

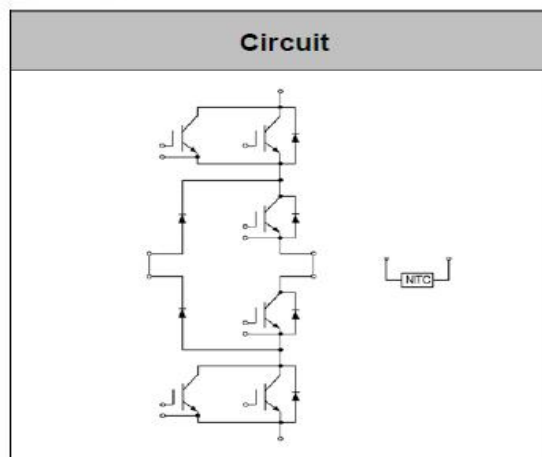
IGBT Module

- V_{CE} : 650V
- $I_{C\ nom}$: 200A
- I_{CRM} : 400A



Features

- Low switching losses
- Copper insulation baseplate with low thermal resistance
- Compact design
- Integrated NTC temperature sensor
- High power density



- IGBT- T1.1/T1.2/T4.1/T4.2

Application

- Solar applications
- 3-level-applications



Halogen-Free

Absolute Maximum Ratings (TC=25°C unless otherwise noted)

Symbol	Parameter		Rating	Unit
Common Ratings (TC=25°C Unless Otherwise Noted)				
V _{CES}	Collector Emitter Voltage	V _{GE} =0V, I _C =1mA ,T _J =25°C	650	V
V _{GES}	Gate Emitter Voltage	T _J =25°C	±20	V
I _{CN}	Implemented Collector Current		200	A
I _{CDC}	DC Collector Current	T _{VJmax} =175°C,T _H =65°C	130	A
I _{CRM}	Repetitive Peak Collector Current	tp=1ms	400	A

IGBT-T1.1/T1.2/T4.1/T4.2

Electrical Characteristics (TC=25℃ unless otherwise noted)								
Symbol	Parameter	Condition		Min	Typ	Max	Unit	
Static Electrical Characteristics @ TC= 25℃ (unless otherwise stated)								
V _{GE(th)}	Gate Emitter Threshold Voltage	V _{CE} =V _{GE} , I _C =2.0mA		3.3	3.9	4.8	V	
V _{CE(sat)}	Collector - Emitter Saturation Voltage	I _C =100A, V _{GE} =15V, T _J =25℃		--	1.11	1.5	V	
		I _C =100A, V _{GE} =15V, T _J =125℃		--	1.18	--	V	
		I _C =100A, V _{GE} =15V, T _J =150℃		--	1.20	--	V	
I _{CES}	Collector Leakage Current	V _{CE} =650V, V _{GE} =0V, T _J =25℃		--	--	0.25	mA	
I _{GES}	Gate Leakage Current	V _{CE} =0V,V _{GE} =±20V, T _J =25℃		--	--	400	nA	
Q _g	Gate Charge			--	0.95	--	μC	
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f =1MHz		--	7.6	--	nF	
C _{res}	Reverse Transfer Capacitance			--	0.09	--	nF	
t _{d(on)}	Turn-on Delay Time	V _{CE} =300V, I _C =100A, R _G =4.7Ω, V _{GE} =±15V	T _J =25℃	--	28	--	ns	
			T _J =125℃	--	24	--	ns	
			T _J =150℃	--	23	--	ns	
t _r	Turn-on Rise Time		T _J =25℃	--	16	--	ns	
			T _J =125℃	--	19	--	ns	
			T _J =150℃	--	20	--	ns	
t _{d(off)}	Turn-Off Delay Time		T _J =25℃	--	110	--	ns	
			T _J =125℃	--	125	--	ns	
			T _J =150℃	--	131	--	ns	
t _f	Turn-Off Fall Time		T _J =25℃	--	45	--	ns	
			T _J =125℃	--	48	--	ns	
			T _J =150℃	--	49	--	ns	
E _{on}	Turn on Energy		T _J =25℃		1.18		mJ	
			T _J =150℃	--	1.52	--	mJ	
E _{off}	Turn off Energy	V _{CE} =300V,I _C =100A, R _G =4.7Ω, V _{GE} =±15V,	T _J =25℃	--	0.81	--	mJ	
			T _J =150℃	--	1.48	--	mJ	
R _{thJH}	Thermal Resistance Junction to Heatsink(per IGBT-T1.1/T1.2/T4.1/T4.2)			--	0.4	--	K/W	

