



Preliminary Data

Circuit Diagram

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- Automotive Applications
- Hybrid Electrical Vehicles(H)EV
- Motor Drives
- Commercial Agriculture Vehicles

V _{CES}	Collector-Emitter Blocking Voltage	T _J =25 °C	1200	V
V _{GES}	Gate-Emitter Voltage		±20	V
I _{CN}	Implemented Collector Current		400	A
I _C	Continuous Collector Current	T _F =100 °C, T _{Jmax} =175 °C	250	A
I _{CM}	Peak Collector Current Repetitive	tp=1ms	800	A
P _D	Maximum Power Dissipation per IGBT	T _F =75 °C, T _{Jmax} =175 °C	1085	W



Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{GE(th)}	Gate-Emitter Threshold Voltage	I _C =7.6, V _{CE} =V _{GE} , T _J =25°C		5.0	5.8	6.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =250A, V _{GE} =15V	T _J =25°C		1.35	1.55	V
			T _J =125°C		1.50		V
			T _J =150°C		1.55		V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =400A, V _{GE} =15V	T _J =25°C		1.60	1.90	V
			T _J =125°C		1.90		V
			T _J =150°C		2.00		V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =V _{CES} , T _J =25°C				1	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =±20V, V _{CE} =0V, T _J =25°C				±200	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=100kHz, T _J =25°C			44.2		nF
C _{oes}	Output Capacitance				1.7		nF
C _{res}	Reverse Transfer Capacitance				0.5		nF

Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =400A, R _{Gon} =2.3Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		518		ns
			T _J =125℃		521		
			T _J =150℃		525		
t _r	Rise Time		T _J =25℃		120		ns
			T _J =125℃		140		
			T _J =150℃		141		
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =400A, R _{Goff} =2.3Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		450		ns
			T _J =125℃		480		
			T _J =150℃		490		
t _f	Fall Time		T _J =25℃		183		ns
			T _J =125℃		220		
			T _J =150℃		229		



E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =400A, R _{Gon} =2.3Ω, V _{GE} =±15V, di/dt=1403A/μs (T _J =150℃), Inductive Load	T _J =25℃		36.6		mJ
			T _J =125℃		43.8		
			T _J =150℃		52.0		
E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =400A, R _{Goff} =2.3Ω, V _{GE} =±15V, du/dt=3455V/μs (T _J =150℃), Inductive Load	T _J =25℃		24.2		mJ
			T _J =125℃		31.0		
			T _J =150℃		34.4		
Q _g	Total Gate Charge		T _J =25℃		3115		μC
R _{G(int)}	Internal Gate Resistance		T _J =25℃		1.45		Ω
I _{SC}	V _{CC} =600V, t _p =10μs, V _{GE} =±15V, R _G =2.3Ω, T _J =150℃				2438		A
R _{θJF}	Thermal Resistance, Junction to Cooling Fluid	Per IGBT Cooling Fluid = 50% Water; DV/Dt = 10.0 dm³/min				0.092	℃/W

Diode, Inverter Maximum Rated Values

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1200	V
I _{FN}	Implemented Forward Current		400	A
I _F	Diode Continuous Forward Current	T _F =100°C	250	A
I _{FM}	Repetitive Peak Forward Current	t _p =1ms	800	A

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =250A	T _J =25°C		1.45		V
			T _J =125°C		1.45		
			T _J =150°C		1.40		
V _{FM}	Forward Voltage	I _F =400A	T _J =25°C		1.60		V
			T _J =125°C		1.65		
			T _J =150°C		1.65		
t _{rr}	Reverse Recovery Time	I _F =400A, -di _r /dt=1832A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		230		ns
			T _J =125°C		460		
			T _J =150°C		532		



I _{rr}	Peak Reverse Recovery Current	I _F =400A, -diF/dt=1832A/μs(T _J =150℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		238		A
			T _J =125℃		288		
			T _J =150℃		300		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		31.9		μC
			T _J =125℃		64.7		
			T _J =150℃		74.6		
E _{rec}	Reverse Recovery Energy		T _J =25℃		10.6		mJ
			T _J =125℃		22.9		
			T _J =150℃		25.9		
R _{θJF}	Thermal Resistance, Junction to Cooling Fluid	Per Diode Cooling Fluid = 50% Water; DV/Dt = 10.0 dm³/min				0.137	℃/W

