

### Electrical Features

- Trench/Fieldstop IGBT
- Low  $V_{CE(sat)}$
- $V_{CE(sat)}$  with positive temperature coefficient
- 10  $\mu$  s short circuit capability
- Fast&soft reverse recovery anti-parallel FWD
- Low inductance case



### Typical Applications

- Motor Drives
- High Power Converters
- UPS System
- Servo Drives
- Wind Turbines

### IGBT, Inverter

Maximum Rated Values							
Symbol	Item	Conditions	Rating	Unit			
IGBT							
$V_{CES}$	Collector-emitter voltage	$T_{vj}=25^{\circ}\text{C}$	1200	V			
$V_{GES}$	Gate-emitter voltage	-	$\pm 20$	V			
$I_C$	Collector current,DC	$T_C=100^{\circ}\text{C}, T_{vj}=175^{\circ}\text{C}$	600	A			
$I_{CRM}$	Repetitive peak collector current	$t_p=1\text{ms}$	1200	A			
tsc	Short circuit withstand time	$V_{GE}=15\text{V}, V_{CC}=600\text{V}, T_{vj}\leq 150^{\circ}\text{C}$	10	$\mu\text{s}$			
$P_{tot}$	Total power dissipation	$T_C=25^{\circ}\text{C}, T_{vj}=175^{\circ}\text{C}$	4838	W			
Characteristics Values							
Symbol	Item	Conditions	Values			Unit	
IGBT			Min.	Typ.	Max.		
$I_{CES}$	Collector-emitter cut-off current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$	-	-	3	mA	
$I_{GES}$	Gate leakage current	$V_{CE}=0\text{V}, V_{GE}=20\text{V}, T_{vj}=25^{\circ}\text{C}$	-	-	400	nA	
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=23\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.0	5.7	7.0	V	
$V_{CE(sat)}$	Collector-emitter saturation voltage	$I_C=600\text{A}$ $V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$	-	2.2		2.4
			$T_{vj}=125^{\circ}\text{C}$	-	2.7		-
			$T_{vj}=150^{\circ}\text{C}$	-	2.9	-	
$C_{ies}$	Input capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $f=1\text{MHz}, T_{vj}=25^{\circ}\text{C}$	-	49.77	-	nF	
$C_{oes}$	Output capacitance		-	2.28	-		
$C_{res}$	Reverse transfer capacitance		-	2.22	-		
$Q_G$	Gate charge	$V_{GE}=\pm 15\text{V}$	-	7.5	-	nC	
$R_g$	Internal gate resistance	$T_{vj}=25^{\circ}\text{C}$	-	0.28	-	$\Omega$	