IGBT-T2/T3

Absolute Maximum Ratings (TC=25℃ unless otherwise noted)				
Symbol	Parameter		Rating	Unit
Common Ratings (TC=25℃ Unless Otherwise Noted)				
V _{CES}	Collector Emitter Voltage	V _{GE} =0V, I _C =1mA ,T _J =25℃	650	V
V _{GES}	Gate Emitter Voltage	T _J =25℃	±20	V
I _{CN}	Implemented Collector Current		300	A
I _{CDC}	DC Collector Current	T _{VJmax} =175℃, T _H =65℃	255	A
I _{CRM}	Repetitive Peak Collector Current	tp=1ms	600	A

IGBT-T2/T3

Electrical Characteristics (TC=25°C unless otherwise noted)								
Symbol	Parameter	Condition		Min	Typ	Max	Unit	
Static Electrical Characteristics @ TC= 25°C (unless otherwise stated)								
V _{GE(th)}	Gate Emitter Threshold Voltage	V _{CE} =V _{GE} , I _C =2.0mA		4.2	4.75	5.4	V	
V _{CE(sat)}	Collector - Emitter Saturation Voltage	I _C =100A, V _{GE} =15V, T _J =25°C		--	0.91	--	V	
		I _C =100A, V _{GE} =15V, T _J =125°C		--	0.85	--	V	
		I _C =100A, V _{GE} =15V, T _J =150°C		--	0.81	--	V	
I _{CES}	Collector Leakage Current	V _{CE} =650V, V _{GE} =0V, T _J =25°C		--	--	0.25	mA	
I _{GES}	Gate Leakage Current	V _{CE} =0V,V _{GE} =±20V, T _J =25°C		--	--	400	nA	
Q _g	Gate Charge			--	4.0	--	μC	
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f =1MHz		--	18.5	--	nF	
C _{res}	Reverse Transfer Capacitance			--	0.254	--	nF	
t _{d(on)}	Turn-on Delay Time	V _{CE} =300V, I _C =100A, R _G =4.7Ω, V _{GE} =±15V	T _J =25°C	--	135	--	ns	
			T _J =125°C	--	115	--	ns	
			T _J =150°C	--	113	--	ns	
t _r	Turn-on Rise Time		T _J =25°C	--	29	--	ns	
			T _J =125°C	--	37	--	ns	
			T _J =150°C	--	39	--	ns	
t _{d(off)}	Turn-Off Delay Time		T _J =25°C	--	620	--	ns	
			T _J =125°C	--	760	--	ns	
			T _J =150°C	--	790	--	ns	
t _f	Turn-Off Fall Time		T _J =25°C	--	130	--	ns	
			T _J =125°C	--	216	--	ns	
			T _J =150°C	--	243	--	ns	
E _{on}	Turn on Energy		T _J =25°C		1.12		mJ	
			T _J =150°C	--	1.63	--	mJ	
E _{off}	Turn off Energy	V _{CE} =300V,I _C =100A, R _G =4.7Ω, V _{GE} =±15V,	T _J =25°C	--	5.69	--	mJ	
			T _J =150°C	--	9.23	--	mJ	
R _{thJH}	Thermal Resistance Junction to Heatsink(per IGBT-T2/T3)			--	0.24	--	K/W	

Diode-D1/D4

Absolute Maximum Ratings (TC=25°C unless otherwise noted)				
Symbol	Parameter		Rating	Unit
Common Ratings (TC=25°C Unless Otherwise Noted)				
V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	650	V
I _{FN}	Implemented Forward Current		225	A
I _F	Continuous DC Forward Current		100	A
I _{FRM}	Repetitive Peak Forward Current	tp=1ms	450	A
I ² t	I ² t-Value	V _R =0V, tp=10ms, T _J =125°C	3010	A²s
		V _R =0V, tp=10ms, T _J =150°C	2740	

