

WM3HA300065E

N-Channel SiC Power MOSFET

G3 MOSFET Technology

V_{DS}	=	650	V
$R_{DS(on)}$	=	300	mΩ
$I_D@25^{\circ}C$	=	10	A

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive
- 15V / 0V V_{GS} compatible with most flyback controllers

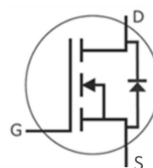
Benefits

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

Applications

- Solar and UPS inverters
- On Board Charger
- High voltage DC/DC converters
- Switched mode power supplies
- Load switch
- LED/LCD/PDP TV and monitor Lighting

Package



Part Number	Package	Marking
WM3HA300065E	TO-252-2L	WM3HA300065E

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	650	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...0/+15...+18	V	Recommended operational values	
I_D	Continuous Drain Current	10	A	$V_{GS}=15V, T_c=25^{\circ}C$	Fig. 19
		7		$V_{GS}=15V, T_c=100^{\circ}C$	
		11		$V_{GS}=18V, T_c=25^{\circ}C$	
		8		$V_{GS}=18V, T_c=100^{\circ}C$	
$I_{D(pulse)}$	Pulsed Drain Current	25	A	Pulse width t_p limited by T_{Jmax}	
P_D	Power Dissipation	53	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	650	/	/	V	$V_{GS}=0V, I_D=100\mu A$	
$V_{GS(th)}$	Gate Threshold Voltage	2.4	3.2	4.0	V	$V_{DS}=V_{GS}, I_D=1.4mA$	Fig. 11
		/	2.4	/		$V_{DS}=V_{GS}, I_D=1.4mA, T_J=175^{\circ}\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current	/	1	10	μA	$V_{DS}=650V, V_{GS}=0V$	
I_{GSS+}	Gate-Source Leakage Current	/	10	50	nA	$V_{DS}=0V, V_{GS}=23V$	
I_{GSS-}	Gate-Source Leakage Current	/	10	50	nA	$V_{DS}=0V, V_{GS}=-10V$	
$R_{DS(on)}$	Drain-Source On-State Resistance	/	300	420	m Ω	$V_{GS}=15V, I_D=5A$	Fig. 4,5,6
		/	370	/	m Ω	$V_{GS}=15V, I_D=5A, T_J=175^{\circ}\text{C}$	
		/	250	350	m Ω	$V_{GS}=18V, I_D=5A$	
		/	305	/	m Ω	$V_{GS}=18V, I_D=5A, T_J=175^{\circ}\text{C}$	
g_{fs}	Transconductance	/	3.1	/	S	$V_{DS}=20V, I_{DS}=5A$	Fig. 7
		/	2.8	/		$V_{DS}=20V, I_{DS}=5A, T_J=175^{\circ}\text{C}$	
C_{iss}	Input Capacitance	/	224	/	pF	$V_{GS}=0V$	Fig. 17,18
C_{oss}	Output Capacitance	/	10.5	/		$V_{DS}=400V$	
C_{rss}	Reverse Transfer Capacitance	/	1.1	/		$f=1MHz$	
E_{oss}	C_{oss} Stored Energy	/	1.3	/	μJ	$V_{AC}=25mV$	Fig. 16
E_{ON}	Turn-On Switching Energy	/	12	/	μJ	$V_{DS}=400V, V_{GS}=0V/15V$	
E_{OFF}	Turn-Off Switching Energy	/	8	/		$I_D=5A, R_{G(ext)}=2.5\Omega, L=100\mu H$	
$t_{d(on)}$	Turn-On Delay Time	/	5.5	/	ns	$V_{DS}=400V, V_{GS}=0V/15V, I_D=5A$ $R_{G(ext)}=2.5\Omega, R_L=160\Omega$	
t_r	Rise Time	/	4.3	/			
$t_{d(off)}$	Turn-Off Delay Time	/	9.1	/			
t_f	Fall Time	/	7.3	/			
$R_{G(int)}$	Internal Gate Resistance	/	12	/	Ω	$f=1MHz, V_{AC}=25mV$	
Q_{GS}	Gate to Source Charge	/	2.3	/	nC	$V_{DS}=400V$	Fig. 12
Q_{GD}	Gate to Drain Charge	/	1.9	/		$V_{GS}=0V/15V$	
Q_G	Total Gate Charge	/	6.3	/		$I_D=5A$	