t <sub>d(on)</sub>	Turn-on delay time	V <sub>CC</sub> =600V, I <sub>C</sub> =600A, V <sub>GE</sub> =±15V, R <sub>G(on)</sub> =5.1 Ω, R <sub>G(off)</sub> =5.1 Ω, L <sub>load</sub> =200uH	T <sub>vj</sub> =25°C	-	272	-	ns	
			T <sub>vj</sub> =125°C	-	253	-		
			T <sub>vj</sub> =150°C	-	249	-		
t <sub>r</sub>	Rise time		T <sub>vj</sub> =25°C	-	264	-		
			T <sub>vj</sub> =125°C	-	262	-		
			T <sub>vj</sub> =150°C	-	259	-		
t <sub>d(off)</sub>	Turn-off delay time		T <sub>vj</sub> =25°C	-	1019	-		
			T <sub>vj</sub> =125°C	-	1096	-		
			T <sub>vj</sub> =150°C	-	1112	-		
t <sub>f</sub>	Fall time		T <sub>vj</sub> =25°C	-	144	-		
			T <sub>vj</sub> =125°C	-	195	-		
			T <sub>vj</sub> =150°C	-	225	-		
E <sub>on</sub>	Turn-on energy (per pulse)	T <sub>vj</sub> =25°C	-	148.5	-	mJ		
		T <sub>vj</sub> =125°C	-	159.4	-			
		T <sub>vj</sub> =150°C	-	166.9	-			
E <sub>off</sub>	Turn-off energy (per pulse)	T <sub>vj</sub> =25°C	-	83.9	-			
		T <sub>vj</sub> =125°C	-	95.6	-			
		T <sub>vj</sub> =150°C	-	99.3	-			
R <sub>thJC</sub>	Thermal resistance, junction to case	per IGBT	-	-	0.031	K/W		
R <sub>thCH</sub>	Thermal resistance, case to heatsink	per IGBT/ λgrease=1W/(m·K)	-	0.035	-	K/W		
T <sub>vjop</sub>	Temperature under switching conditions		-40		150	°C		
<b>Diode, Inverter</b>								
<b>Maximum Rated Values</b>								
Symbol	Item	Conditions			Rating	Unit		
V <sub>RRM</sub>	Repetitive peak reverse voltage	T <sub>vj</sub> =25°C			1200	V		
I <sub>F</sub>	Forward current, DC	T <sub>C</sub> =100°C, T <sub>vj</sub> =150°C			600	A		
I <sub>FRM</sub>	Repetitive peak forward current	t <sub>p</sub> =1ms			1200	A		
<b>Characteristic Values</b>								
V <sub>F</sub>	Continuous forward voltage	I <sub>F</sub> =600A V <sub>GE</sub> =0V	T <sub>vj</sub> =25°C	-	2.28	-	V	
			T <sub>vj</sub> =125°C	-	2.51	-		
			T <sub>vj</sub> =150°C	-	2.53	-		
I <sub>RM</sub>	Peak reverse recovery current		T <sub>vj</sub> =25°C	-	159.5	-	A	
			T <sub>vj</sub> =125°C	-	228.4	-		
			T <sub>vj</sub> =150°C	-	249.4	-		
t <sub>rr</sub>	Reverse recovery time		V <sub>R</sub> =600V I <sub>F</sub> =600A V <sub>GE</sub> =-15V	T <sub>vj</sub> =25°C	-	516.1	-	ns
				T <sub>vj</sub> =125°C	-	475.9	-	
				T <sub>vj</sub> =150°C	-	474.5	-	
Q <sub>r</sub>	Recovered charge			T <sub>vj</sub> =25°C	-	35.1	-	μC
				T <sub>vj</sub> =125°C	-	55.8	-	
				T <sub>vj</sub> =150°C	-	66.5	-	
E <sub>rec</sub>	Reverse recovery energy	T <sub>vj</sub> =25°C		-	9.9	-	mJ	
		T <sub>vj</sub> =125°C		-	18.9	-		
		T <sub>vj</sub> =150°C		-	21.9	-		

$R_{thJC}$	Thermal resistance, junction to case	per diode	-	-	0.071	K/W
$R_{thCH}$	Thermal resistance, case to heatsink	per diode/ $\lambda_{grease}=1W/(m \cdot K)$	-	0.0395	-	K/W
$T_{vjop}$	Temperature under switching conditions		-40		150	°C

**NTC Thermistor Characteristics**

Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
$R_{25}$	Rated resistance	$T_C=25^\circ C$	-	5	-	k $\Omega$
$\Delta R/R$	Deviation of resistance	$T_C=100^\circ C, R_{100}=493\Omega$	-5	-	5	%
$P_{25}$	Power dissipation	$T_C=25^\circ C$	-	-	20	mW
$B_{25/50}$	B-constant	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15K))]$	-	3375	-	K
$B_{25/80}$	B-constant	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15K))]$	-	3411	-	
$B_{25/100}$	B-constant	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15K))]$	-	3433	-	