Electrical Characteristics (TC=25°C unless otherwise noted)						
Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Electrical Characteristics @ TC= 25°C (unless otherwise stated)						
V_F	Forward Voltage	$I_F=100\text{A}, T_J=25^{\circ}\text{C}$	--	1.4	1.65	V
		$I_F=100\text{A}, T_J=125^{\circ}\text{C}$	--	1.25	--	V
		$I_F=100\text{A}, T_J=150^{\circ}\text{C}$	--	1.15	--	V
Q_{rr}	Turn-on Delay Time	$T_J=25^{\circ}\text{C}$	--	6.32	--	μC
		$T_J=125^{\circ}\text{C}$	--	13.2	--	μC
		$T_J=150^{\circ}\text{C}$	--	15.1	--	μC
I_{rr}	Turn-on Rise Time	$V_R=300\text{V}, I_F=100\text{A}, diF/dt=2500\text{A}/\mu\text{s}$ $T_J=25^{\circ}\text{C}$	--	110	--	A
		$T_J=125^{\circ}\text{C}$	--	148	--	A
		$T_J=150^{\circ}\text{C}$	--	159	--	A
E_{rec}	Turn-Off Delay Time	$T_J=25^{\circ}\text{C}$	--	1.38	--	mJ
		$T_J=125^{\circ}\text{C}$	--	2.69	--	mJ
		$T_J=150^{\circ}\text{C}$	--	3.35	--	mJ
R_{thJH}	Thermal Resistance Junction to Heatsink(per Diode-D1/D4)		--	0.36	--	K/W

Diode-D2/D3

Absolute Maximum Ratings (TC=25°C unless otherwise noted)				
Symbol	Parameter		Rating	Unit
Common Ratings (TC=25°C Unless Otherwise Noted)				
V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	650	V
I _{FN}	Implemented Forward Current		225	A
I _F	Continuous DC Forward Current		100	A
I _{FRM}	Repetitive Peak Forward Current	tp=1ms	450	A
I ² t	I ² t-Value	V _R =0V, tp=10ms, T _J =125°C	3010	A²s
		V _R =0V, tp=10ms, T _J =150°C	2740	

Electrical Characteristics (TC=25°C unless otherwise noted)						
Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Electrical Characteristics @ TC= 25°C (unless otherwise stated)						
V_F	Forward Voltage	$I_F=100\text{A}, T_J=25^{\circ}\text{C}$	--	1.42	1.65	V
		$I_F=100\text{A}, T_J=125^{\circ}\text{C}$	--	1.28	--	V
		$I_F=100\text{A}, T_J=150^{\circ}\text{C}$	--	1.20	--	V
Q_{rr}	Turn-on Delay Time	$T_J=25^{\circ}\text{C}$	--	6.32	--	μC
		$T_J=125^{\circ}\text{C}$	--	13.2	--	μC
		$T_J=150^{\circ}\text{C}$	--	15.1	--	μC
I_{rr}	Turn-on Rise Time	$V_R=300\text{V},$ $I_F=100\text{A},$ $di_F/dt=2500\text{A}/\mu\text{s}$	$T_J=25^{\circ}\text{C}$	--	110	A
			$T_J=125^{\circ}\text{C}$	--	148	A
			$T_J=150^{\circ}\text{C}$	--	159	A
E_{rec}	Turn-Off Delay Time	$T_J=25^{\circ}\text{C}$	--	1.38	--	mJ
		$T_J=125^{\circ}\text{C}$	--	2.69	--	mJ
		$T_J=150^{\circ}\text{C}$	--	3.35	--	mJ
R_{thJH}	Thermal Resistance Junction to Heatsink(per Diode-D2/D3)		--	0.33	--	K/W

Diode-D5/D6

Absolute Maximum Ratings (TC=25°C unless otherwise noted)				
Symbol	Parameter		Rating	Unit
Common Ratings (TC=25°C Unless Otherwise Noted)				
V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	650	V
I _{FN}	Implemented Forward Current		300	A
I _F	Continuous DC Forward Current		100	A
I _{FRM}	Repetitive Peak Forward Current	tp=1ms	600	A
I ² t	I ² t-Value	V _R =0V, tp=10ms, T _J =125°C	6600	A²s
		V _R =0V, tp=10ms, T _J =150°C	6000	