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.2	/	V	$V_{GS}=-5V, I_{SD}=2.5A, T_J=25^{\circ}\text{C}$	Fig. 8,9,10
		3.6	/		$V_{GS}=-5V, I_{SD}=2.5A, T_J=175^{\circ}\text{C}$	
I_S	Continuous Diode Forward Current	/	8	A	$T_C=25^{\circ}\text{C}$	
t_{rr}	Reverse Recover Time	8.2	/	ns	$V_R=400V, I_{SD}=2.5A$	
Q_{rr}	Reverse Recovery Charge	14.1	/	nC		
I_{rrm}	Peak Reverse Recovery Current	0.9	/	A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	2.82	/	$^{\circ}\text{C}/\text{W}$		
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	/	40			

Typical Performance

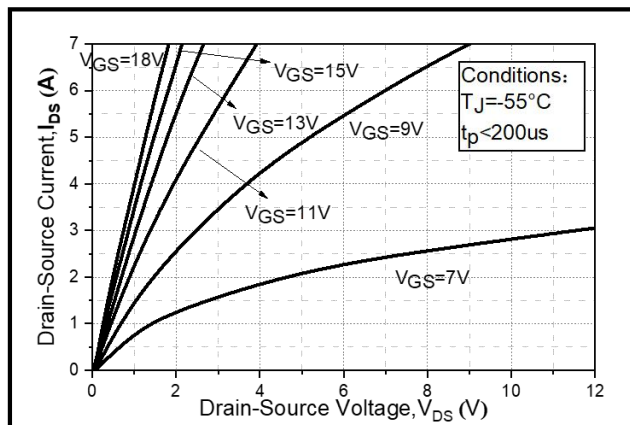
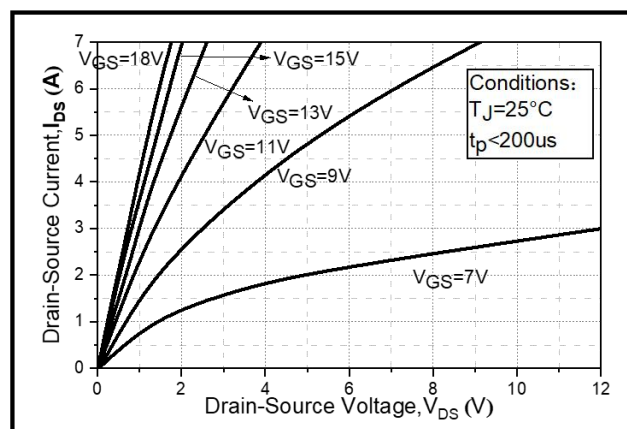