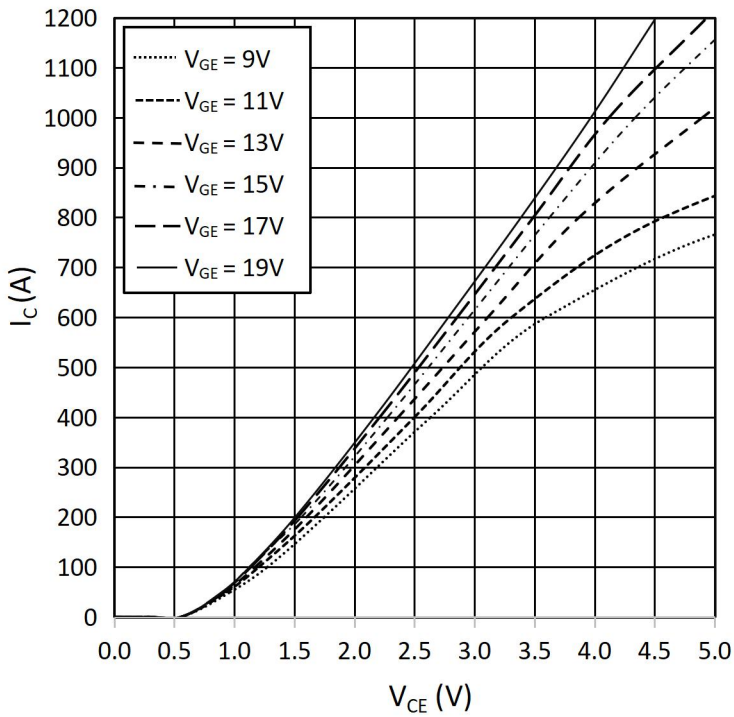
**Module**

Symbol	Item	Conditions	Rating			Unit
$V_{ISOL}$	Isolation voltage	Terminals to baseplate, RMS, $f=50Hz, t=1min$	2500			V
-	Material of module baseplate	-	Cu			-
-	Internal isolation	Basic insulation(class 1, IEC 61140)	$Al_2O_3$			-
$T_{stg}$	Storage temperature	-	-40~125			°C
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
M	Mounting torque for module mounting	Screw M6	3.0	-	5.0	Nm
	Terminal connection torque	Screw M6	2.5	-	5.0	Nm
ds	Creepage distance	Terminal to terminal	-	13	-	mm
		Terminal to base plate	-	14.5	-	
da	Clearance	Terminal to terminal	-	10	-	mm
		Terminal to base plate	-	12.5	-	
m	Weight	-	-	340	-	g

