中电国基南方集团有限公司

WMH003M150E1A

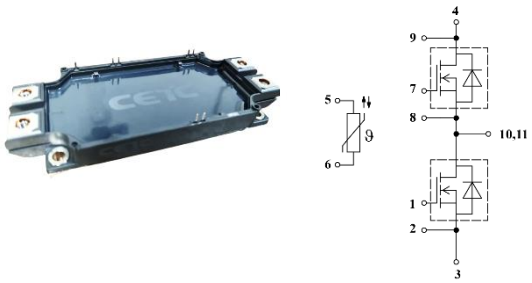
N-Channel SiC Power MOSFET

V_{DS}	=	1500	V
$R_{DS(on).typ}(T_j=25°C)$	=	3.2	mΩ
$I_D(T_C=25°C)$	=	480	A

Features

- V_{DSS}=1500V, I_D=480A
- High current density
- Low switching losses
- High-frequency operation

Package



Benefits

- Si_3N_4 ceramic substrate with low thermal resistance
- Press-FIT contact technology
- Intergrated NTC temperature sensor

Applications

- Construction, commercial, and agriculture vehicles
- UPS systems
- Motor drives
- Wind turbines
- Solar applications

Part Number	Package
WMH003M150E1A	ED3

Maximum Ratings (T_C=25℃ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	1500	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	480	A	V_{GS}=18V, T_c=25°C,T_J≤175°C	Fig.21
		340		V_{GS}=18V, T_c=100°C,T_J≤175°C	
I_{SD}	DC Source-Drain Current(Schottky Diode)	350	A	V_{GS}=-5V, T_c=25°C,T_J≤175°C	
$I_{D(pulse)}$	Pulsed Drain Current	960	A	Pulse width t_p limited by T_{Jmax}	
P_D	Power Dissipation	1500	W	T_c=25°C,T_J≤175°C	Fig.22
T_J	Operating Junction Temperature	-55 to +175	℃		
T_{STG}	Storage Temperature	-55 to +175	℃		

Package Characteristics

Symbol	Parameter	Value	Unit
V_{ISOL}	Isolation test voltage, RMS,AC,50Hz,1min	3.4	kV
L_S	Stray inductance module	12.3	nH
R_{HS}	High-side Resistance	1.0	mΩ
R_{LS}	Low-side Resistance	1.0	mΩ
Distance	Terminal to Heatsink Creepage Distance	14.5	mm
	Terminal to Terminal Creepage Distance	13.0	mm
	Terminal to Heatsink Clearance	12.5	mm
	Terminal to Terminal Clearance	10.0	mm
$R_{\theta JC}$	Average Thermal Resistance of Per Upper Switch	0.1	℃/W
	Average Thermal Resistance of Per Lower Switch	0.1	℃/W
T_{jmax}	Maximum Junction Temperature	175	℃
T_{jop}	Operation Junction Temperature	-40 to +175	℃
T_{STG}	Storage Temperature Range	-40 to +175	℃
G	Weight	396	g
M_t	Module Electrodes Torque, Recommended(M6)	6.0	Nm
M_s	Module to Heatsink Torque, Recommended(M5)	6.0	Nm

Electrical Characteristics (T_{vj}=25℃ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.7	4.0	V	V_{DS}=V_{GS}, I_D=120mA,T_J=25℃	
		/	2.1	/		V_{DS}=V_{GS}, I_D=120mA,T_J=175℃	
I_{DSS}	Zero Gate Voltage Drain Current	/	10	100	μA	V_{DS}=1500V, V_{GS}=0V, T_J=25℃	
I_{GSS+}	Gate-Source Leakage Current	/	50	200	nA	V_{DS}=0V, V_{GS}=23V	
I_{GSS-}	Gate-Source Leakage Current	/	50	200	nA	V_{DS}=0V, V_{GS}=-10V	
$R_{DS(on)}$	Drain-Source On-State Resistance	/	3.15	/	mΩ	V_{GS}=18V, I_D=400A	Fig.2 Fig.3
		/	5.74	/		V_{GS}=18V, I_D=400A, T_J=150℃	
		/	6.47	/		V_{GS}=18V, I_D=400A, T_J=175℃	
g_{fs}	Transconductance	/	130.9	/	S	V_{DS}=20V, I_D=400A, T_J=25℃	Fig.4
E_{ON}	Turn-On Switching Energy, T_J=25℃	/	11.79	/	mJ	V_{DS}=900V, V_{GS}=-5V/18V, I_D=400A L=15μH,$R_{G(OFF)}$=1Ω, $R_{G(ON)}$=1Ω	
	Turn-On Switching Energy, T_J=125℃	/	13.07	/			
	Turn-On Switching Energy, T_J=150℃	/	13.68	/			
E_{OFF}	Turn-Off Switching Energy, T_J=25℃	/	9.76	/			
	Turn-Off Switching Energy, T_J=125℃	/	9.95	/			
	Turn-Off Switching Energy, T_J=150℃	/	9.98	/			
$R_{G(int)}$	Internal Gate Resistance	/	1.78	/	Ω	f=100kHz	
C_{iss}	Input Capacitance	/	26.2	/	nF	V_{GS}=0V V_{DS}=1000V f=100kHz V_{AC}=25mV	
C_{oss}	Output Capacitance	/	0.755	/			
C_{rss}	Reverse Transfer Capacitance	/	64.2	/	pF		
Q_G	Total Gate Charge	/	1270	/	nC	V_{DS}=1000V,V_{GS}=-5/18V I_D=400A	
Q_{GS}	Gate-Source Charge	/	314.6	/			
Q_{GD}	Gate-Drain Charge	/	606.8	/			

Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	5.19	/	V	V_{GS}=-5V, I_{SD}=400A T_J=25℃	Fig.7
		4.2	/		V_{GS}=-5V, I_{SD}=400A, T_J=150℃	
I_{rrm}	Peak Reverse Recovery Current	388	/	A	V_{GS}=-5V, V_R=900V, I_{SD}=400A, T_J=150℃	
Q_{rr}	Recovered Charge	13.07	/	μC		
t_{rr}	Reverse Recovery Time	59	/	nS		
E_{rr}	Reverse Recovery Energy， T_J=25℃	1.96	/	mJ	V_{DS}=900V, I_D=400A, V_{GS}=-5/18V, $R_{G(On)}$=1Ω, $R_{G(off)}$=1Ω, L=15μH	Fig.14
	Reverse Recovery Energy， T_J=125℃	2.93	/			
	Reverse Recovery Energy， T_J=150℃	3.35	/			

NTC Thermistor

Symbol	Parameter	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
R_{25}	Rated Resistance		5		kΩ	T_{NTC}=25°C
ΔR/R	Deviation of R_{100}	-5		5	%	T_{NTC} = 100°C,R_{100}=493Ω
P_{25}	Power dissipation			60	mW	T_{NTC}=25°C
$B_{25/50}$	B-value		3375		K	$R_2 = R_{25}\exp[B_{25/50}(1/T2-1/(298.15\ K))]$

Typical Performance

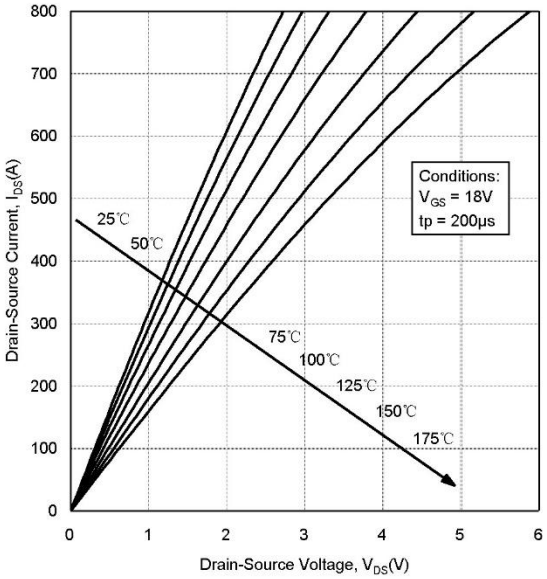


Figure 1. Output Characteristic for Various Junction Temperature

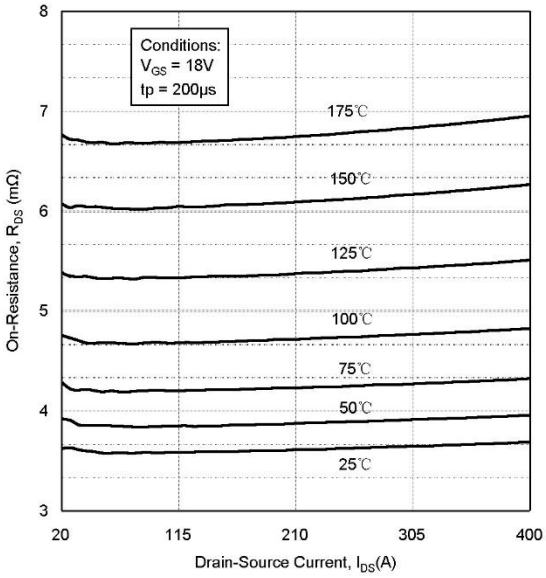


Figure 2. On-State Resistance vs. Drain Current for Various Junction Temperatures

