

**Features:**

- Low switching losses
- VCE(sat) with Positive temperature coefficient
- Short circuit rated

**Typical Applications:**

- Motor drives
- Servo drives
- High Frequency Switching Applications

**Module-Inverter**

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	VALUE			UNIT
			Min	Type	Max	
V <sub>CES</sub>	Collector-Emitter voltage	T <sub>j</sub> =25°C			1200	V
V <sub>GES</sub>	Gate-Emitter voltage	T <sub>j</sub> =25°C			±20	V
I <sub>C</sub>	Collector current	Continuous@ T <sub>C</sub> =100°C			100	A
I <sub>CP</sub>		T <sub>P</sub> =1ms			200	A
P <sub>tot</sub>	Power Dissipation Per IGBT				500	W
T <sub>j</sub>	Junction temperature	/			150	°C
T <sub>op</sub>	Operating temperature	/	-40		150	°C
T <sub>stg</sub>	Storage temperature	/	-40		125	°C
V <sub>iso</sub>	Isolation between terminal and copper base	T <sub>j</sub> =25°C , AC: 1minute	2500			V
I <sub>CES</sub>	Zero gate voltage collector current	T <sub>j</sub> =25°C , V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V			1	mA
		T <sub>j</sub> =150°C , V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V			5	mA
I <sub>GES</sub>	Gate-Emitter leakage current	T <sub>j</sub> =25°C , V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V	-0.4		0.4	µA
V <sub>GE(th)</sub>	Gate-Emitter threshold voltage	T <sub>j</sub> =25°C , V <sub>CE</sub> =20V, I <sub>C</sub> =3.8mA	5.0	5.8	6.6	V
V <sub>CE(sat)</sub>	Collector-Emitter saturation voltage	T <sub>j</sub> =25°C , V <sub>GE</sub> =15V, I <sub>C</sub> =100A		1.7	2.05	V
		T <sub>j</sub> =150°C , V <sub>GE</sub> =15V, I <sub>C</sub> =100A		2.05		V
Q <sub>g</sub>	Gate Charge	T <sub>j</sub> =25°C , V <sub>CE</sub> =600V, I <sub>C</sub> =100A, V <sub>GE</sub> =±15V		0.75		µC
C <sub>ies</sub>	Input capacitance	T <sub>j</sub> =25°C , V <sub>CE</sub> =25V, V <sub>GE</sub> =0V, f=100kHz		8.50		nF
C <sub>res</sub>	Reverse transfer capacitance			0.07		nF
t <sub>(d)on</sub>	Turn-on time	V <sub>CC</sub> =600V, I <sub>C</sub> =100A, V <sub>GE</sub> =±15V, R <sub>g</sub> =1.6Ω, Inductive load	T <sub>j</sub> =25°C	14		ns
			T <sub>j</sub> =150°C	16		ns
t <sub>r</sub>	T <sub>j</sub> =25°C		80		ns	
	T <sub>j</sub> =150°C		40		ns	
t <sub>(d)off</sub>	Turn-off time		T <sub>j</sub> =25°C	280		ns
			T <sub>j</sub> =150°C	340		ns
t <sub>f</sub>			T <sub>j</sub> =25°C	100		ns
			T <sub>j</sub> =150°C	150		ns
E <sub>on</sub>	Turn on energy		T <sub>j</sub> =25°C	5.75		mJ
			T <sub>j</sub> =150°C	11.0		mJ
E <sub>off</sub>	Turn off energy	T <sub>j</sub> =25°C	5.75		mJ	
		T <sub>j</sub> =150°C	8.40		mJ	
I <sub>sc</sub>	Short circuit current	t <sub>psc</sub> ≤ 10µS, V <sub>GE</sub> =15V, V <sub>CC</sub> =800V	T <sub>j</sub> =150°C	350		A
V <sub>F</sub>	Forward on voltage	T <sub>j</sub> =25°C , I <sub>F</sub> =100A		1.95	2.25	V
		T <sub>j</sub> =150°C , I <sub>F</sub> =100A		1.55		V
I <sub>F(AV)</sub>	Average forward current	T <sub>C</sub> =100°C		100		A