Figure 1. Output Characteristics $T_J = -55^{\circ}\text{C}$



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

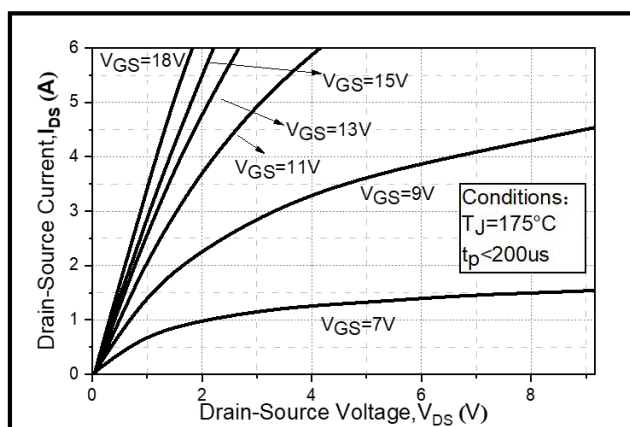


Figure 3. Output Characteristics $T_J = 175^{\circ}\text{C}$

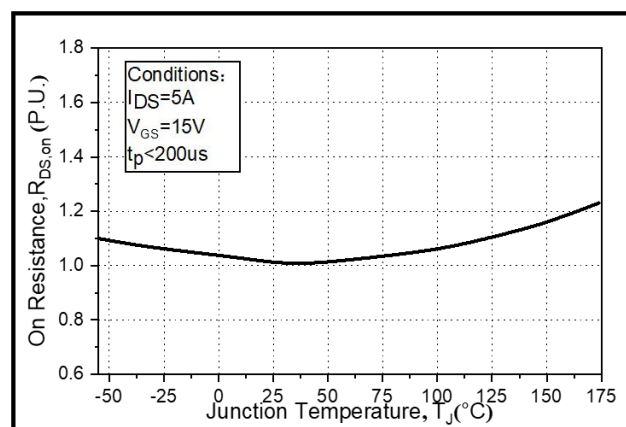


Figure 4. Normalized On-Resistance vs. Temperature

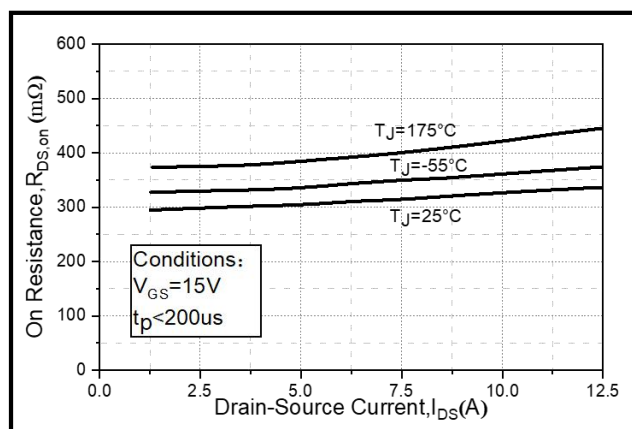


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

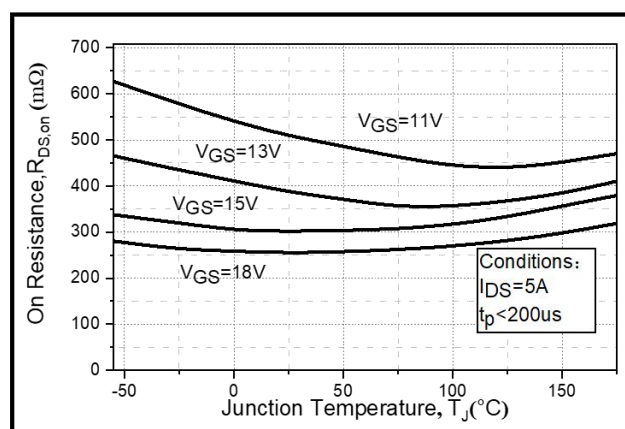


Figure 6. On Resistance vs. Temperature For Various Gate Voltage