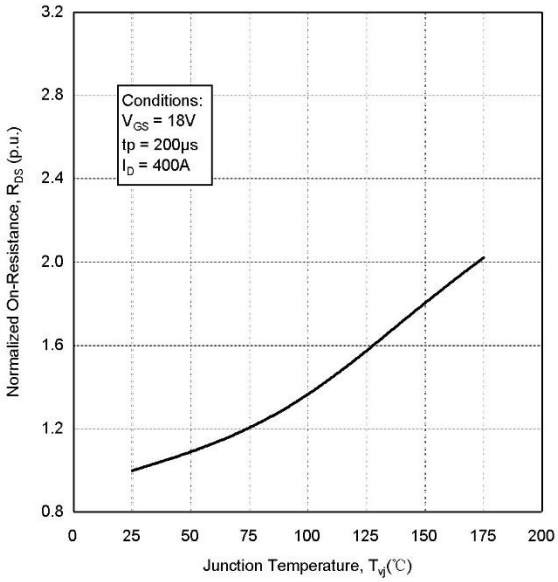


Figure 3. Normalized On-State Resistance vs. Junction Temperature

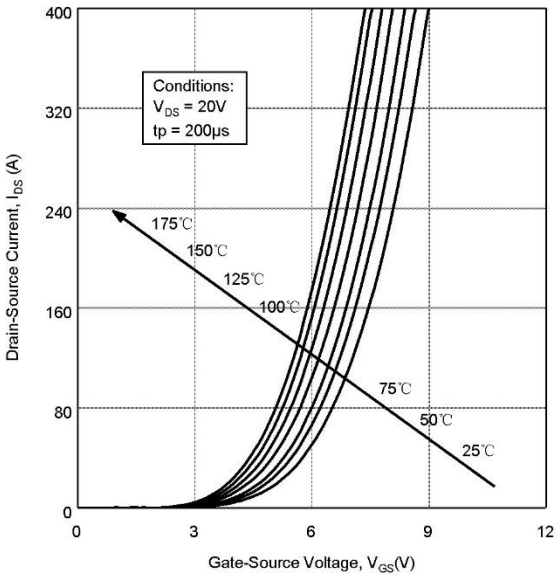


Figure 4. Transfer Characteristic for Various Junction Temperatures

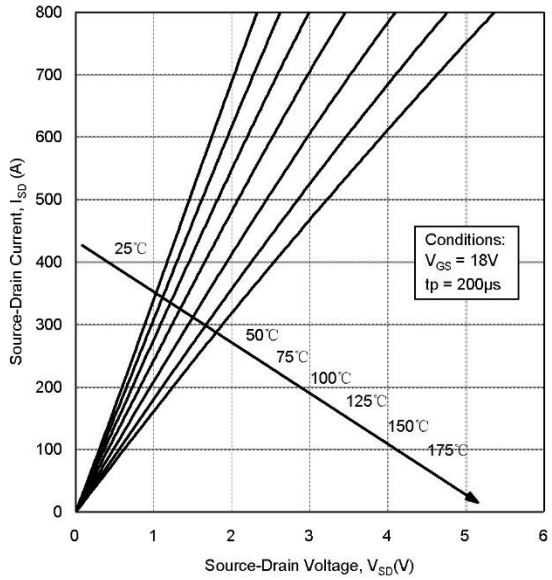


Figure 5. 3rd Quadrant Characteristic vs. Junction Temperatures at V_{GS}=18V

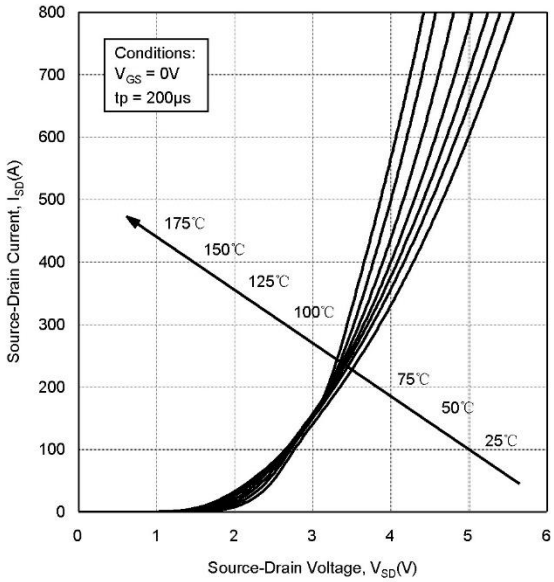


Figure 6. 3rd Quadrant Characteristic vs. Junction Temperatures at V_{GS}=0V(Diode)

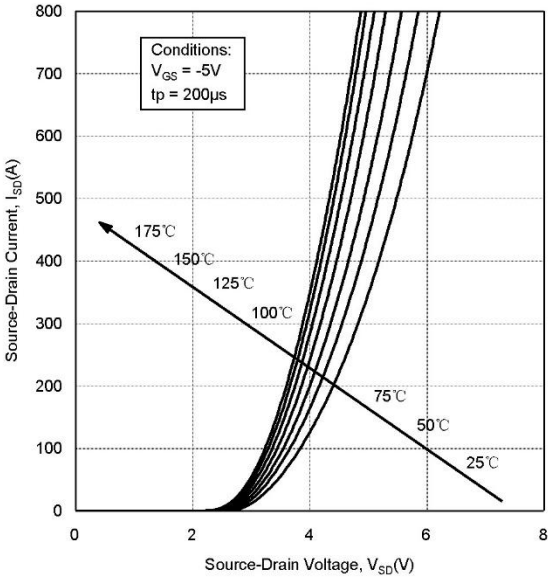


Figure 7. 3rd Quadrant Characteristic vs. Junction Temperatures at V_{GS}=-5V(Diode)

