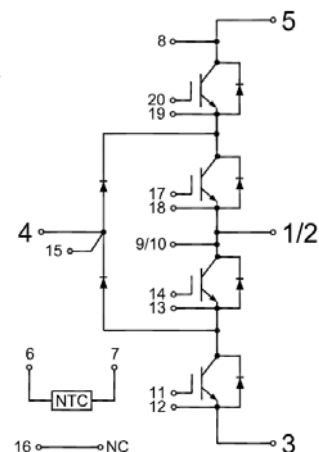
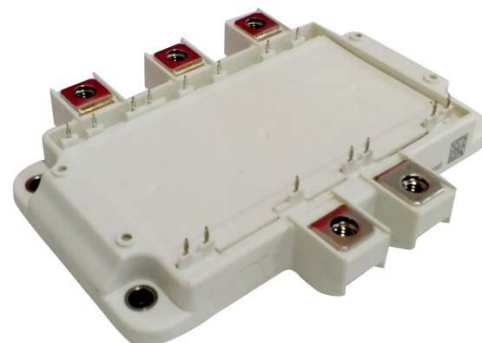


IGBT Module

Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated >10 μ s
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested (2 $\times$ I_C)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement
- Assembling solution with PressFIT signal pins and screw power terminals



Applications:

- Motor Drives
- Solar Applications
- UPS Systems

IGBT, Inverter

Maximum Rated Values of IGBT(T_C=25°C unless otherwise specified)

V _{CES}	Collector-Emitter Blocking Voltage		650	V
V _{GES}	Gate-Emitter Voltage		±20	V
I _C	Continuous Collector Current	T _C = 80°C	400	A
		T _C = 25°C	470	A
I _{CM}	Repetitive Peak Collector Current	T _J = 175°C	800	A
t _{SC}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation per IGBT	T _C = 25°C T _{Jmax} = 175°C	1600	W

Electrical Characteristics of IGBT ($T_C=25^{\circ}\text{C}$ unless otherwise specified)
Static Characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C = 6.4\text{mA}$, $V_{CE} = V_{GE}$	5.0	5.9	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 400\text{A}$, $V_{GE} = 15\text{V}$	$T_J = 25^{\circ}\text{C}$	1.70		V
			$T_J = 125^{\circ}\text{C}$	2.00		V
			$T_J = 150^{\circ}\text{C}$	2.00		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE} = 0\text{V}$, $V_{CE} = V_{CES}$, $T_J = 25^{\circ}\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE} = \pm 20\text{V}$, $V_{CE} = 0\text{V}$, $T_J = 25^{\circ}\text{C}$			400	nA
C_{ies}	Input Capacitance	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$		31.55		nF
C_{oes}	Output Capacitance			1.93		nF
C_{res}	Reverse Transfer Capacitance			1.32		nF

Switching Characteristics

Switching Characteristics							
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 300V, I_C = 400A,$ $R_{Gon} = 1\Omega, V_{GE} = \pm 15V,$ Inductive Load	$T_J = 25^{\circ}C$		284		ns
			$T_J = 125^{\circ}C$		275		
			$T_J = 150^{\circ}C$		269		
t_r	Rise Time		$T_J = 25^{\circ}C$		285		ns
			$T_J = 125^{\circ}C$		285		
			$T_J = 150^{\circ}C$		284		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC} = 300V, I_C = 400A,$ $R_{Goff} = 1\Omega, V_{GE} = \pm 15V,$ Inductive Load	$T_J = 25^{\circ}C$		386		ns
			$T_J = 125^{\circ}C$		371		
			$T_J = 150^{\circ}C$		375		
t_f	Fall Time		$T_J = 25^{\circ}C$		142		ns
			$T_J = 125^{\circ}C$		152		
			$T_J = 150^{\circ}C$		156		
E_{on}	Turn-on Switching Loss	$V_{CC} = 300V, I_C = 400A,$ $R_{Gon} = 1\Omega, V_{GE} = \pm 15V,$ $di/dt = 1210A/\mu s (T_J = 150^{\circ}C),$ Inductive Load	$T_J = 25^{\circ}C$		4.1		mJ
			$T_J = 125^{\circ}C$		5.3		
			$T_J = 150^{\circ}C$		5.8		