Typical Performance

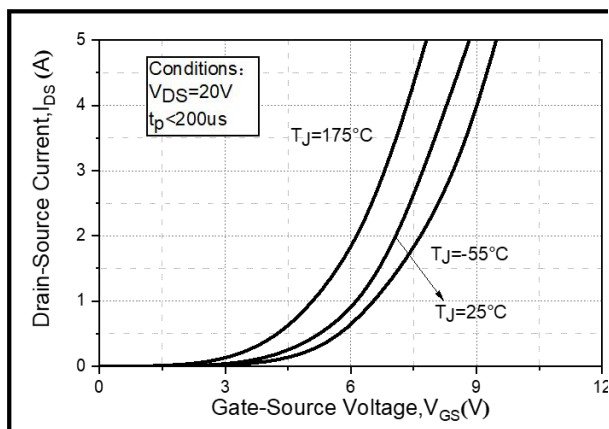


Figure 7. Transfer Characteristic for Various Junction Temperatures

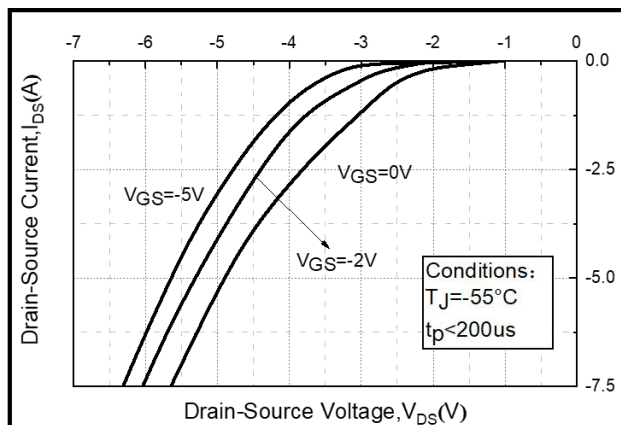


Figure 8. Body Diode Characteristic at -55°C

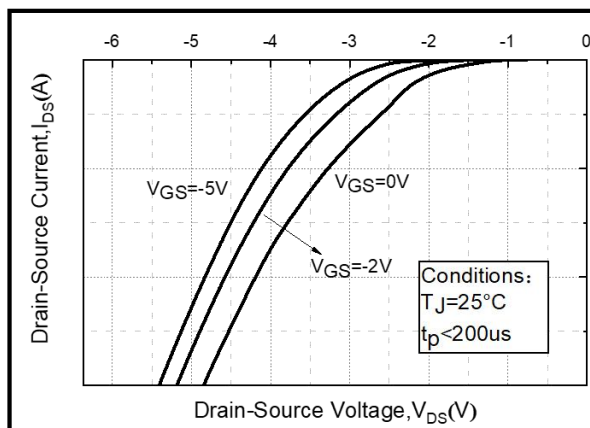


Figure 9. Body Diode Characteristic at 25°C

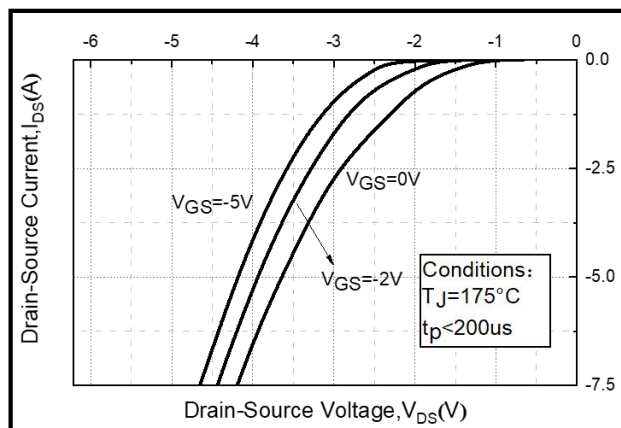


Figure 10. Body Diode Characteristic at 175°C

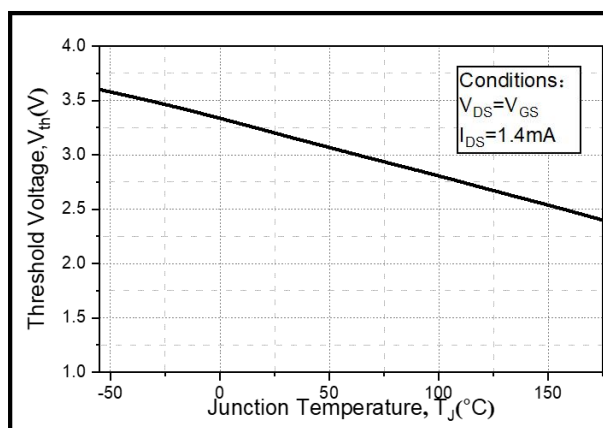


Figure 11. Threshold Voltage vs. Temperature

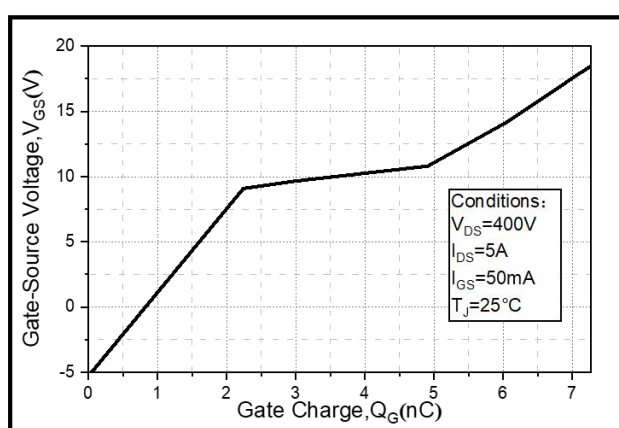


