LGM40PJ120E2T3S

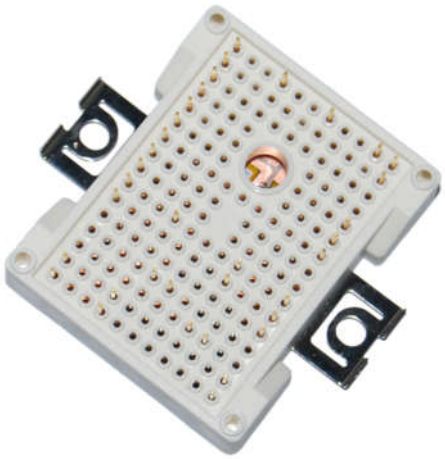
1200V/40A PIM in one-package

FEATURES

- V_{CEsat} with positive temperature coefficient
- Low V_{CEsat}
- Low switching losses
- Low inductance case
- 10μs short circuit capability
- Isolated copper baseplate using DBC technology

IGBT

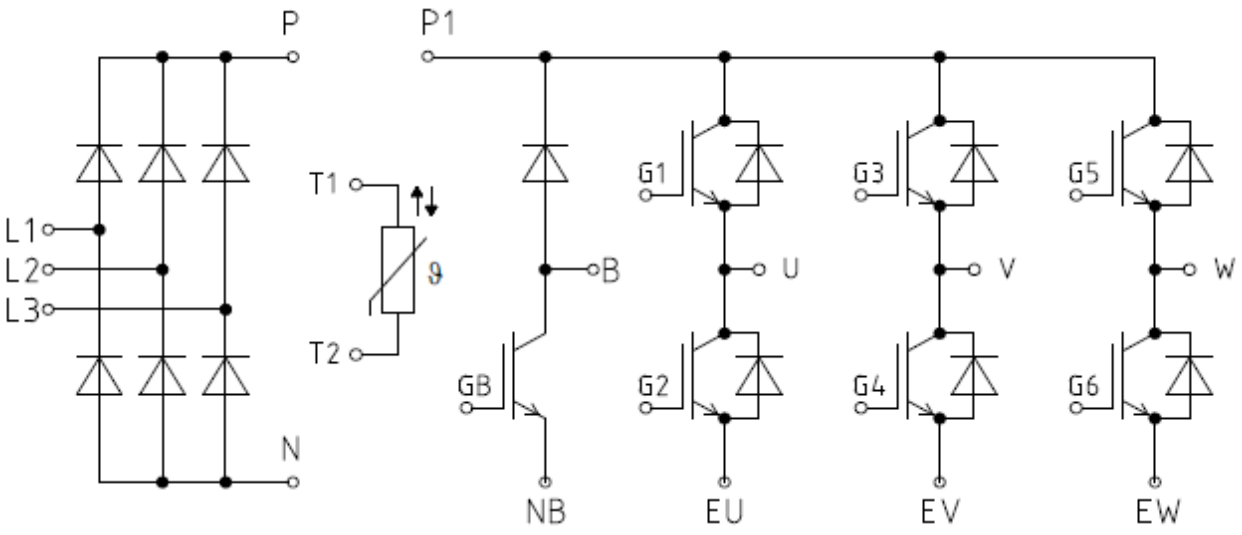
VCES = 1200V
IC nom = 40A / ICRM = 80A



APPLICATION

- Inverter for motor drive Inverter
- Air Conditioning
- Auxiliary inverters
- Uninterruptible power supply

Equivalent Circuit Schematic



IGBT,Inverter

Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Collector-emitter voltage	Tvj = 25°C	V_{CES}	1200	V
Continuous DC collector current	T_C = 95°C, Tvj max = 175°C	$I_{C\ nom}$	40	A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	80	A
Total power dissipation	TC = 25°C, Tvj max = 175°C	P_{tot}	230	W
Gate-emitter peak voltage		V_{CES}	±20	V

