

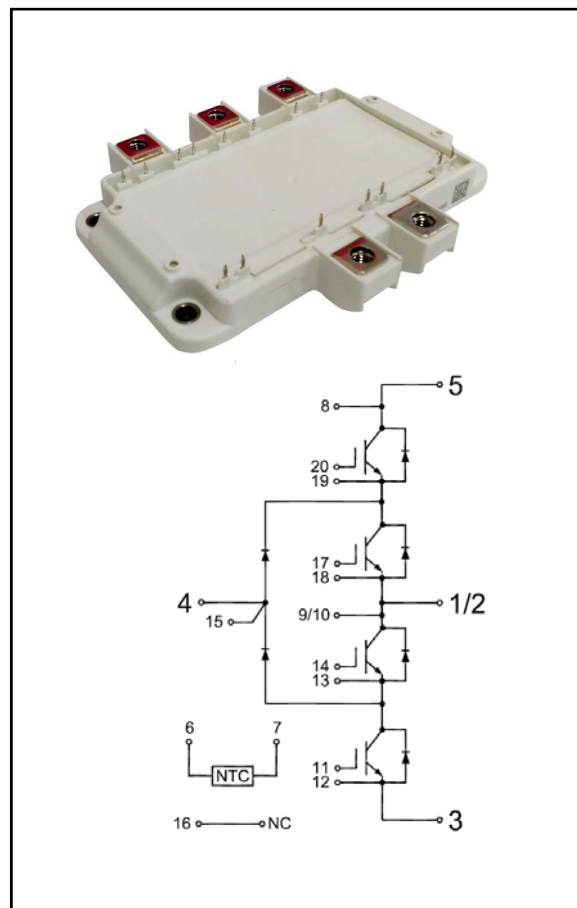
IGBT Module

Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated >10μs
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested (2×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	300	A
		T _C = 25°C	440	A
I _{CM}	Repetitive Peak Collector Current	T _J = 175°C	600	A
t _{SC}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation per IGBT	T _C = 25°C T _{Jmax} = 175°C	1325	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	$I_C = 8\text{mA}$, $V_{CE} = V_{GE}$	5.0	5.9	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 300\text{A}$, $V_{GE} = 15\text{V}$	$T_J = 25^{\circ}\text{C}$	1.50		V
			$T_J = 125^{\circ}\text{C}$	1.80		V
			$T_J = 150^{\circ}\text{C}$	1.80		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	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$		25		nF
C_{oes}	Output Capacitance			1.0		nF
C_{res}	Reverse Transfer Capacitance			0.8		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 300\text{V}$, $I_C = 300\text{A}$, $R_{Gon} = 4.7\Omega$, $V_{GE} = \pm 15\text{V}$, Inductive Load	$T_J = 25^{\circ}\text{C}$		408		ns
			$T_J = 125^{\circ}\text{C}$		404		
t_r	Rise Time		$T_J = 25^{\circ}\text{C}$		203		ns
			$T_J = 125^{\circ}\text{C}$		205		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC} = 300\text{V}$, $I_C = 300\text{A}$, $R_{Goff} = 4.7\Omega$, $V_{GE} = \pm 15\text{V}$, Inductive Load	$T_J = 25^{\circ}\text{C}$		359		ns
			$T_J = 125^{\circ}\text{C}$		365		
t_f	Fall Time		$T_J = 25^{\circ}\text{C}$		98		ns
			$T_J = 125^{\circ}\text{C}$		121		
E_{on}	Turn-on Switching Loss	$V_{CC} = 300\text{V}$, $I_C = 300\text{A}$, $R_{Gon} = 4.7\Omega$, $V_{GE} = \pm 15\text{V}$, $di/dt = 1250\text{A}/\mu\text{s}$ ($T_J = 125^{\circ}\text{C}$), Inductive Load	$T_J = 25^{\circ}\text{C}$		5.3		mJ
			$T_J = 125^{\circ}\text{C}$		5.7		
E_{off}	Turn-off Switching Loss	$V_{CC} = 300\text{V}$, $I_C = 300\text{A}$, $R_{Goff} = 4.7\Omega$, $V_{GE} = \pm 15\text{V}$, $dv/dt = 2570\text{V}/\mu\text{s}$ ($T_J = 125^{\circ}\text{C}$), Inductive Load	$T_J = 25^{\circ}\text{C}$		12.9		mJ
			$T_J = 125^{\circ}\text{C}$		15.5		
Q_g	Total Gate Charge	$V_{GE} = +15\text{V} \dots -15\text{V}$	$T_J = 25^{\circ}\text{C}$		1.82		nC
RBSOA	Reverse Bias Safe Operation Area	$I_C = 600\text{A}$, $V_{CC} = 600\text{V}$, $V_p = 650\text{V}$, $R_{Goff} = 4.7\Omega$, $V_{GE} = +15\text{V}$ to 0V , $T_J = 150^{\circ}\text{C}$	Trapezoid				
SC Data	SC Data	$V_{CC} = 300\text{V}$, $t_p = 10\mu\text{s}$, $V_{GE} = \pm 15\text{V}$, $R_{Gon} = 10\Omega$, $R_{Goff} = 10\Omega$, $T_J = 25^{\circ}\text{C}$		1780			A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)			0.113			$^{\circ}\text{C}/\text{W}$

