

# STARPOWER

SEMICONDUCTOR

**IGBT**

## GD75FFT120C6S

**Molding Type Module****1200V/75A 6 in one-package**

### General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.



### Features

- Low  $V_{CE(sat)}$  Trench IGBT technology
- 10 $\mu$ s short circuit capability
- $V_{CE(sat)}$  with positive temperature coefficient
- Maximum junction temperature 175 °C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

### Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

**Absolute Maximum Ratings**  $T_C=25^{\circ}\text{C}$  unless otherwise noted

Symbol	Description	GD75FFT120C6S	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 30$	V
$I_C$	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	130 75	A
$I_{CM}$	Pulsed Collector Current $t_p=1\text{ms}$	150	A
$I_F$	Diode Continuous Forward Current	75	A
$I_{FM}$	Diode Maximum Forward Current $t_p=1\text{ms}$	150	A
$P_D$	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	466	W
$T_{jmax}$	Maximum Junction Temperature	175	$^{\circ}\text{C}$
$T_{jop}$	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
$T_{STG}$	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
$V_{ISO}$	Isolation Voltage RMS, $f=50\text{Hz}$ , $t=1\text{min}$	4000	V
Mounting Torque	Mounting Screw:M5	3.0 to 6.0	N.m

**Electrical Characteristics of IGBT**  $T_C=25^{\circ}\text{C}$  unless otherwise noted**Off Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	1200			V
$I_{CES}$	Collector Cut-Off Current	$V_{CE}=V_{CES}$ , $V_{GE}=0\text{V}$ , $T_j=25^{\circ}\text{C}$			5.0	mA
$I_{GES}$	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}$ , $V_{CE}=0\text{V}$ , $T_j=25^{\circ}\text{C}$			400	nA

**On Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=3.5\text{mA}$ , $V_{CE}=V_{GE}$ , $T_j=25^{\circ}\text{C}$	5.0	5.5	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=75\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=25^{\circ}\text{C}$		2.00	2.45	V
		$I_C=75\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=175^{\circ}\text{C}$		2.60		

**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=75A,$ $R_G=4.7\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		531		ns	
$t_r$	Rise Time			146		ns	
$t_{d(off)}$	Turn-Off Delay Time			381		ns	
$t_f$	Fall Time			270		ns	
$E_{on}$	Turn-On Switching Loss				13.6		mJ
$E_{off}$	Turn-Off Switching Loss				3.66		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=75A,$ $R_G=4.7\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		522		ns	
$t_r$	Rise Time			148		ns	
$t_{d(off)}$	Turn-Off Delay Time			425		ns	
$t_f$	Fall Time			280		ns	
$E_{on}$	Turn-On Switching Loss				15.8		mJ
$E_{off}$	Turn-Off Switching Loss				5.80		mJ
$C_{ies}$	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		9.45		nF	
$C_{oes}$	Output Capacitance			0.34		nF	
$C_{res}$	Reverse Transfer Capacitance			0.23		nF	
$Q_G$	Gate Charge	$V_{CC}=600V, I_C=75A,$ $V_{GE}=0-15V$		360		nC	
$I_{SC}$	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		720		A	
$L_{CE}$	Stray Inductance			21		nH	
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			1.80		m $\Omega$	

**Electrical Characteristics of Diode**  $T_C=25^\circ C$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_F$	Diode Forward Voltage	$I_F=75A, V_{GE}=0V$	$T_j=25^\circ C$	1.65	2.05	V
			$T_j=125^\circ C$	1.65		
$Q_r$	Recovered Charge	$I_F=75A,$ $V_R=600V,$ $R_G=4.7\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	6.9		$\mu C$
			$T_j=125^\circ C$	13.1		
$I_{RM}$	Peak Reverse Recovery Current	$V_{GE}=-15V$	$T_j=25^\circ C$	30		A
			$T_j=125^\circ C$	40		
$E_{rec}$	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	2.30		mJ
			$T_j=125^\circ C$	4.73		

**Electrical Characteristics of NTC**  $T_C=25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$R_{25}$	Rated Resistance			5.0		k $\Omega$
$\Delta R/R$	Deviation of $R_{100}$	$R_{100}=493.3\Omega$	-5		5	%
$P_{25}$	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.322	K/W
$R_{\theta JC}$	Junction-to-Case (per Diode)		0.523	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.009		K/W
Weight	Weight of Module	300		g

