STARPOWER

SEMICONDUCTOR™

IGBT

GD75HCK60C5S Preliminary

Molding Type Module

600V/75A 4 in one-package

General Description

STARPOWER IGBT Power Module provides ultrafast switching speed as well as short circuit ruggedness. It's designed for the applications such as electrical welding and inductive heating.

Features

- Low $V_{CE(sat)}$ NPT IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Rugged with ultrafast performance
- Square RBSOA
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- Switching mode power supplies
- Inductive heating
- Electrical welding

IGBT-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD75HCK60C5S	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	600	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=80℃	95 75	A
$I_{CM(1)}$	Pulsed Collector Current t_p=1ms	150	A
P_{tot}	Total Power Dissipation @ T_j=150℃	272	W
T_{SC}	Short Circuit Withstand Time @ T_j=125℃	10	μs

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	600			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			200	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=250μA,V_{CE}=V_{GE},T_j=25℃	3.5	4.5	5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=75A,V_{GE}=15V, T_j=25℃		1.95	2.30	V
		I_C=75A,V_{GE}=15V, T_j=125℃		2.25		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=75A, R_G=18Ω,V_{GE}=±15V, T_j=25℃		217		ns
t_r	Rise Time			72		ns
$t_{d(off)}$	Turn-Off Delay Time			230		ns
t_f	Fall Time			88		ns
E_{on}	Turn-On Switching Loss			1.69		mJ
E_{off}	Turn-Off Switching Loss			1.33		mJ

$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=75A, R_G=18Ω,V_{GE}=±15V, T_j=125℃		213		ns
t_r	Rise Time			72		ns
$t_{d(off)}$	Turn-Off Delay Time			236		ns
t_f	Fall Time			103		ns
E_{on}	Turn-On Switching Loss			1.79		mJ
E_{off}	Turn-Off Switching Loss			1.80		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		4.30		nF
C_{oes}	Output Capacitance			0.35		nF
C_{res}	Reverse Transfer Capacitance			0.16		nF
I_{SC}	SC Data	T_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=360V, V_{CEM}≤600V		TBD		A

DIODE-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD75HCK60C5S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	600	V
I_F	DC Forward Current @ T_C=80℃	75	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	150	A
I^2t	I^2t-value,V_R=0V,t_p=10ms,T_j=125℃	455	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=75A,V_{GE}=0V	T_j=25℃		1.45	1.85	V
			T_j=125℃		1.50		
Q_r	Recovered Charge	I_F=75A, V_R=300V, di/dt=-1200A/μs, V_{GE}=-15V	T_j=25℃		3.2		μC
			T_j=125℃		4.2		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		49		A
			T_j=125℃		51		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.76		mJ
			T_j=125℃		0.96		

Electrical Characteristics of NTC T_C=25℃ unless otherwise noted

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

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min		2500		V
L_{CE}	Stray Inductance		60		nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip @ T_C=25℃		2.5		mΩ
$R_{\theta JC}$	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per DIODE-inverter)			0.46 0.65	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.02		K/W
T_j	Maximum Junction Temperature			150	℃
T_{STG}	Storage Temperature Range	-40		125	℃
Mounting Torque	Mounting Screw:M5	3.0		6.0	N.m
G	Weight of Module		200		g