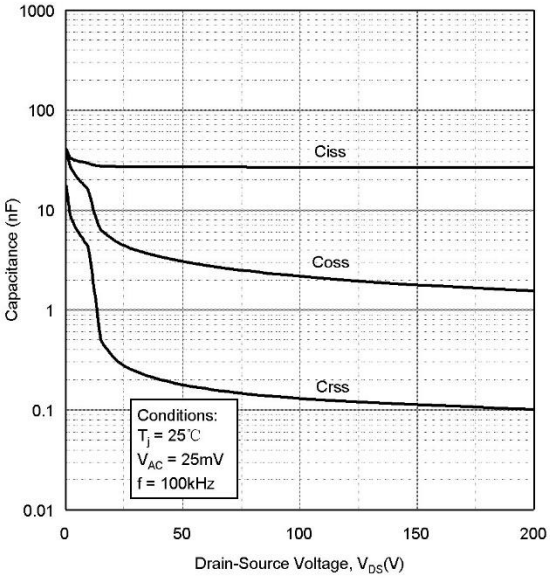


Figure 8. Typical Capacitances vs. Drain to Source Voltage(0~200V)

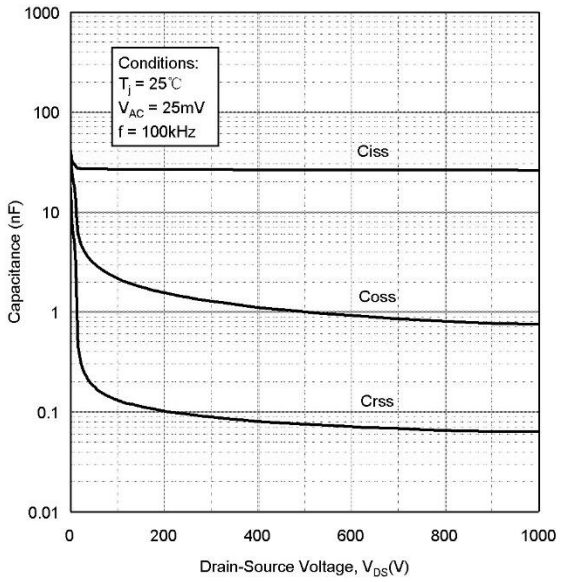


Figure 9. Typical Capacitances vs. Drain to Source (0~1000V)

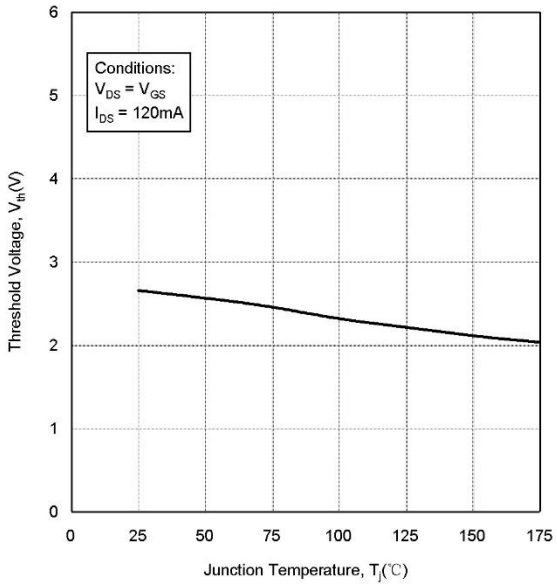


Figure 10. Threshold Voltage vs. Junction Temperature

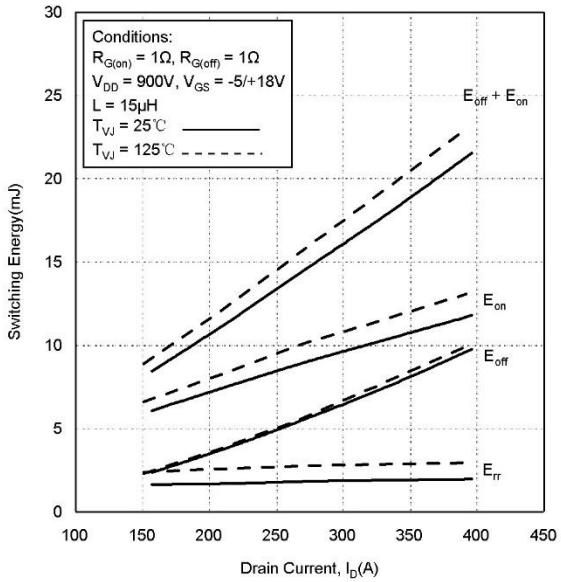


Figure 11. Switching Energy vs. Drain Current (T_{VJ}=25℃/125℃)

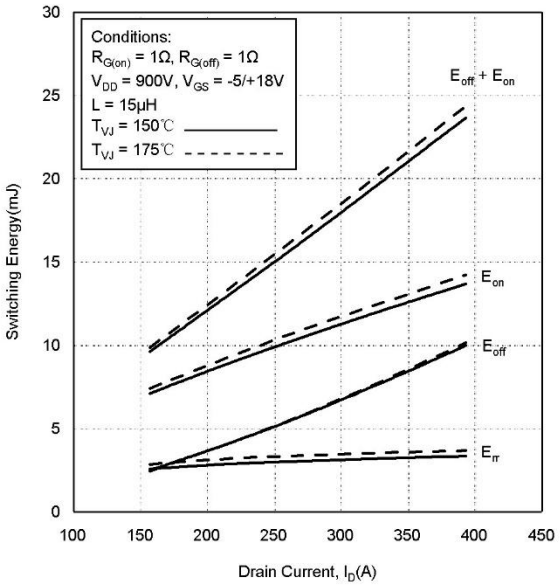


Figure 12. Switching Energy vs. Drain Current (T_{VJ}=150℃/175℃)

