

STARPOWER

IGBT

GD25PIT120C5S

Molding Type Module

1200V/25A PIM in one-package



Features

- Low $V_{CE(sat)}$ trench IGBT technology
- Low switching losses
- 10 μ 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

IGBT-inverter $T_C=25^{\circ}\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD25PIT120C5S	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	50 25	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	50	A
P_{tot}	Total Power Dissipation @ $T_j=175^{\circ}\text{C}$	241	W

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	$I_C=1.2\text{mA}, V_{CE}=V_{GE},$ $T_j=25^{\circ}\text{C}$	5.0	5.8	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=25\text{A}, V_{GE}=15\text{V},$ $T_j=25^{\circ}\text{C}$		1.90	2.30	V
		$I_C=25\text{A}, V_{GE}=15\text{V},$ $T_j=125^{\circ}\text{C}$		2.30		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_G	Gate charge	$V_{CC}=600\text{V}, I_C=25\text{A},$ $V_{GE}=15\text{V}$		160		nC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=25\text{A},$ $R_G=33\Omega, V_{GE}=\pm 15\text{V},$ $T_j=25^{\circ}\text{C}$		233		ns
t_r	Rise Time			66		ns
$t_{d(off)}$	Turn-Off Delay Time			184		ns
t_f	Fall Time			208		ns
E_{on}	Turn-On Switching Loss			3.06		mJ
E_{off}	Turn-Off Switching Loss			1.16		mJ

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$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=25A,$ $R_G=33\Omega, V_{GE}=\pm 15V,$ $T_J=125^\circ C$		310		ns
t_r	Rise Time			86		ns
$t_{d(off)}$	Turn-Off Delay Time			217		ns
t_f	Fall Time			324		ns
E_{on}	Turn-On Switching Loss			3.16		mJ
E_{off}	Turn-Off Switching Loss			1.78		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		3.43		nF
C_{oes}	Output Capacitance			0.13		nF
C_{res}	Reverse Transfer Capacitance			0.08		nF
I_{SC}	SC Data	$T_P \leq 10\mu s, V_{GE}=15V,$ $T_J=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		240		A

DIODE-inverter $T_C=25^\circ C$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD25PIT120C5S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_J=25^\circ C$	1200	V
I_F	DC Forward Current @ $T_C=80^\circ C$	25	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1ms$	50	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =25A, V _{GE} =0V	T _j =25℃		2.10	2.50	V
			T _j =125℃		2.15		
Q _{rr}	Recovered Charge	I _F =25A, V _R =600V, di/dt=-425A/μs, V _{GE} =-15V	T _j =25℃		1.1		μC
			T _j =125℃		3.2		
I _{RM}	Peak Reverse Recovery Current		T _j =25℃		17		A
			T _j =125℃		21		
E _{rec}	Reverse Recovery Energy		T _j =25℃		0.80		mJ
			T _j =125℃		1.38		

DIODE-rectifier $T_C=25^{\circ}\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD25PIT120C5S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_J=25^{\circ}\text{C}$	1600	V
$I_{F(AV)}$	Average On-state Current Per Diode @ $T_C=100^{\circ}\text{C}$	31	A
I_{RMSM}	Maximum RMS Current at Rectifier Output @ $T_C=80^{\circ}\text{C}$	60	A
I_{FSM}	Surge Forward Current $V_R=0\text{V}, t_p=10\text{ms}, T_J=45^{\circ}\text{C}$	320	A
I^2t	I^2t -value, $V_R=0\text{V}, t_p=10\text{ms}, T_J=45^{\circ}\text{C}$	510	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=25\text{A}$	$T_J=125^{\circ}\text{C}$		1.10		V
I_R	Reverse Current	$T_J=150^{\circ}\text{C}, V_R=1600\text{V}$				2.0	mA

IGBT-brake-chopper $T_C=25^{\circ}\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD25PIT120C5S	Units
V_{CES}	Collector-Emitter Voltage @ $T_J=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage @ $T_J=25^{\circ}\text{C}$	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	30 15	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	30	A
P_{tot}	Total Power Dissipation @ $T_J=150^{\circ}\text{C}$	169	W