I <sub>FRM</sub>	Repetitive peak forward current		200		A
Q <sub>rr</sub>	Reverse charge		17.5		μC
I <sub>RRM</sub>	Max. reverse recovery current	I <sub>F</sub> =100A , V <sub>R</sub> =600V, V <sub>GE</sub> =-15V, R <sub>Gon</sub> =1.6 Ω , T <sub>Vj</sub> =150°C	137		A
E <sub>rec</sub>	Reverse recovery energy		6.5		mJ
R <sub>th(j-c)</sub>	Thermal resistance(per chip)	IGBT		0.30	°C/W
		FWD		0.48	°C/W
Torque	To-sink	Recommended (M5)	2.4	3	N · m
W <sub>t</sub>	Weight		300		g
Outline	M40pa				

Module-Brake

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	VALUE			UNIT
			Min	Type	Max	
V <sub>CES</sub>	Collector-Emitter voltage	T <sub>j</sub> =25°C			1200	V
V <sub>GES</sub>	Gate-Emitter voltage	T <sub>j</sub> =25°C			±20	V
I <sub>c</sub>	Collector current	Continuous@ T <sub>c</sub> =100°C			75	A
I <sub>CP</sub>		T <sub>P</sub> =1ms			150	A
P <sub>tot</sub>	Power Dissipation Per IGBT				384	W
I <sub>CES</sub>	Zero gate voltage collector current	T <sub>j</sub> =25°C ,V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V			1	mA
		T <sub>j</sub> =150°C ,V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V			5	mA
I <sub>GES</sub>	Gate-Emitter leakage current	T <sub>j</sub> =25°C ,V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V	-0.4		0.4	μA
V <sub>GE(th)</sub>	Gate-Emitter threshold voltage	T <sub>j</sub> =25°C ,V <sub>CE</sub> =20V, I <sub>c</sub> =2.4mA	5.0	5.8	6.6	V
V <sub>CE(sat)</sub>	Collector-Emitter saturation voltage	T <sub>j</sub> =25°C ,V <sub>GE</sub> =15V, I <sub>c</sub> =75A		1.70	2.05	V
		T <sub>j</sub> =150°C ,V <sub>GE</sub> =15V, I <sub>c</sub> =75A		2.00		V
Q <sub>g</sub>	Gate Charge	T <sub>j</sub> =25°C ,V <sub>CE</sub> =600V,I <sub>c</sub> =75A,V <sub>GE</sub> =±15V		0.50		μC
C <sub>ies</sub>	Input capacitance	T <sub>j</sub> =25°C ,V <sub>CE</sub> =25V, V <sub>GE</sub> =0V, f=100kHz		6.6		nF
C <sub>res</sub>	Reverse transfer capacitance			0.05		nF
t <sub>(d)on</sub>	Turn-on time	V <sub>CC</sub> =600V, I <sub>c</sub> =50A, V <sub>GE</sub> =±15V, R <sub>g</sub> =15Ω, Inductive load	T <sub>j</sub> =25°C	160		ns
			T <sub>j</sub> =150°C	170		ns
t <sub>r</sub>	T <sub>j</sub> =25°C		90		ns	
	T <sub>j</sub> =150°C		90		ns	
t <sub>(d)off</sub>	Turn-off time		T <sub>j</sub> =25°C	270		ns
			T <sub>j</sub> =150°C	320		ns
t <sub>f</sub>			T <sub>j</sub> =25°C	90		ns
			T <sub>j</sub> =150°C	190		ns
E <sub>on</sub>	Turn on energy		T <sub>j</sub> =25°C	8.50		mJ
			T <sub>j</sub> =150°C	13.5		mJ
E <sub>off</sub>	Turn off energy	T <sub>j</sub> =25°C	4.25		mJ	
		T <sub>j</sub> =150°C	6.15		mJ	
I <sub>sc</sub>	Short circuit current	t <sub>psc</sub> ≤10μS, V <sub>GE</sub> =15V, V <sub>CC</sub> =800V	T <sub>j</sub> =150°C	270		A
V <sub>F</sub>	Forward on voltage	T <sub>j</sub> =25°C ,I <sub>F</sub> =50A		2.05	2.55	V
		T <sub>j</sub> =150°C ,I <sub>F</sub> =50A		1.70		V
I <sub>F(AV)</sub>	Average forward current	T <sub>c</sub> =100°C		50		A
I <sub>FRM</sub>	Repetitive peak forward current			100		A
Q <sub>rr</sub>	Reverse charge	I <sub>F</sub> =50A , V <sub>R</sub> =600V, V <sub>GE</sub> =-15V, R <sub>Gon</sub> =15 Ω		6.45		μC