E_{off}	Turn-off Switching Loss	$V_{CC} = 300V, I_C = 400A,$ $R_{Goff} = 1\Omega, V_{GE} = \pm 15V,$ $dv/dt = 2678V/\mu s (T_J = 150^\circ C),$ Inductive Load	$T_J = 25^\circ C$		27.5		mJ
			$T_J = 125^\circ C$		29.2		
			$T_J = 150^\circ C$		30		
Q_g	Total Gate Charge	$V_{GE} = +15V \dots -15V$	$T_J = 25^\circ C$		1.72		μC
RBSOA	Reverse Bias Safe Operation Area	$I_C = 800A, V_{CC} = 600V, V_p = 650V,$ $R_{Goff} = 4.7\Omega, V_{GE} = +15V \text{ to } 0V, T_J = 150^\circ C$			Trapezoid		
SC Data	$V_{CC} = 300V, V_{GE} = 15V, T_J = 150^\circ C$			10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)				0.094		$^\circ C/W$

Diode, Reverse

Maximum Rated Values of Diode ($T_C = 25^\circ C$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	400	A
I_{FM}	Diode Maximum Forward Current	800	A

Electrical Characteristics of Diode ($T_C = 25^\circ C$ unless otherwise specified)

Symbol	Description	Conditions		Min	Typ	Max	Unit
V _{FM}	Forward Voltage	I _F =400A	T _J =25℃		2.00		V
			T _J =125℃		2.00		
			T _J =150℃		2.10		
t _{rr}	Reverse Recovery Time	I _F =400A, -diF/dt =1270A/μs(T _J =150℃), V _R = 300V, V _{GE} = -15V	T _J =25℃		184		ns
			T _J =125℃		249		
			T _J =150℃		277		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		69		A
			T _J =125℃		119		
			T _J =150℃		131		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		7.8		μC
			T _J =125℃		18.3		
			T _J =150℃		22.5		

E _{rec}	Reverse Recovery Energy	I _F =400A, di/dt =1270A/μs(T _J =150℃), V _{rr} =300V, V _{GE} =-15V	T _J =25℃		0.86		mJ
			T _J =125℃		3.17		
			T _J =150℃		4.37		
R _{θJC}	Diode Thermal Resistance: Junction-To-Case (per leg)				0.184		℃/W

Diode, 3-Level

Maximum Rated Values of Diode ($T_C=25^\circ C$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	400	A
I_{FM}	Diode Maximum Forward Current	800	A

Electrical Characteristics of Diode ($T_C=25^\circ C$ unless otherwise specified)

Symbol	Description	Conditions		Min	Typ	Max	Unit
V _{FM}	Forward Voltage	I _F =400A	T _J =25℃		2.00		V
			T _J =125℃		2.00		
			T _J =150℃		2.10		
t _{rr}	Reverse Recovery Time	I _F =400A, -diF/dt =1270A/μs(T _J =150℃), V _R = 300V, V _{GE} = -15V	T _J =25℃		184		ns
			T _J =125℃		249		
			T _J =150℃		277		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		69		A
			T _J =125℃		119		
			T _J =150℃		131		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		7.8		μC
			T _J =125℃		18.3		
			T _J =150℃		22.5		
E _{rec}	Reverse Recovery Energy		T _J =25℃		0.86		mJ
			T _J =125℃		3.17		
			T _J =150℃		4.37		
R _{θJC}	Diode Thermal Resistance: Junction-To-Case (per leg)				0.184		℃/W

Internal NTC- Thermistor Characteristic

Symbol	Condition	Typ.	Max.	Units
R_{25}	$T_C = 25^{\circ}\text{C}$	5		k Ω
$\Delta R/R$	$T_C = 100^{\circ}\text{C}$, $R_{100} = 481\Omega$		± 5	%
P_{25}	$T_C = 25^{\circ}\text{C}$	50		mW
$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$	3380		K
$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298.15\text{K}))]$	3440		K