Figure 12. Gate Charge Characteristics

Typical Performance

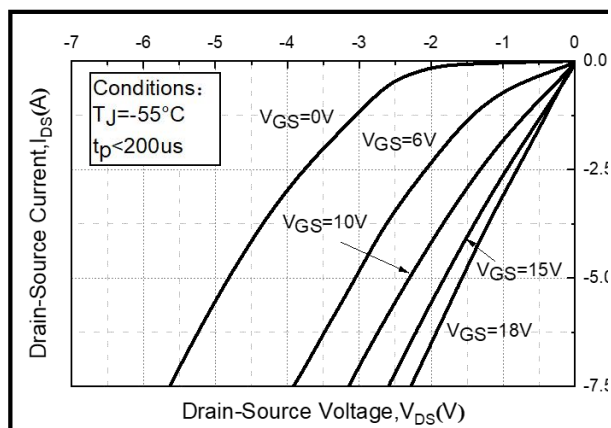


Figure 13. 3rd Quadrant Characteristic at

-55°C

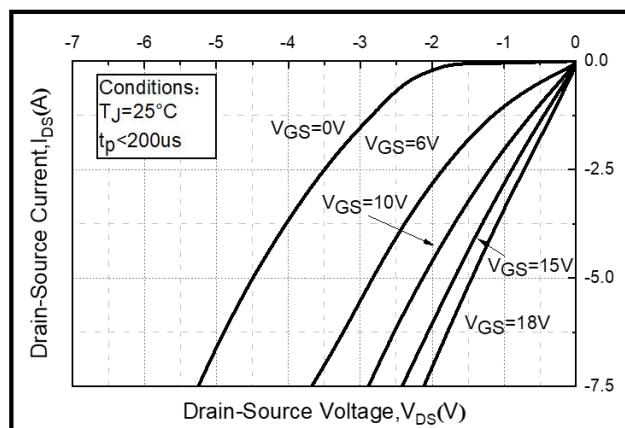


Figure 14. 3rd Quadrant Characteristic at 25°C

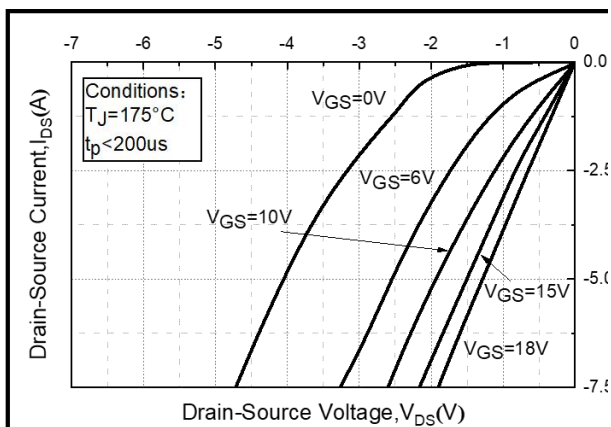


Figure 15. 3rd Quadrant Characteristic at 175°C

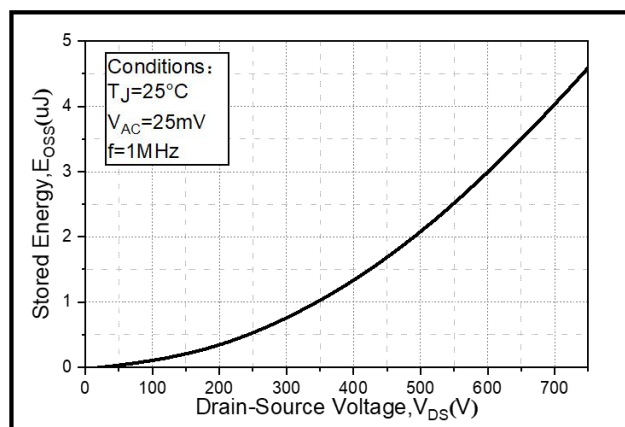


Figure 16. Output Capacitor Stored Energy

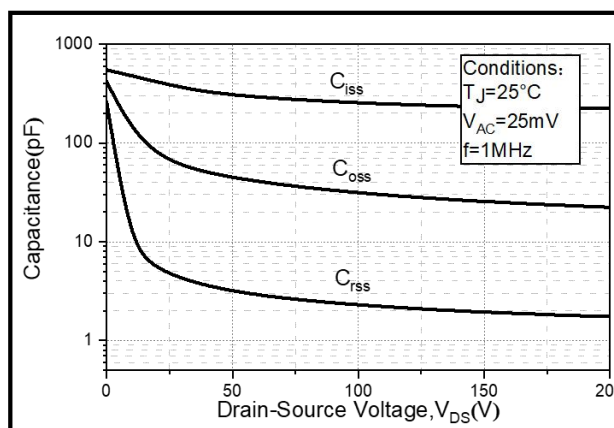


Figure 17. Capacitances vs. Drain-Source Voltage
(0 - 200V)