Electrical Characteristics (TC=25℃ unless otherwise noted)							
Symbol	Parameter	Condition		Min	Typ	Max	Unit
Static Electrical Characteristics @ TC= 25℃ (unless otherwise stated)							
V _F	Forward Voltage	I _F =100A, T _J =25℃		--	1.10	1.54	V
		I _F =100A, T _J =125℃		--	1.00	--	V
		I _F =100A, T _J =150℃		--	0.95	--	V
Q _{rr}	Turn-on Delay Time	V _R =300V, I _F =100A, diF/dt=2500A/us	T _J =25℃	--	6.17	--	uC
			T _J =125℃	--	13.8	--	uC
			T _J =150℃	--	14.9	--	uC
I _{rr}	Turn-on Rise Time		T _J =25℃	--	145	--	A
			T _J =125℃	--	191	--	A
			T _J =150℃	--	205	--	A
E _{rec}	Turn-Off Delay Time		T _J =25℃	--	1.05	--	mJ
			T _J =125℃	--	2.56	--	mJ
			T _J =150℃	--	3.22	--	mJ
R _{thJH}	Thermal Resistance Junction to Heatsink(per Diode-D5/D6)			--	0.4	--	K/W

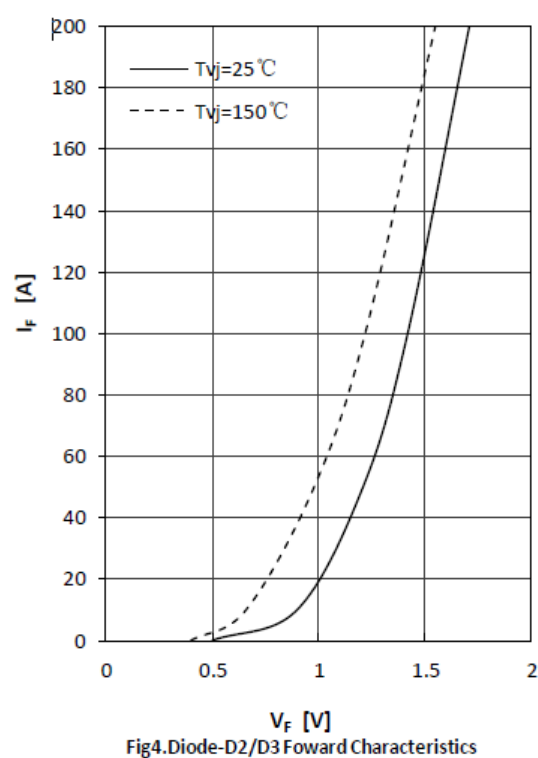
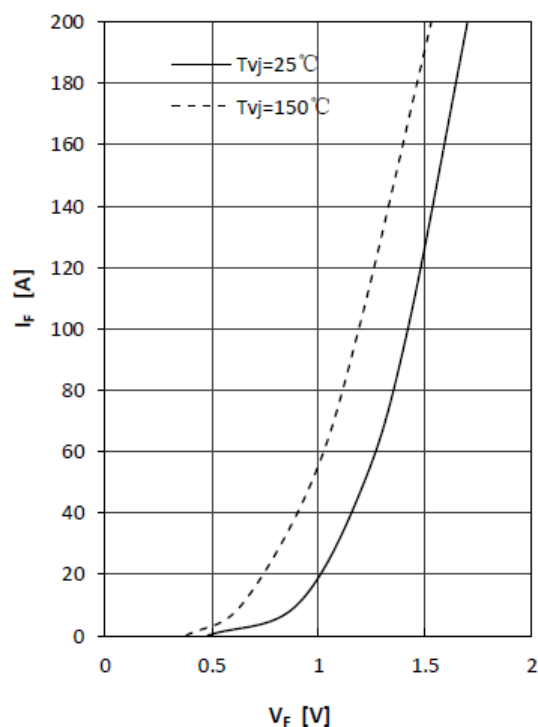
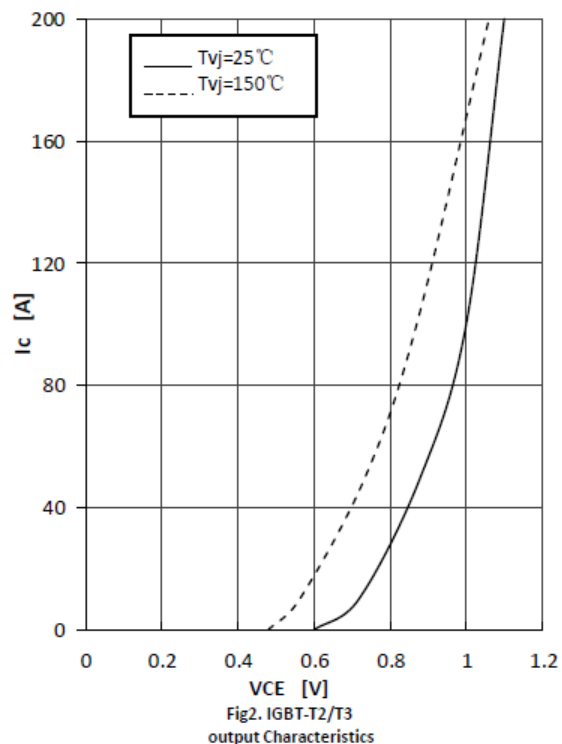
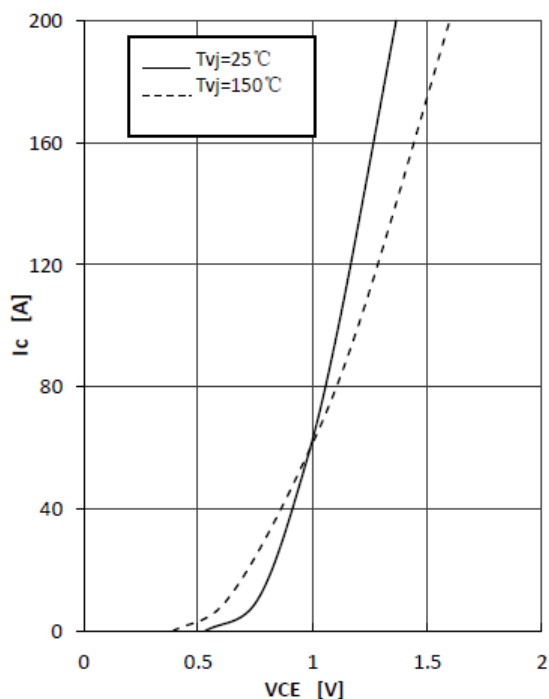
NTC Thermistor