Module

Symbol	Description	Min	Typ	Max	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted)	$f = 50\text{Hz}$, 1minute	4000		V
Material of Module Base plate		Copper			
Internal Isolation		Al ₂ O ₃			
d_{creep}	Creepage Distance: Terminal to Heatsink		25		mm
	Creepage Distance: Terminal to Terminal		12.5		
d_{clear}	Clearance: Terminal to Heatsink		11		mm
	Clearance: Terminal to Terminal		7		
L_{SCE}	Stray Inductance Module		45		nH
T_J	Maximum Junction Temperature			175	$^{\circ}\text{C}$
T_{JOP}	Maximum Operating Junction Temperature Range	-40		+150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	-40		+125	$^{\circ}\text{C}$
CTI	Comparative Tracking Index	200			V
$R_{\theta CS}$	Case-To-Sink Thermally (Conductive Grease Applied)		0.02		$^{\circ}\text{C}/\text{W}$
M	Power Terminals Screw:M6	3.0		6.0	N·m
M	Mounting Screw:M5	3.0		6.0	N·m
G	Weight		390		g

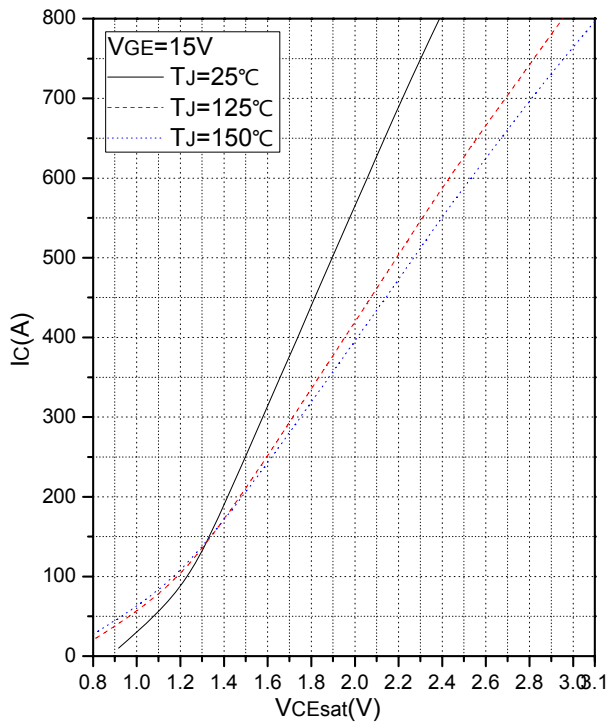


Fig.1 Typical Saturation Voltage Characteristics

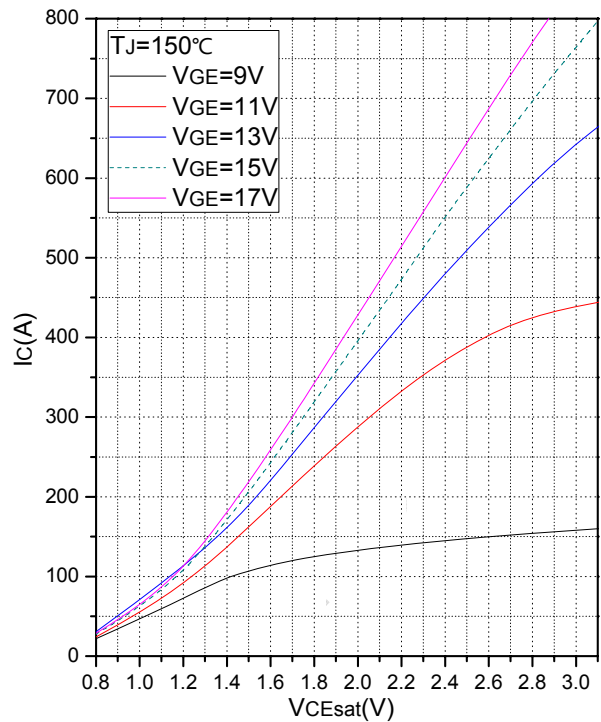


Fig.2 Typical Output Characteristics

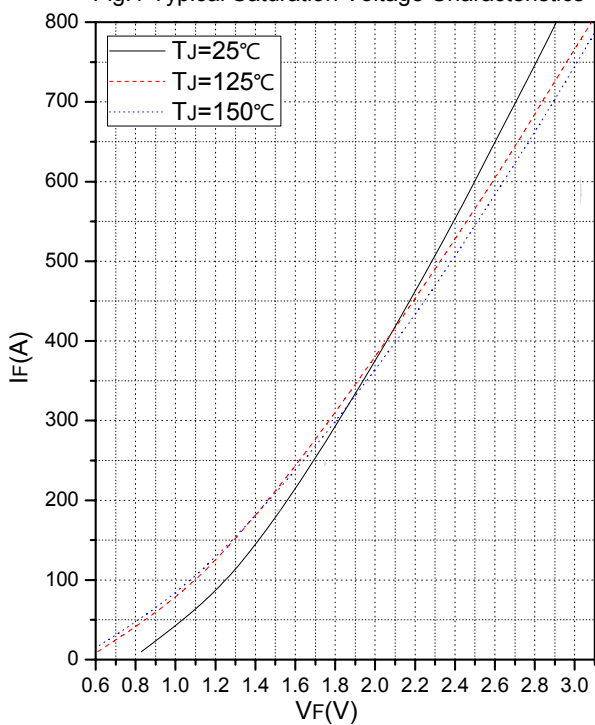


Fig.3 Forward Characteristics of Diode-Reverse

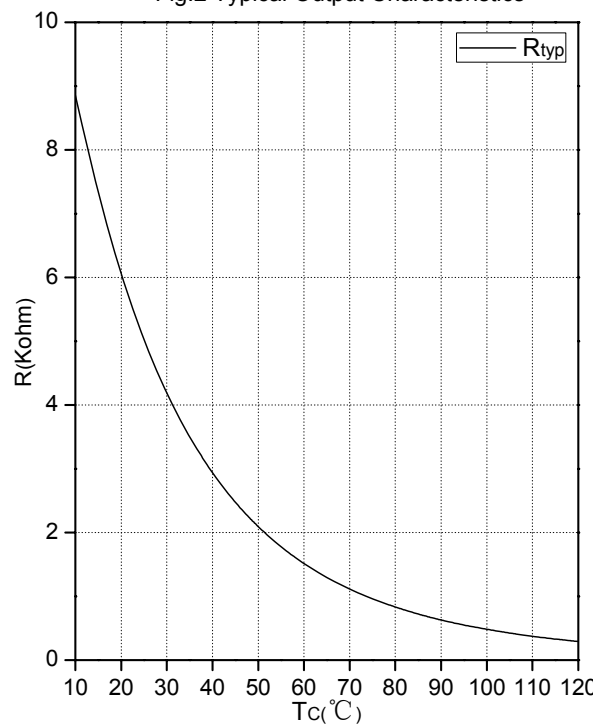


Fig.4 NTC Temperature Characteristics

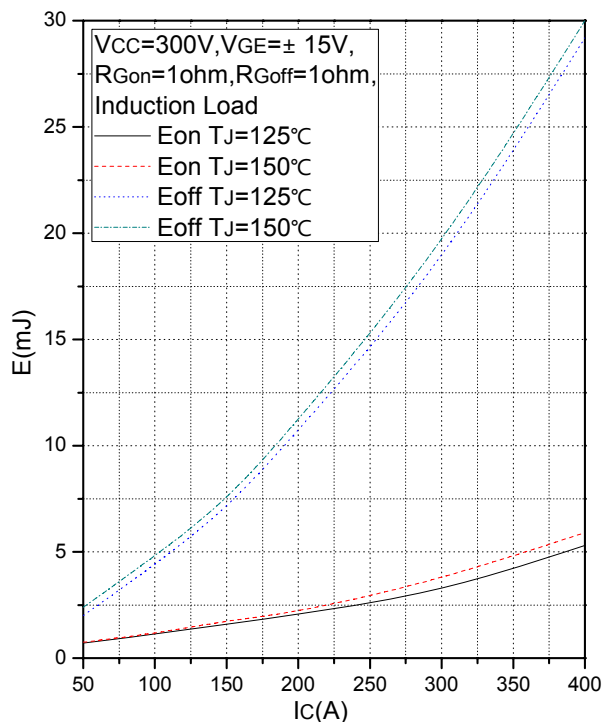