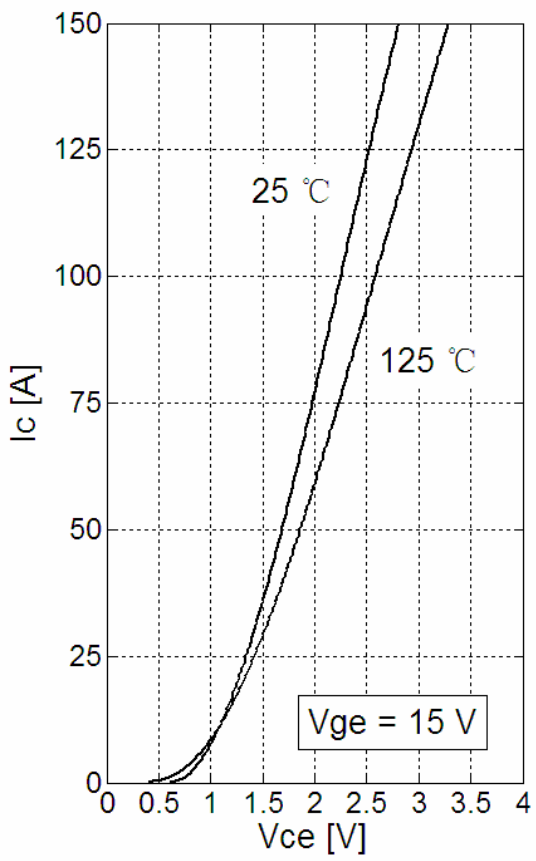


Fig 1. IGBT Typical Output Characteristics

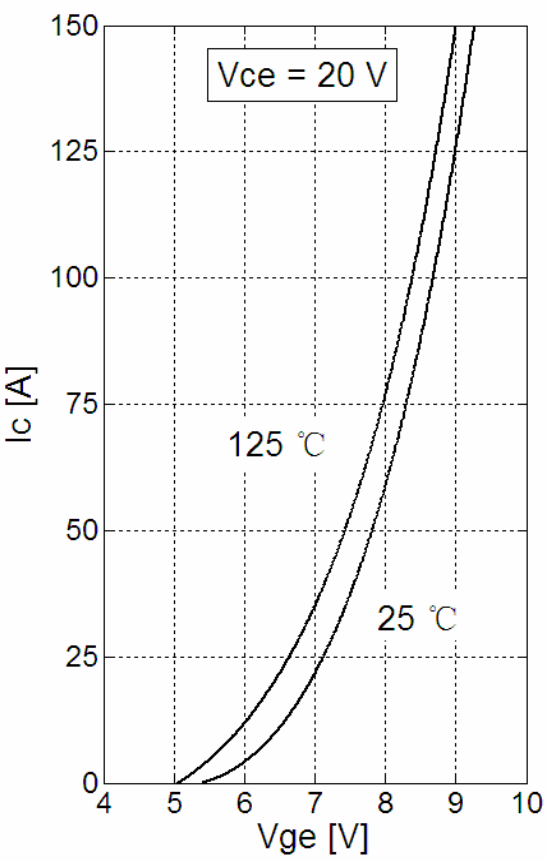


Fig 2. IGBT Typical Transfer Characteristics

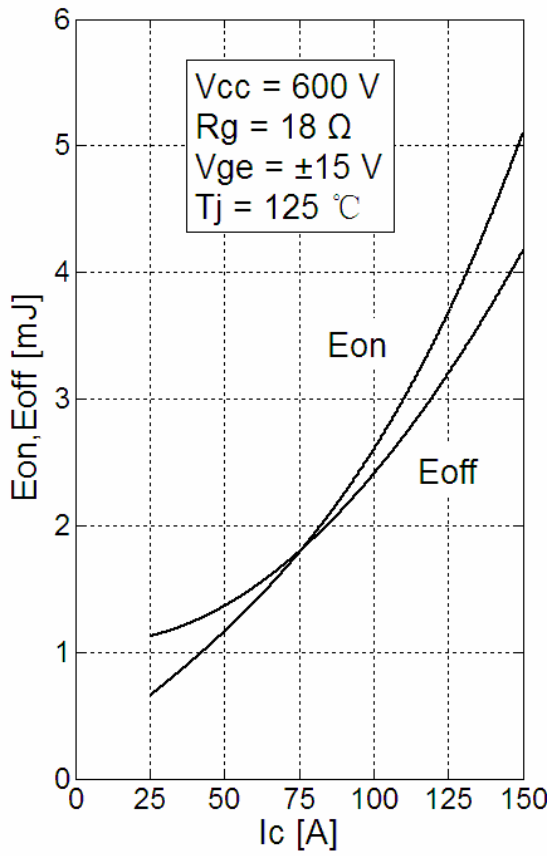


