

WMH003M170E1SA

N-Channel SiC Power MOSFET

V_{DS}	=	1700	V
$R_{DS(on),typ}(T_J=25^{\circ}C)$	=	2.5	m Ω
$I_D(T_C=25^{\circ}C)$	=	750	A

Features

- $V_{DS}=1700V$, $I_D=750A$
- High current density
- Low switching losses
- High-frequency operation

Benefits

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

Applications

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

Package



Part Number	Package
WMH003M170E1SA	ED3

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	1700	V	$V_{GS}=0V$, $I_D=1mA$	
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	750	A	$V_{GS}=18V$, $T_C=25^{\circ}C$	
		525		$V_{GS}=18V$, $T_C=100^{\circ}C$	
$I_{D(pulse)}$	Pulsed Drain Current	1500	A	Pulse width t_p limited by T_{Jmax}	
P_D	Power Dissipation	2500	W	$T_C=25^{\circ}C$, $T_J=175^{\circ}C$	
T_J	Operating Junction Temperature	-55 to +175	$^{\circ}C$		
T_{STG}	Storage Temperature	-55 to +175	$^{\circ}C$		

Package Characteristics

Symbol	Parameter	Value	Unit
V_{ISOL}	Isolation test voltage, RMS,AC,50Hz,1min	3.4	kV
L_S	Stray inductance module	10	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
$R_{θJC}$	Average Thermal Resistance of Per Upper Switch	0.0600	°C/W
	Average Thermal Resistance of Per Lower Switch	0.0602	°C/W
T_{jmax}	Maximum Junction Temperature	175	°C
T_{jop}	Operation Junction Temperature	-40 to +175	°C
T_{STG}	Storage Temperature Range	-40 to +175	°C
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 ($T_c=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1700	/	/	V	$V_{GS}=0V, I_D=1mA$	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.9	4.0	V	$V_{DS}=V_{GS}, I_D=180mA$	Fig. 11
		/	2.1	/		$V_{DS}=V_{GS}, I_D=180mA, T_J=175^{\circ}\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current	/	/	100	μA	$V_{DS}=1700V, V_{GS}=0V$	
I_{GSS+}	Gate-Source Leakage Current	/	/	1.0	μA	$V_{DS}=0V, V_{GS}=23V$	
I_{GSS-}	Gate-Source Leakage Current	/	/	1.0	μA	$V_{DS}=0V, V_{GS}=-10V$	
$R_{DS(on)}$	Drain-Source On-State Resistance	/	2.5	3.5	$m\Omega$	$V_{GS}=18V, I_D=450A$	Fig. 5,6
		/	4.5	/		$V_{GS}=18V, I_D=450A, T_J=175^{\circ}\text{C}$	
g_{fs}	Transconductance	/	348	/	S	$V_{DS}=20V, I_{DS}=450A$	Fig. 7
		/	318	/		$V_{DS}=20V, I_{DS}=450A, T_J=175^{\circ}\text{C}$	
C_{iss}	Input Capacitance	/	37.4	/	nF	$V_{GS}=0V$	
C_{oss}	Output Capacitance	/	1.46	/		$V_{DS}=1000V$	
C_{rss}	Reverse Transfer Capacitance	/	138		pF	$f=100kHz$	
E_{oss}	C_{oss} Stored Energy	/	654	/	μJ	$V_{AC}=25mV$	
$R_{G(int)}$	Internal Gate Resistance	/	1.5	/	Ω	$f=1MHz, V_{AC}=25mV$	
Q_{GS}	Gate to Source Charge	/	378	/	nC	$V_{DS}=1000V$	Fig. 12
Q_{GD}	Gate to Drain Charge	/	270	/		$V_{GS}=-5V/18V$	
Q_G	Total Gate Charge	/	1512	/		$I_D=450A$	

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.2	/	V	$V_{GS}=-5V, I_{SD}=350A, T_J=25^{\circ}\text{C}$	
		3.8	/		$V_{GS}=-5V, I_{SD}=350A, T_J=175^{\circ}\text{C}$	
I_S	Continuous Diode Forward Current	/	500	A	$T_c=25^{\circ}\text{C}$	

NTC Thermistor

Symbol	Parameter	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
R_{25}	Rated Resistance		5		$k\Omega$	$T_{NTC}=25^{\circ}\text{C}$
$\Delta R/R$	Deviation of R_{100}	-5		5	%	$T_{NTC}=100^{\circ}\text{C}, R_{100}=493\Omega$
P_{25}	Power dissipation			60	mW	$T_{NTC}=25^{\circ}\text{C}$
$B_{25/50}$	B-value		3375		K	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15\text{ K}))]$