**output characteristic IGBT, Inverter (typical)**

$I_C = f(V_{CE})$

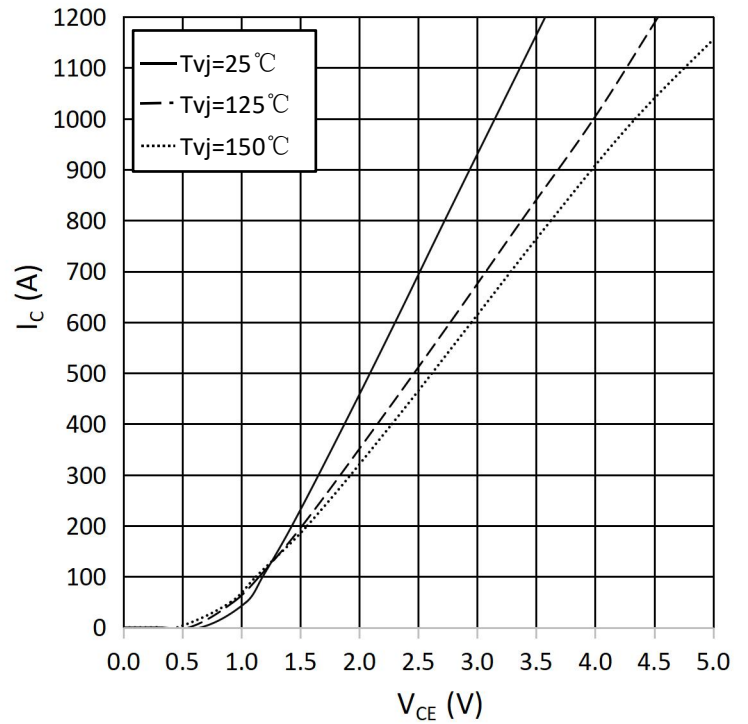
$T_{vj} = 150^\circ\text{C}$



**output characteristic IGBT, Inverter (typical)**

$I_C = f(V_{CE})$

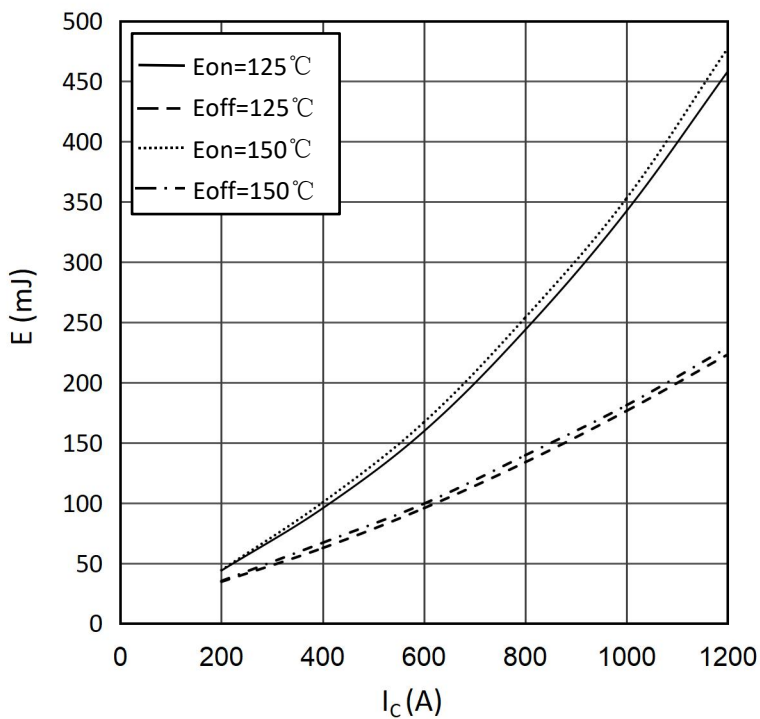
$V_{GE} = 15\text{ V}$



**switching losses IGBT, Inverter (typical)**

$E_{on} = f(I_C), E_{off} = f(I_C)$

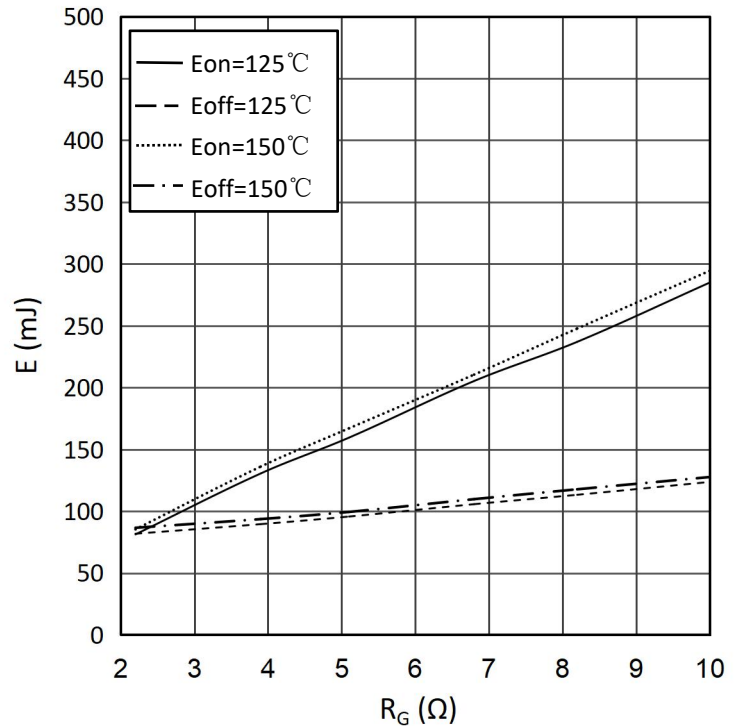
$V_{GE} = \pm 15\text{V}, R_{Gon} = 5.1\Omega, R_{Goff} = 5.1\Omega, V_{CE} = 600\text{V}$