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 40 A, V_{GE} = 15 V Tvj = 25°C Tvj = 125°C	$V_{CE\ sat}$		1.95 2.20		V
Gate threshold voltage	I_C = 0.48 mA, V_{CE} = V_{GE}, Tvj = 25°C	V_{GEth}		5.8		V
Gate charge	V_{GE} = -15 / 15 V	Q_G		0.18		µC
Input capacitance	f = 1 MHz, Tvj = 25°C, V_{CE} = 25 V,V_{GE} = 0 V	C_{ies}		2.82		nF
Reverse transfer capacitance	f = 1 MHz, Tvj = 25°C, V_{CE} = 25 V, V_{GE} = 0 V	C_{res}		0.13		nF
Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, Tvj = 25°C	I_{CES}			1.0	mA
Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, Tvj = 25°C	I_{GES}			400	nA
SC data	V_{GE} ⩽ 15 V, V_{CC} = 800 V V_{CEmax} = V_{CES} -L_{SCE} ·di/dt t_P ⩽ 10 µs, Tvj = 25°C	I_{SC}		220		A
Thermal resistance, junction to case	per IGBT	R_{thJC}		0.62	0.75	K/W
Thermal resistance, case to heatsink	per IGBT λ_{Paste}=1 W/(m·K) /λ_{grease}=1 W/(m·K)	R_{thCH}		0.63		K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C
Turn-on delay time, inductive load	I_C = 40 A, V_{CE} = 600 V V_{GE} = -15 / 15 V , RG = 20Ω Tvj = 25°C Tvj = 125°C	$t_{d\ on}$		0.02 0.02		µs
Rise time, inductive load		t_r		0.06 0.07		µs
Turn-off delay time, inductive load		$t_{d\ off}$		0.17 0.17		µs
Fall time, inductive load		t_f		0.19 0.20		µs
Turn-on energy loss per pulse		E_{on}		2.80 3.36		mJ
Turn-off energy loss per pulse		E_{off}		2.30 2.52		mJ

Diode, Inverter
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Repetitive peak reverse voltage	Tvj = 25°C	VRRM	1200	V
Continuous DC forward current		IF	40	A
Repetitive peak forward current	t_P = 1 ms	IFRM	80	A

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Forward voltage	I_F = 40 A, V_{GE} = 0 V Tvj = 25°C Tvj = 125°C	V_F		2.05 2.00		V
Peak reverse recovery current	I_F = 40 A, - di_F/dt = 1200 A/µs (Tvj=150°C) V_R = 600 V, VGE = -15 V Tvj = 25°C Tvj = 125°C	I_{RM}		92 95		A
Recovered charge		Qr		3.1 5.6		µC
Reverse recovery energy		E_{rec}		0.50 1.00		mJ
Thermal resistance, junction to case	per diode	R_{thJC}		0.9	1.0	K/W
Thermal resistance, case to heatsink	per diode l_{Paste} = 1 W/(m·K) / l_{grease} = 1 W/(m·K)	R_{thCH}		0.8		K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

Diode, Rectifier
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Repetitive peak reverse voltage	Tvj = 25°C	V_{RRM}	1600	V
Average Output Current	50Hz/60Hz,sine wave	I_O	60	A
Surge forward current	t_p = 10 ms, Tvj = 25°C	I_{FSM}	680	A
I^2t - value	t_p = 10 ms, Tvj = 25°C	I^2t	2300	A^2s

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Forward voltage	Tvj = 25°C, I_F = 40 A	V_F		1.14		V
Reverse current	Tvj = 25°C, VR = 1600 V	I_R			1.0	mA
Thermal resistance, junction to case	per diode	R_{thJC}		0.9	1.05	K/W
Thermal resistance, case to heatsink	per diode l_{Paste} = 1 W/(m·K) / l_{grease} = 1 W/(m·K)	R_{thCH}		0.8		K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

IGBT, Brake-Chopper
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Collector-emitter voltage	Tvj = 25°C	V_{CES}	1200	V
Continuous DC collector current	T_C = 95°C, Tvj max = 175°C	$I_{C\ nom}$	40	A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	80	A
Gate-emitter peak voltage		V_{GES}	±20	V

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 25 A, V_{GE} = 15 V Tvj = 25°C Tvj = 125°C	$V_{CE\ sat}$		1.90 2.15		V
Gate threshold voltage	I_C = 0.48 mA, V_{CE} = V_{GE}, Tvj = 25°C	V_{GEth}		6.0		V
Gate charge	V_{GE} = -15 / 15 V	Q_G		0.1		µC
Input capacitance	f = 1 MHz, Tvj = 25°C, V_{CE} = 25 V, V_{GE} = 0 V	C_{ies}		1.79		nF
Reverse transfer capacitance	f = 1 MHz, Tvj = 25°C, V_{CE} = 25 V, V_{GE} = 0 V	C_{res}		0.08		nF
Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V,Tvj = 25°C	I_{CES}			1.0	mA
Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, Tvj = 25°C	I_{GES}			400	nA
SC data	V_{GE} ⩽ 15 V, V_{CC} = 800 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt t_P ⩽ 10 µs, Tvj = 25°C	I_{SC}		150		A
Thermal resistance, junction to case	per IGBT	R_{thJC}		0.68	0.72	K/W
Thermal resistance, case to heatsink	per IGBT λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		0.65		K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C
Turn-on delay time, inductive load	I_C = 25 A, V_{CE} = 600 V V_{GE} = -15 / 15 V， RG =20Ω Tvj = 25°C Tvj = 125°C	$t_{d\ on}$		0.01 0.01		µs
Rise time, inductive load		t_r		0.02 0.02		µs
Turn-off delay time, inductive load		$t_{d\ off}$		0.11 0.10		µs
Fall time, inductive load		t_f		0.21 025		µs
Turn-on energy loss per pulse		E_{on}		1.72 1.81		mJ
Turn-off energy loss per pulse		E_{off}		1.20 1.56		mJ

