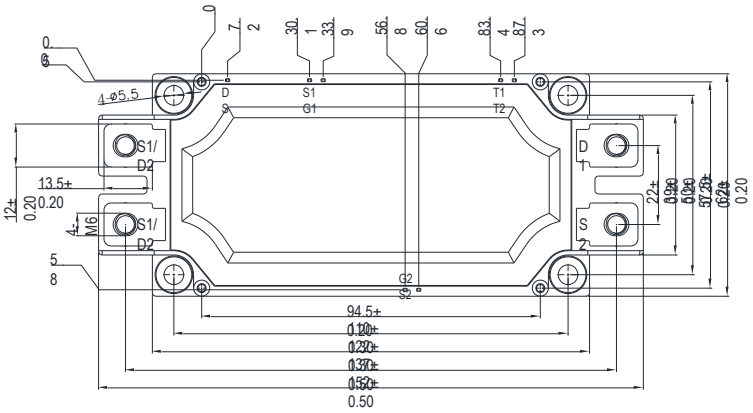
HC4R120E5

SiC Power Module

V_{DS}=1200V $R_{DS(on)}$=4mΩ

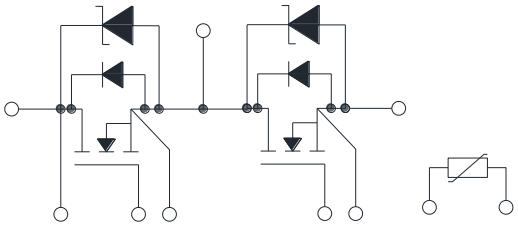


Applications

- Motor Drives
- Solar and Wind Inverters
- DC/AC Converters

Features

- Ultra Low Loss
- High-Frequency Operation
- Zero Reverse Recovery Current from Diode
- Zero Turn-Off Tail Current from MOSFET
- High Junction Temperature(175℃) Operation
- High Reliability Si_3N_4 Insulator



Equivalent Circuit Schemati

● Absolute Maximum Ratings (T_{vj} =25℃ unless otherwise specified)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	$V_{DS\ max}$		1200	V
Continuous Drain Current	I_D	V_{GS}=18V, T_c=25℃	360	A
		V_{GS}=18V, T_c=80℃	300	
Gate- Source Voltage	$V_{GS\ max}$	Absolute Maximum Values	-8/+22	V
Gate-Source Voltage	$V_{GS\ op}$	Recommended Operational Values	-4/+18	V
Maximum Pulsed Drain-Source Current	$I_{D(pulsed)}$	V_{GS}=18V, T_{vj}=25℃, t_{pmax} limited by $T_{vj\ max}$	600	A
Operating Junction Temperature	$T_{vj\ op}$		-40～+150	℃
Maximum Junction Temperature	$T_{vj\ max}$		175	℃
Total power dissipation	P_{tot}	T_c=80℃	730	W

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

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=92mA	2.0	2.6	4	V
		V_{DS}=V_{GS}, I_D=92mA, T_{vj}=175℃		1.8		
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V		4	400	uA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=-8V/+22V		40	2000	nA
On State Resistance	$R_{DS(on)}$	V_{GS}=18V, I_{DS}=300A		4	5.5	mΩ
		V_{GS}=18V, I_{DS}=300A, T_{vj}=175℃		7.2		mΩ
Input Capacitance	C_{iss}	V_{DS}=1000V, V_{AC}=25mV f=1MHz		16.8		nF
Output Capacitance	C_{oss}			2000		pF
Reverse Transfer Capacitance	C_{rss}			64		pF
Gate-Source Charge	Q_{GS}	V_{DS}=600V, V_{GS} =-4V/+18V I_D=300A		216		nC
Gate-Drain Charge	Q_{GD}			116		nC
Total Gate Charge	Q_G			1100		nC
Turn-On Delay Time	$t_{d(on)}$	I_D=300A V_{DS}=600V V_{GS} =-4V/+18V R_G=5.1Ω T_{vj}=25℃		TBD		ns
Rise Time	t_r			TBD		ns
Turn-Off Delay Time	$t_{d(off)}$			TBD		ns
Fall Time	t_f			TBD		ns
Energy Dissipation during Turn-On Time	E_{on}			TBD		mJ
Energy Dissipation during Turn-Off Time	E_{off}			TBD		mJ
Turn-On Delay Time	$t_{d(on)}$	I_D=300A V_{DS}=600V V_{GS} =-4V/+18V R_G=5.1Ω T_{vj}=150℃		TBD		ns
Rise Time	t_r			TBD		ns
Turn-Off Delay Time	$t_{d(off)}$			TBD		ns
Fall Time	t_f			TBD		ns
Energy Dissipation during Turn-On Time	E_{on}			TBD		mJ
Energy Dissipation during Turn-Off Time	E_{off}			TBD		mJ