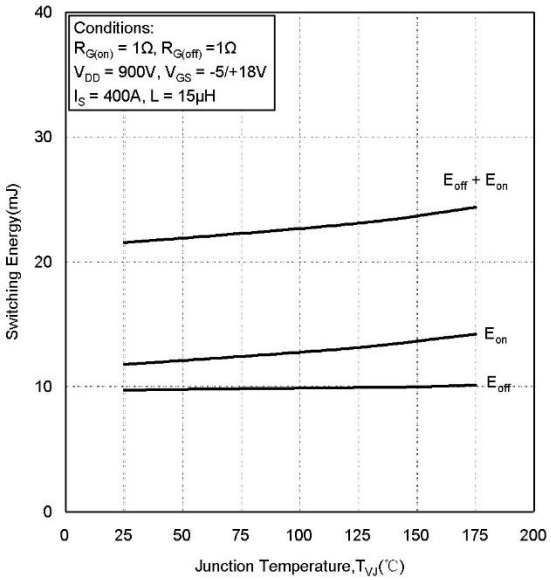


Figure 13. MOSFET Switching Energy vs. Junction Temperature

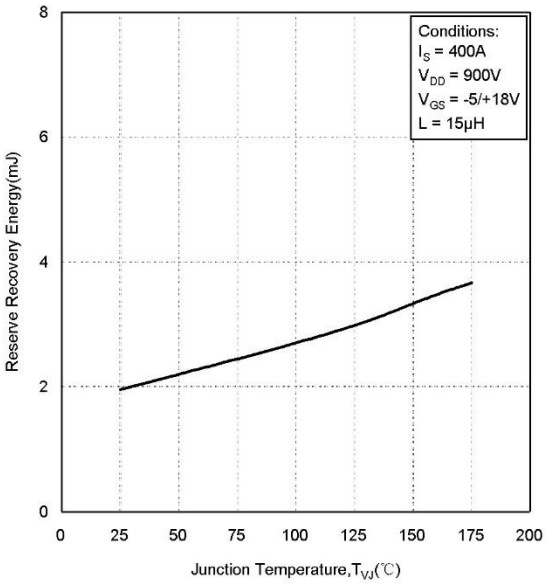


Figure 14. Reverse Recovery Energy vs. Junction Temperature

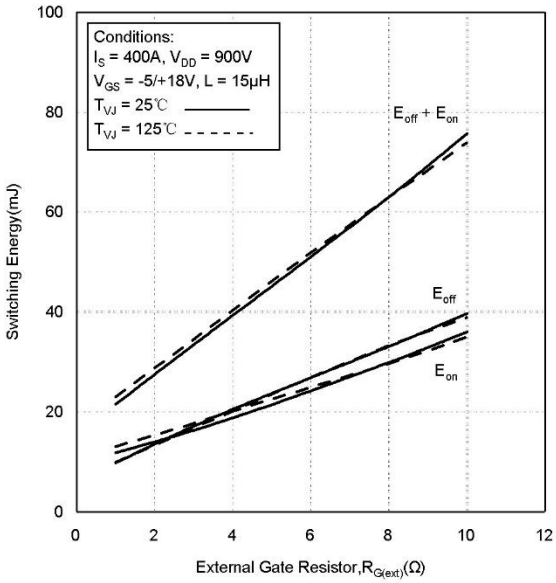


Figure 15. MOSFET Switching Energy vs. External Gate Resistance(T_{VJ}=25℃/125℃)

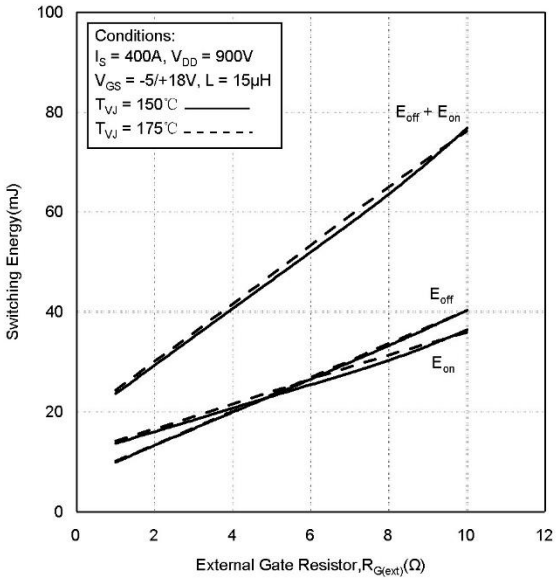


Figure 16. MOSFET Switching Energy vs. External Gate Resistance(T_{VJ}=150℃/175℃)