Diode, Brake-Chopper
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Repetitive peak reverse voltage	Tvj = 25°C	V_{RRM}	1200	V
Continuous DC forward current		I_F	15	A
Repetitive peak forward current	t_P = 1 ms	I_{FRM}	30	A

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Forward voltage	I_F = 10A, V_{GE} = 0 V Tvj = 25°C Tvj = 125°C	V_F		1.85 1.95		V
Peak reverse recovery current	V_R = 600 V, I_F = 10 A, VGE = -15 V Tvj = 25°C Tvj = 125°C	I_{RM}		14.5 13.6		A
Recovered charge		Qr		0.76 0.85		µC
Reverse recovery energy		E_{rec}		0.30 0.35		mJ
Thermal resistance, junction to case	per diode	R_{thJC}		1.68	1.8	K/W
Thermal resistance, case to heatsink	per diode l_{Paste} = 1 W/(m·K) / l_{grease} = 1 W/(m·K)	R_{thCH}		1.2		K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

NTC-Thermistor
Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Rated resistance	T_{NTC} = 25°C	R_{25}		5		kΩ
Deviation of R100	T_{NTC} = 100°C, R_{100} = 493 Ω	ΔR/R	-5		5	%
Power dissipation	T_{NTC} = 25°C	P_{25}			20	Mw
B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298{,}15\ K))]$	$B_{25/50}$		3380		K

Module

Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	VISOL	2.5	kV
Internal isolation	basic insulation (class 1, IEC 61140)		AI_2O_3	
Creepage distance	terminal to heatsink terminal to terminal		11.5 6.3	mm
Clearance	terminal to heatsink terminal to terminal		10 5	mm
Comperative tracking index		CTI	＞200	

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Stray inductance module and fixture		L_{sCE}		30		nH
Module lead resistance, terminals - chip	TC = 25°C, per switch	$R_{CC'+EE'}$ $R_{AA'+CC'}$		5 6		mΩ
Storage temperature		T_{stg}	-40		125	°C
mountig force per clamp		F	40		80	N
Weight		G		39		g