Internal NTC-Thermistor Characteristics

R_{25}	$T_C=25^{\circ}C$	5		k Ω
$\Delta R/R$	$T_C=100^{\circ}C$, $R_{100}=465\Omega$		± 5	%
P_{25}	$T_C=25^{\circ}C$	10		mW
$B_{25/50}$	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15K))]$	3380		K
$B_{25/80}$	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15K))]$	3440		K
$B_{25/100}$	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15K))]$	3545		K



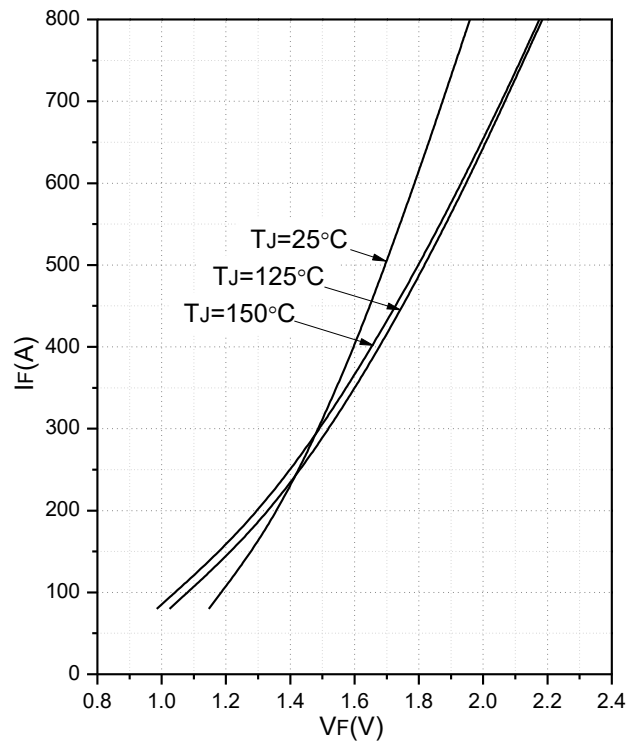
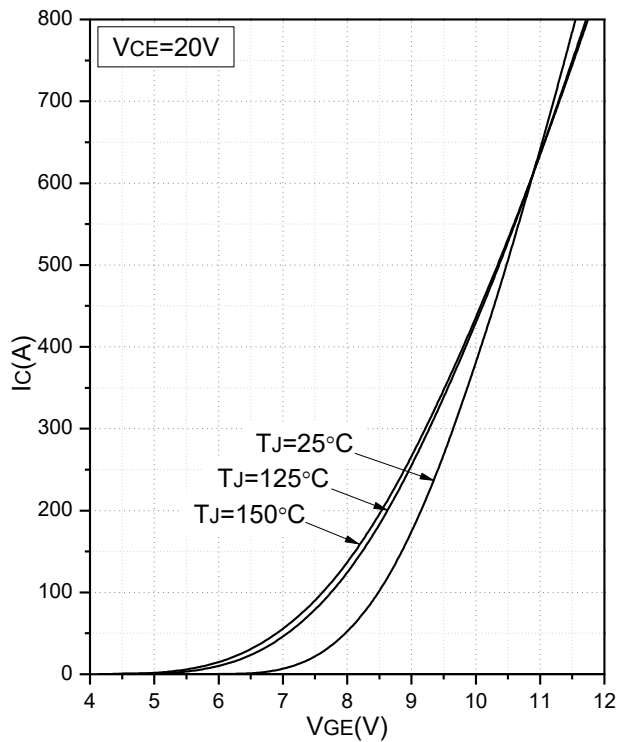
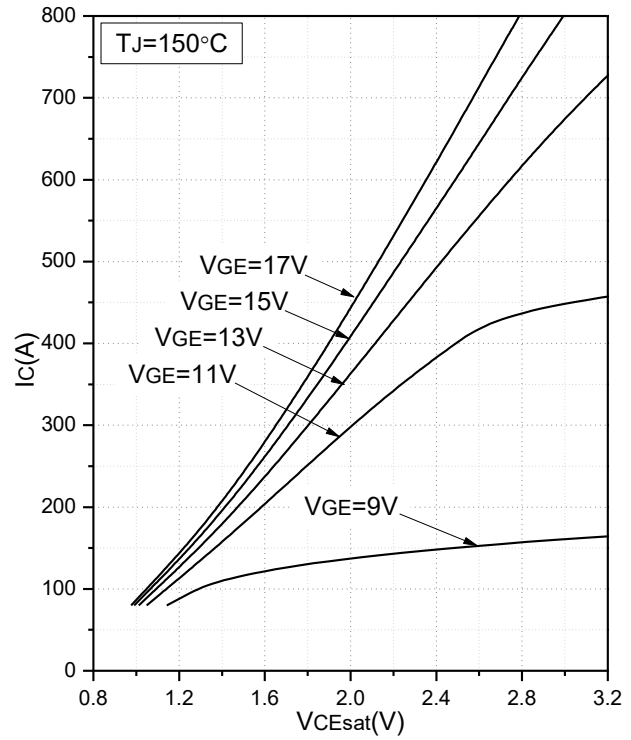
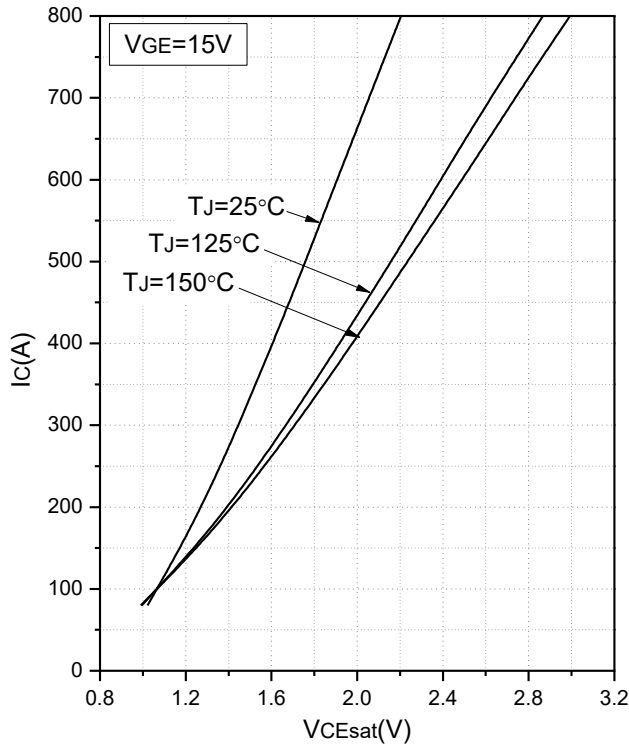
Module