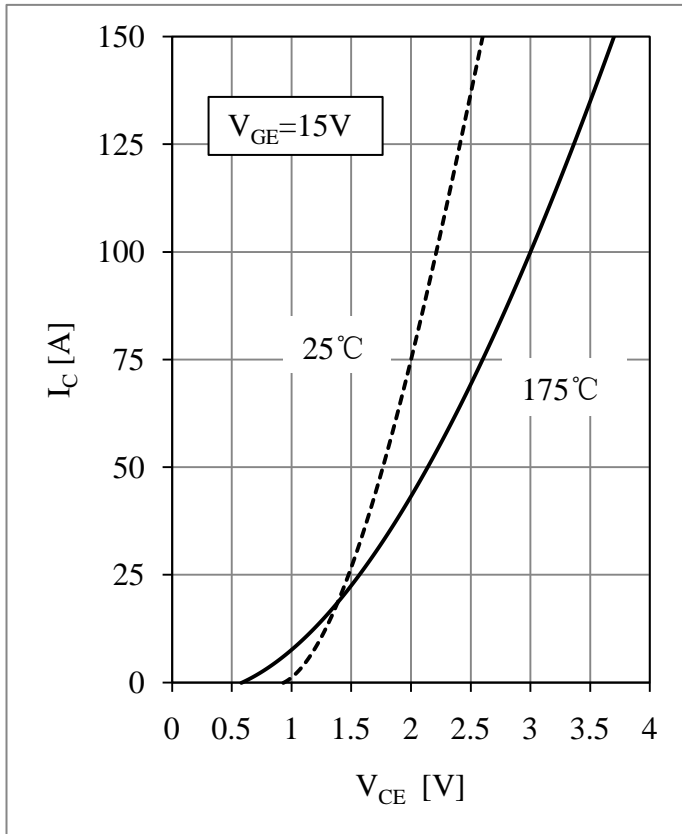


Fig 1. IGBT Output Characteristic

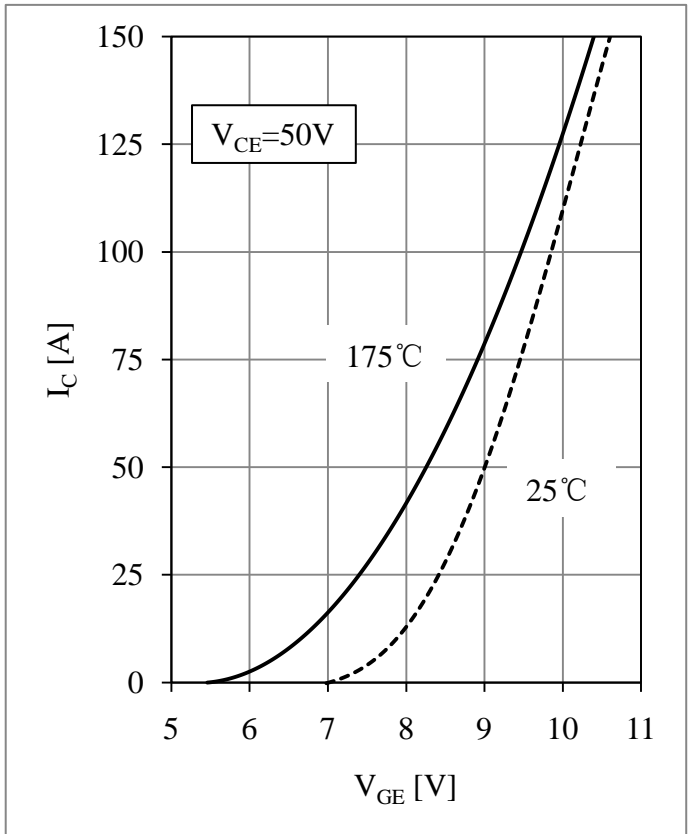


Fig 2. IGBT Transfer Characteristic