Fig. 1 output characteristic IGBT,Inverter

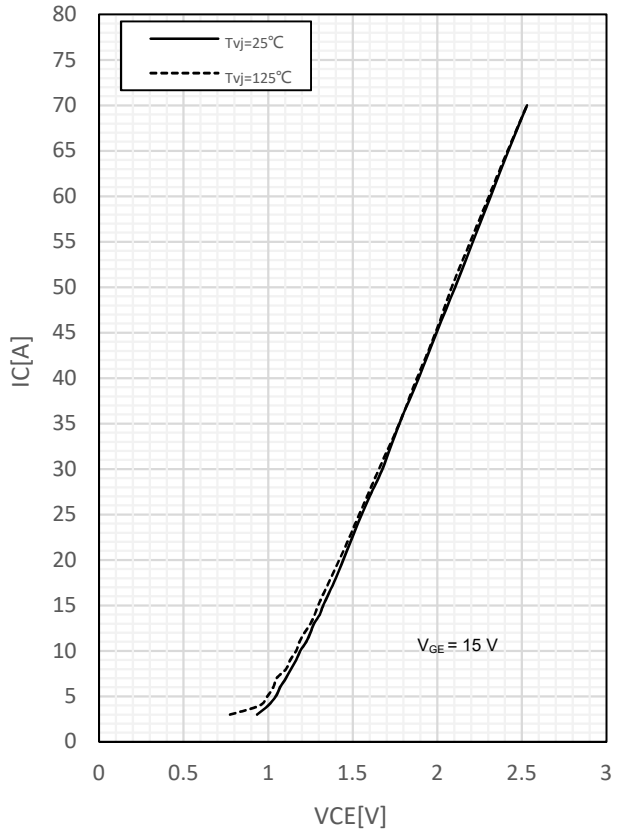


Fig.2 output characteristic IGBT,Inverter

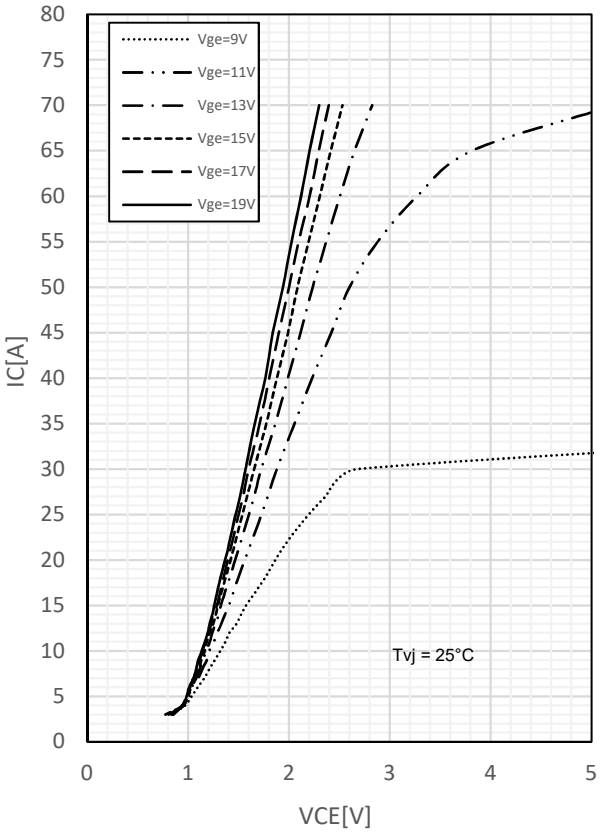


Fig. 3 transfer characteristic IGBT,Inverter

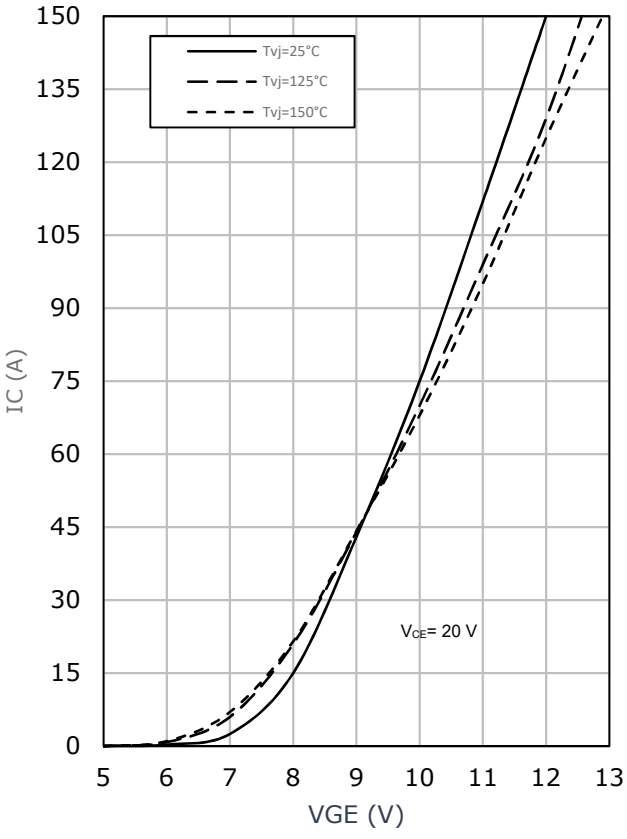