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	$I_C=125\mu A, V_{CE}=V_{GE}, T_J=25^\circ C$	4.4	4.9	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=15A, V_{GE}=15V, T_J=25^\circ C$		2.46	2.95	V
		$I_C=15A, V_{GE}=15V, T_J=125^\circ C$		2.95		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q_G	Gate charge	$V_{CC}=400V, I_C=15A, V_{GE}=15V$		95		nC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=15A, R_G=68\Omega, V_{GE}=\pm 15V, T_J=25^\circ C$		251		ns
t_r	Rise Time			64		ns
$t_{d(off)}$	Turn-Off Delay Time			242		ns
t_f	Fall Time			247		ns
E_{on}	Turn-On Switching Loss			2.97		mJ
E_{off}	Turn-Off Switching Loss			0.95		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=15A, R_G=68\Omega, V_{GE}=\pm 15V, T_J=125^\circ C$		221		ns
t_r	Rise Time			64		ns
$t_{d(off)}$	Turn-Off Delay Time			251		ns
t_f	Fall Time			390		ns
E_{on}	Turn-On Switching Loss			3.58		mJ
E_{off}	Turn-Off Switching Loss			1.47		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz, V_{GE}=0V$		1.32		nF
C_{oes}	Output Capacitance			0.12		nF
C_{res}	Reverse Transfer Capacitance			0.05		nF
I_{SC}	SC Data	$T_P \leq 10\mu s, V_{GE}=15V, T_J=125^\circ C, V_{CC}=900V, V_{CEM} \leq 1200V$		120		A

DIODE-brake-chopper $T_C=25^{\circ}\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD25PIT120C5S	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_J=25^{\circ}\text{C}$	1200	V
I_F	DC Forward Current @ $T_C=80^{\circ}\text{C}$	15	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1\text{ms}$	30	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =15A,V _{GE} =0V	T _j =25℃		2.05	2.45	V
			T _j =125℃		2.20		
Q _r	Recovered Charge	I _F =15A, V _R =600V, di/dt=-245A/μs, V _{GE} =-15V	T _j =25℃		0.6		μC
			T _j =125℃		2.1		
I _{RM}	Peak Reverse Recovery Current		T _j =25℃		10		A
			T _j =125℃		12		
E _{rec}	Reverse Recovery Energy		T _j =25℃		0.47		mJ
			T _j =125℃		0.86		

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		$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$T_C=100^{\circ}\text{C}, R_{100}=493.3\Omega$	-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

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 @ $T_C=25^{\circ}C$		4.00		m Ω
$R_{\theta JC}$	Junction-to-Case (per IGBT-inverter)			0.62	K/W
	Junction-to-Case (per DIODE-inverter)			1.02	
	Junction-to-Case (per DIODE-rectifier)			1.23	
	Junction-to-Case (per IGBT-brake-chopper)			0.74	
	Junction-to-Case (per DIODE-brake-chopper)			1.49	
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.02		K/W
T_j	Maximum Junction Temperature			175	$^{\circ}C$
T_{STG}	Storage Temperature Range	-40		125	$^{\circ}C$
Mounting Torque	Mounting Screw:M5	3.0		6.0	N.m
G	Weight of Module		200		g