Fig.5 Typical Switching Loss vs. Collector Current

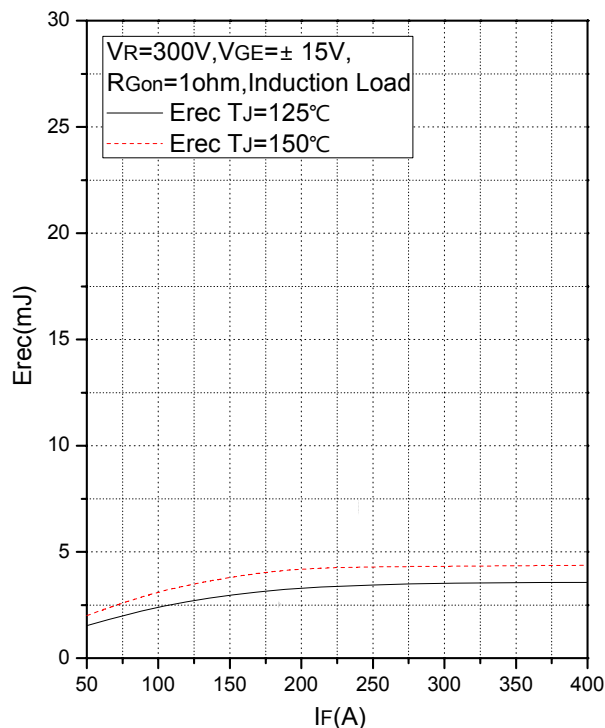


Fig.6 Typical Switching Loss vs. Forward Current

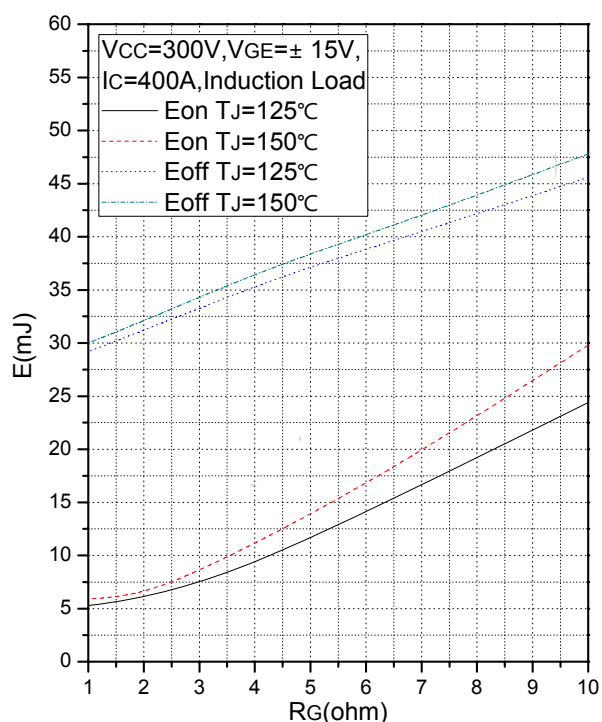


Fig.7 Typical Switching Loss vs. Gate Resistance

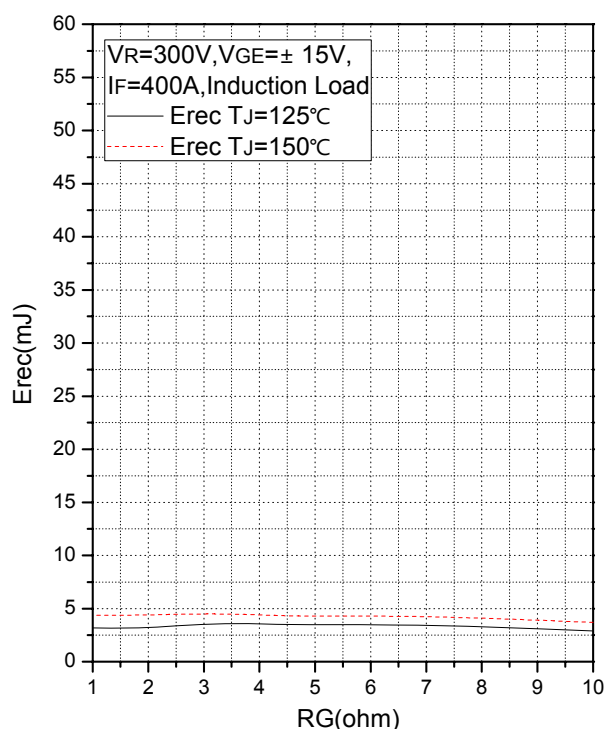


Fig.8 Typical Switching Loss vs. Gate Resistance

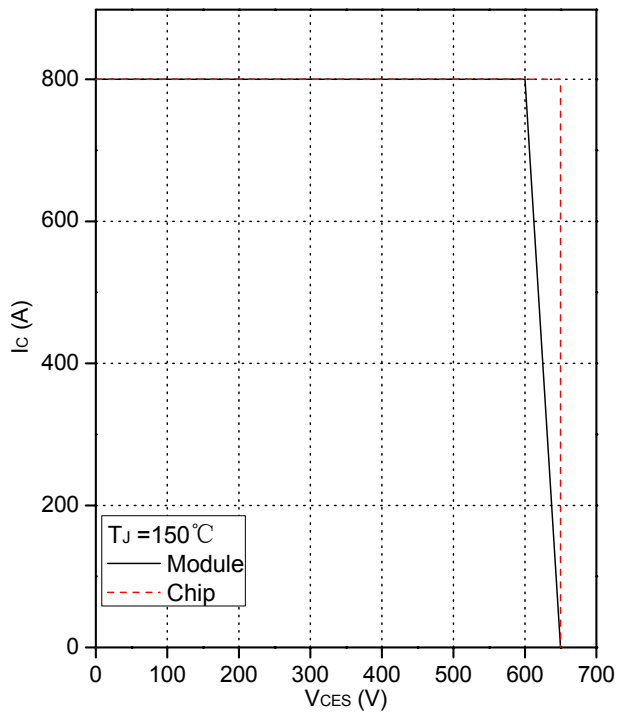


Fig.9 Reverse Bias Safe Operation Area (RBSOA)