Symbol	Description		Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=0Hz, t=3sec	4200			V
T _J	Maximum junction temperature				175	°C
T _{JOP}	Maximum operating junction temperature range		-40		+150	°C
T _{stg}	Storage temperature		-40		+150	°C
CTI	Comparative Tracking Index		200			
M	Power Terminals Screw:M5		3.0		5.0	N·m
M	Mounting Screw:M4		1.8	2.0	2.2	N·m
M	Screw PCB to frame		0.45	0.50	0.55	N·m
G	Weight			690		g

Ordering Information Table

Device code	G	T	400	FF	120	C8	S
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench & Field Stop IGBT
- ③ - Rated Current (400=400A)
- ④ - Circuit Configuration: FF (Full Bridge)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Comprehensive Reliability Test-Automotive Grade/High Reliability Module)



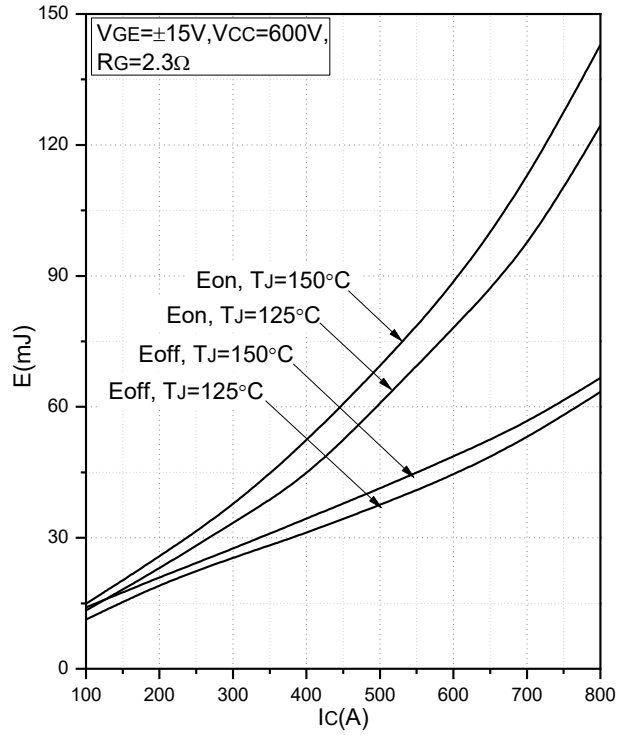


Fig.5 Typical Switching Loss vs. Collector Current

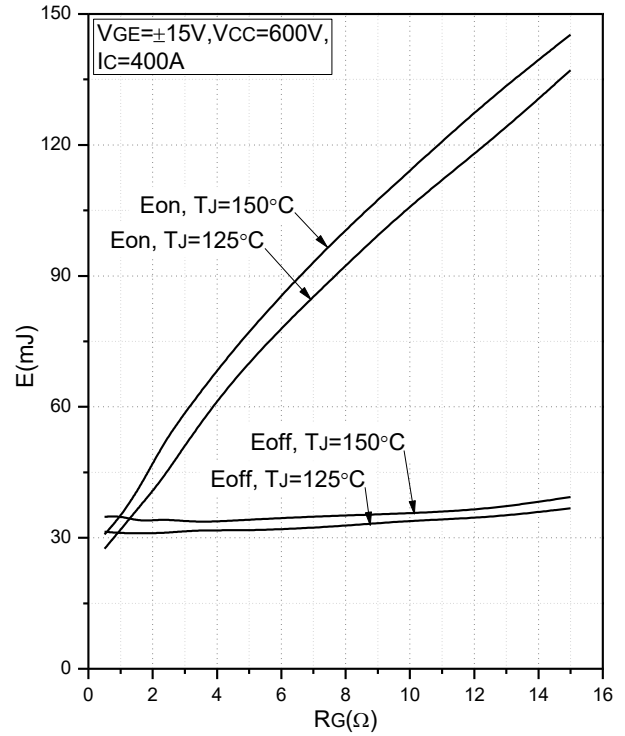


Fig.6 Typical Switching Loss vs. Gate Resistance

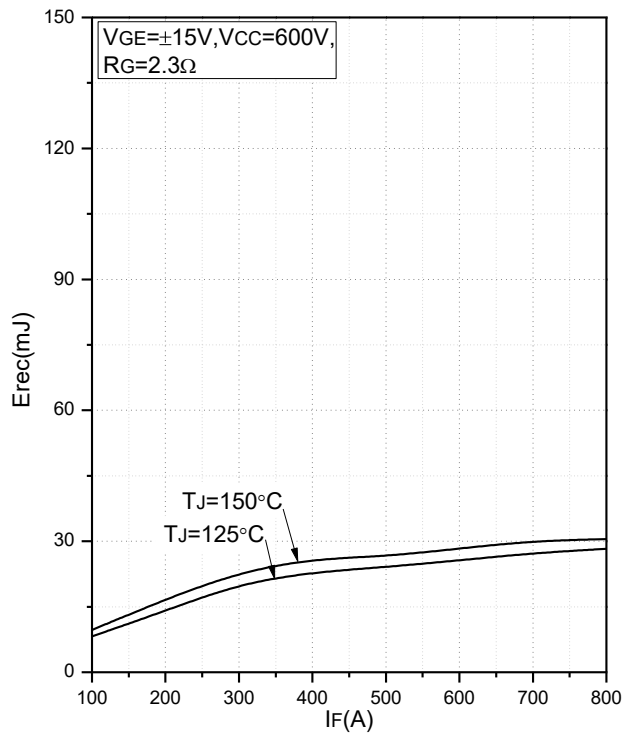


Fig.7 Typical Switching Loss vs. Forward Current

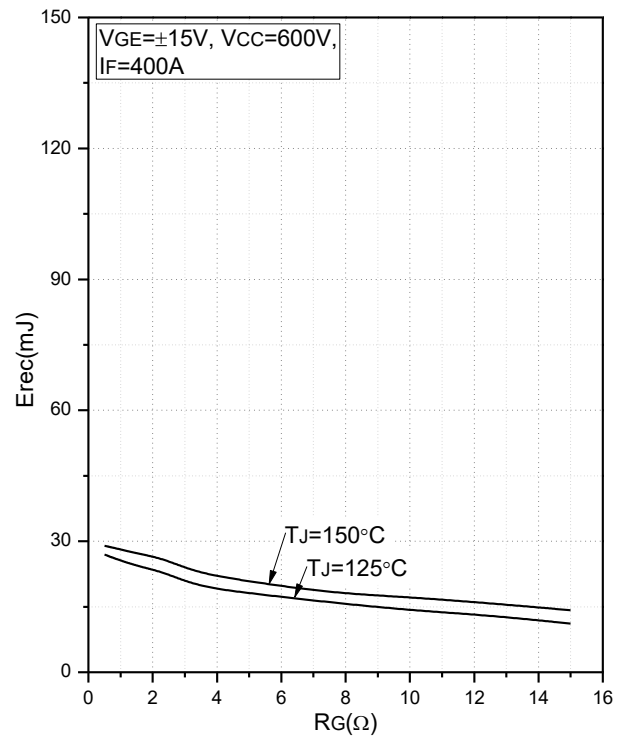


Fig.8 Typical Switching Loss vs. Gate Resistance

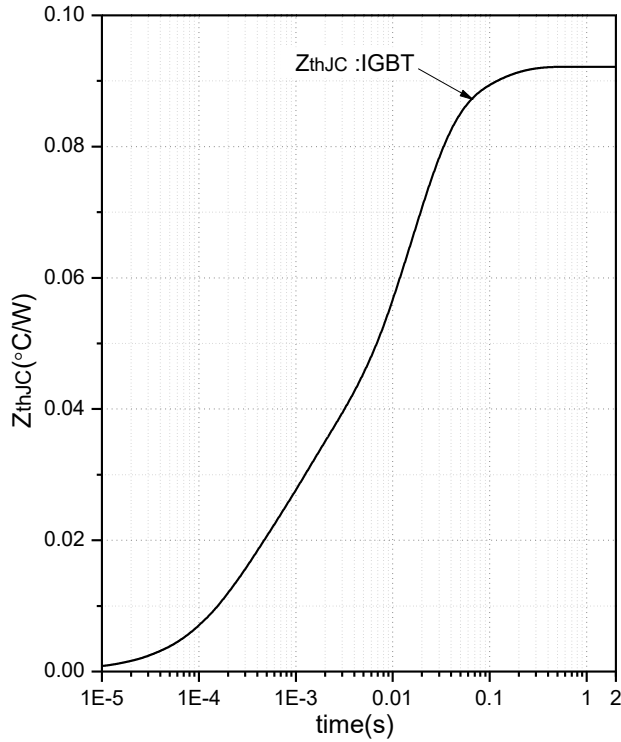


Fig.9 Transient Thermal Impedance (IGBT)