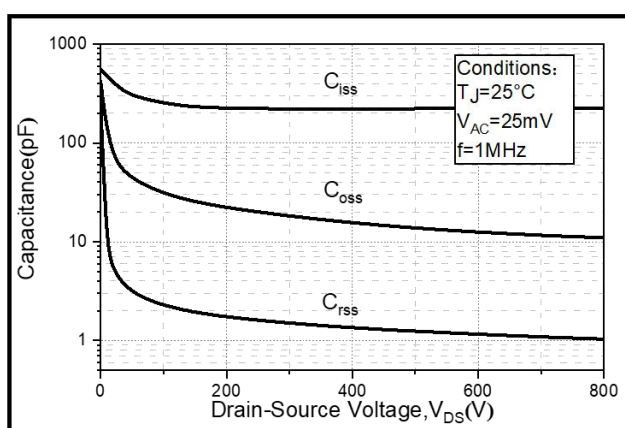


Figure 18. Capacitances vs. Drain-Source Voltage
(0 - 800V)

Typical Performance

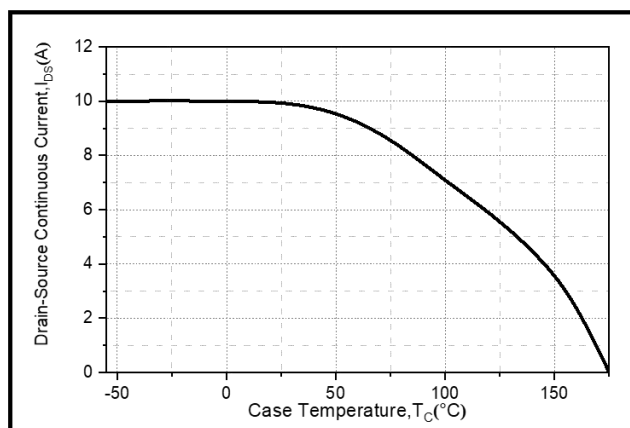


Figure 19. Continuous Drain Current vs. Case Temperature

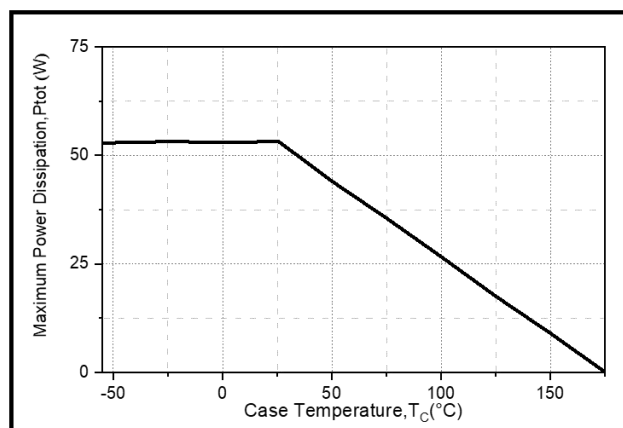
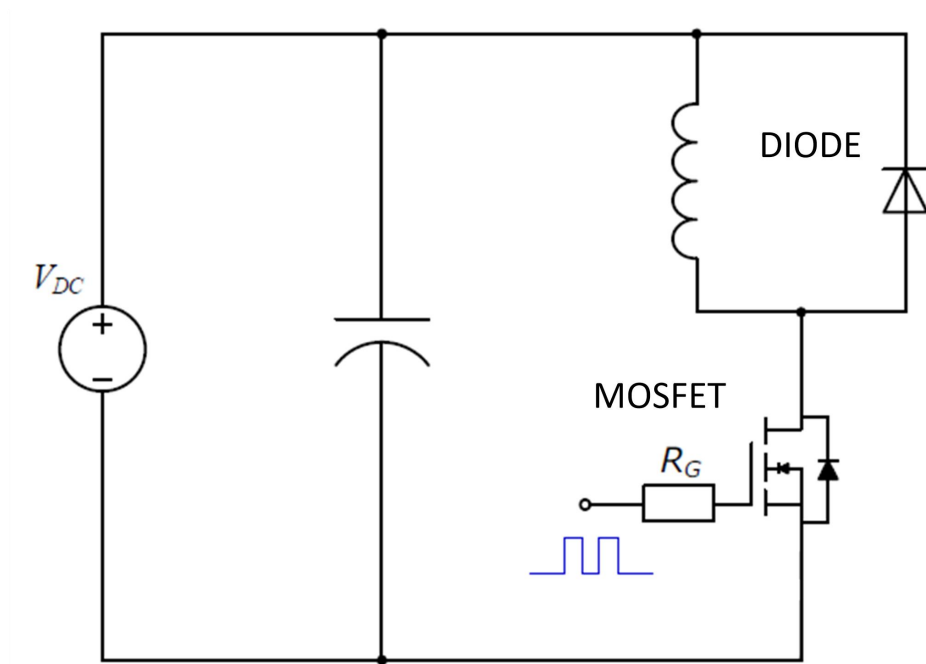