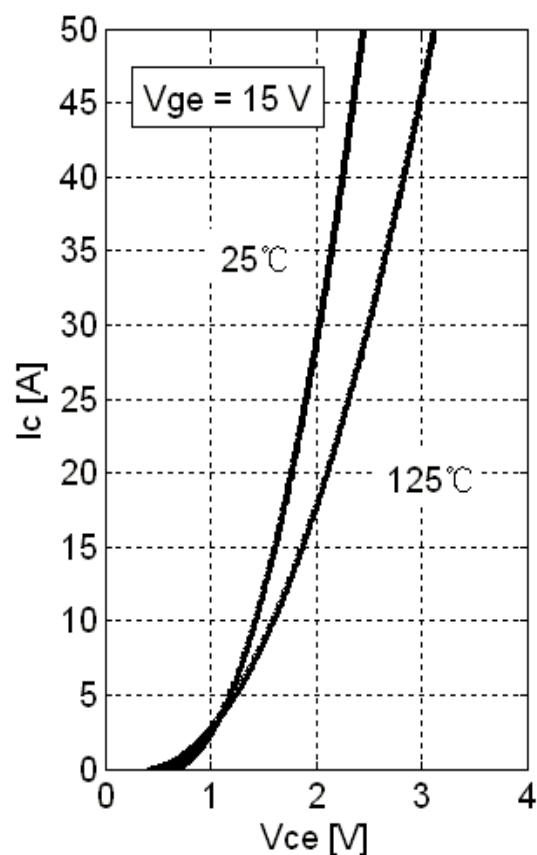


Fig 1. IGBT-inverter Output Characteristics

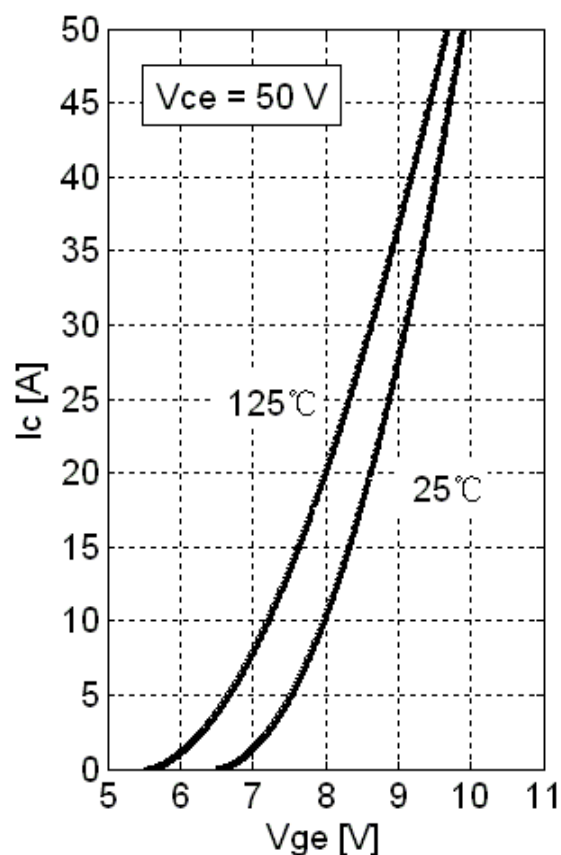
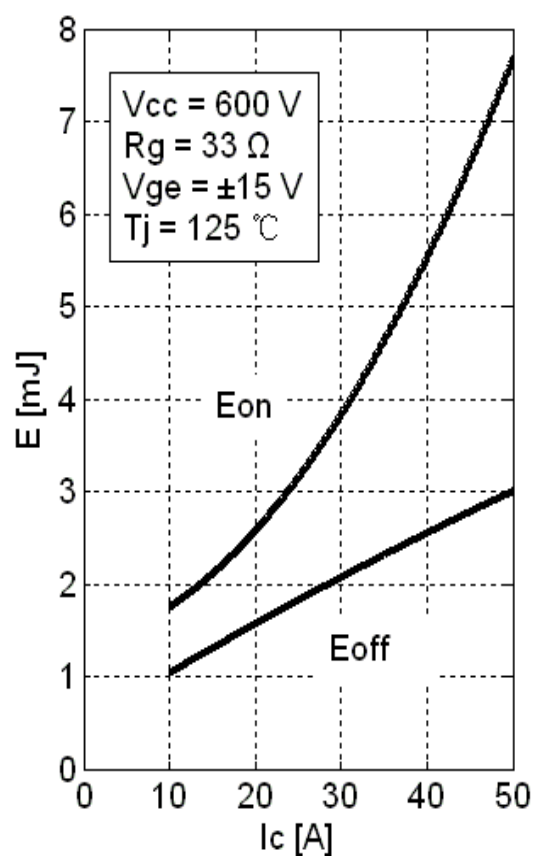
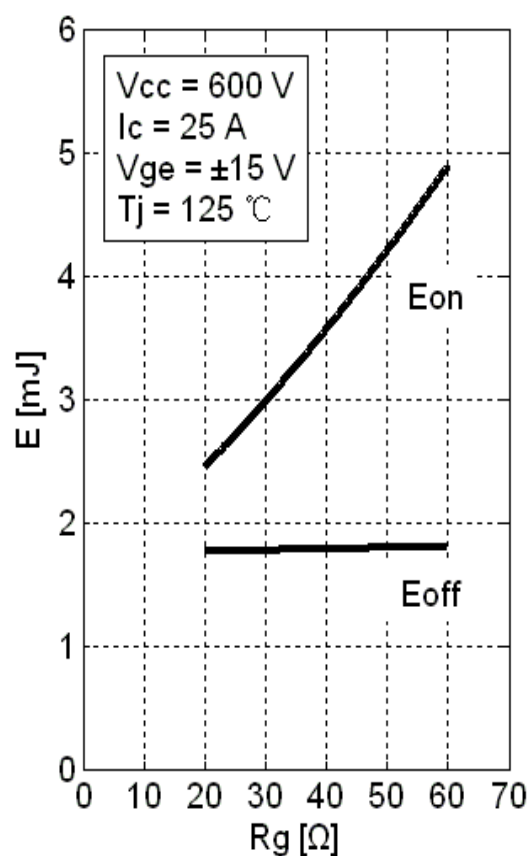