Diode, Reverse
Maximum Rated Values of Diode ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	300	A
I_{FM}	Diode Maximum Forward Current	600	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit	
V _{FM}	Forward Voltage	I _F =300A	T _J =25℃		1.60		V	
			T _J =125℃		1.60			
t _{rr}	Reverse Recovery Time	I _F = 300A, -diF/dt =1772A/μs(T _J =125℃), V _R = 300V, V _{GE} = -15V	T _J =25℃		139		ns	
			T _J =125℃		194			
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		103		A	
			T _J =125℃		138			
Q _{rr}	Reverse Recovery Charge		T _J =25℃		8.55		μC	
			T _J =125℃		16.3			
E _{rec}	Reverse Recovery Energy		T _J =25℃		0.25		mJ	
			T _J =125℃		2.20			
R _{θJC}	Diode Thermal Resistance: Junction-To-Case (per leg)				0.188		℃/W	

Diode, 3-Level
Maximum Rated Values of Diode ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	300	A
I_{FM}	Diode Maximum Forward Current	600	A

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

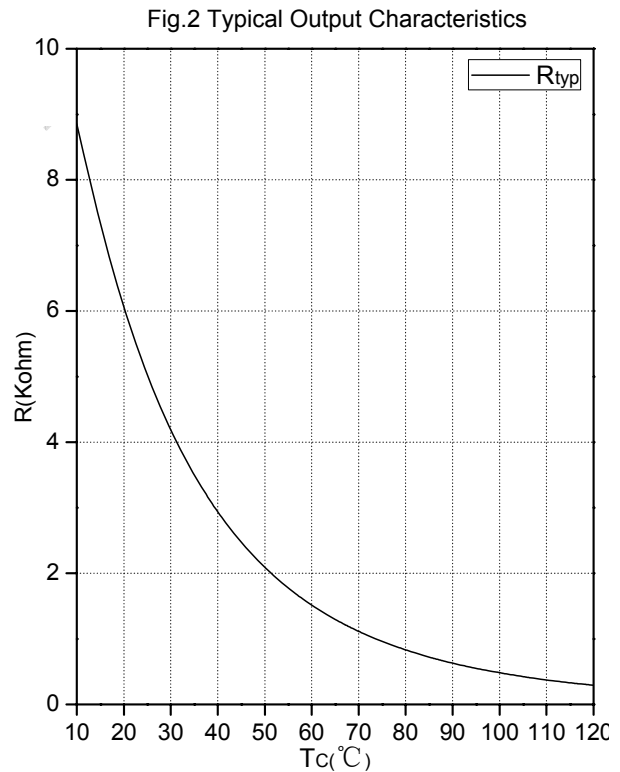
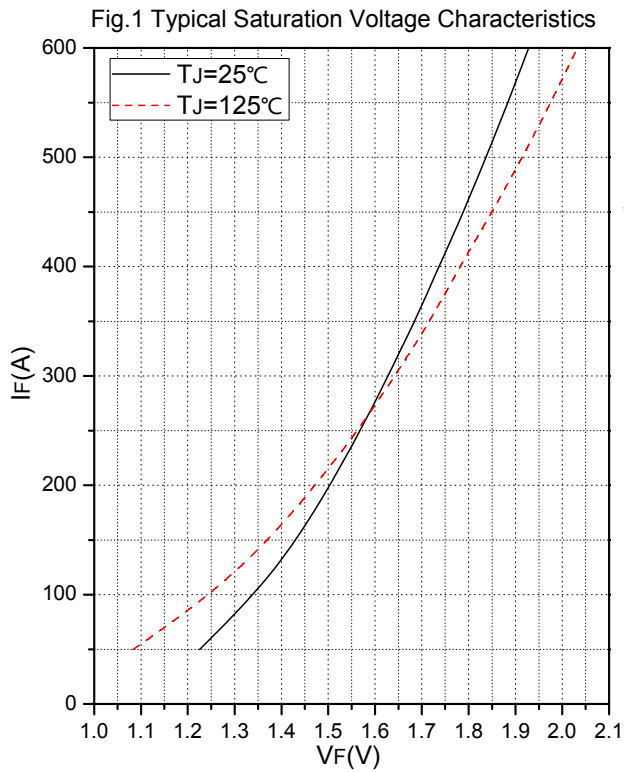
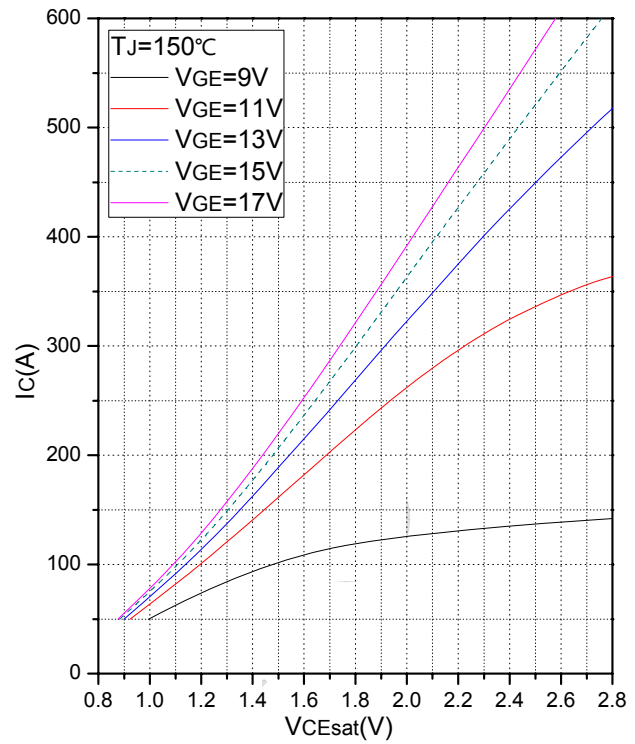
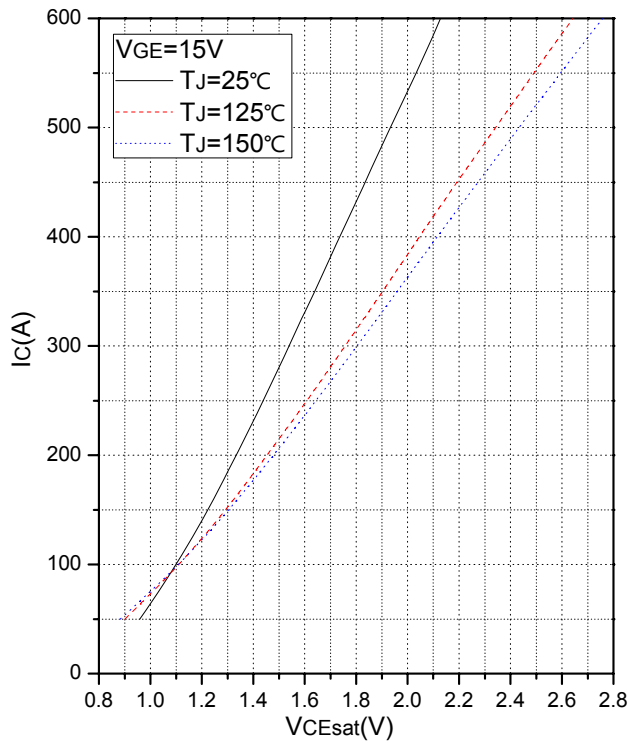
Symbol	Description	Conditions		Min	Typ	Max	Unit	
V _{FM}	Forward Voltage	I _F =300A	T _J =25°C		1.60		V	
			T _J =125°C		1.60			
t _{rr}	Reverse Recovery Time	I _F = 300A, -diF/dt =1772A/μs(T _J =125°C), V _R = 300V, V _{GE} = -15V	T _J =25°C		139		ns	
			T _J =125°C		194			
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		103		A	
			T _J =125°C		138			
Q _{rr}	Reverse Recovery Charge		T _J =25°C		8.55		μC	
			T _J =125°C		16.3			
E _{rec}	Reverse Recovery Energy		T _J =25°C		0.25		mJ	
			T _J =125°C		2.20			
R _{θJC}	Diode Thermal Resistance: Junction-To-Case (per leg)				0.188		°C/W	