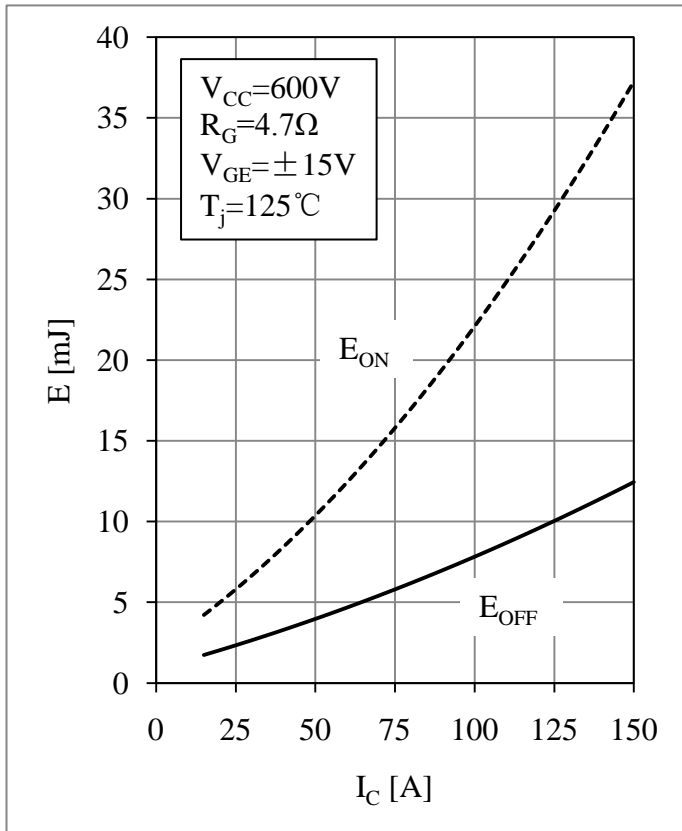


Fig 3. IGBT Switching Loss vs.  $I_C$

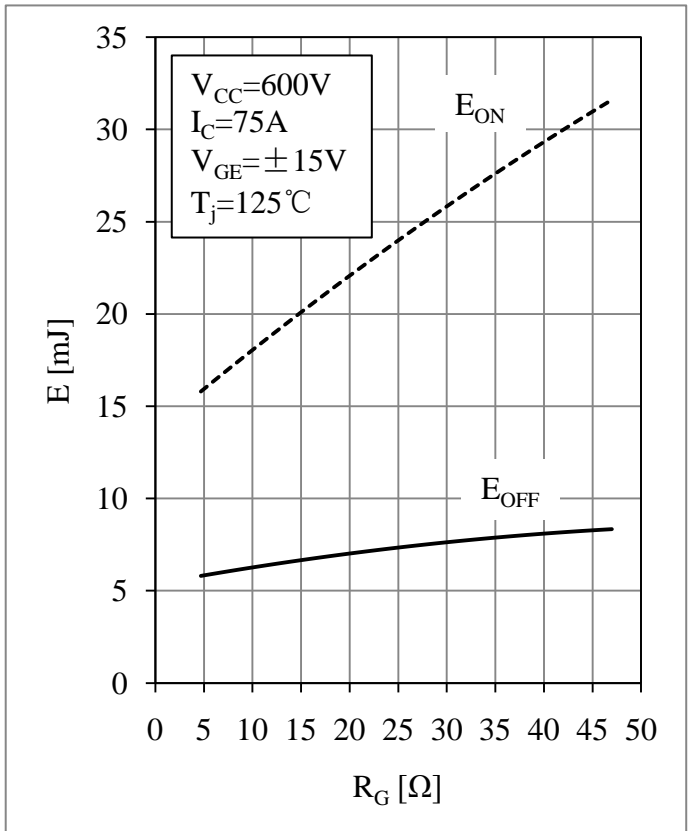


Fig 4. IGBT Switching Loss vs.  $R_G$

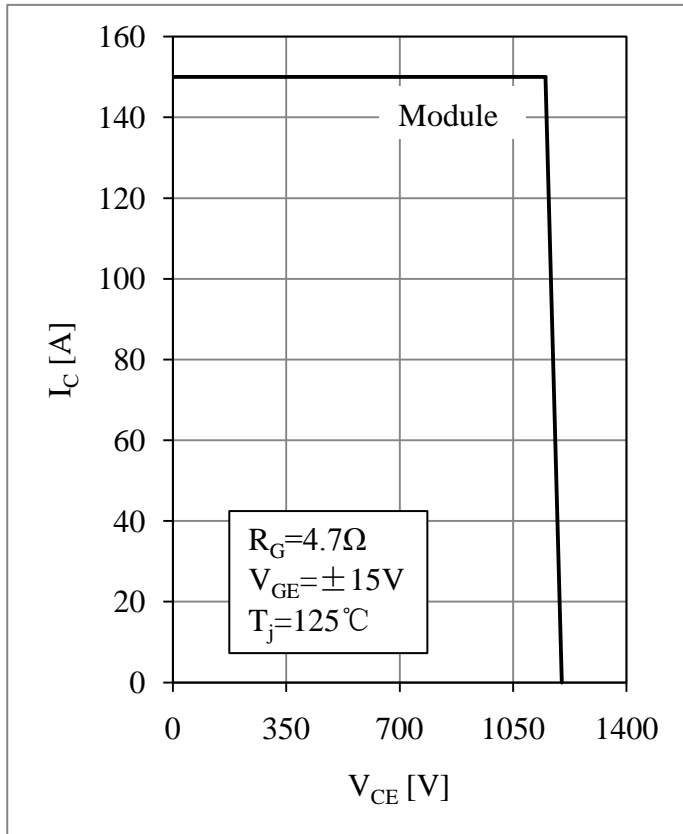