Fig 2. IGBT-inverter Transfer Characteristics

Fig 3. IGBT-inverter Switching Loss vs. I_c Fig 4. IGBT-inverter Switching Loss vs. R_g

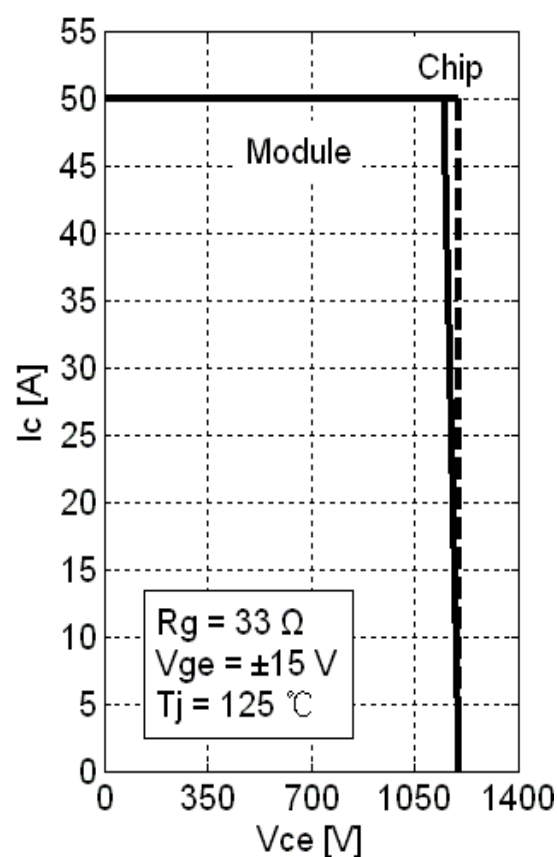