Diode Characteristics

Parameter	Symbol	Conditions	Value	Unit
Diode Forward Current	I_{SD}	V_{GS}=-4V,T_C=80℃	300	A
Pulsed diode Source-Drain current	$I_{SD\ pulse}$	verified by design,t_p limited by T_{vjmax}	600	A

Parameter	Symbol	Conditions		Value			Unit
				Min.	Typ.	Max.	
Diode Forward Voltage	V_{SD}	I_F=300A,V_{GS}=-4V	T_{vj}=25℃		1.6	1.8	V
			T_{vj}=175℃		2.25	2.7	
Forward Recovery Time	t_{rr}	I_D=300A V_{DS}=600V V_{GS} =-4V	T_{vj}=25℃		TBD		ns
			T_{vj}=150℃		TBD		
Peak Reverse Recovery Current	I_{rrm}		T_{vj}=25℃		TBD		A
			T_{vj}=150℃		TBD		
Recovered Charge	Q_{rr}		T_{vj}=25℃		TBD		uC
			T_{vj}=150℃		TBD		
Reverse Recovery Energy	E_{rec}		T_{vj}=25℃		TBD		mJ
			T_{vj}=150℃		TBD		

NTC Thermistor

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Rated Resistance	R_{25}			5.0		kΩ
Deviation of R100	ΔR/R	T_{NTC}=100, R_{100}=493.3Ω	-5		5	%
Power Dissipation	P_{25}			20.0		mW
B-Value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K

● Module Characteristics

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Case Isolation Voltage	V_{isol}	t=1min, f=50Hz	2500			V
Maximum Junction Temperature	$T_{j\,max}$				175	℃
Operating Junction Temperature	$T_{vj\,op}$		-40		150	℃
Storage Temperature	T_{stg}		-40		125	℃
Stray Inductance Module	L_{sCE}			20		nH
Thermal Resistance Junction to Case	R_{thJC}	Per MOSFET		0.11	0.13	K/W
Module Electrodes Torque	M_t	Recommended(M6)	3.0		6.0	N·m
Module to Heatsink Torque	M_s	Recommended(M5)	3.0		6.0	
Weight of Module	G			346		g