Fig. 4 switching losses IGBT,Inverter

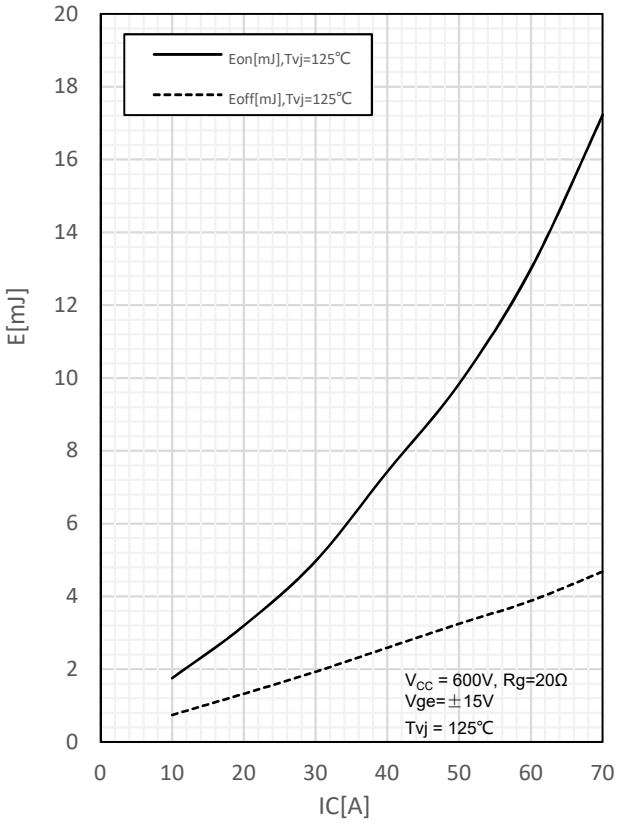


Fig. 5 switching losses IGBT,Inverter

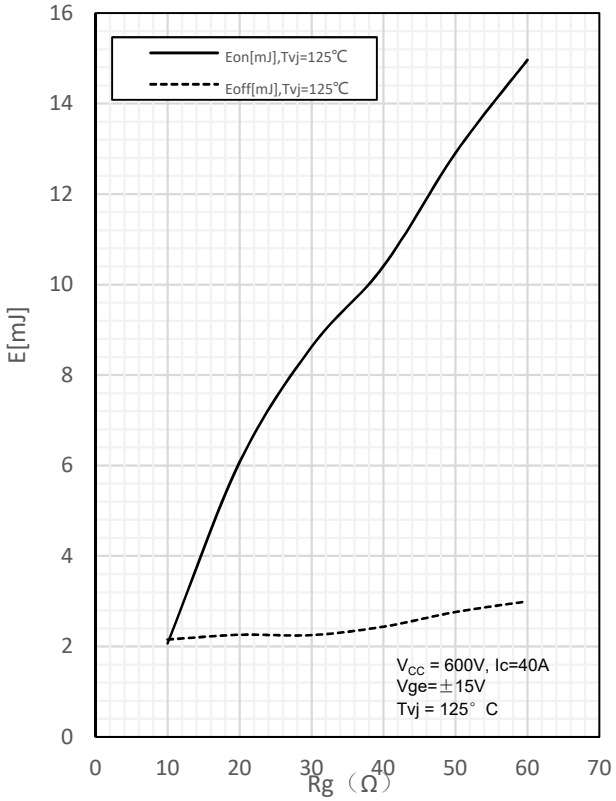


Fig. 6 transient thermal impedance IGBT,Inverter

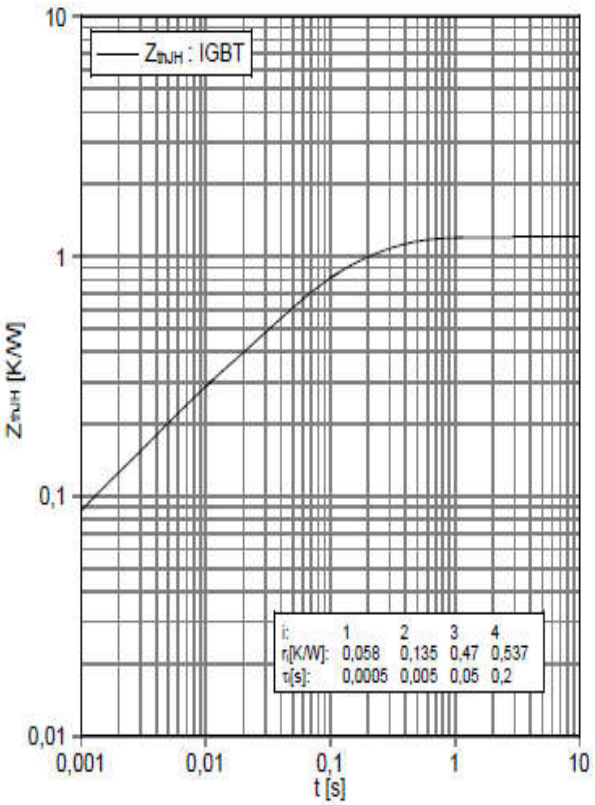