Typical Performance

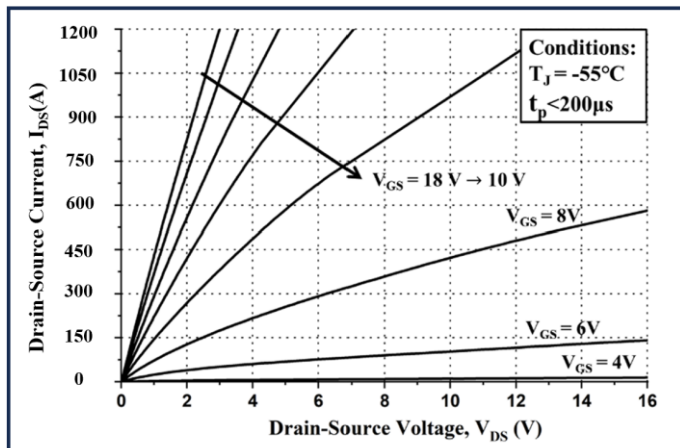


Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$

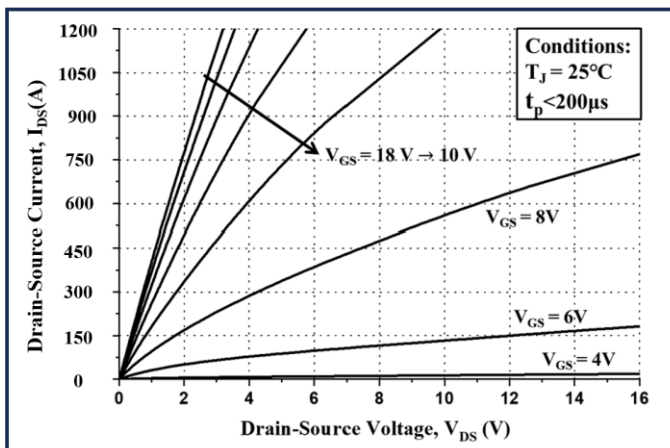


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

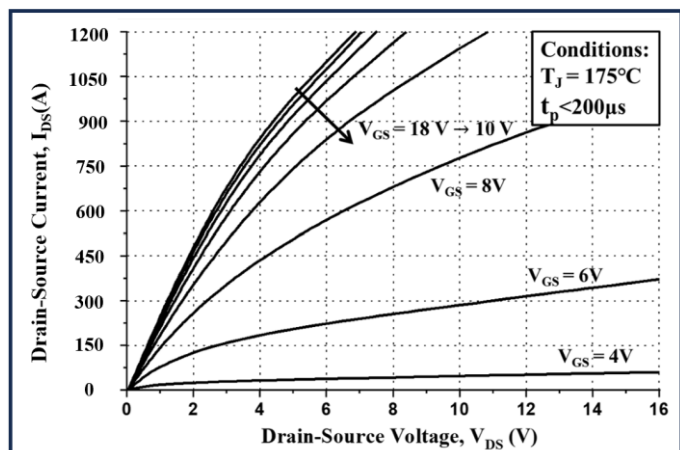


Figure 3. Output Characteristics $T_J = 175^\circ\text{C}$

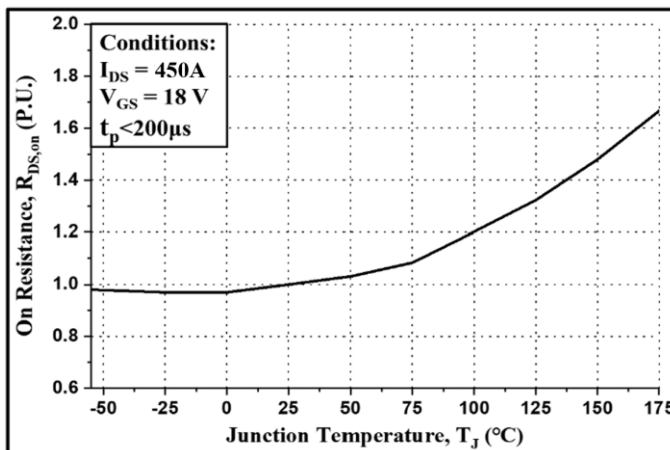


Figure 4. Normalized On-Resistance vs. Temperature