$I_{RRM}$	Max. reverse recovery current	$T_{vj}=150^{\circ}C$		39.5		A
$E_{rec}$	Reverse recovery energy			1.90		mJ
$R_{th(j-c)}$	Thermal resistance(per chip)	IGBT			0.39	$^{\circ}C/W$
		FWD			0.98	$^{\circ}C/W$
Outline	M40pa					

### Diode-Recifier

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	VALUE			UNIT
			Min	Type	Max	
$V_F$	Forward on voltage	$T_J=25^{\circ}C, I_F=100A$		1.10		V
$I_R$	Reverse Leakage Current				1	mA
$I_{F(AV)}$	Average Forward Current			100		A
$I_{FSM}$	Surge Forward Current	$t_p=10ms, T_c=25^{\circ}C, \sin 180^{\circ}$		840		A
$I^2t$				3528		$A^2s$
$R_{th(j-c)}$	Thermal resistance(per chip)	FWD			0.385	$^{\circ}C/W$
Outline	M40pa					

### NTC

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	VALUE			UNIT
			Min	Type	Max	
$R_{25}$	Resistance	$T_{vj}=25^{\circ}C$		5		k $\Omega$
$B_{25/50}$	$R_2=R_{25} \exp [B_{25/50}(1/T_2-1/(298,15K))]$			3375		K

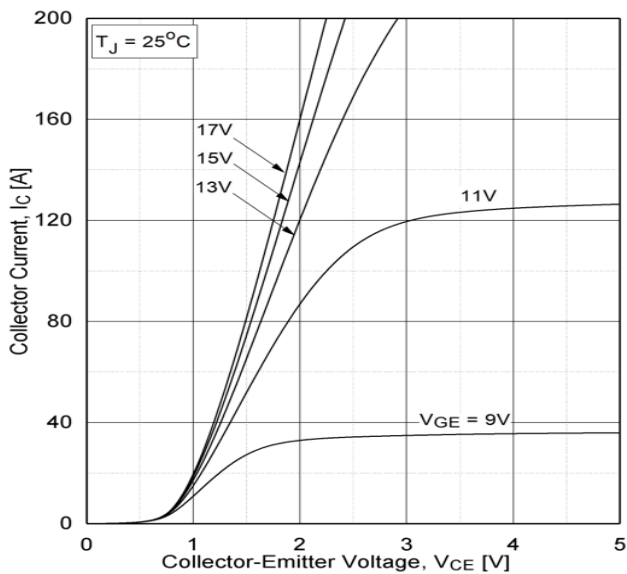


Fig 1, Output Characteristics IGBT, Inverter (typical)

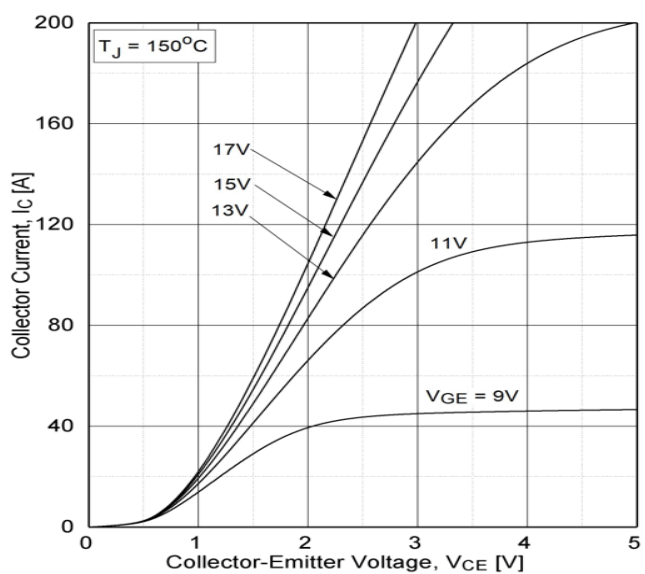


Fig 2, Output Characteristics IGBT, Inverter (typical)