Fig 5. RBSOA

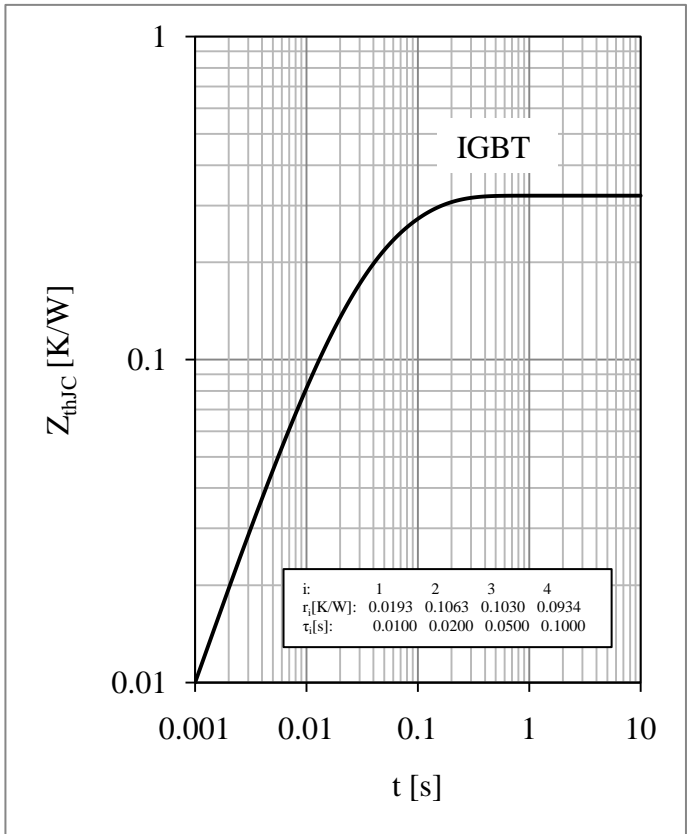


Fig 6. IGBT Transient Thermal Impedance

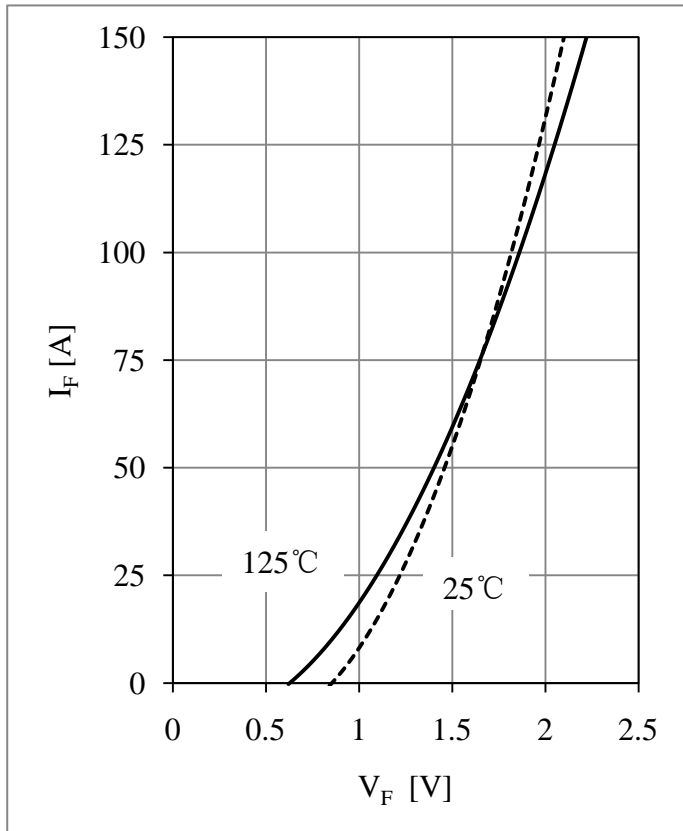


Fig 7. Diode Forward Characteristic