Fig 3. IGBT Switching Loss vs. I_C

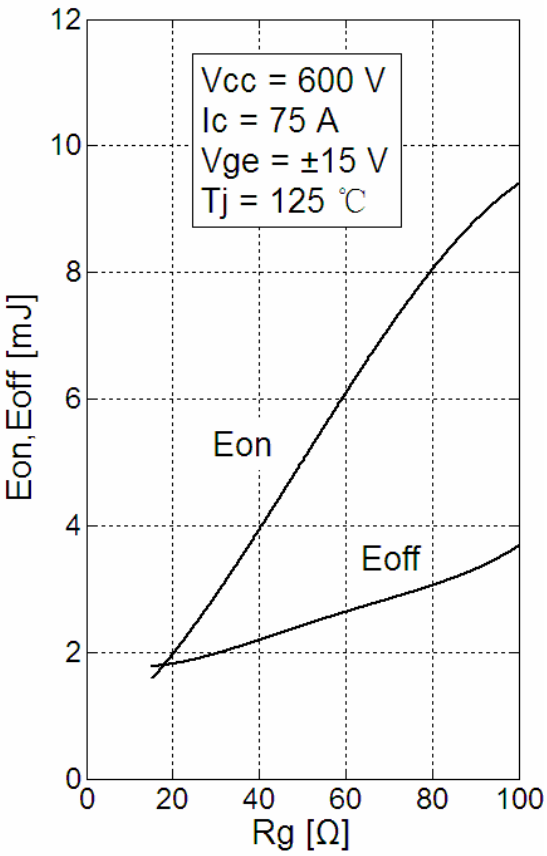


Fig 4. IGBT Switching Loss vs. R_G

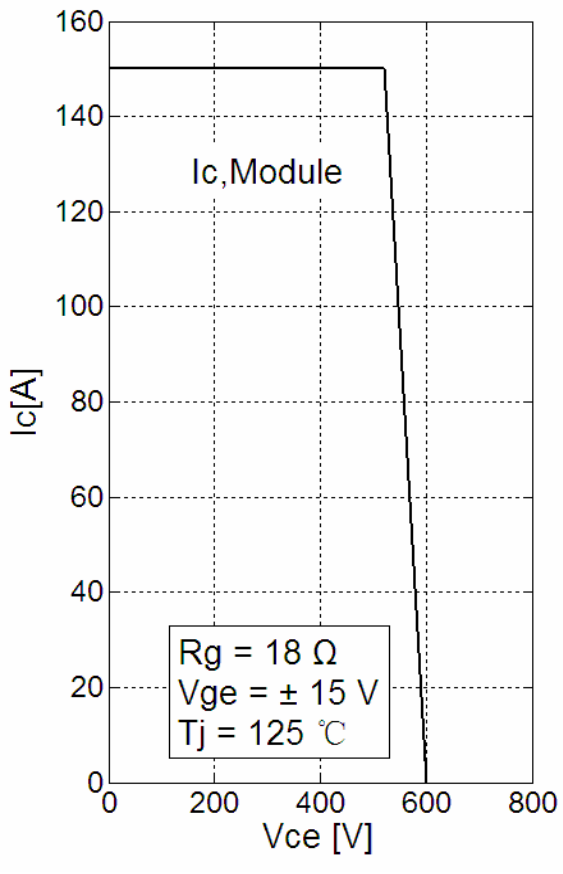


Fig 5. RBSOA

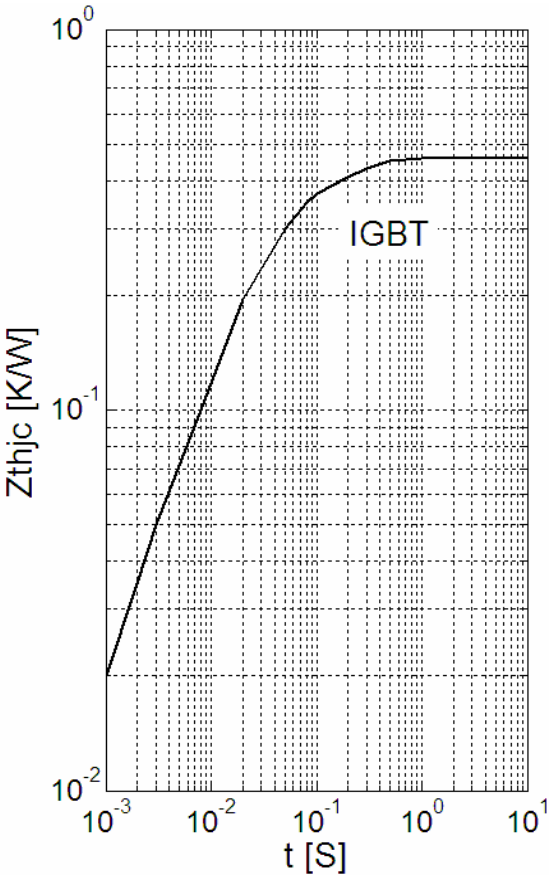