**switching losses IGBT, Inverter (typical)**

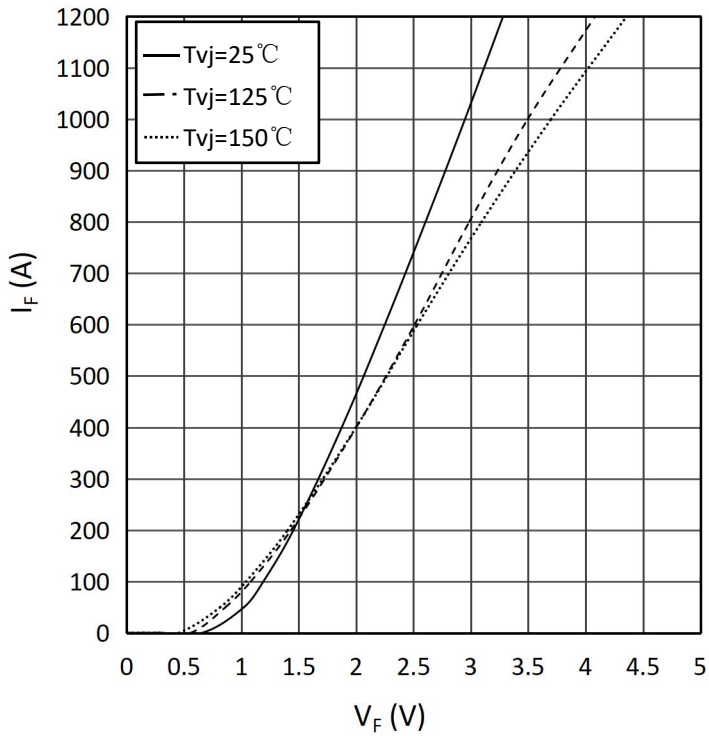
$E_{on} = f(R_G), E_{off} = f(R_G)$

$V_{GE} = \pm 15\text{V}, I_C = 600\text{A}, V_{CE} = 600\text{V}$



**forward characteristic of Diode, Inverter (typical)**

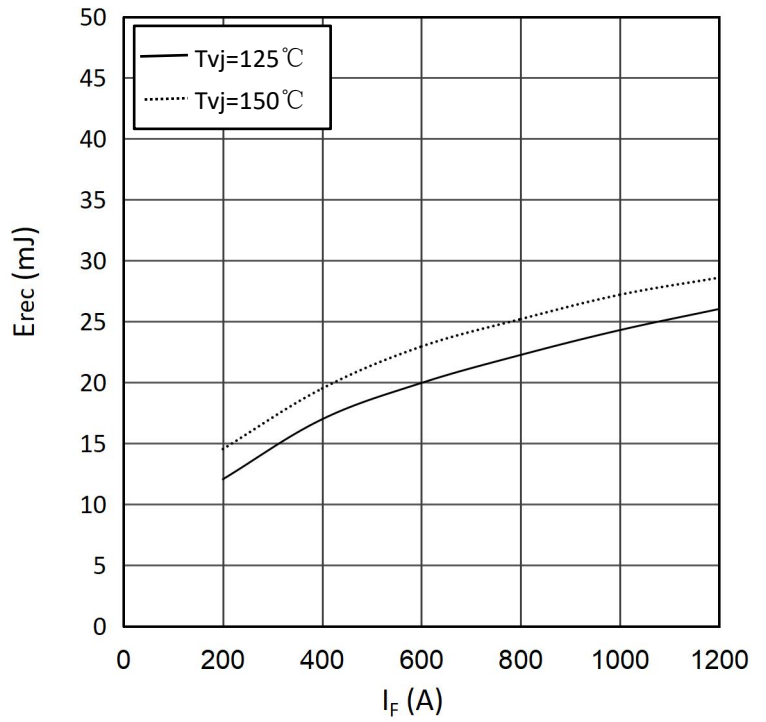