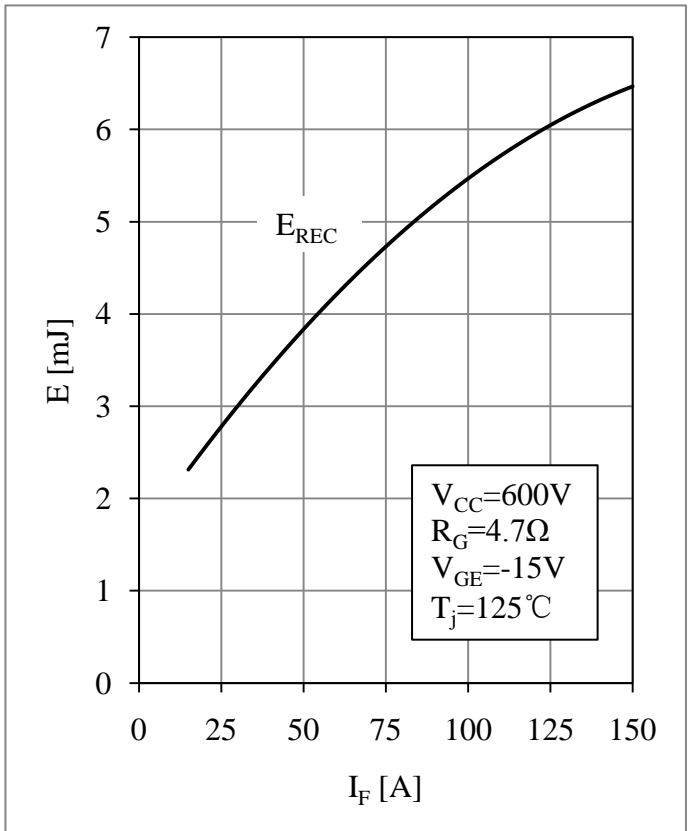


Fig 8. Diode Switching Loss vs.  $I_F$

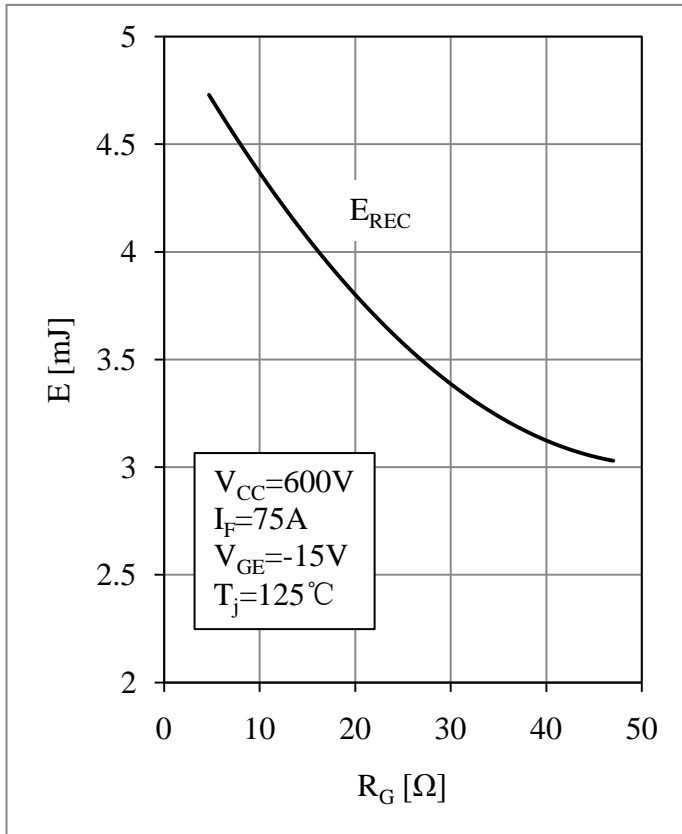


Fig 9. Diode Switching Loss vs.  $R_G$