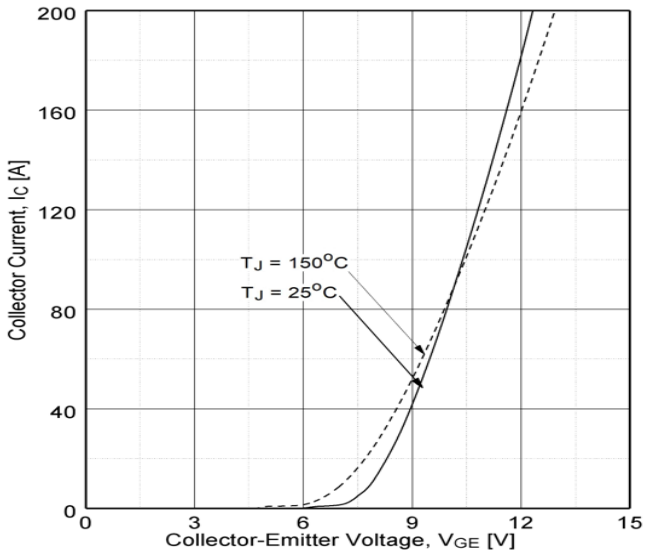


Fig 3, Transfer Characteristics IGBT, Inverter (typical)

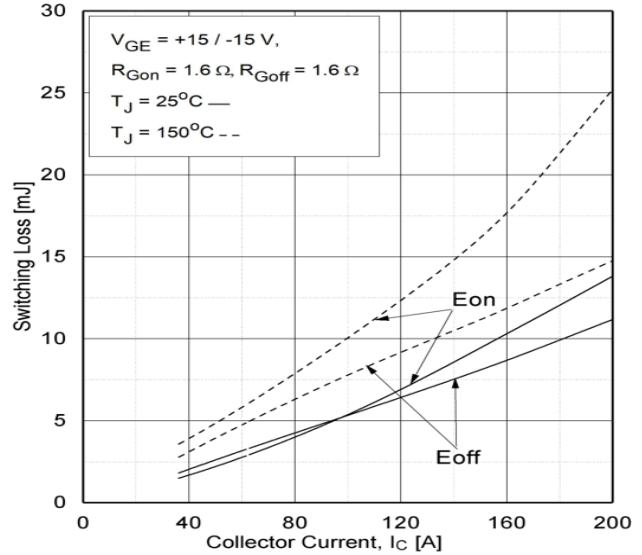


Fig 4, Switching Losses IGBT, Inverter (typical)

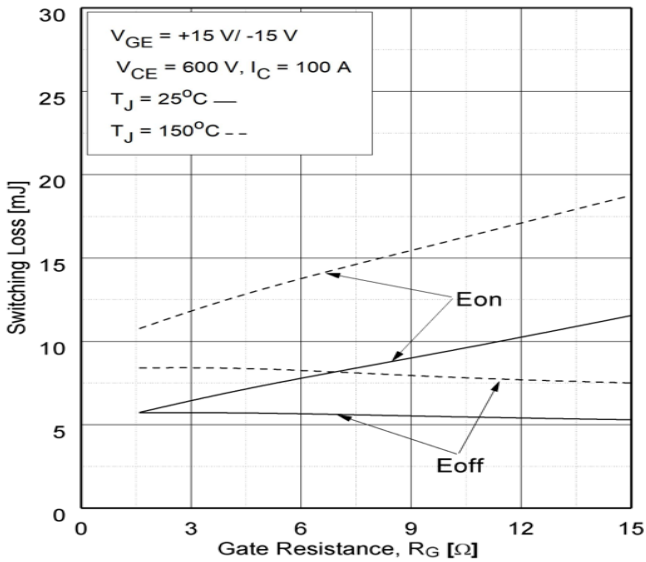


Fig 5, Switching Losses IGBT, Inverter (typical)