Internal NTC- Thermistor Characteristic

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

Module

Symbol	Description		Min	Typ	Max	Unit
V _{iso}	Isolation Voltage (All Terminals Shorted)	f = 50Hz, 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	°C
T _{JOP}	Maximum Operating Junction Temperature Range		-40		+150	°C
T _{stg}	Storage Temperature		-40		+125	°C
CTI	Comparative Tracking Index		200			V
R _{θCS}	Case-To-Sink Thermally (Conductive Grease Applied)			0.02		°C/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



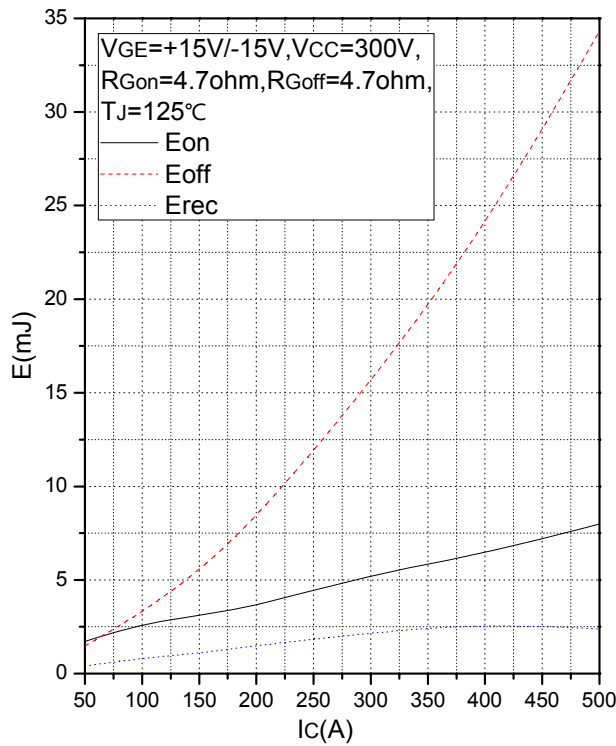


Fig.5 Typical Switching Loss vs. Collector Current

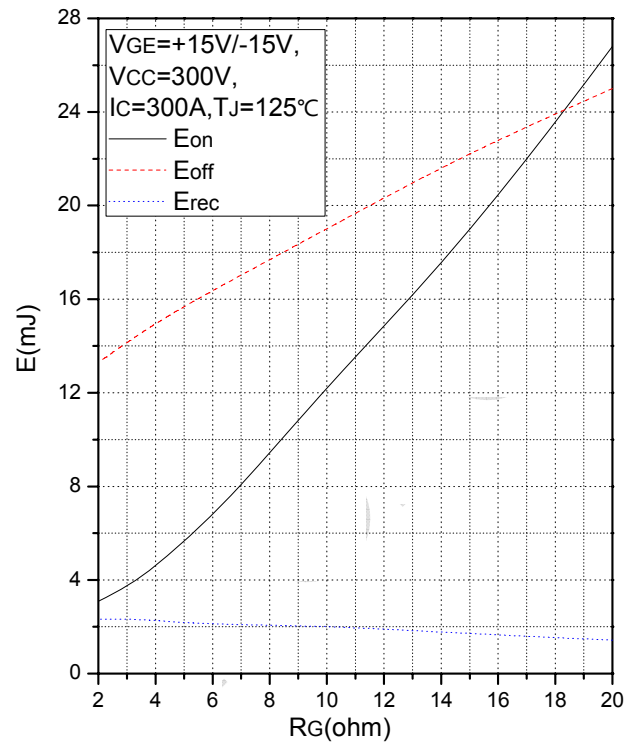


Fig.6 Typical Switching Loss vs. Gate Resistance

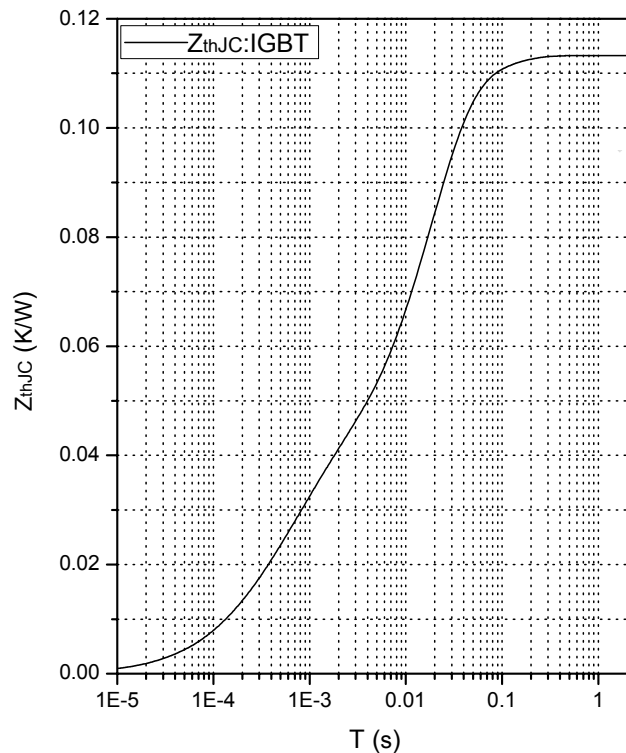


Fig.7 Transient Thermal Impedance (IGBT)

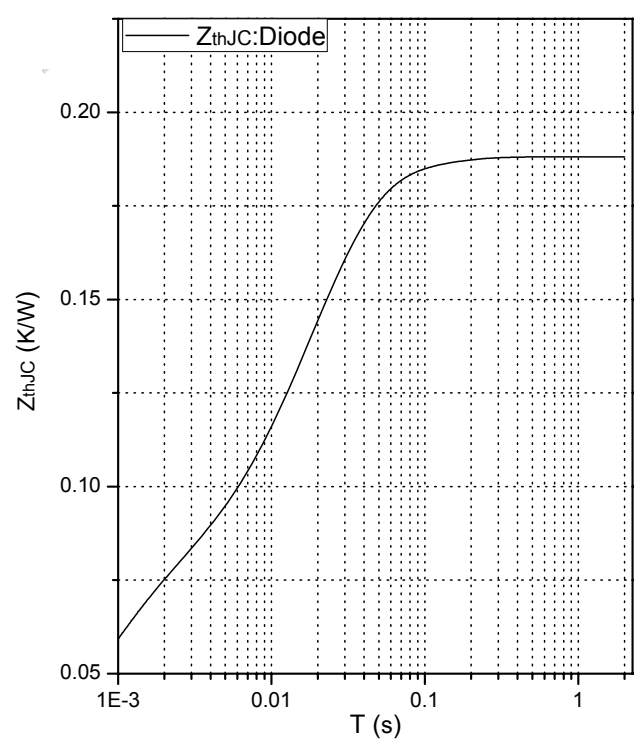


Fig.8 Transient Thermal Impedance (Diode)