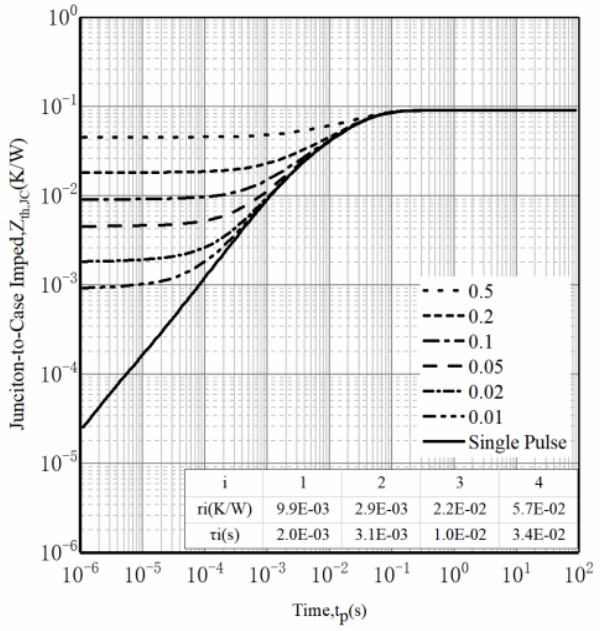


Figure 17. MOSFET Junction to Case Transient Thermal Impedance, $Z_{th,jc}$(℃/W)

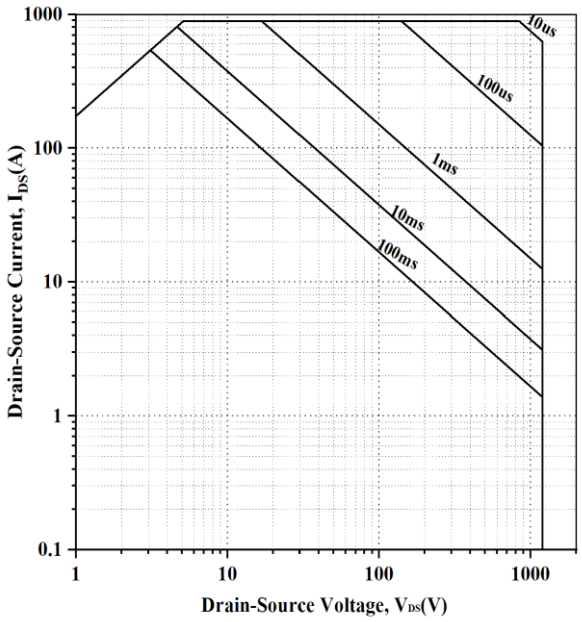


Figure 18. Forward Bias Safe Operating Area(FBSOA)