Fig 6. IGBT Transient Thermal Impedance

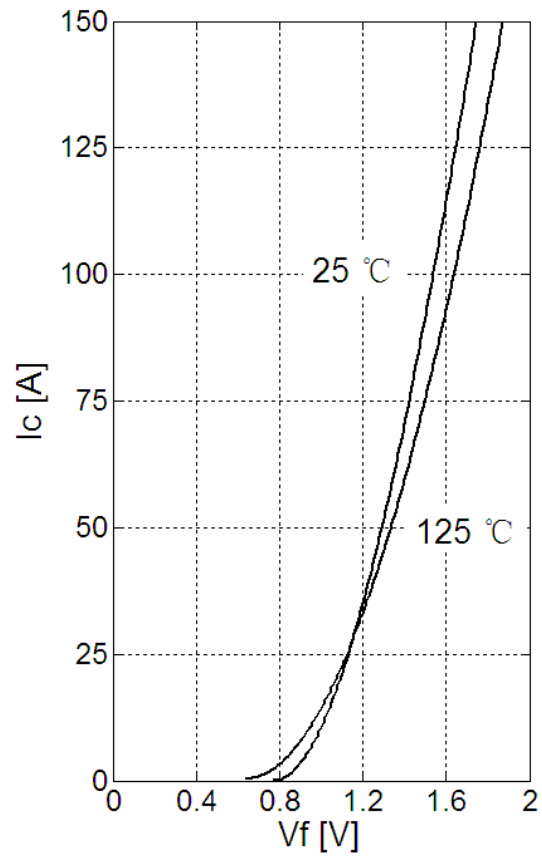


Fig 7. Forward Characteristics of Diode

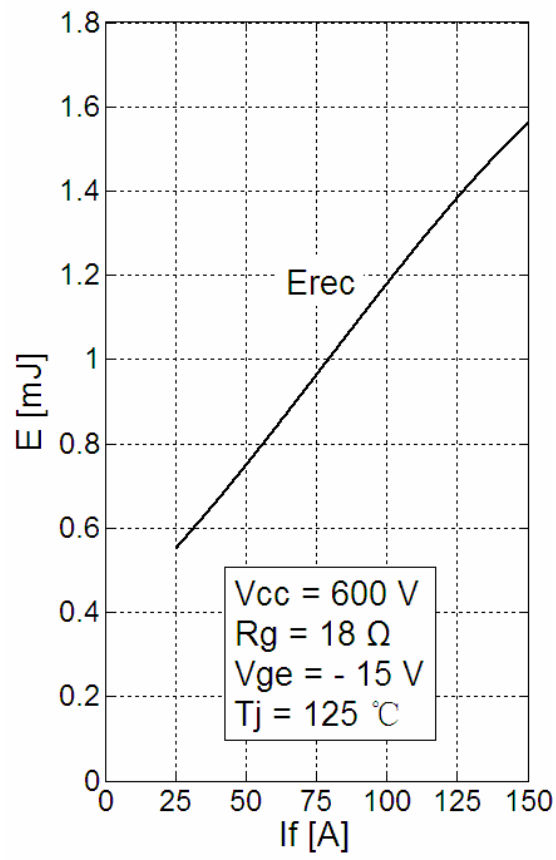


Fig 8. Diode Switching Loss vs. I_F

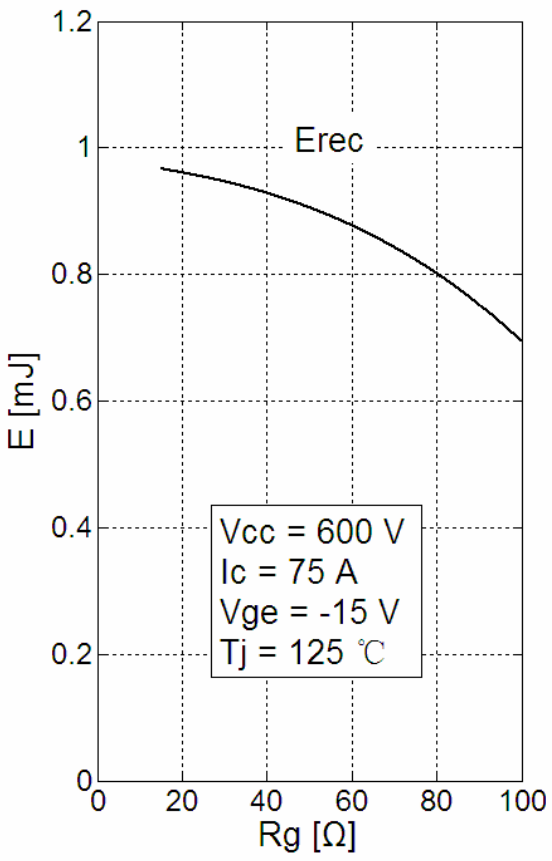