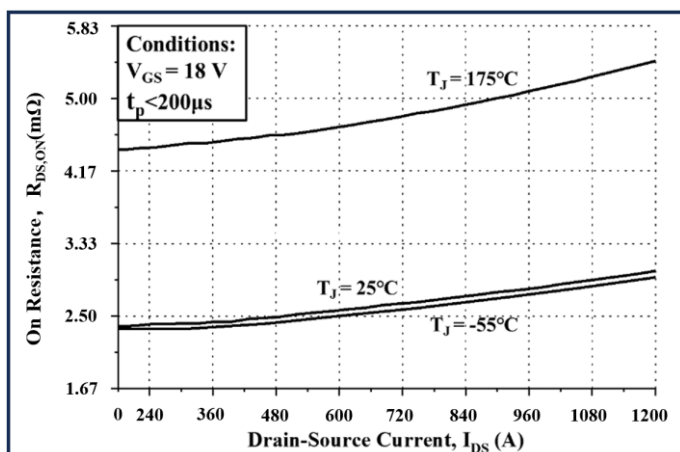


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

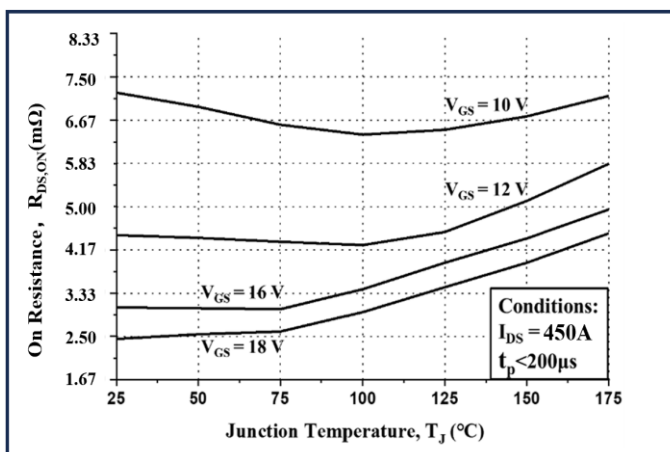


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

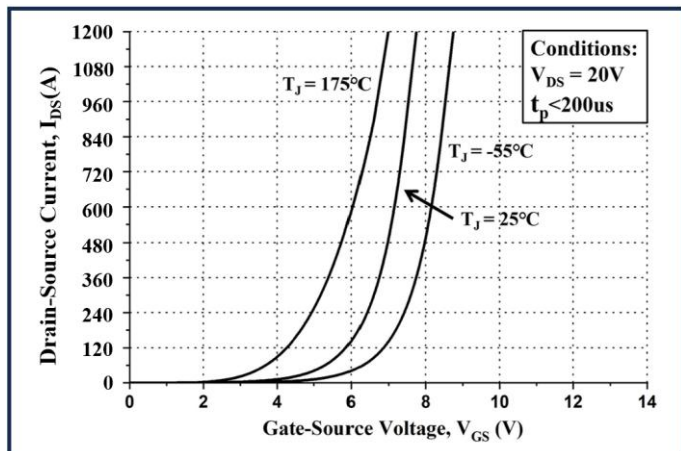


Figure 7. Transfer Characteristic for Various Junction Temperatures

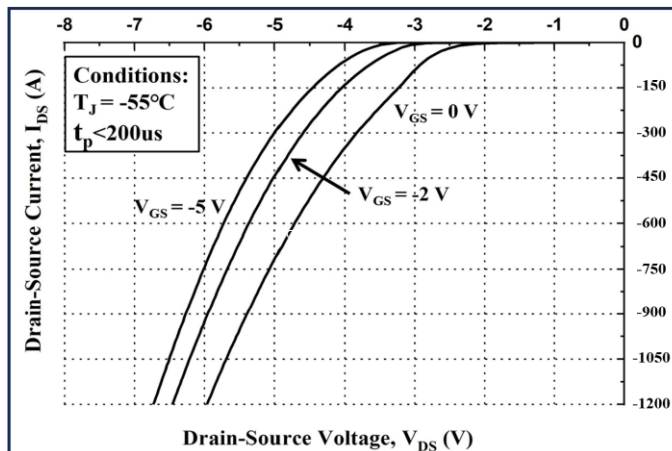


Figure 8. Body Diode Characteristic at -55°C