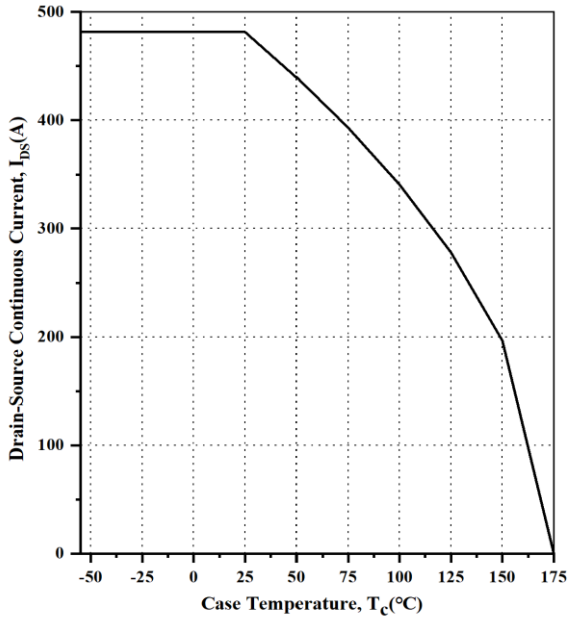


Figure 19. Continuous Drain Current Derating vs. Case Temperature

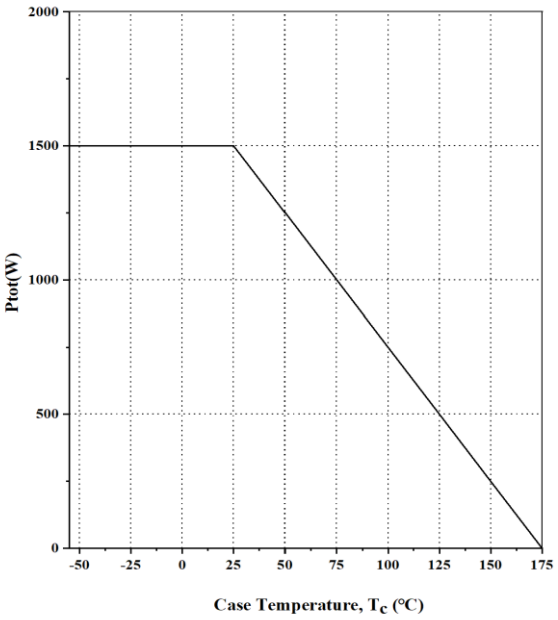


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

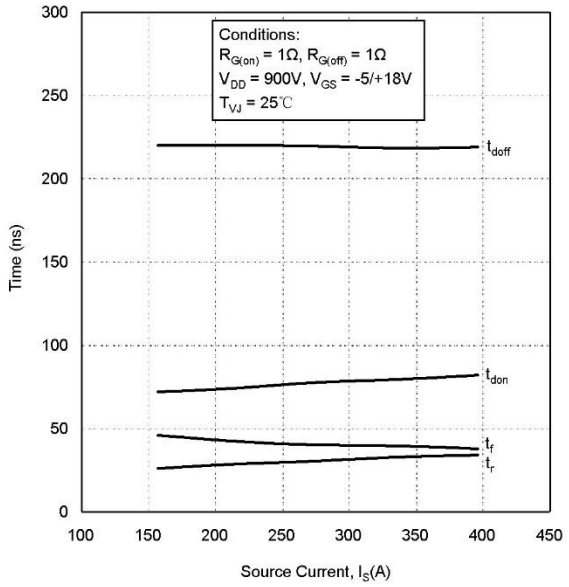


Figure 21. Timing vs. Source Current

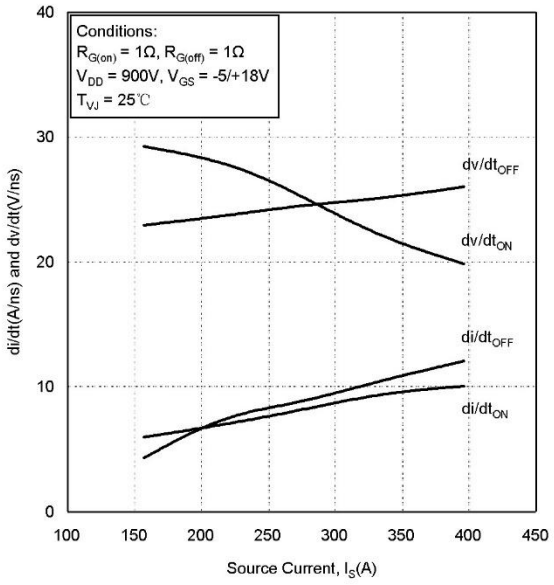


Figure 22.dv/dt and di/dt vs. Source Current

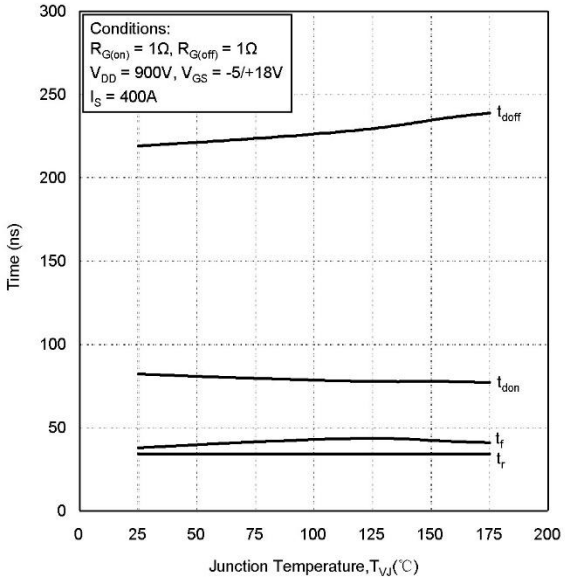


Figure 23. Timing vs. Junction Temperature

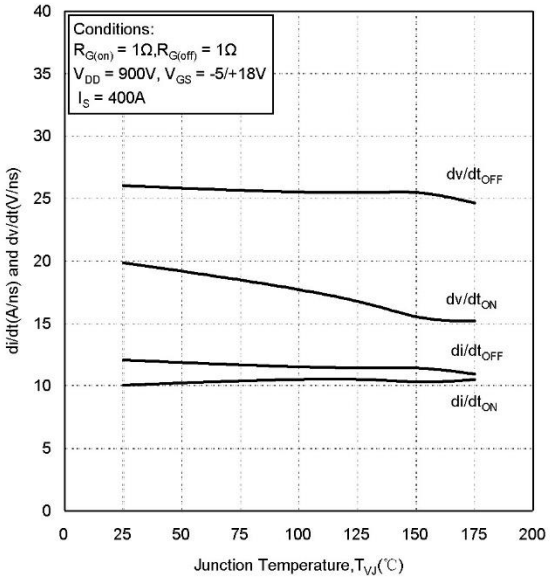


Figure 24.dv/dt and di/dt vs. Junction Temperature