Fig. 7 NTC-Thermistor-temperature characteristic

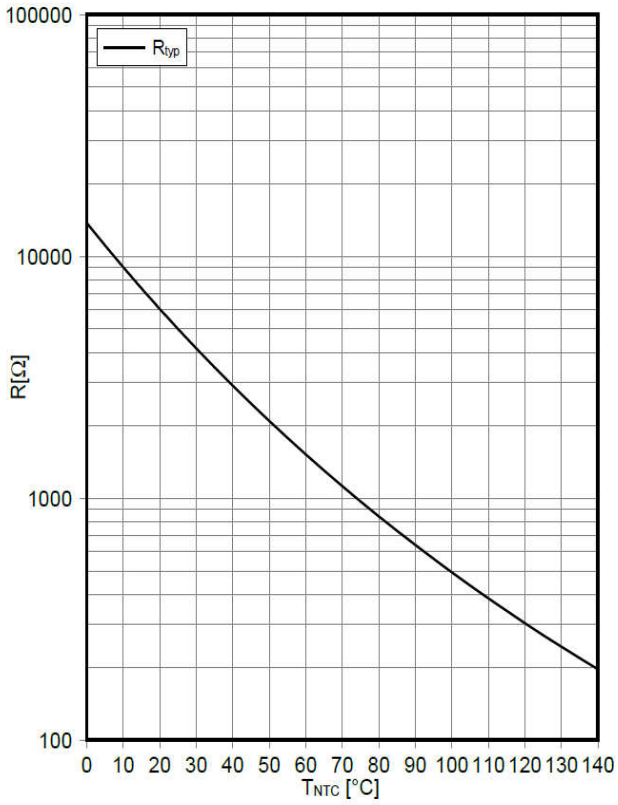


Fig. 8 forward characteristic of Diode, Inverter

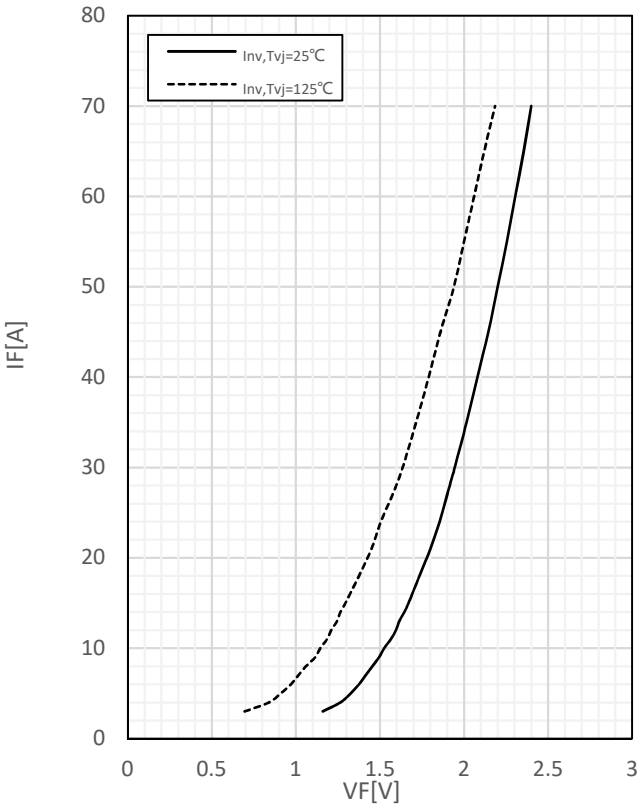


Fig. 9 switching losses Diode, Inverter

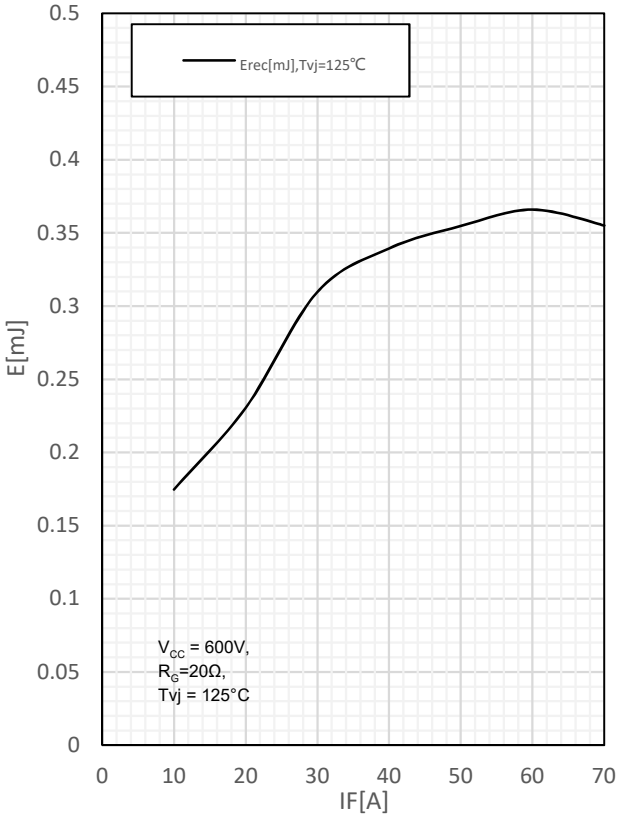