Fig 5. IGBT-inverter RBSOA

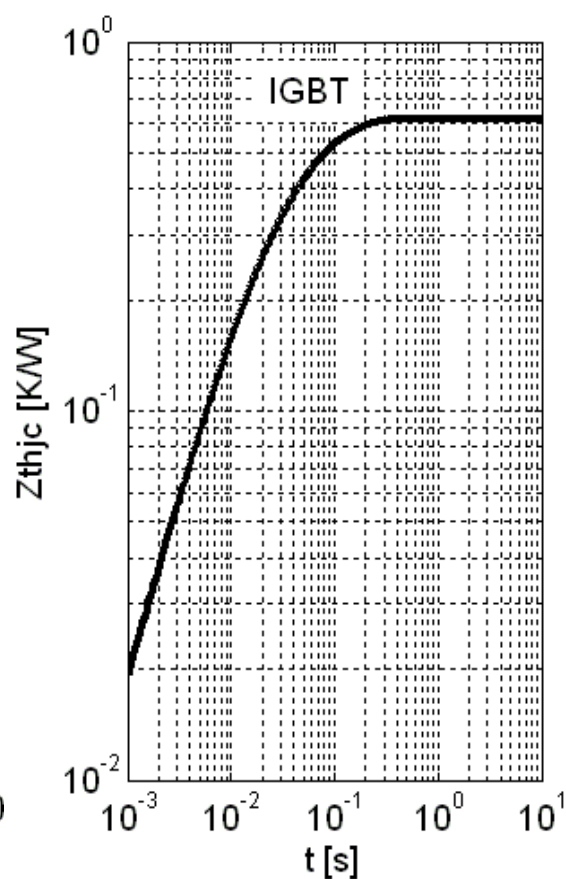


Fig 6. IGBT-inverter Transient Thermal Impedance

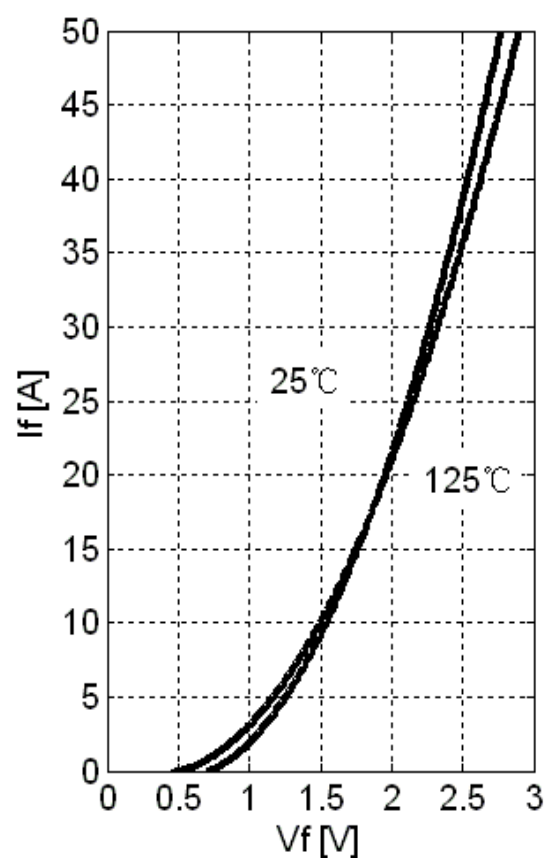
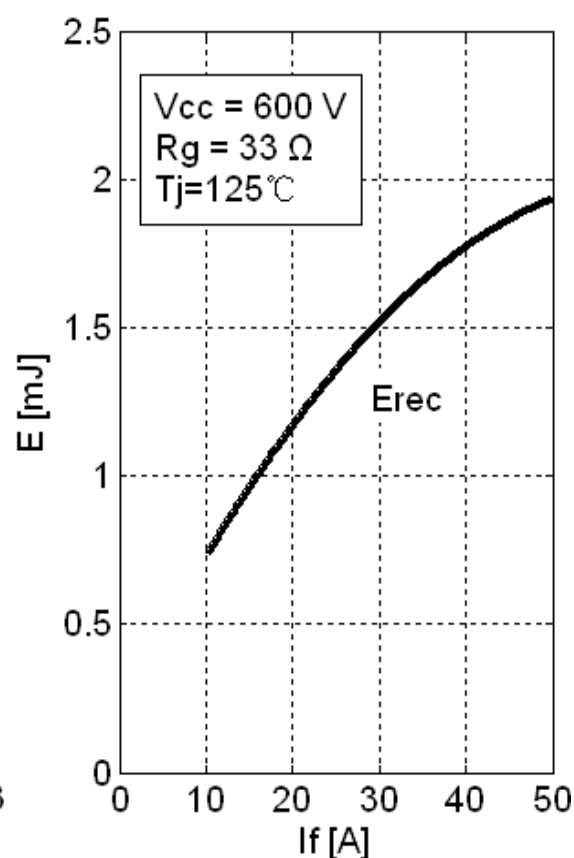