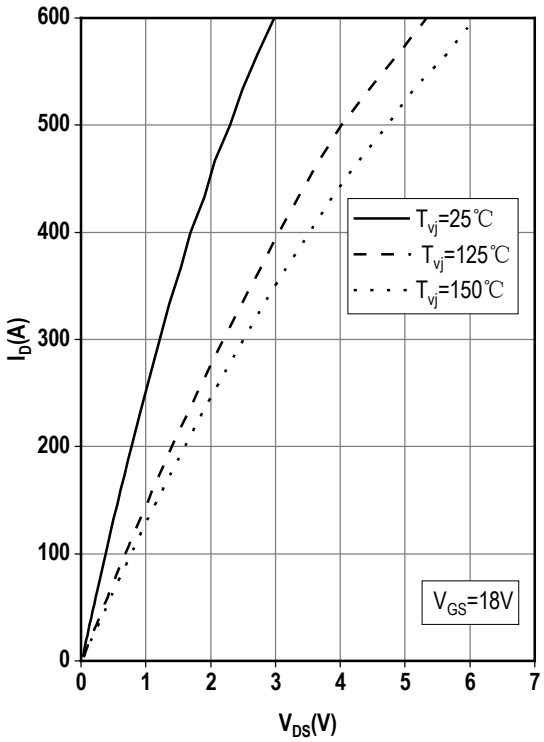


Fig.1 Output Characteristic (MOSFET), $I_D=f(V_{DS})$

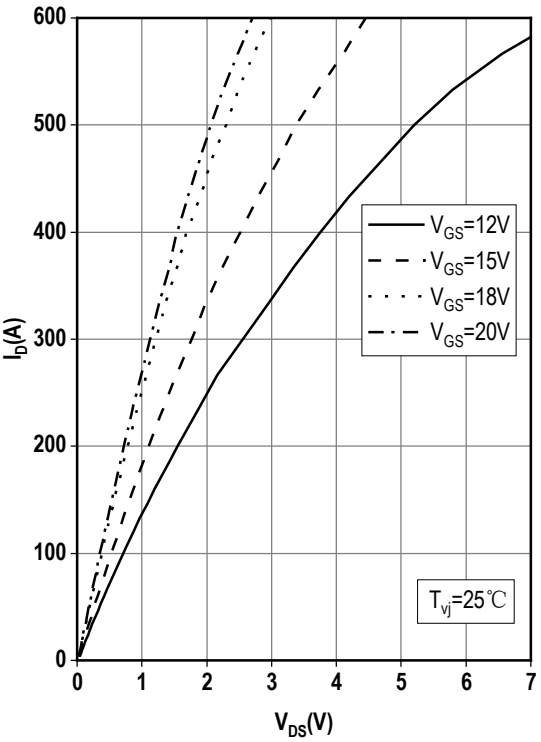


Fig.2 Output Characteristic (MOSFET), $I_D=f(V_{DS})$

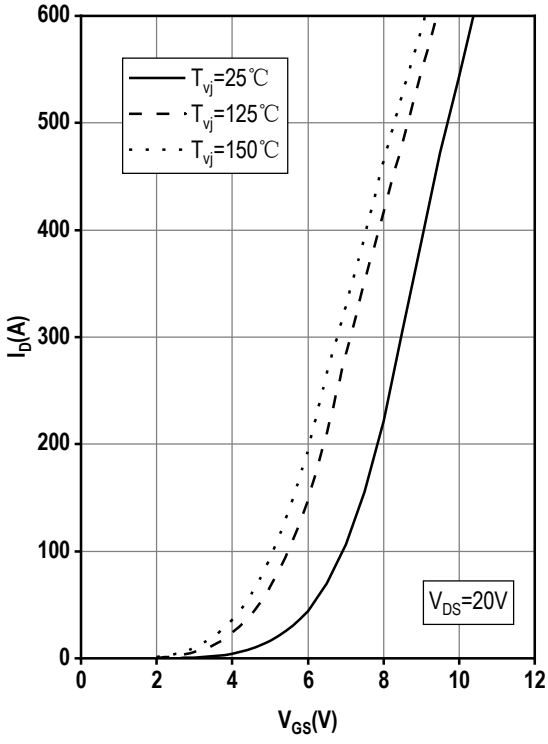


Fig.3 Transfer Characteristic (MOSFET), $I_D=f(V_{GS})$