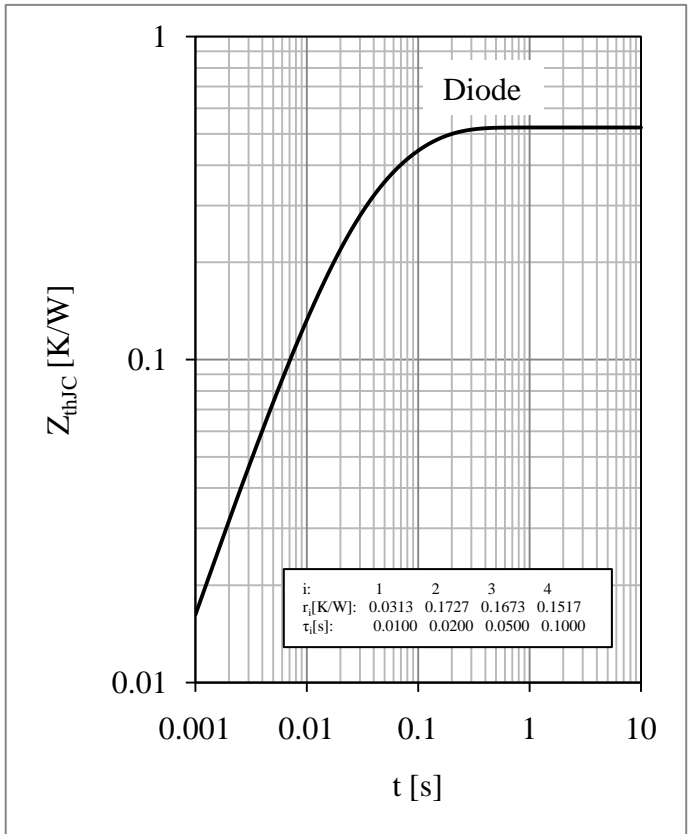


Fig 10. Diode Transient Thermal Impedance

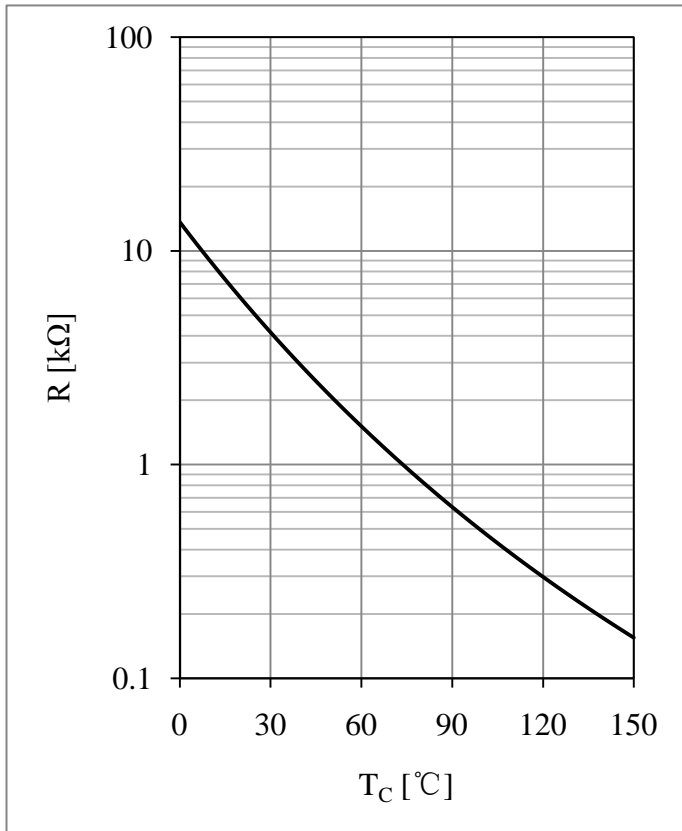
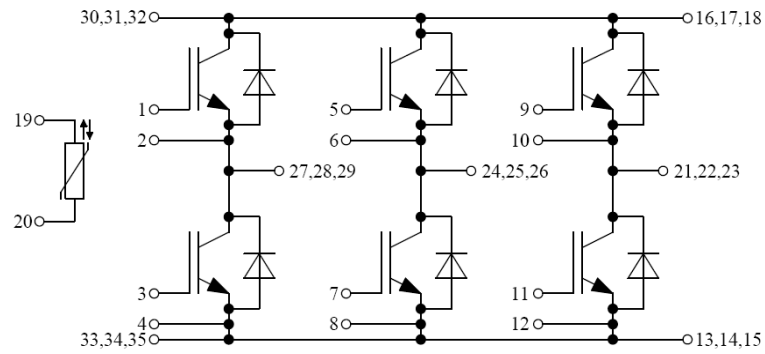