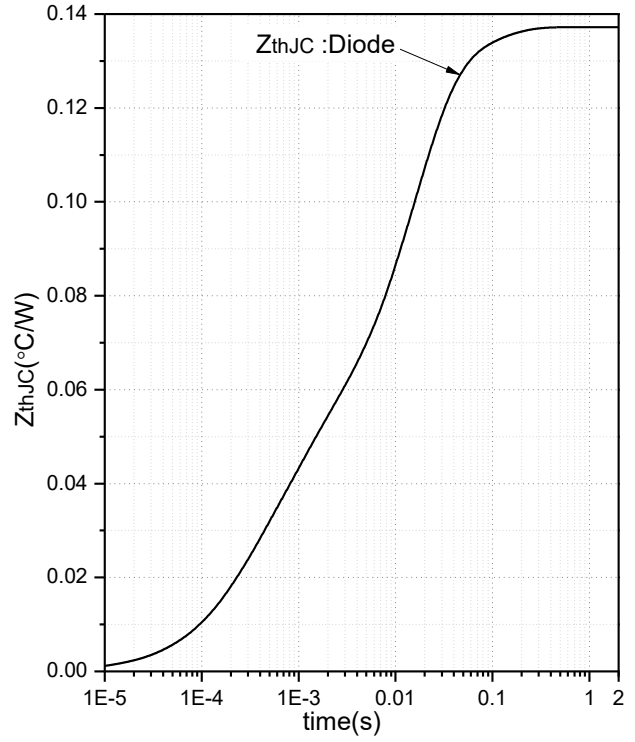


Fig.10 Transient Thermal Impedance (Diode)

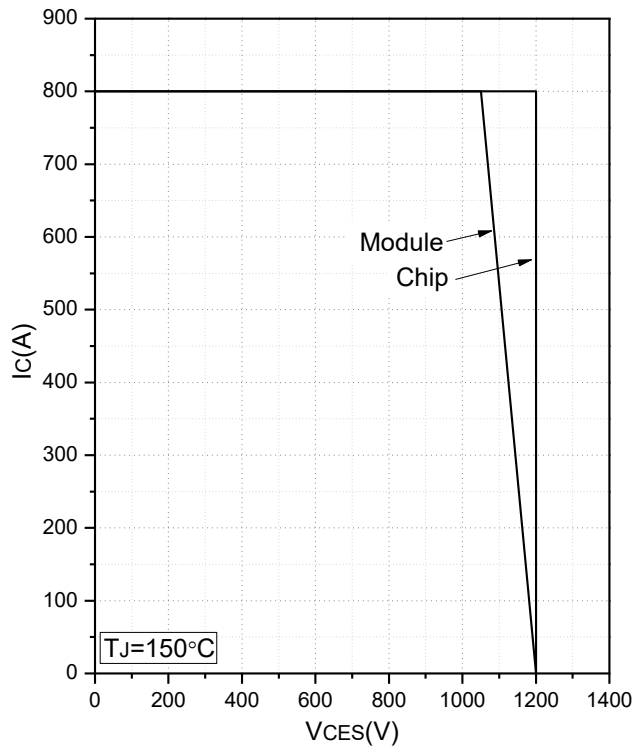


Fig.11 Reverse Bias Safe Operation Area (RBSOA)