$I_F = f(V_F)$



**switching losses Diode, Inverter (typical)**

$E_{rec} = f(I_F)$

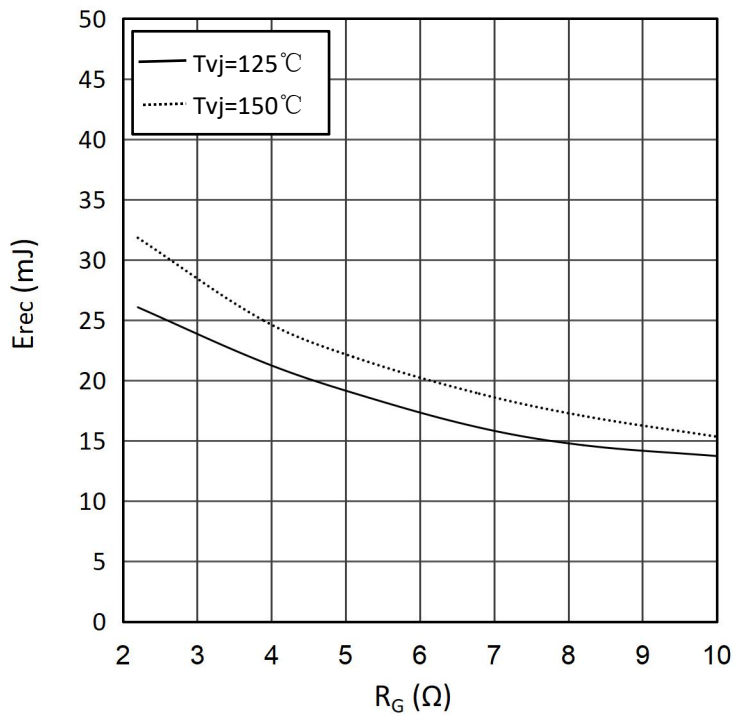
$R_{Gon}=5.1\Omega, V_{CE}=600V$



**switching losses Diode, Inverter (typical)**

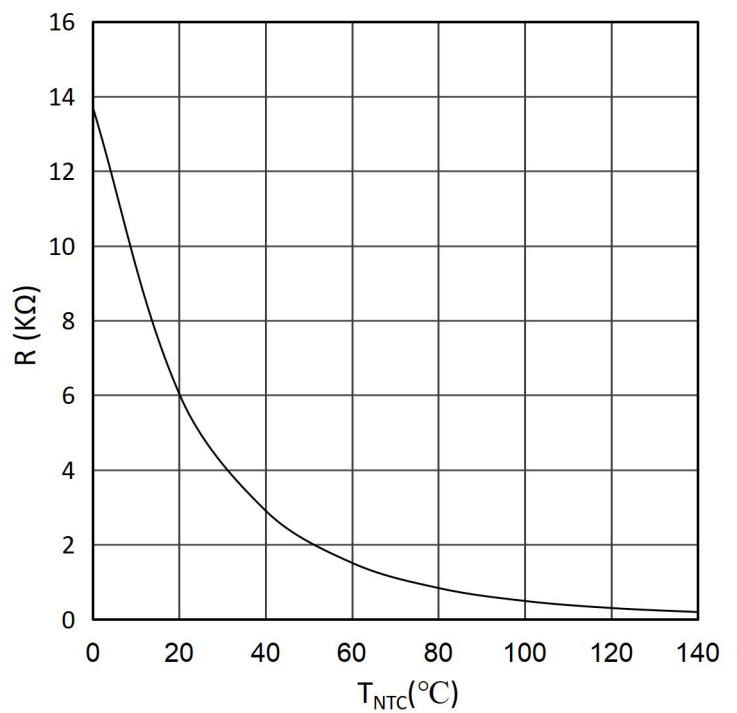
$E_{rec} = f(R_G)$