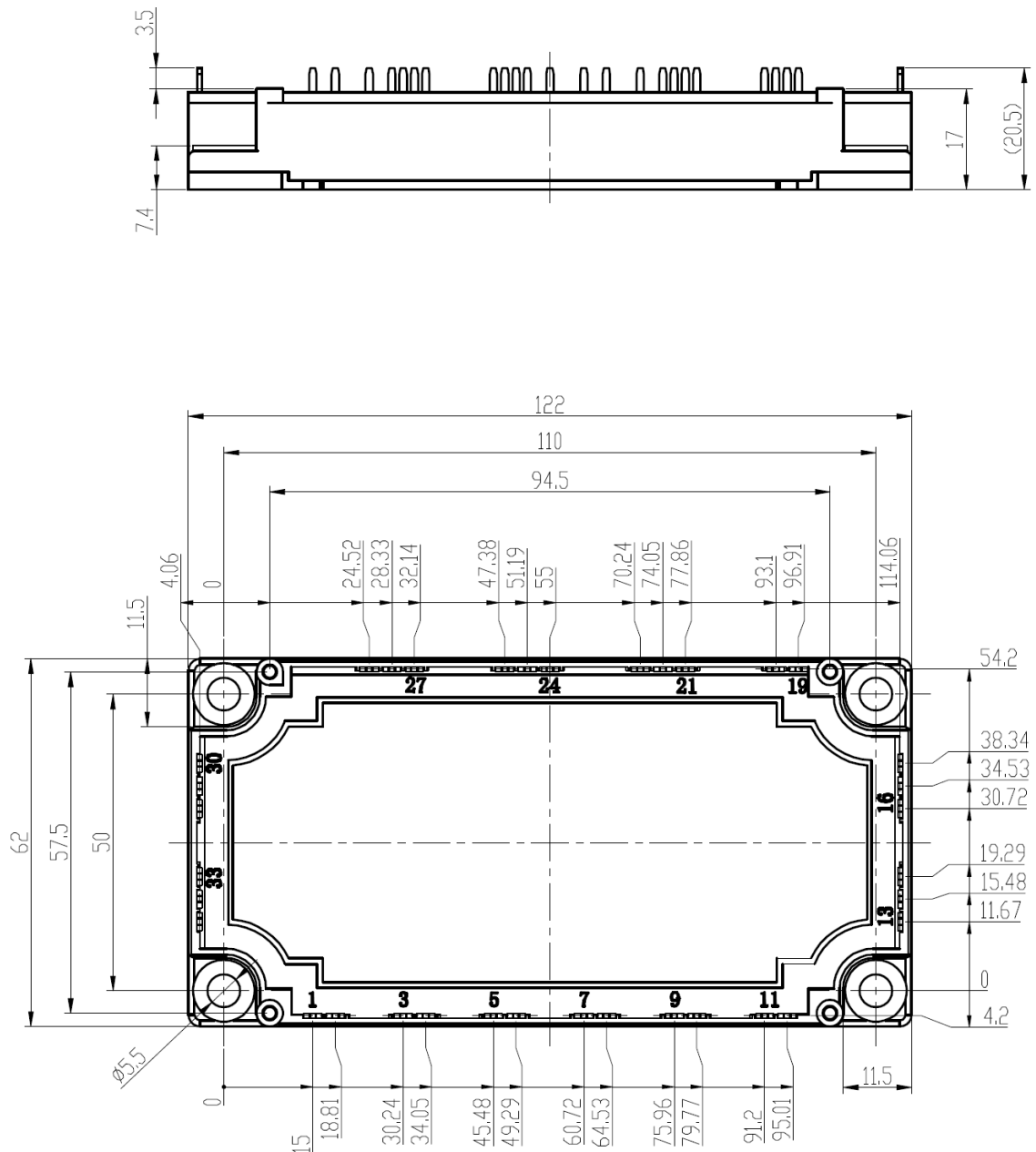
Fig 11. NTC-Temperature Characteristic

### Equivalent Circuit Schematic



### Package Dimensions

Dimensions in Millimeters





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