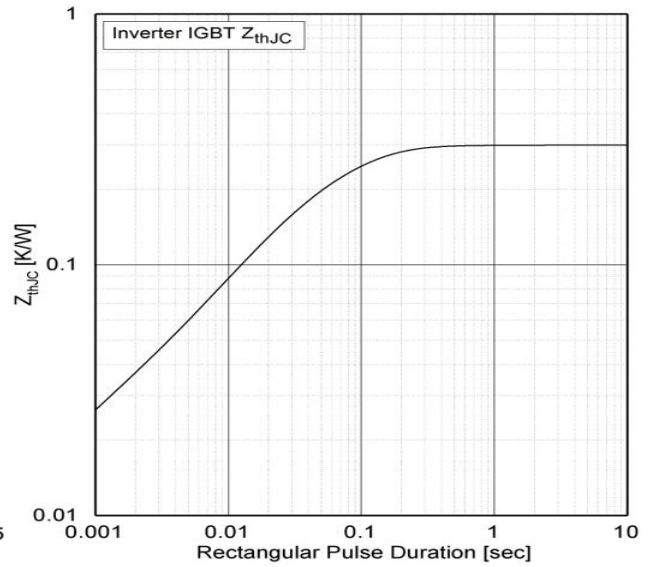


Fig 6, Transient Thermal Impedance IGBT, Inverter

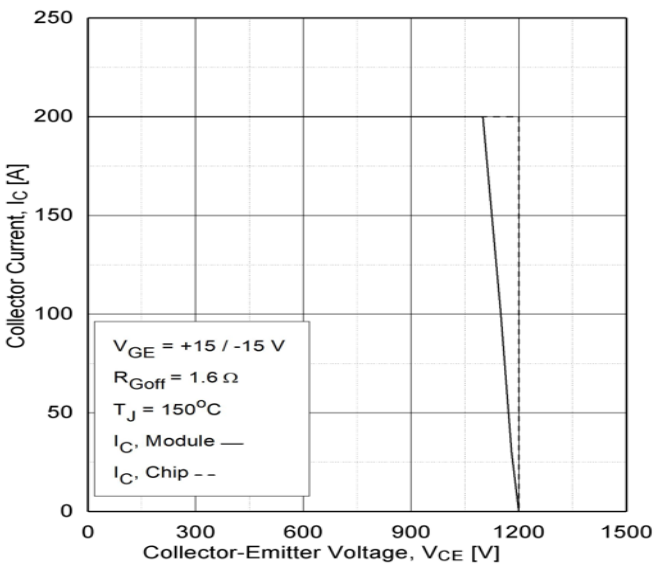


Fig 7, Reverse Bias Safe Operating Area IGBT, Inverter(RBSOA)

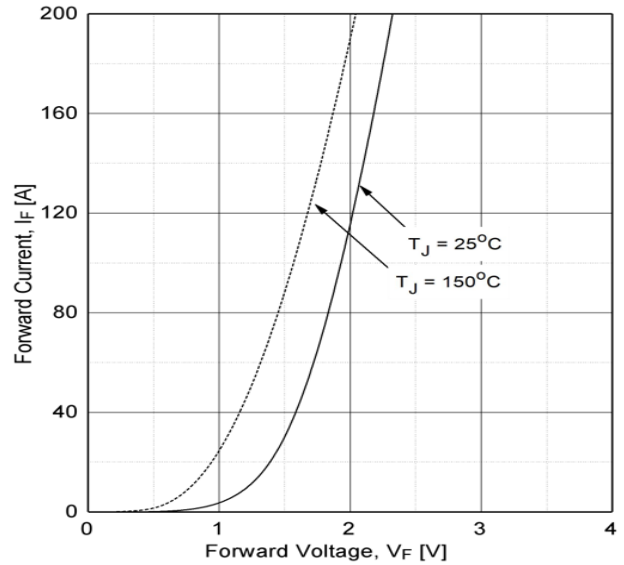


Fig 8, Forward Characteristics of Diode, Inverter (typical)

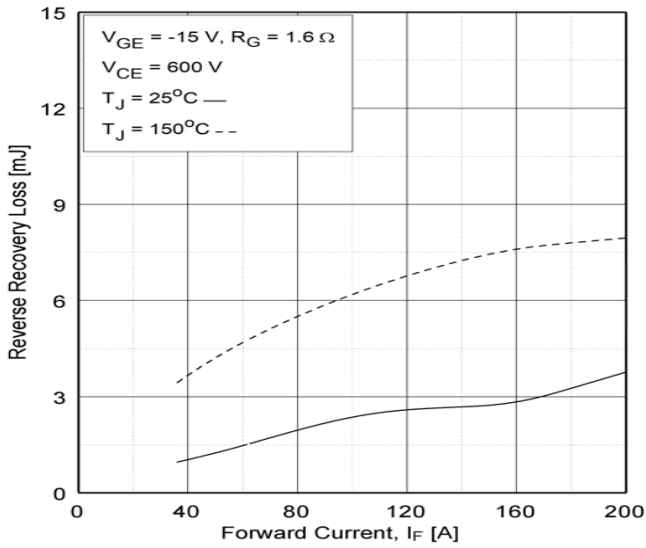


Fig 9, Switching Losses Diode, Inverter (typical)