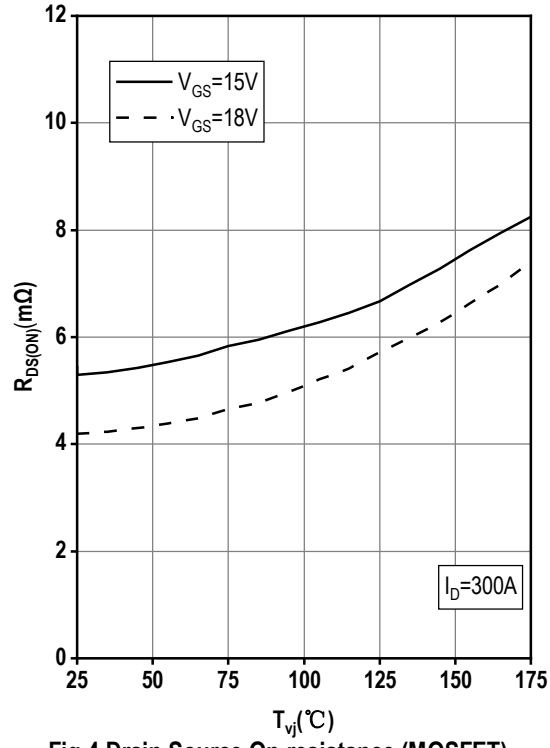


Fig.4 Drain Source On-resistance (MOSFET), $R_{DS(on)}=f(T_{vj})$

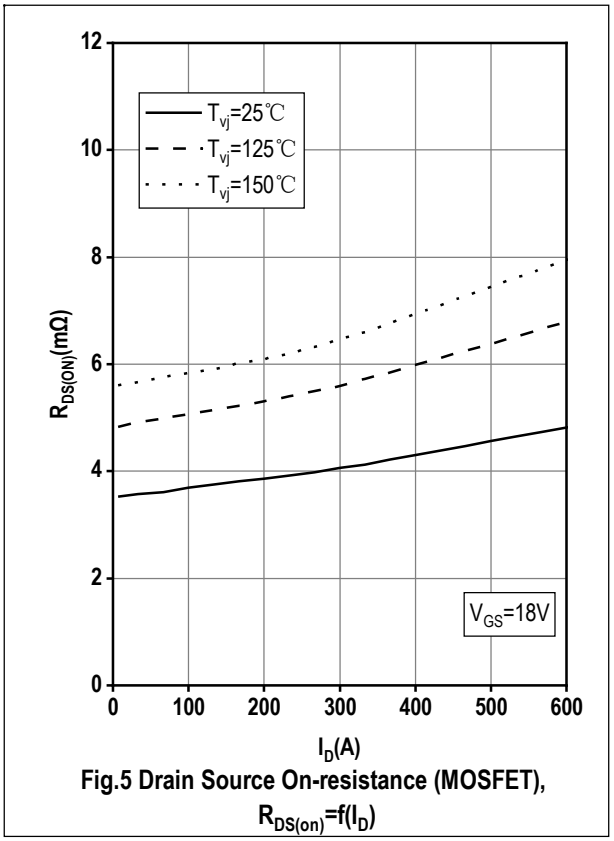


Fig.5 Drain Source On-resistance (MOSFET), $R_{DS(on)}=f(I_D)$

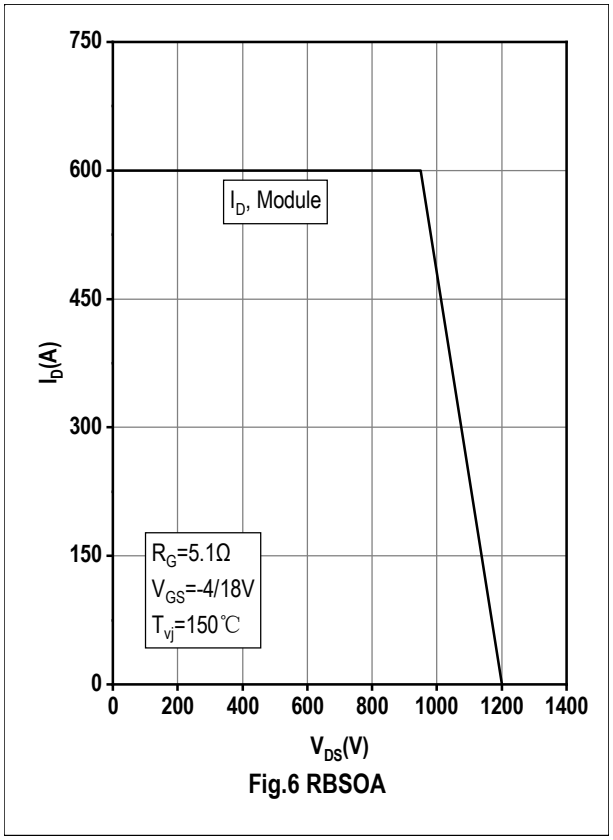


Fig.6 RBSOA