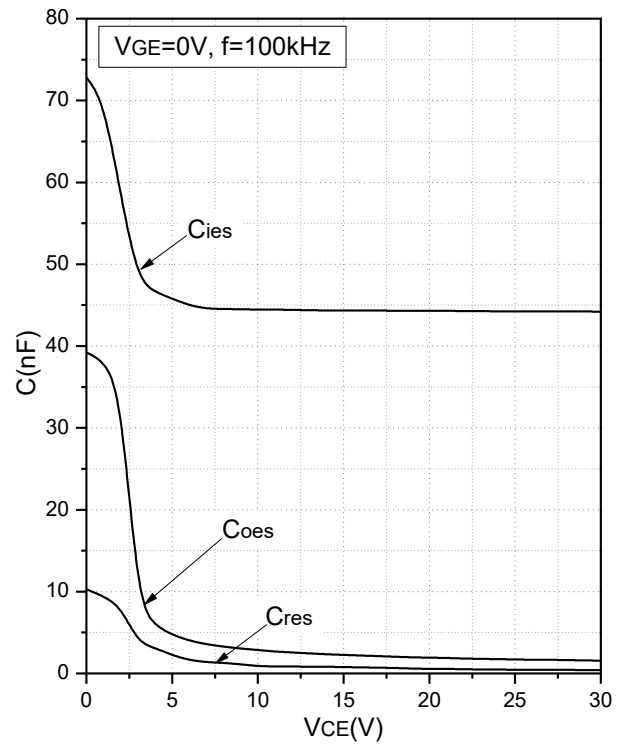


Fig.12 Capacitance Characteristics

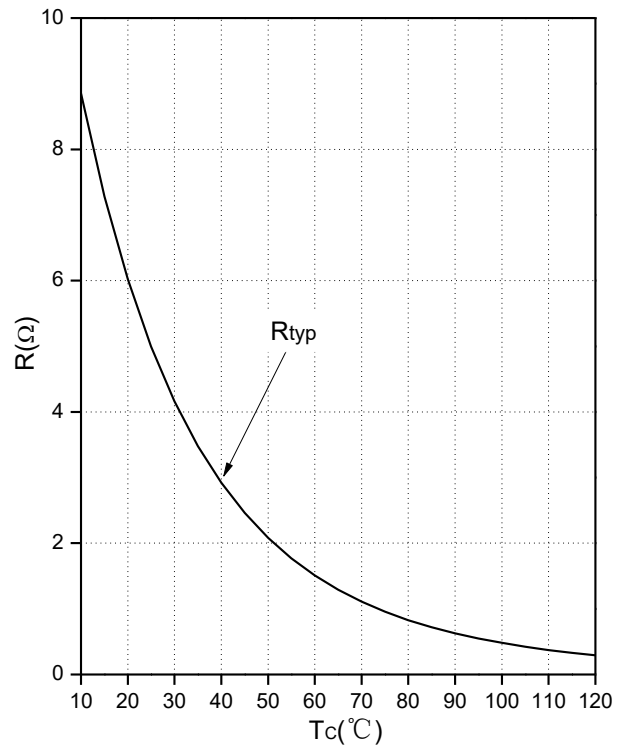
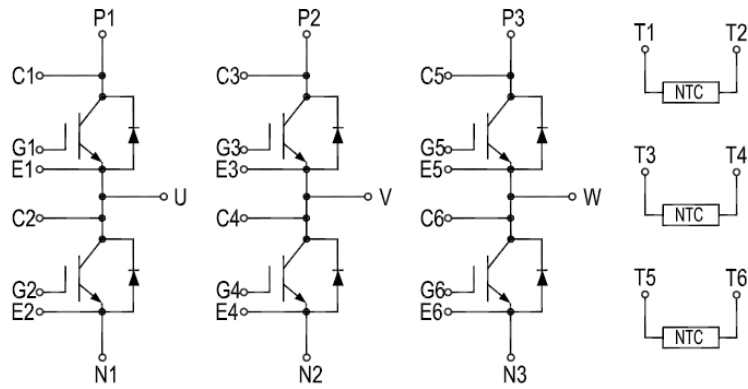


