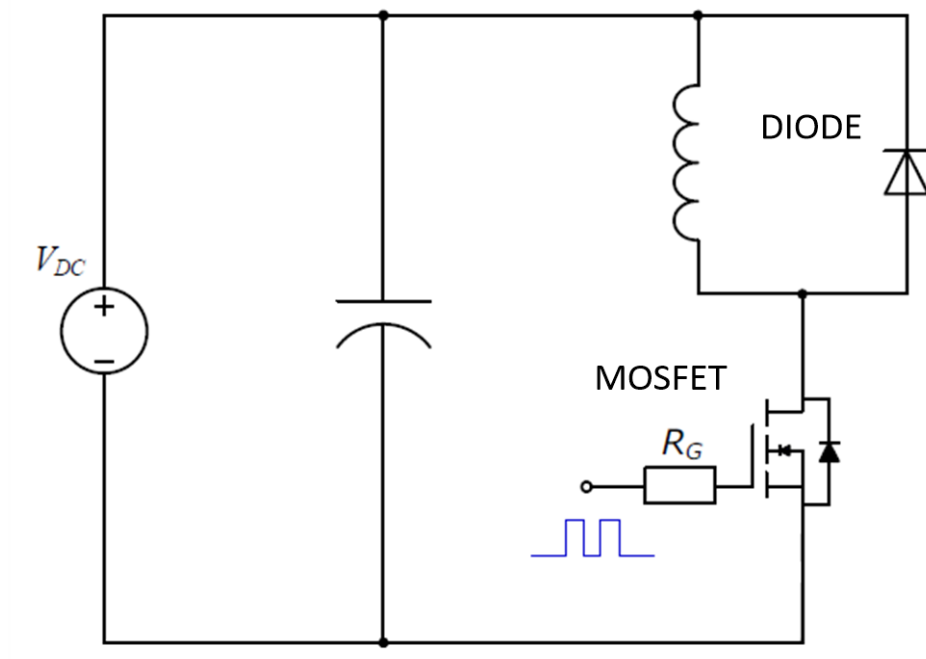
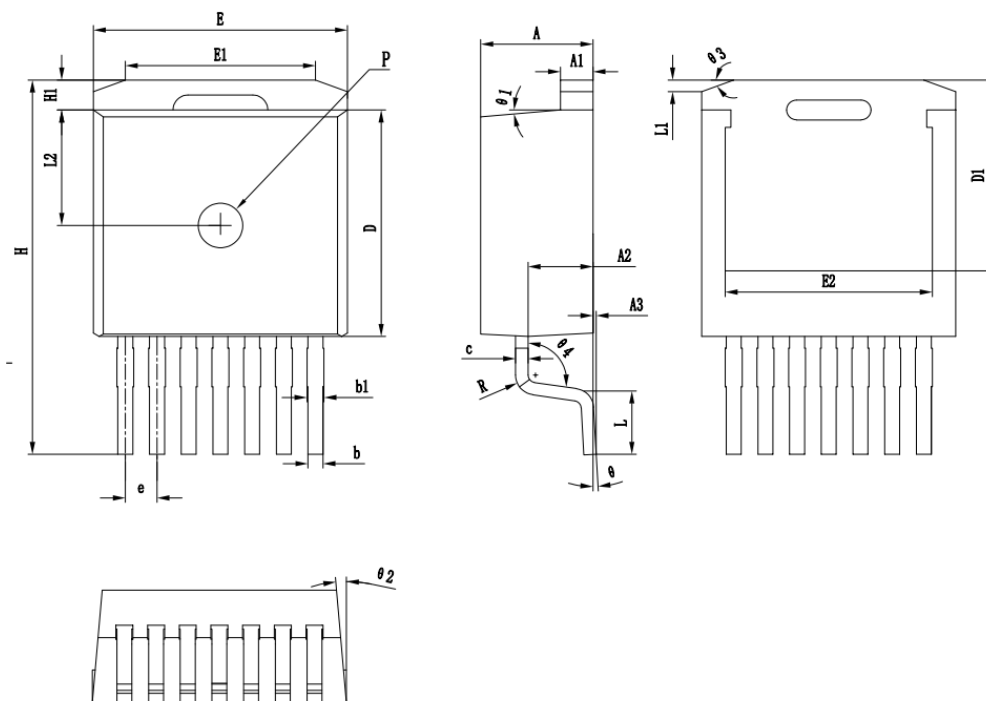


Figure 23. Clamped Inductive Switching
Waveform Test Circuit

Package Dimensions



SYMBOLS	DIMENSIONS MILLIMETERS		
	MIN	NOR	MAX
A	4.40	4.50	4.60
A1	1.25	1.30	1.4
A2	2.45	2.6	2.70
A3	0.05	0.13	0.20
b	0.50	0.60	0.70
b1	0.60	0.70	0.85
c	0.45	0.50	0.60
D	8.88	9.08	9.28
D1	7.45	7.65	7.85
E	9.18	10.18	10.28
E1	6.67	7.07	7.47
E2	8.10	8.30	8.50
e	1.27bsc		
H	14.80	15	15.20
H1	1.10	1.20	1.30
L	2.35	2.55	2.75
L1	0.37	0.57	0.77
L2	4.48	4.63	4.78
θ	0°	3°	5°
$\theta 1$	3°	5°	7°
$\theta 2$	3°	5°	7°
$\theta 3$	15°	20°	25°
$\theta 4$	93°	98°	100°
R	0.75	0.8	0.85
p	1.7	1.8	1.9

Notes

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