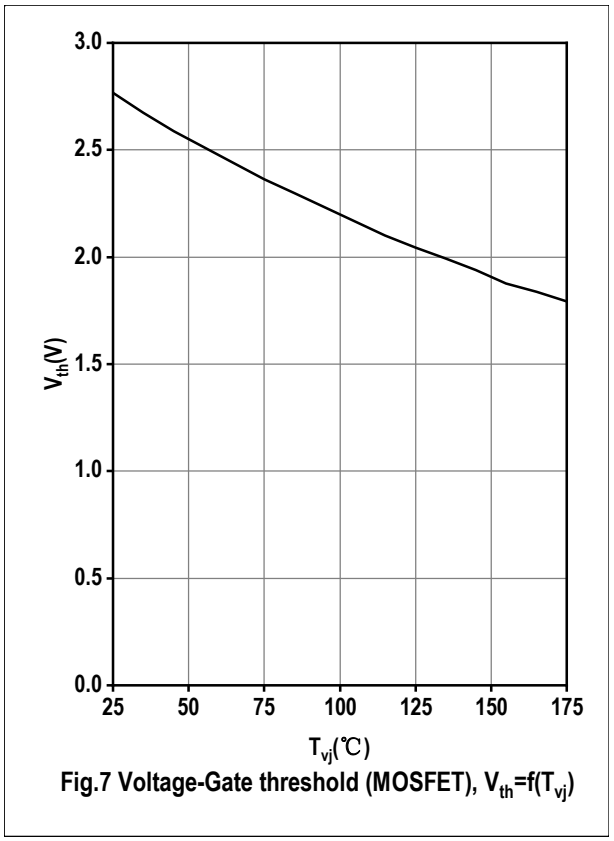


Fig.7 Voltage-Gate threshold (MOSFET), $V_{th}=f(T_{vj})$

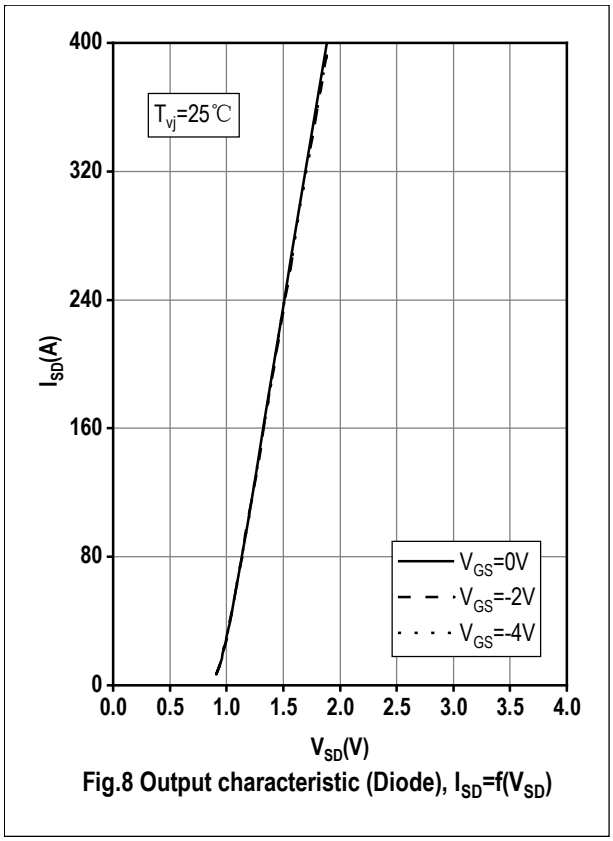


Fig.8 Output characteristic (Diode), $I_{SD}=f(V_{SD})$

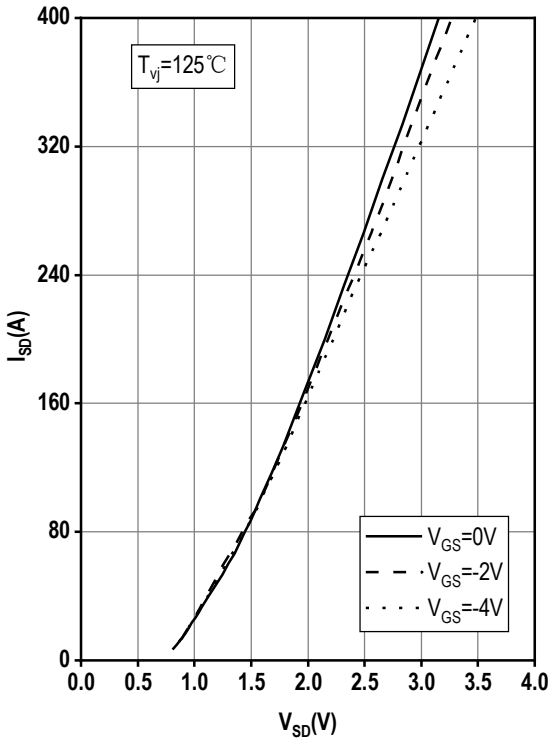


Fig.9 Output characteristic (Diode), $I_{SD}=f(V_{SD})$