Electrical Characteristics (TC=25°C unless otherwise noted)						
Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Electrical Characteristics @ TC= 25°C (unless otherwise stated)						
R ₂₅	Rated Resistance		--	5.0	--	KΩ
ΔR/R	Deviation of R100	T _C =100°C, R ₁₀₀ =493.3Ω	-5.0	--	5.0	%
P ₂₅	Power Dissipation		--	--	20	mW
B _{25/50}	B-Valu	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15K))]$	--	3375	--	K

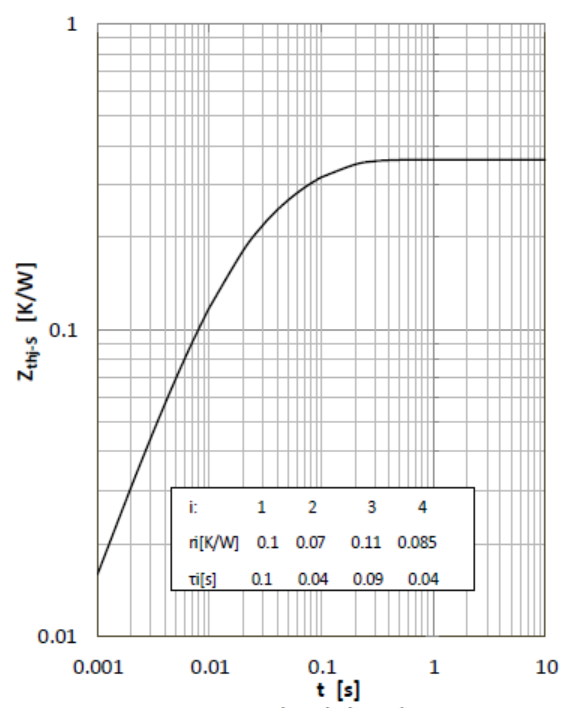
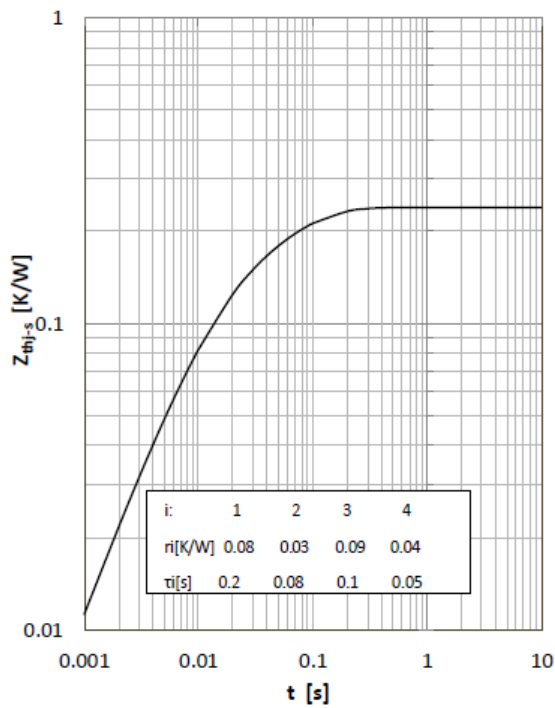
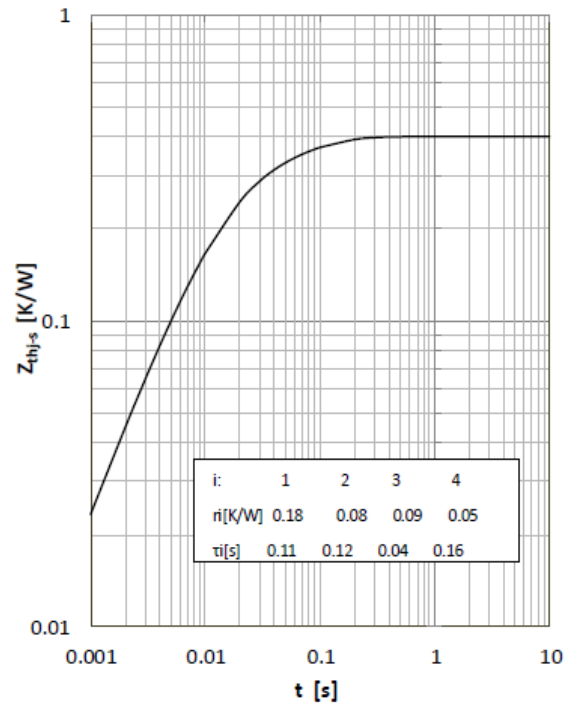
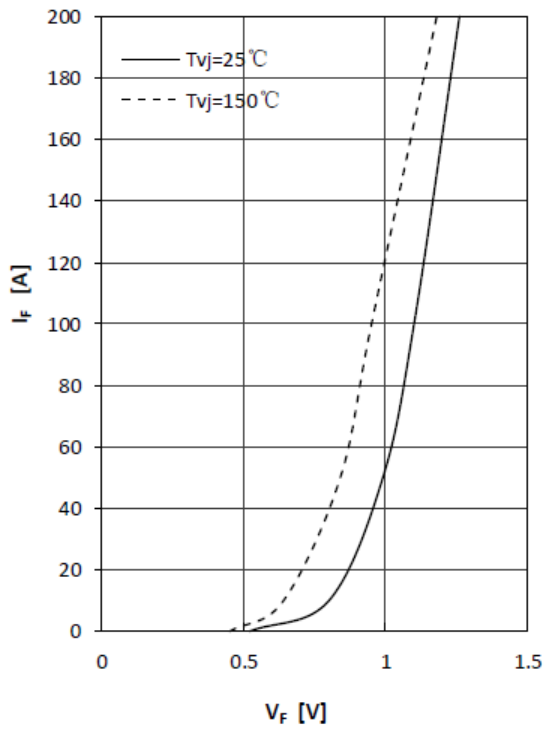
Module Characteristics

Electrical Characteristics (TC=25°C unless otherwise noted)						
Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Electrical Characteristics @ TC= 25°C (unless otherwise stated)						
V _{isol}	Isolation Voltage	t=1min, f=50Hz	3200	--	--	V
d _{Creep}	Creepage Distance	terminal to heatsink	--	11.2	--	mm
d _{Creep}	Creepage Distance	terminal to terminal	--	6.8	--	mm
d _{Clear}	Clearance	terminal to heatsink	--	9.4	--	mm
d _{Clear}	Clearance	terminal to terminal	--	5.5	--	mm
T _{stg}	Storage Temperature		-40	--	125	°C
L _{SCE}	Stray-Inductance-Module		--	12	--	nH
M	Mounting Torque For Modul Mounting		3.0	--	5.0	Nm
G	Weight of Module		--	158	--	g