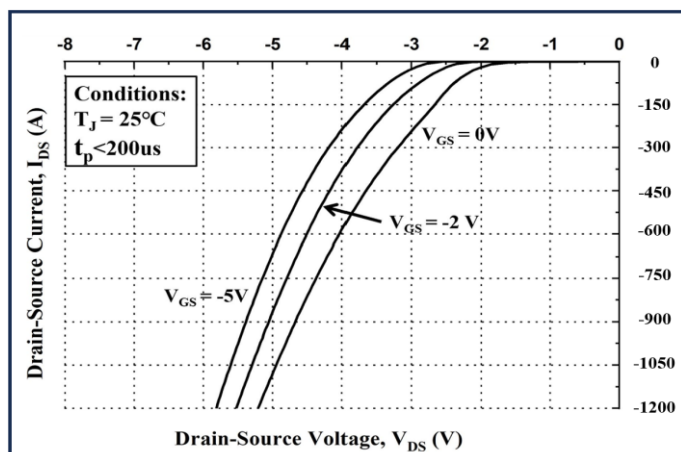


Figure 9. Body Diode Characteristic at 25°C

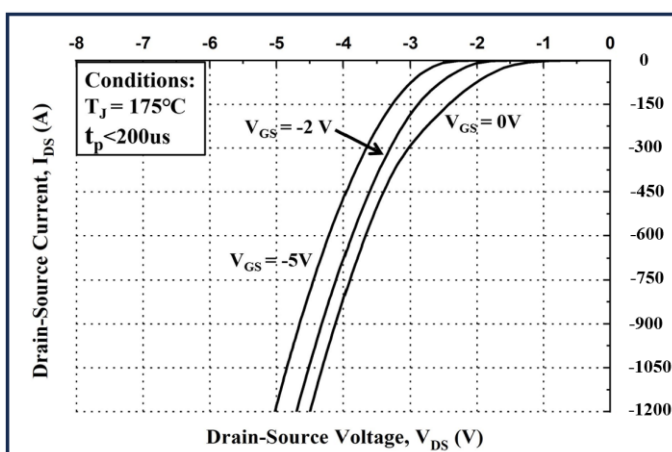


Figure 10. Body Diode Characteristic at 175°C

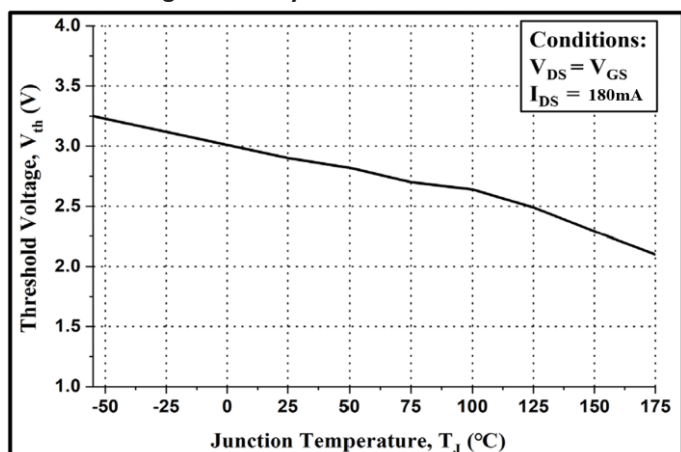


Figure 11. Threshold Voltage vs. Temperature

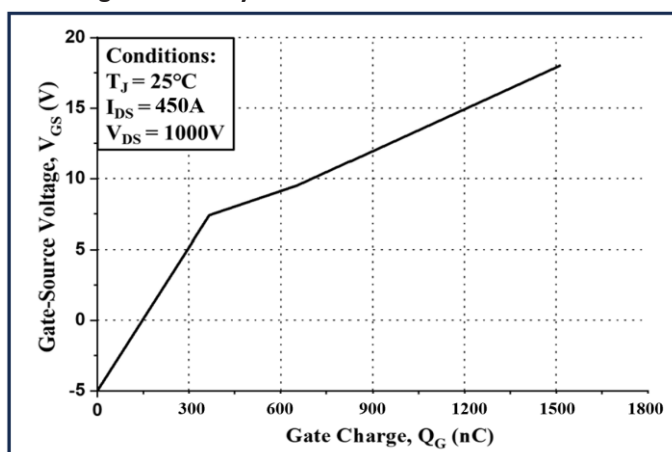


Figure 12. Gate Charge Characteristics

Typical Performance

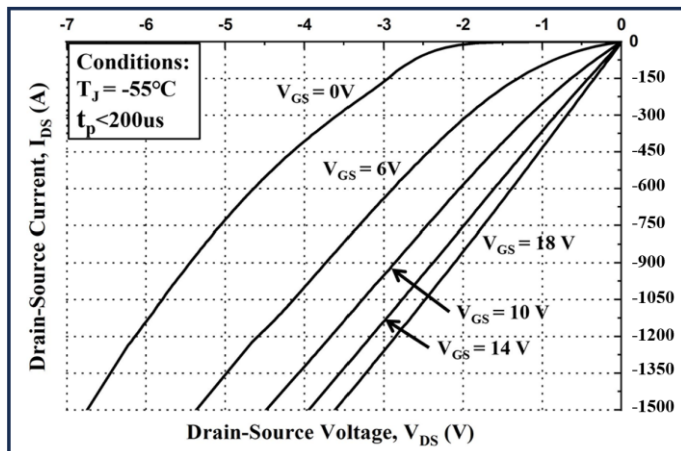