Fig. 10 switching losses Diode, Inverter

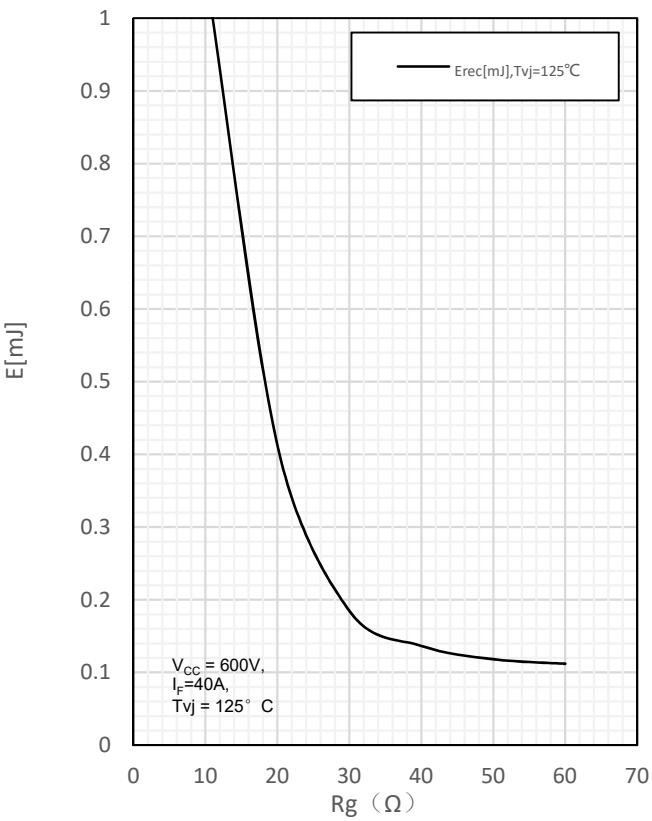


Fig. 11 transient thermal impedance Diode, Inverter

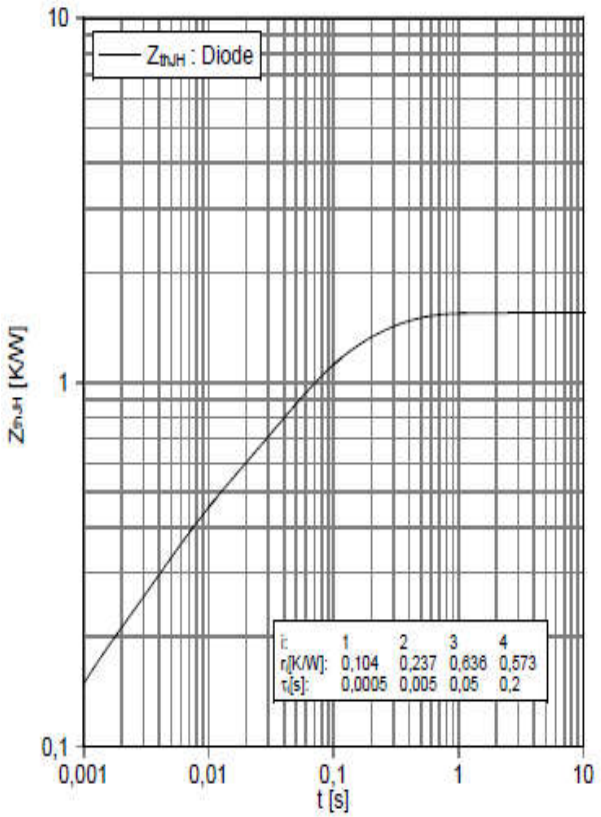


Fig. 12 forward characteristic of Diode, Rectifier

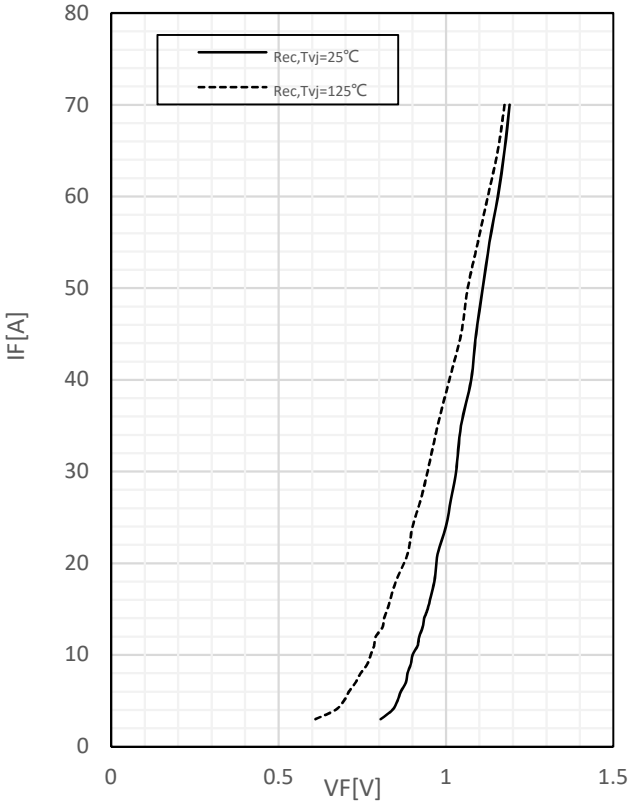