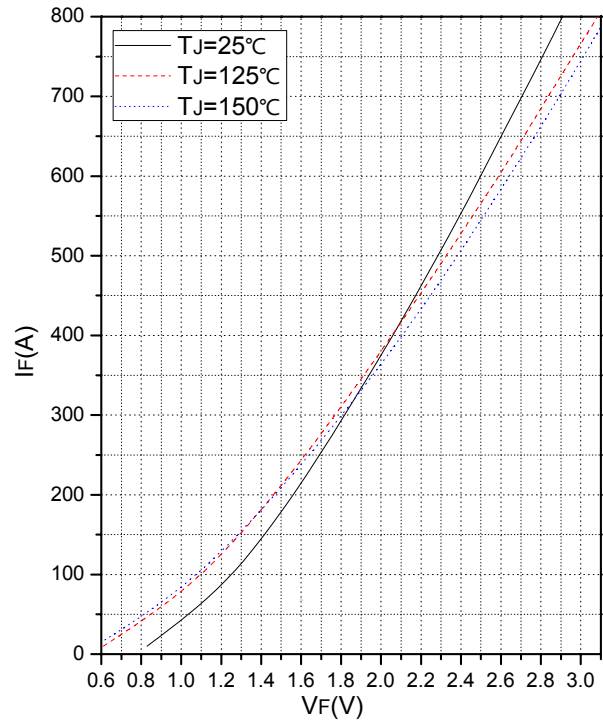


Fig.10 Forward Characteristics of Diode-3-Level

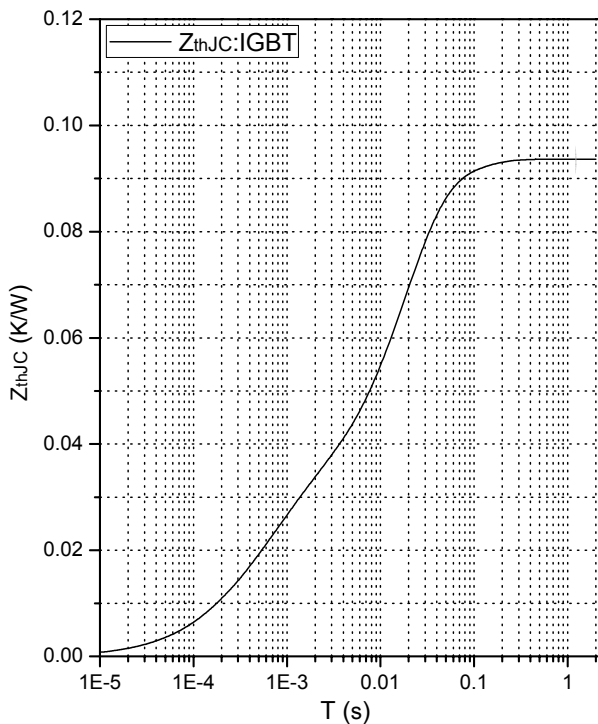


Fig.11 Transient Thermal Impedance (IGBT)

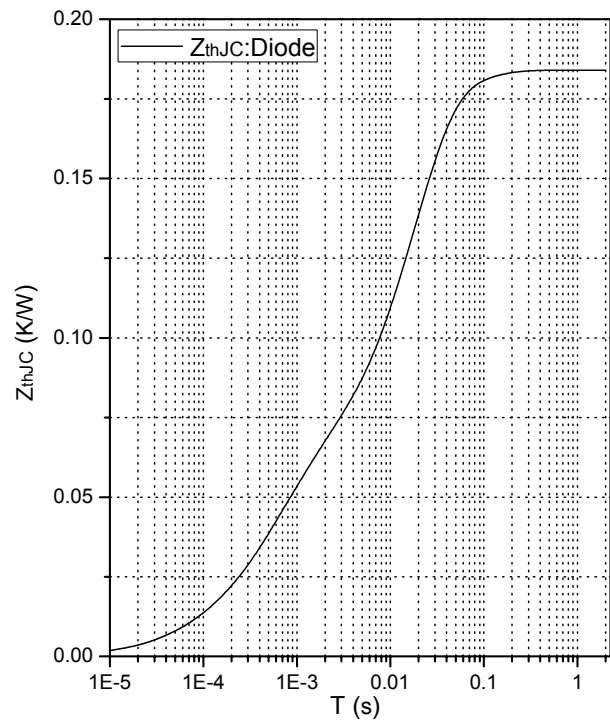
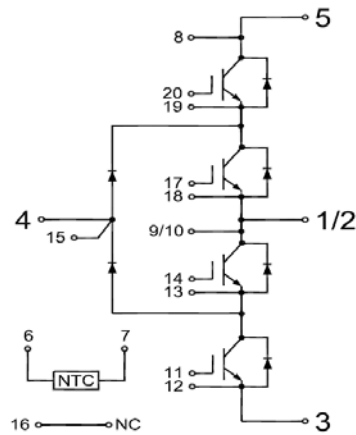


Fig.12 Transient Thermal Impedance (Diode)

Internal Circuit



Package Outline (Unit: mm):