$I_F=600A, V_{CE}=600V$

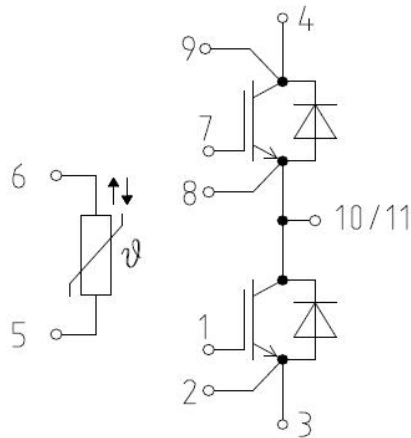


**NTC-Thermistor-temperature characteristic(typical)**

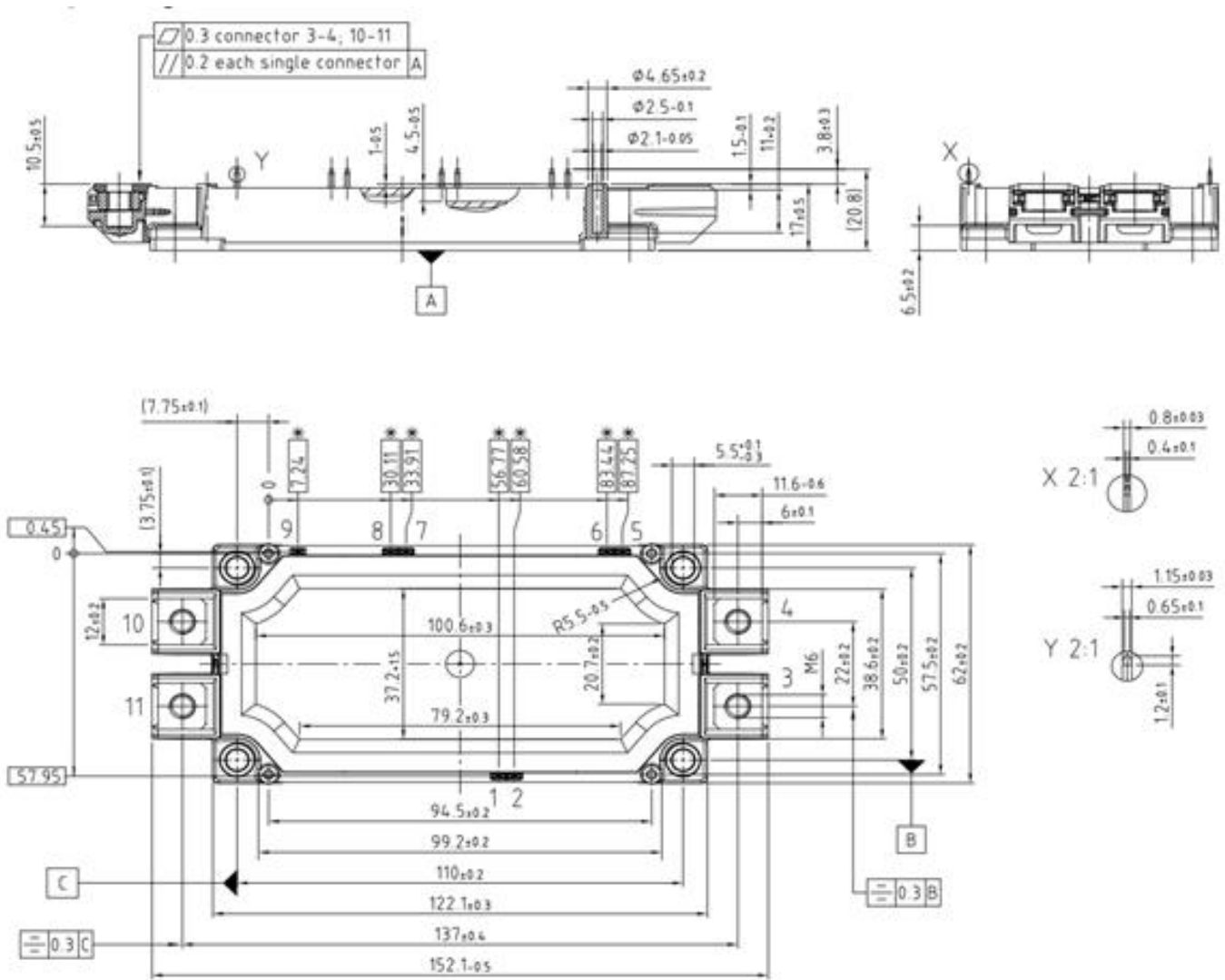
$R=f(T)$



Circuit diagram headline



Package outlines (Unit: mm)



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