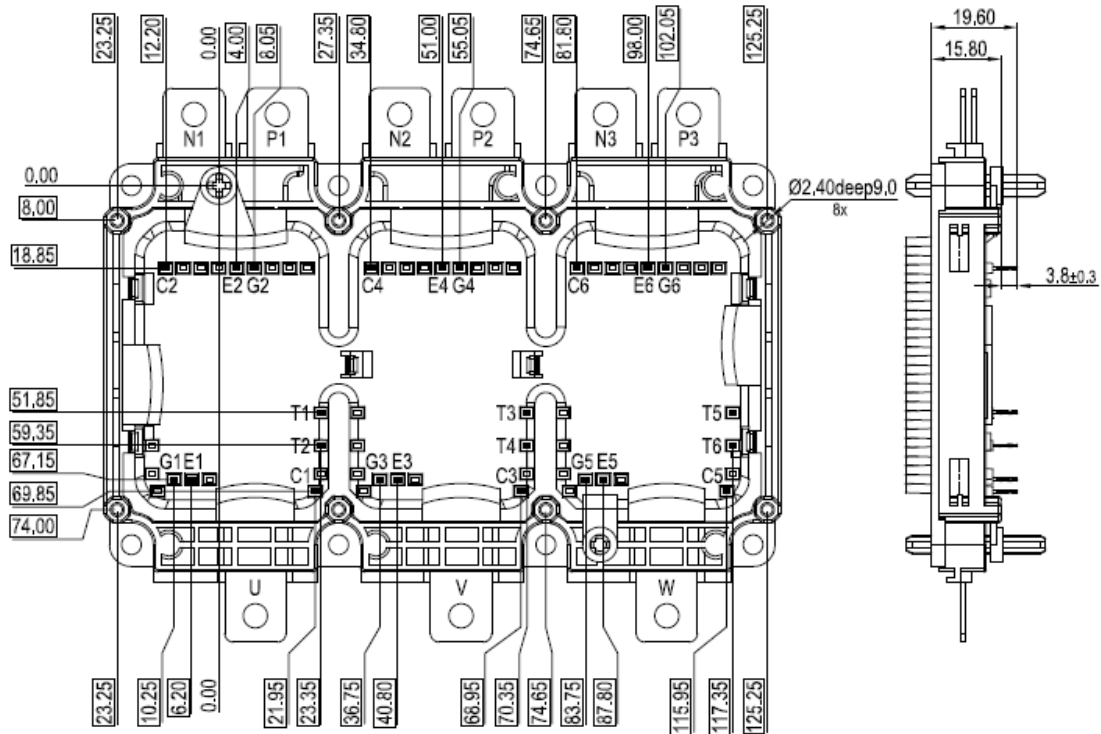
Fig.13 NTC Temperature Characteristics

Internal Circuit:

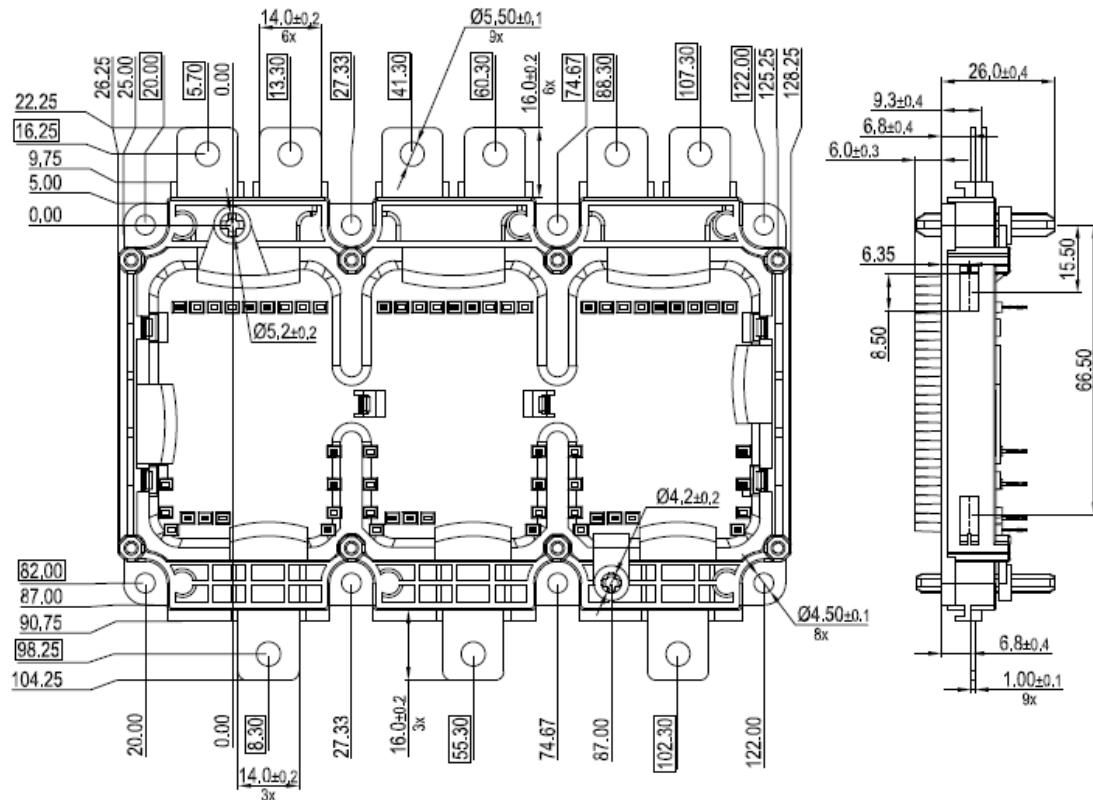




Package Outline (Unit: mm):



Signal Pin to Signal Pin tolerances ± 0.4





Date	Revision	Notes
08/06/2024	01	Initial Release

Announcement

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