Fig 7. Diode-inverter Forward Characteristics

Fig 8. Diode-inverter Switching Loss vs. I_F

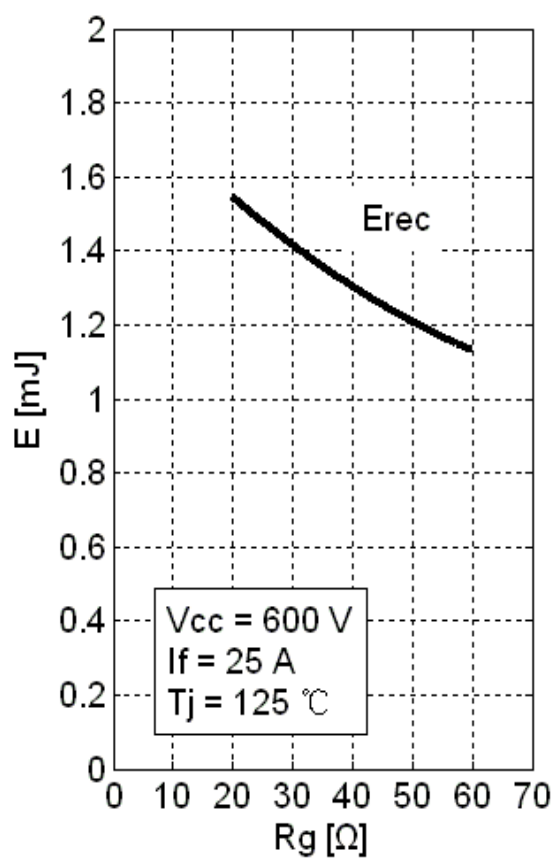
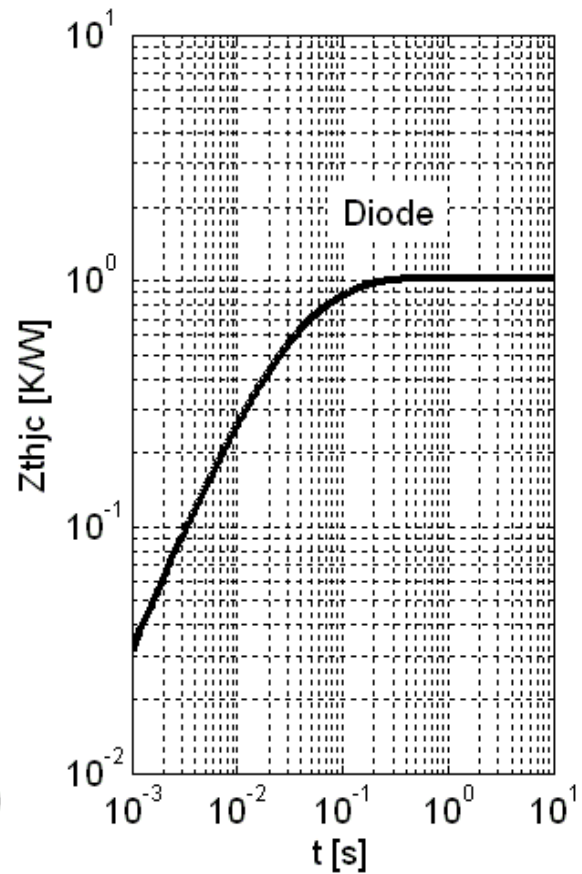
Fig 9. Diode-inverter Switching Loss vs. R_g 