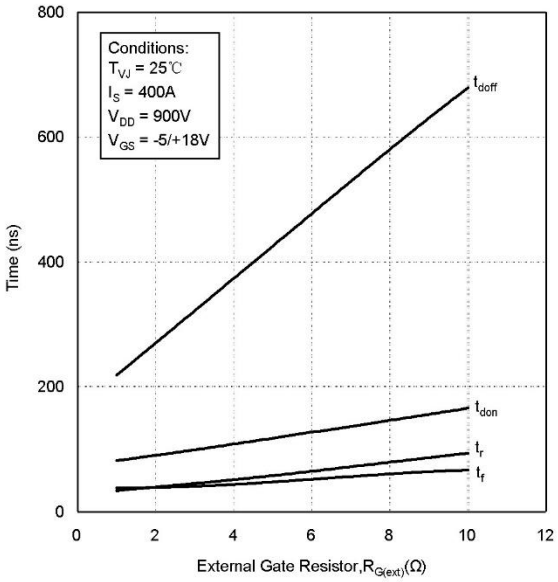


Figure 25. Timing vs. External Gate Resistance

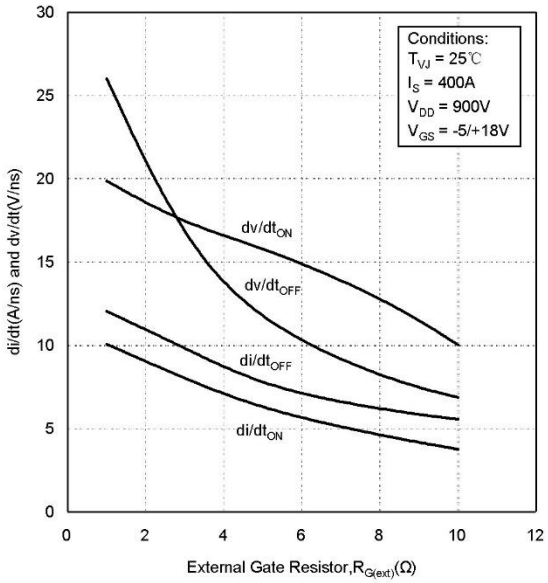


Figure 26.dv/dt and di/dt vs. External Gate Resistance

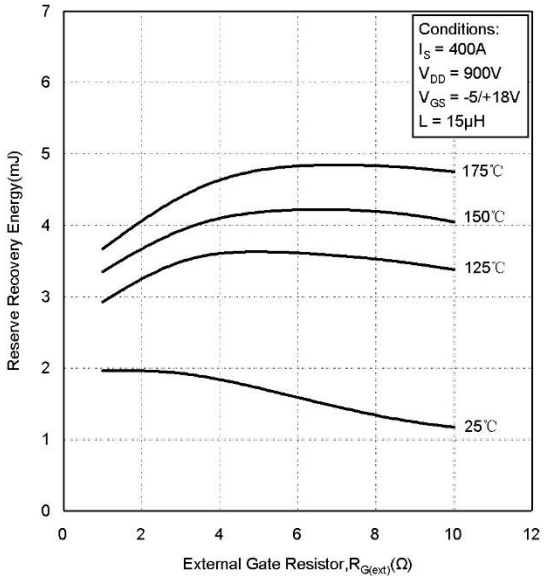


Figure 27. Reverse Recovery Energy vs. External Gate Resistance

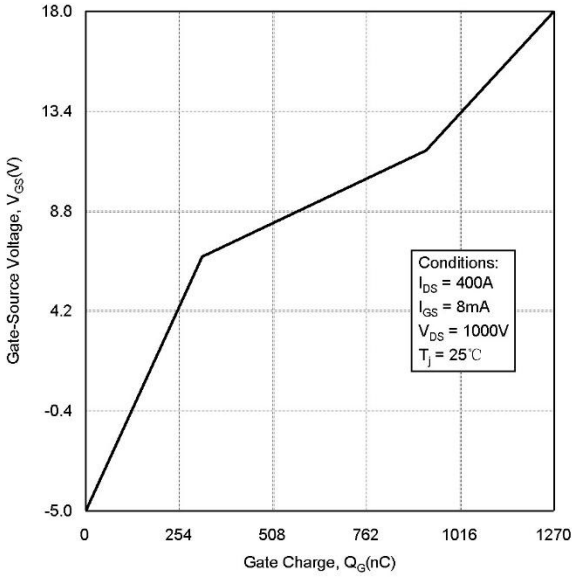


Figure 28. Gate Charge Characteristics

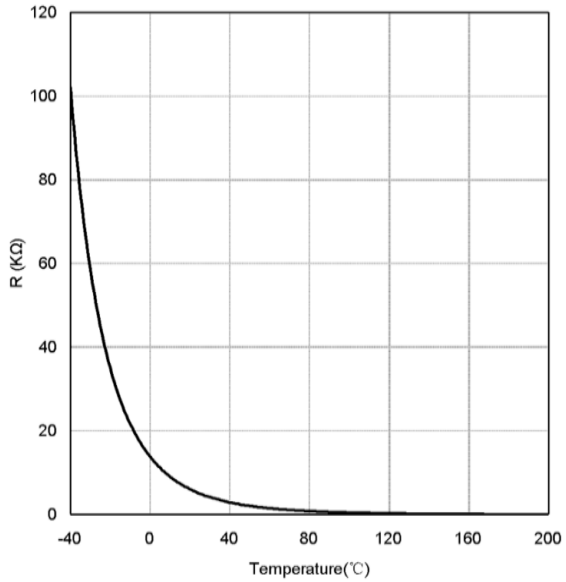


Figure29. Temperature Characteristic(NTC-Thermistor)

$R=f(T_{NTC})$

Package information