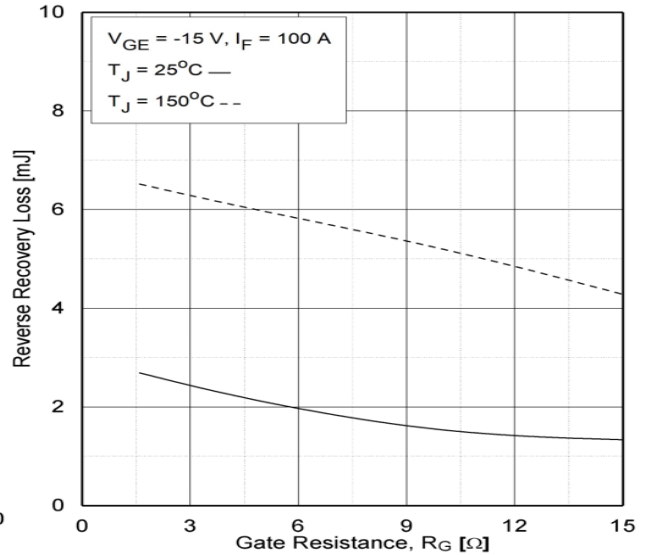


Fig 10, Switching Losses Diode, Inverter (typical)

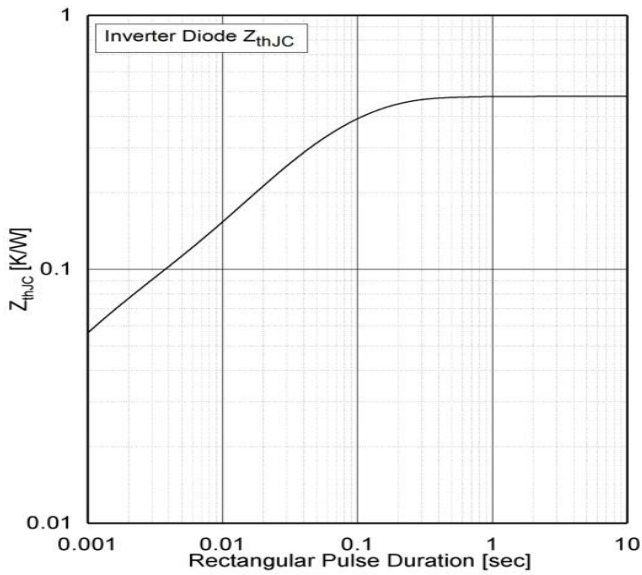


Fig 11, Transient Thermal Impedance Diode, Inverter

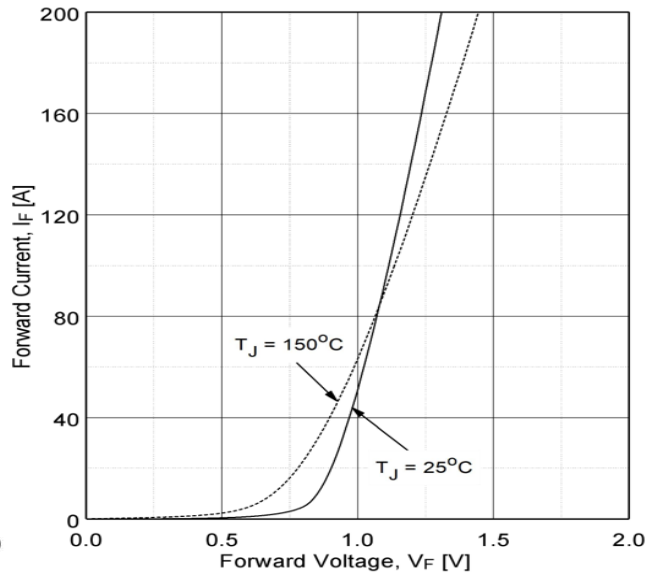


Fig 12, Forward Characteristics of Diode, Rectifier (typical)