Typical Operating Characteristics



Typical Operating Characteristics



Typical Operating Characteristics

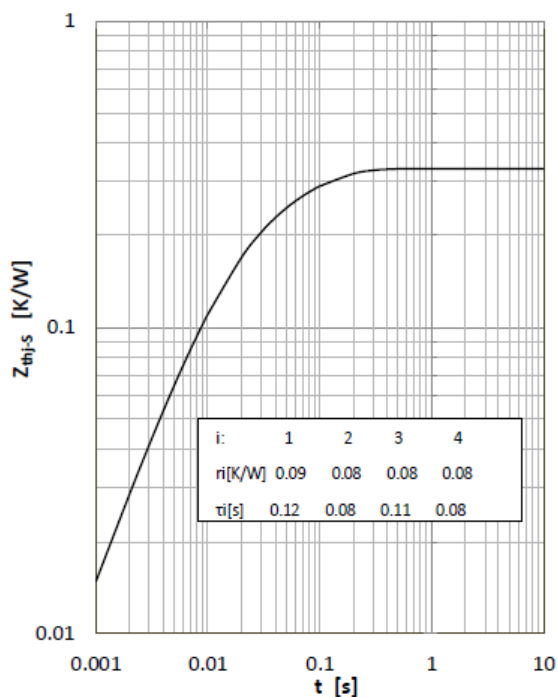


Fig9.Diode D2/D3
Transient Thermal Impedance

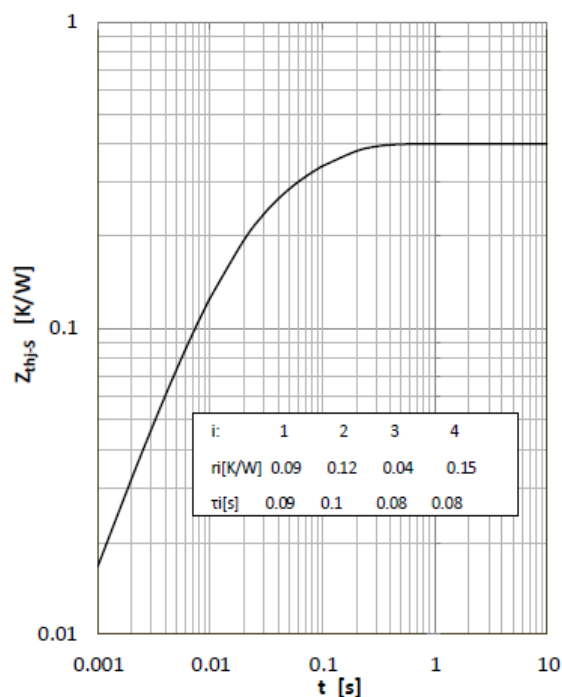
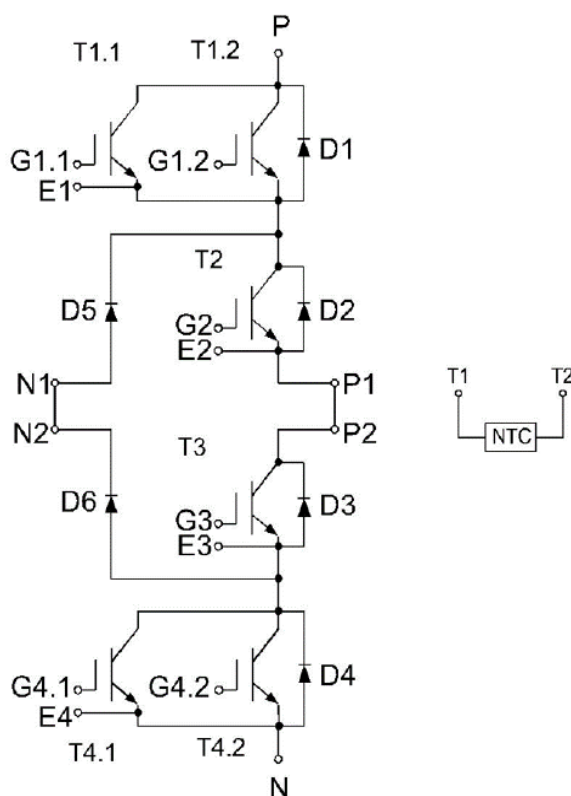


Fig10.Diode D5/D6
Transient Thermal Impedance

Circuit diagram headline



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