Figure 13. 3rd Quadrant Characteristic at -55°C

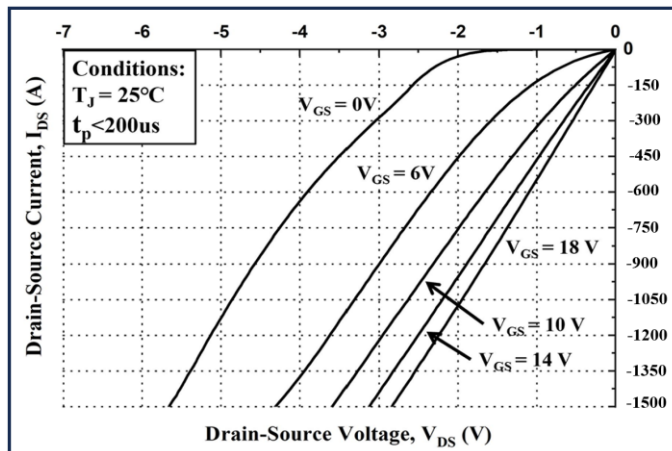


Figure 14. 3rd Quadrant Characteristic at 25°C

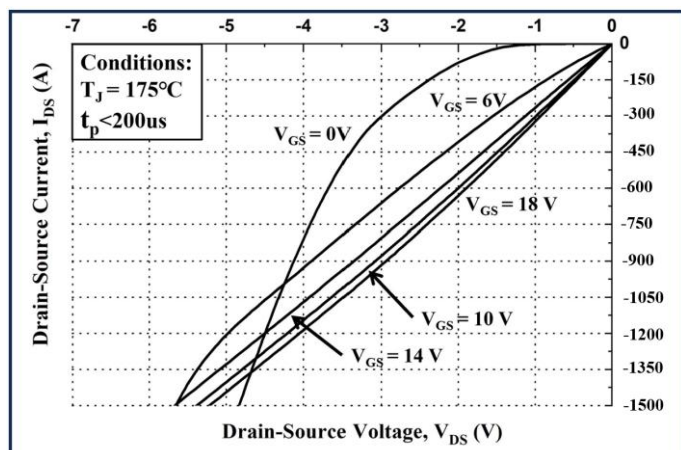


Figure 15. 3rd Quadrant Characteristic at 175°C

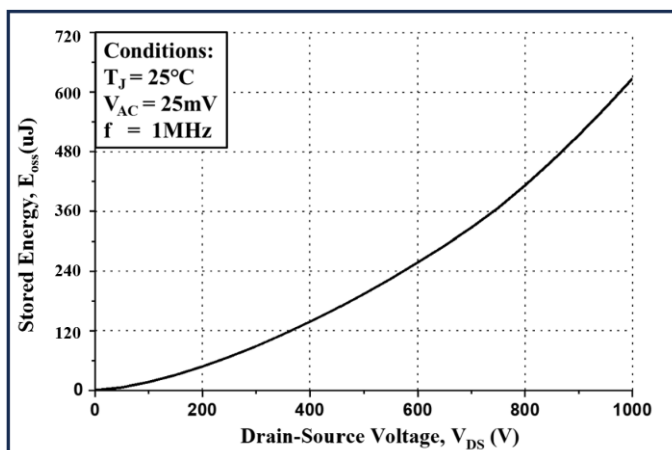


Figure 16. Output Capacitor Stored Energy

Typical Performance

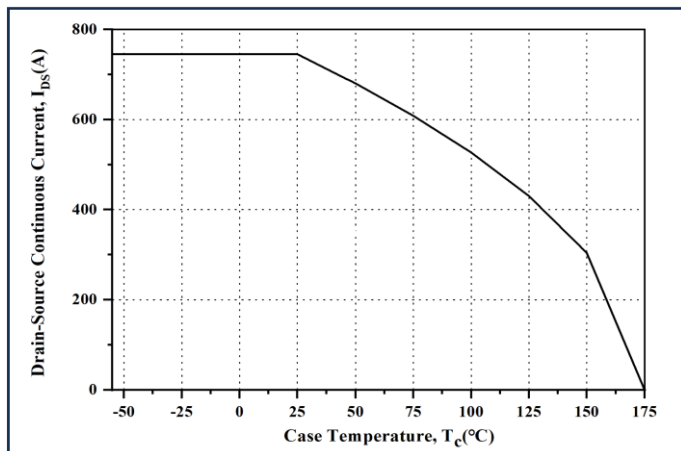