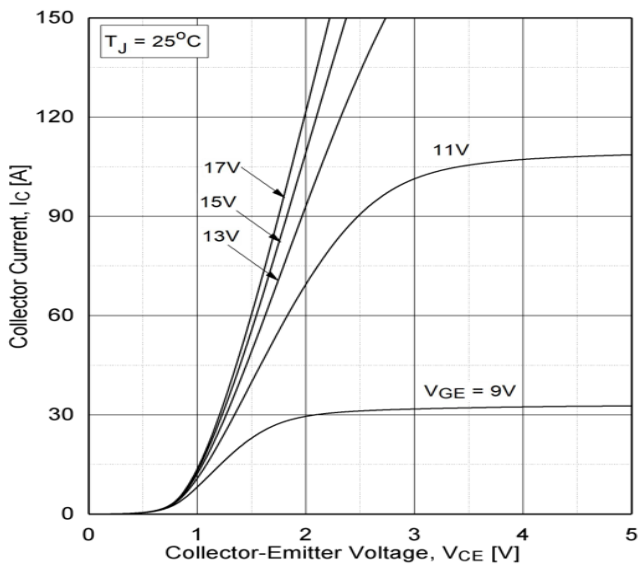


Fig 13, Output Characteristics IGBT, Brake (typical)

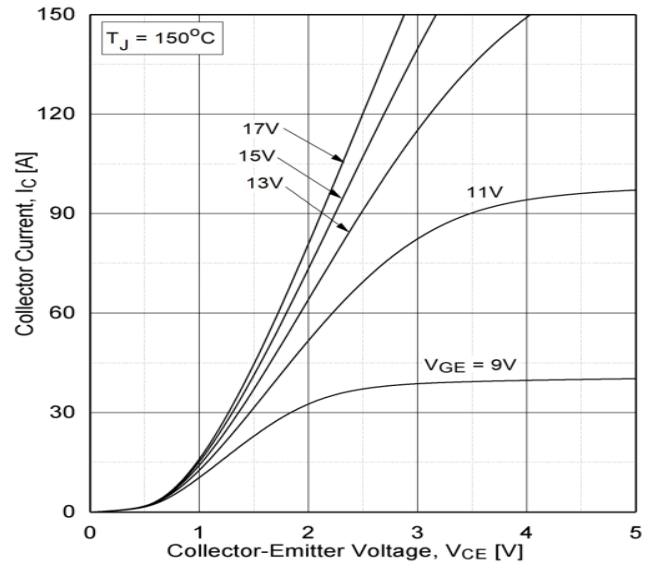


Fig 14, Output Characteristics IGBT, Brake (typical)

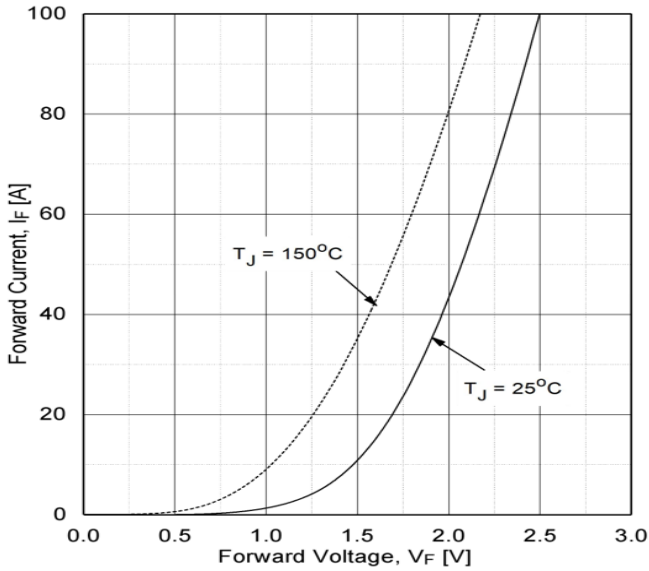


Fig 15, Forward Characteristics of Diode, Brake (typical)