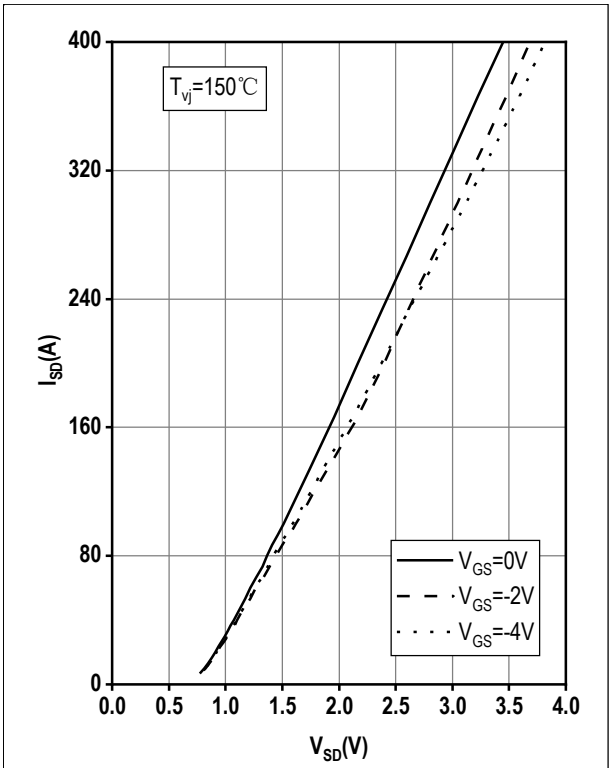


Fig.10 Output characteristic (Diode), $I_{SD}=f(V_{SD})$

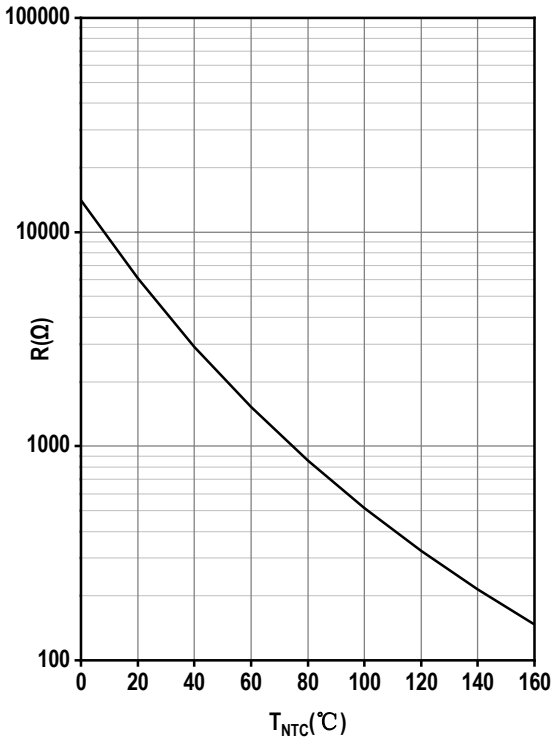
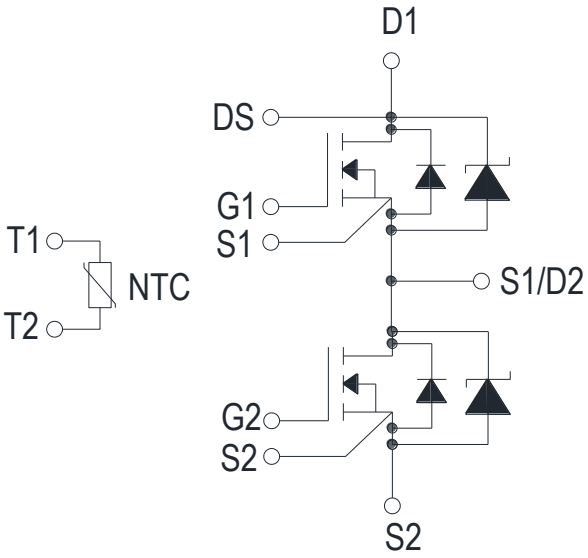


Fig.11 Temperature Characteristic (NTC-Thermistor), $R=f(T_{NTC})$

Circuit Diagram



Package Dimensions (mm)