Fig 10. Diode-inverter Transient Thermal Impedance

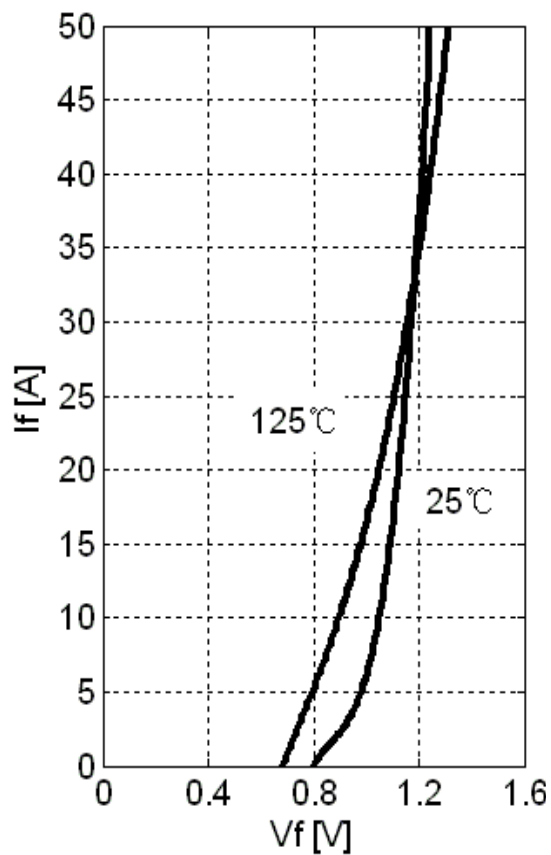


Fig 11. Rectifier Forward Characteristics

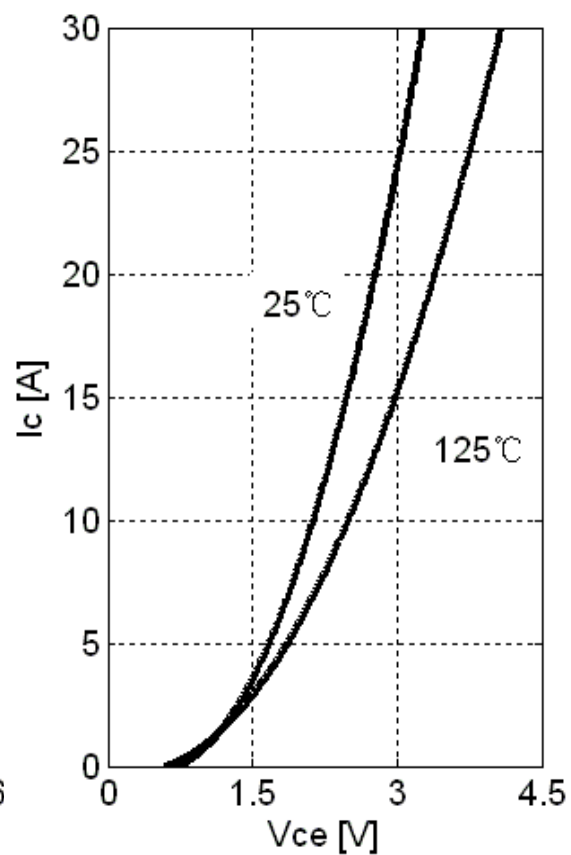


Fig 12. IGBT-brake Output Characteristics

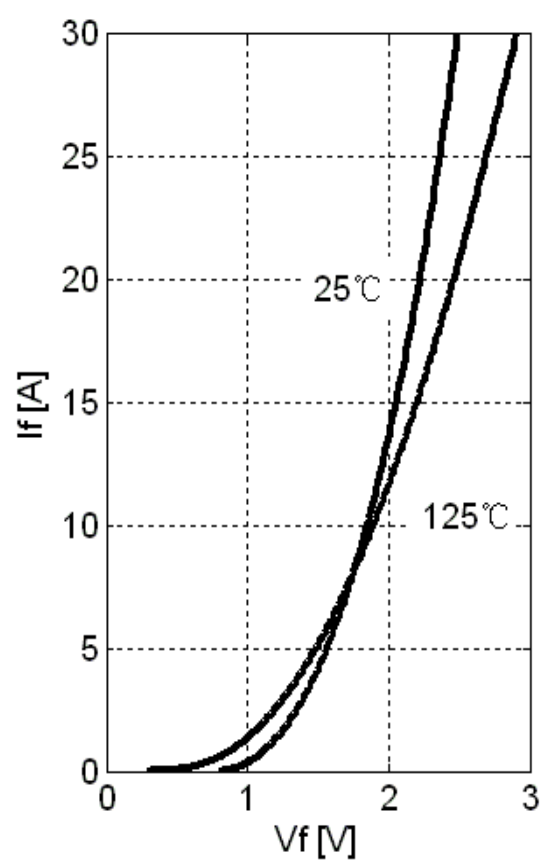