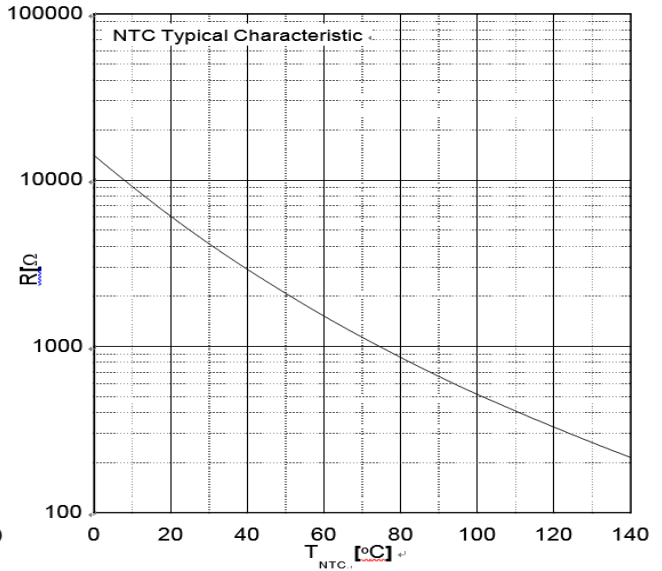
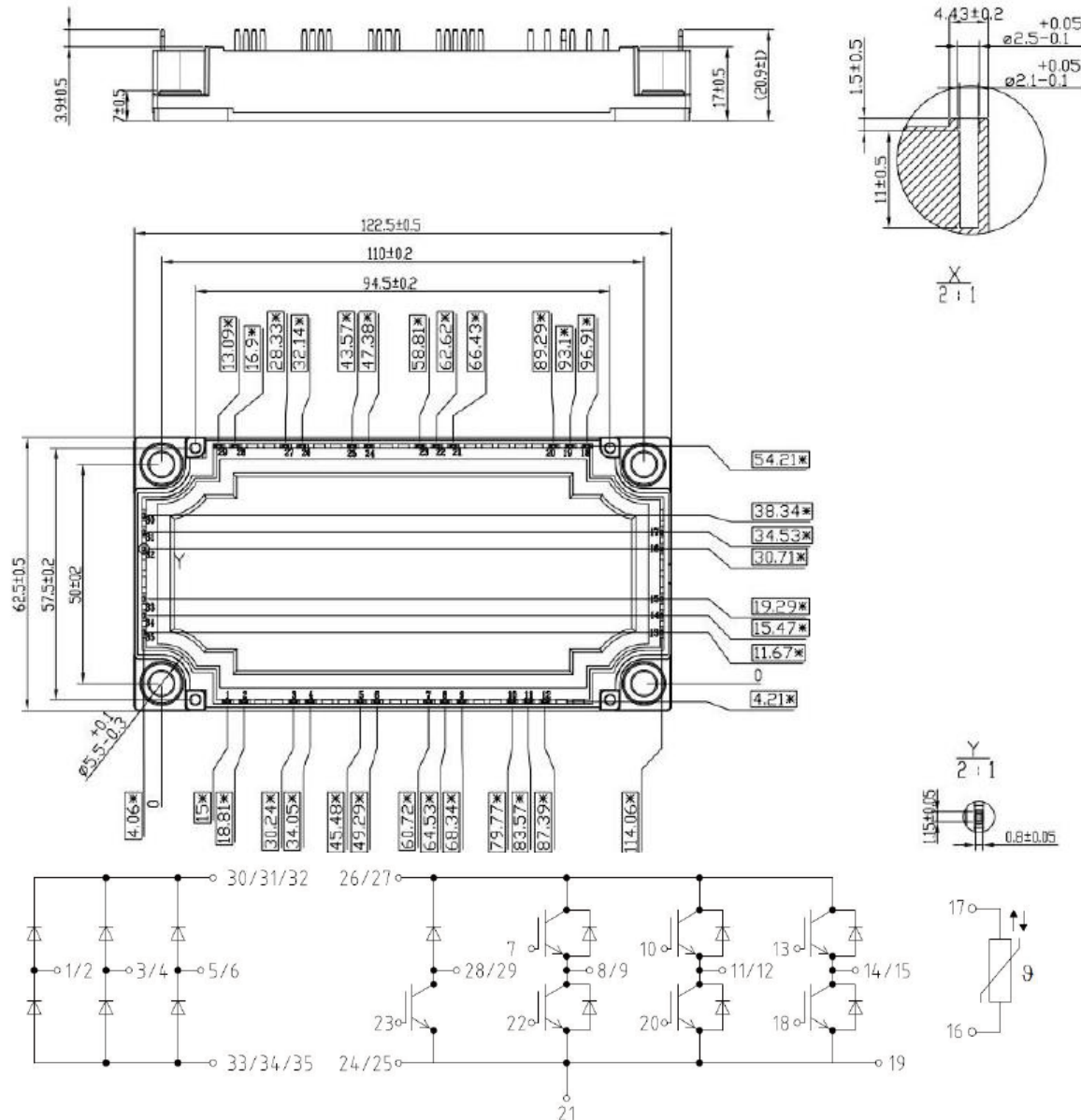


Fig 16, NTC Characteristics (typical)

Outline:



Unmarked dimensional tolerance:  $\pm 0.5\text{mm}$

NIPS reserves the right to change specifications without notice.