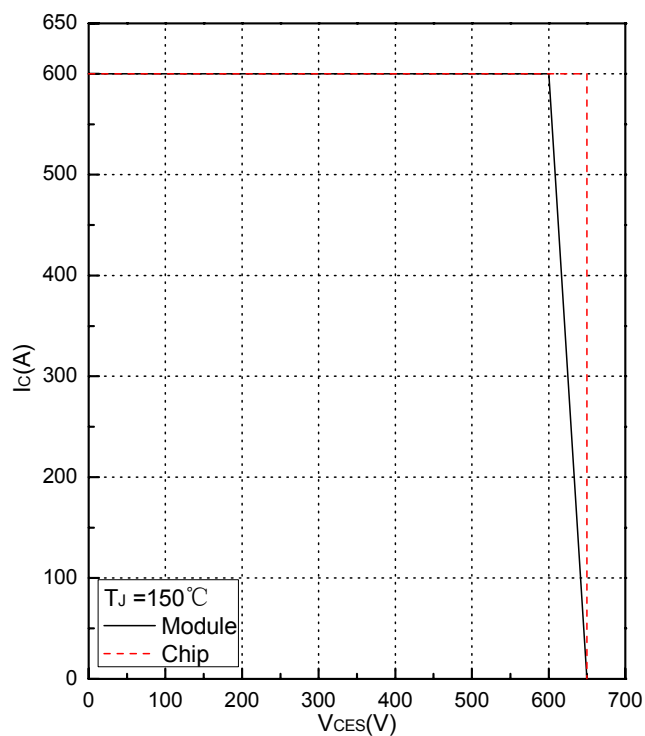


Fig.9 Reverse Bias Safe Operation Area (RBSOA)

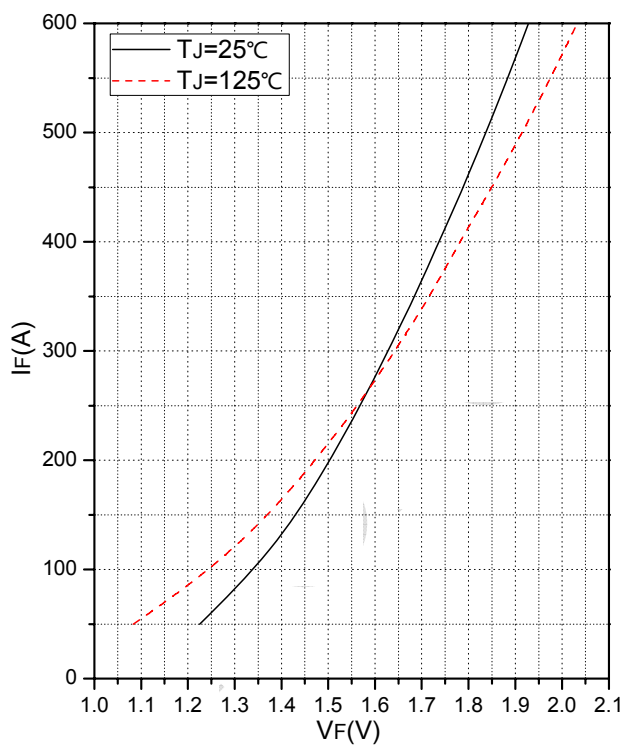
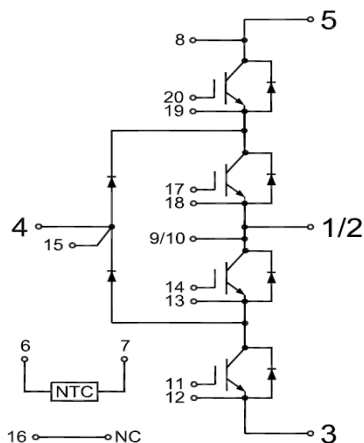


Fig.10 Forward Characteristics of Diode-3-Level

Internal Circuit



Package Outline (Unit: mm):