Fig 13. Diode-brake Forward Characteristics

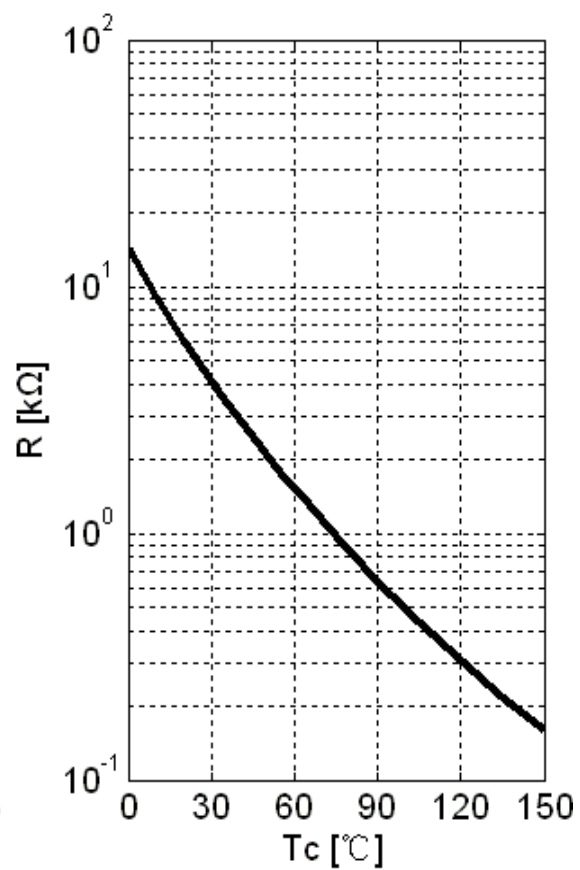
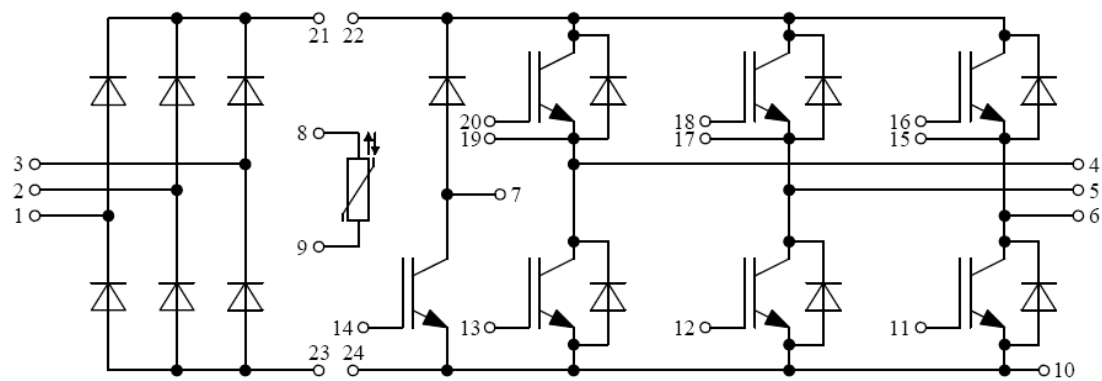


Fig 14. NTC-Temperature Characteristic

Equivalent Circuit Schematic



Package Dimension

Dimensions in Millimeters