Fig 9. Diode Switching Loss vs. R_G

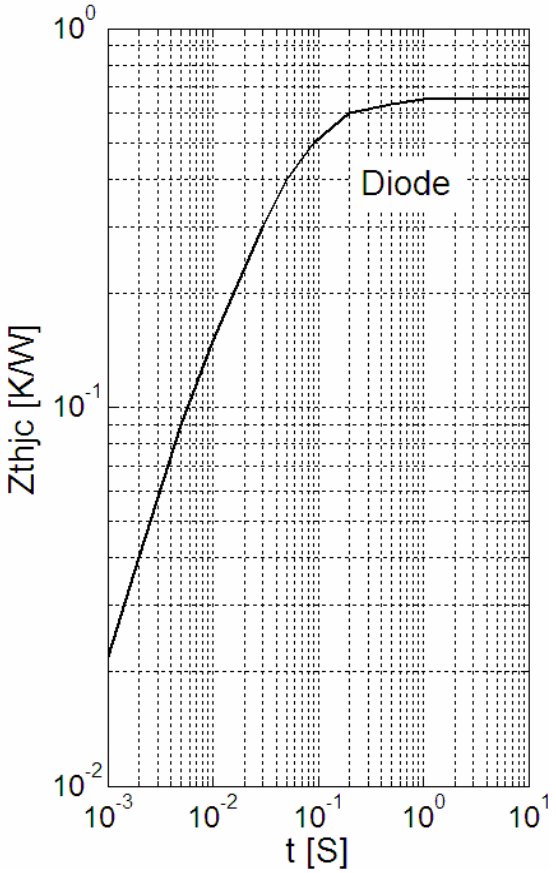


Fig 10. Diode Transient Thermal Impedance

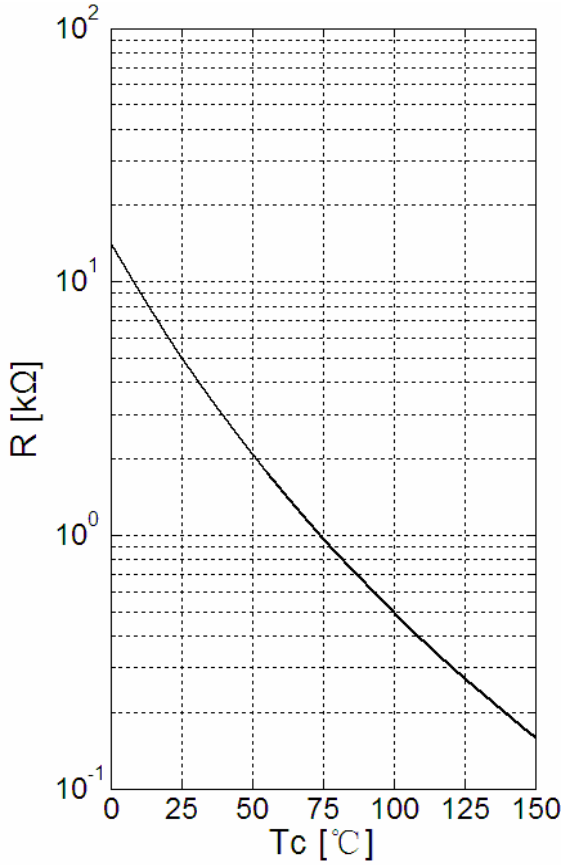
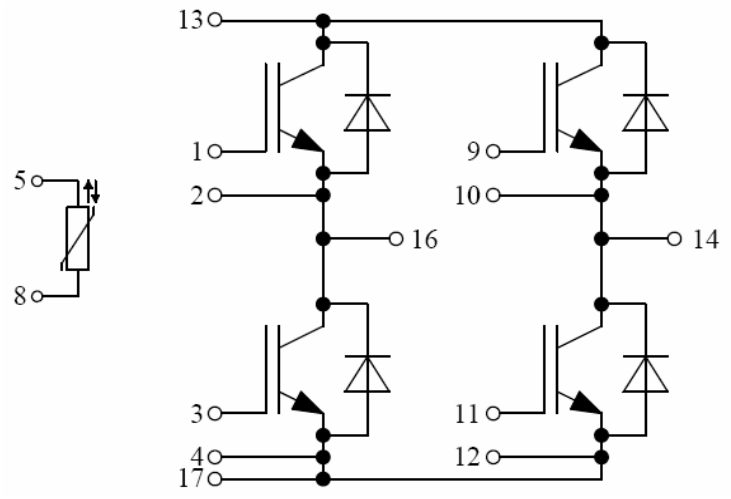