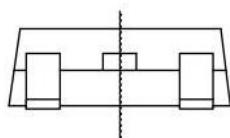
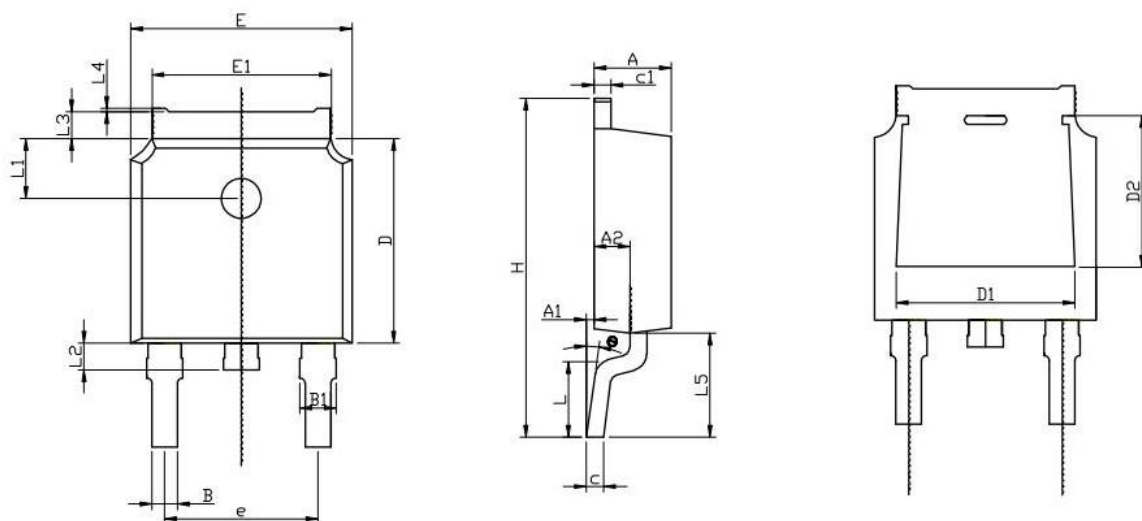
Figure 20. Maximum Power Dissipation vs. Case Temperature

Test Circuit Schematic

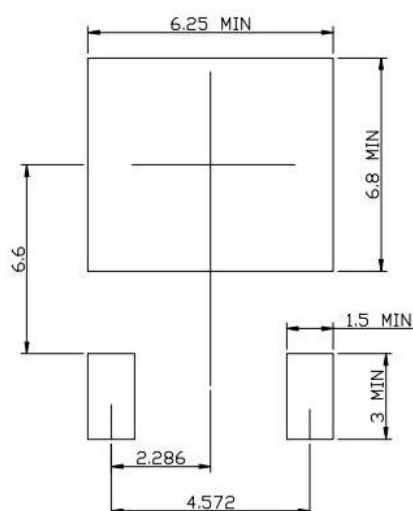


**Figure 21. Clamped Inductive Switching
Waveform Test Circuit**

Package Dimensions



RECOMMENDED LAND PATTERN



	MIN	NOM	MAX
A	2.15	2.30	2.45
A1	0.05	0.10	0.20
A2	0.91	1.07	1.22
B	0.66	0.76	0.86
B1	0.93	1.08	1.23
C	0.40	0.50	0.60
C1	0.40	0.50	0.60
D	5.95	6.10	6.25
D1	—	4.8REF	—
D2	—	3.8REF	—
E	6.45	6.60	6.75
E1	5.12	5.32	5.52
L		1.65	
L1	1.58	1.78	1.98
L2	0.60	0.80	1.00
L3	0.70	0.85	1.00
L4	0.00	0.05	0.20
L5	2.80	3.10	3.40
H	9.80	10.10	10.40
Θ	0°		8°
e		4.572REF	

UNIT: mm

Notes

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