Figure 17. Continuous Drain Current Derating vs. Case Temperature

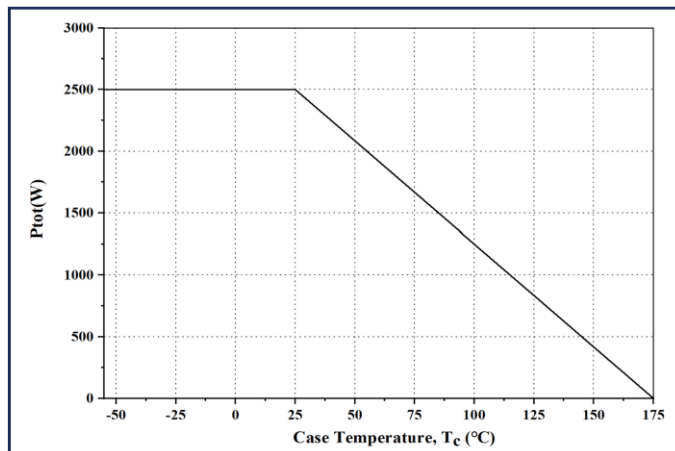


Figure 18. Maximum Power Dissipation Derating vs. Case Temperature

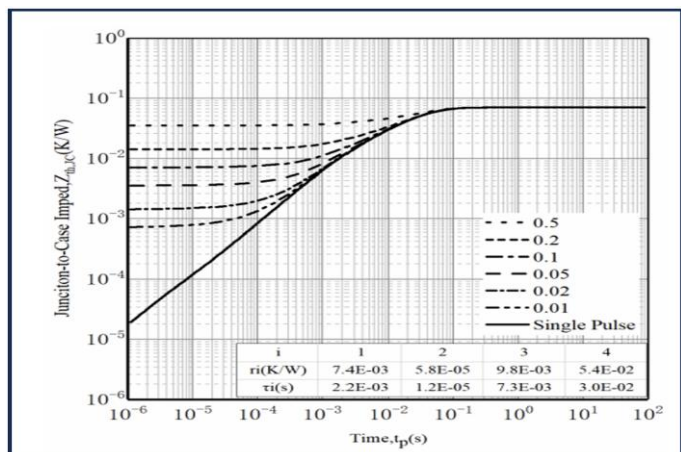


Figure 19. Transient Thermal Impedance (Junction - Case)

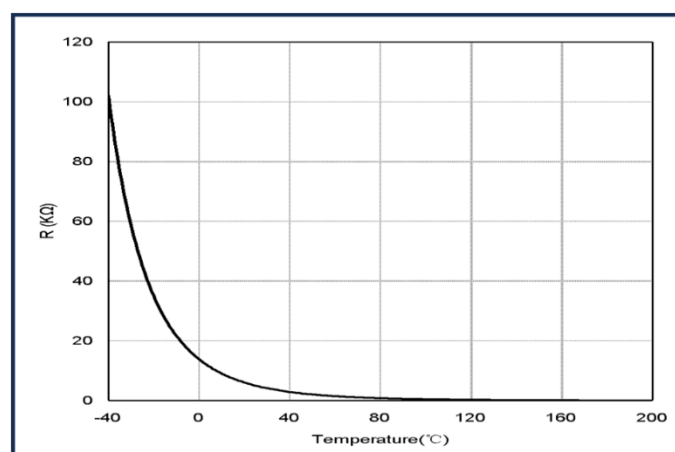


Figure 20. Temperature Characteristic (NTC-Thermistor)
 $R=f(T_{NTC})$

Package information