Fig 11. NTC-Temperature Characteristic

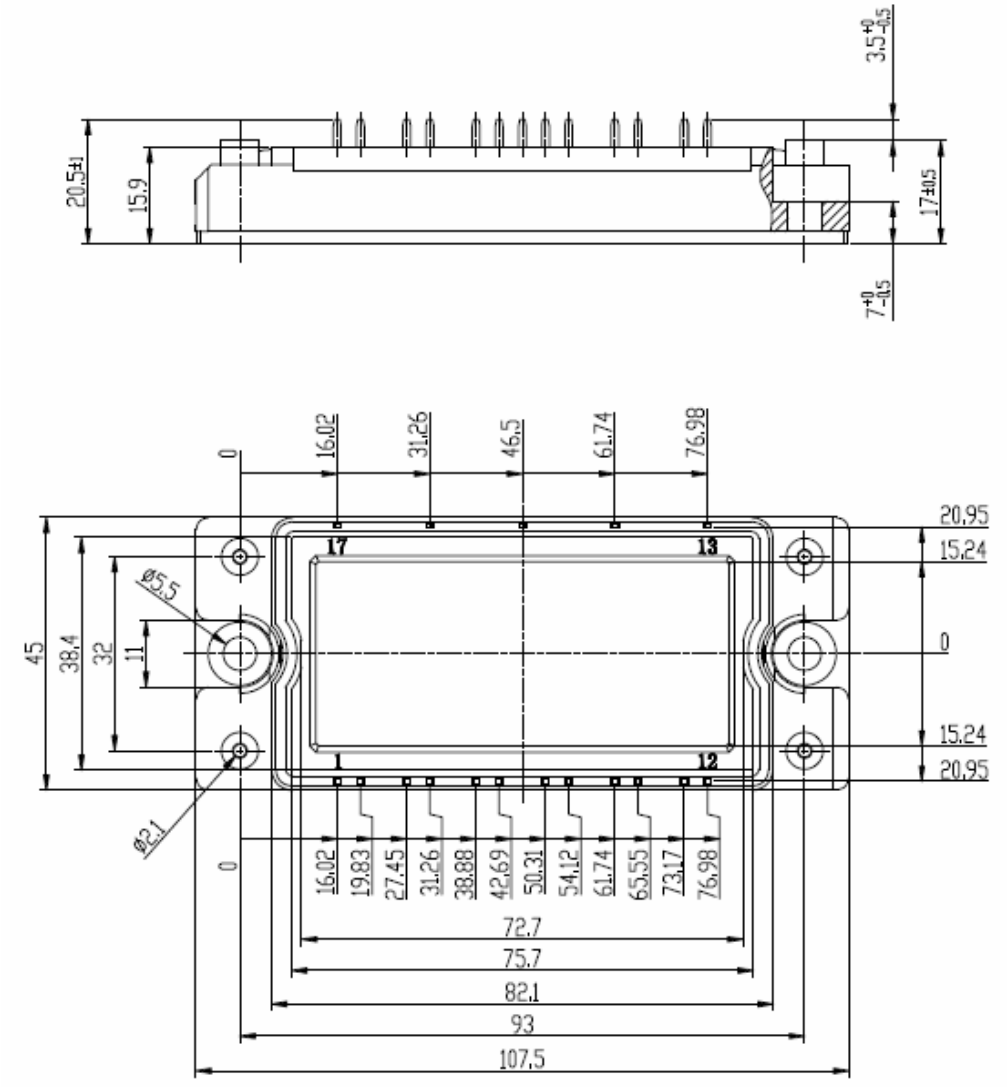
Equivalent Circuit Schematic



Pins 6,7,15 are not connected

Package Dimension

Dimensions in Millimeters



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