Fig. 13 output characteristic IGBT, Brake-Chopper

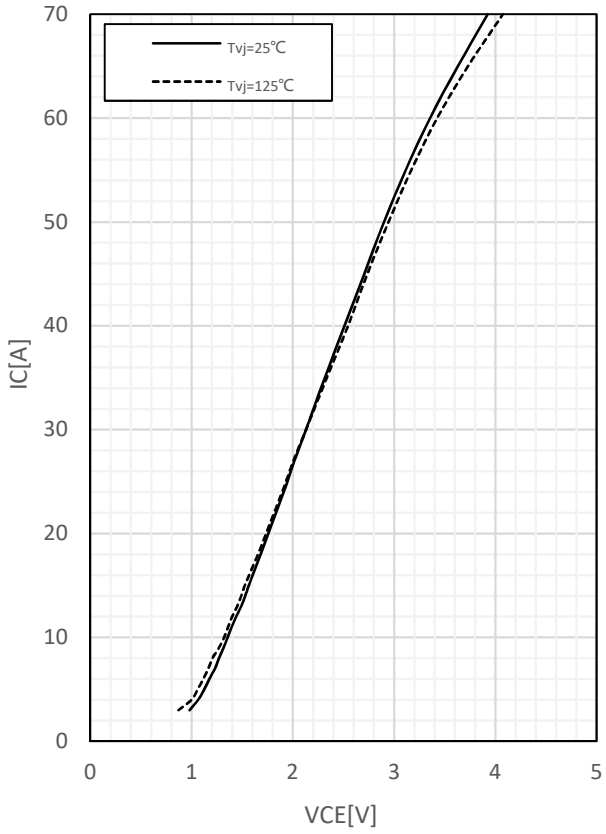
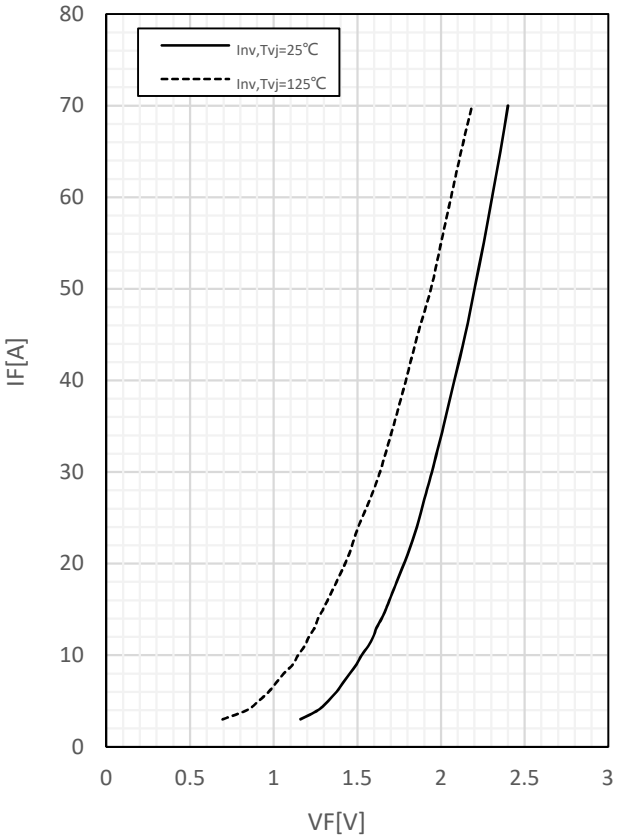
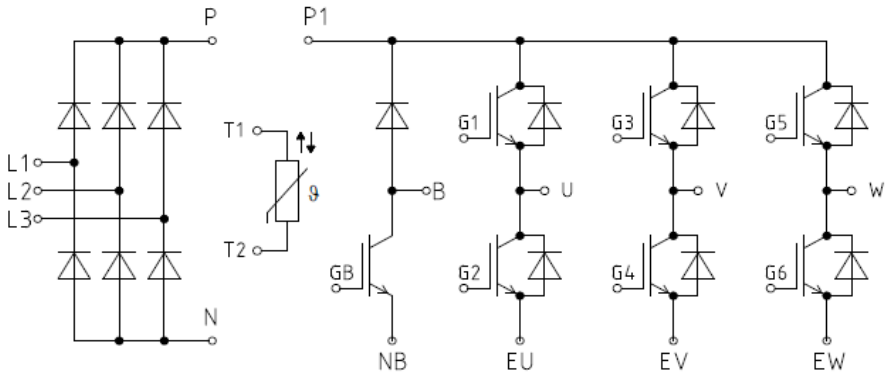


Fig. 14 forward characteristic of Diode, Brake-Chopper



Circuit diagram



Package outlines (mm)