JNG40T120PUBY1S1

1200V 40A PIM Module

Electrical Features

- Low VCEsat
- Trenchstop IGBT
- Overload operation up to 175°C

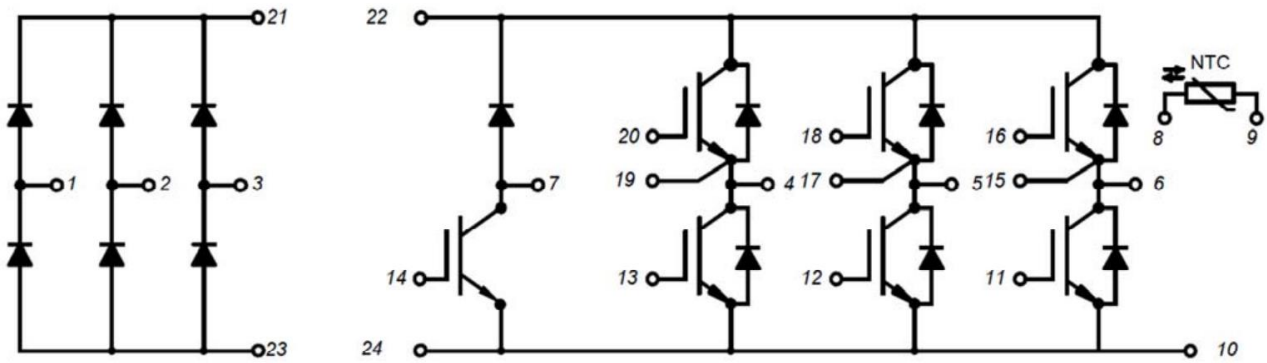
Rectifier + Brake + inverter

Mechanical Features

- 2.5kV AC 1min insulation
- Al2O3 substrate with low thermal resistance
- Solder contact technology
- Compact design
- High power density

Potential Applications

- Motor Drives
- Air conditioning
- Auxiliary inverters



▣ Figure . Circuit Diagram

IGBT,Inverter

Maximum Rated Values

Collector-emitter voltage	T_{vj} = 25°C	V_{CES}	1200		V
Continuous DC collector current	T_C = 80°C, $T_{vj\,max}$ = 150°C T_C = 25°C, $T_{vj\,max}$ = 150°C	$I_{C\,nom}$ I_C	40 40		A A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	80		A
Total power dissipation	T_C = 25°C, $T_{vj\,max}$ = 150	P_{tot}	210		W
Gate-emitter peak voltage		V_{GES}	+/-20		V

Characteristic Values

			min.	typ.	max.	
Collector-emitter saturation voltage	I_C = 40 A, V_{GE} = 15 V I_C = 40 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C	$V_{CE\,sat}$		1,50 2,20	2,10	V V
Gate threshold voltage	I_C = 6,10 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	5,0	6,0	7,0	V
Gate charge	V_{GE} = -15 V ... +15 V		Q_G		104		nC
Internal gate resistor	T_{vj} = 25°C		R_{Gint}		5,1		Ω
Input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 30 V, V_{GE} = 0 V		C_{ies}		2820		pF
Reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 30 V, V_{GE} = 0 V		C_{res}		25		pF
Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			10	uA
Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			500	nA
Turn-on delay time, inductive load	I_C = 40 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Gon} = 13 Ω	T_{vj} = 25°C T_{vj} = 125°C	$t_{d\,on}$		0,09 0,09		µs µs
Rise time, inductive load	I_C = 40 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Gon} = 13 Ω	T_{vj} = 25°C T_{vj} = 125°C	t_r		0,03 0,05		µs µs
Turn-off delay time, inductive load	I_C = 40 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Goff} = 13 Ω	T_{vj} = 25°C T_{vj} = 125°C	$t_{d\,off}$		0,42 0,52		µs µs
Fall time, inductive load	I_C = 40 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Goff} = 13 Ω	T_{vj} = 25°C T_{vj} = 125°C	t_f		0,07 0,09		µs µs
Turn-on energy loss per pulse	I_C = 40 A, V_{CE} = 600 V, L_S = 45 nH V_{GE} = ±15 V, di/dt = 1400 A/µs R_{Gon} = 13 Ω	T_{vj} = 25°C T_{vj} = 125°C	E_{on}		3,20 4,50		mJ mJ
Turn-off energy loss per pulse	I_C = 40 A, V_{CE} = 600 V, L_S = 45 nH V_{GE} = ±15 V, du/dt = 4000 V/µs R_{Goff} = 13 Ω	T_{vj} = 25°C T_{vj} = 125°C	E_{off}		3,60 4,85		mJ mJ
SC data	V_{GE} ≤ 15 V, V_{CC} = 900 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt	t_P ≤ 10 µs, T_{vj} = 125°C	I_{SC}		160		A
Thermal resistance, junction to case	IGBT / per IGBT		R_{thJC}			0,60	K/W
Thermal resistance, case to heatsink	IGBT / per IGBT λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		0,29		K/W
Temperature under switching conditions			$T_{vj\,op}$	-40		125	°C

Diode, Inverter

Maximum Rated Values

Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1200	V
Continuous DC forward current		I_F	40	A
Repetitive peak forward current	t_P = 1 ms	I_{FRM}	80	A
I²t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C	I²t	320	A²s

Characteristic Values

			min.	typ.	max.	
Forward voltage	I_F = 40 A, V_{GE} = 0 V I_F = 40 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C	V_F		1,75 1,85	2,20	V V
Peak reverse recovery current	I_F = 40 A, - di_F/dt = 1400 A/µs (T_{vj}=125°C) V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	I_{RM}		40,0 41,0		A A
Recovered charge	I_F = 40 A, - di_F/dt = 1400 A/µs (T_{vj}=125°C) V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	Q_r		4,40 8,40		µC µC
Reverse recovery energy	I_F = 40 A, - di_F/dt = 1400 A/µs (T_{vj}=125°C) V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	E_{rec}		1,85 3,70		mJ mJ
Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}			0,95	K/W
Thermal resistance, case to heatsink	每个二极管 / per diode λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		0,46		K/W
Temperature under switching conditions			$T_{vj\,op}$	-40		125	°C

Diode, Rectifier

Maximum Rated Values

Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1800	V
Maximum RMS forward current per chip	T_C = 80°C	I_{FRMSM}	50	A
Maximum RMS current at rectifier output	T_C = 80°C	I_{RMSM}	60	A
Surge forward current	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 150°C	I_{FSM}	600 380	A A
I²t - value	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 150°C	I²t	1800 780	A²s A²s

Characteristic Values

			min.	typ.	max.	
Forward voltage	T_{vj} = 150°C, I_F = 40 A	V_F		1,20		V
Reverse current	T_{vj} = 150°C, V_R = 1600 V	I_R		1,50		mA
Thermal resistance, junction to case	per diode	R_{thJC}			0,90	K/W
Thermal resistance, case to heatsink	per diode λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		0,435		K/W
Temperature under switching conditions		$T_{vj\,op}$	-40		150	°C

IGBT, Brake-Chopper

Maximum Rated Values

Collector-emitter voltage	T_{vj} = 25°C	V_{CES}	1200	V
Continuous DC collector current	T_C = 80°C, $T_{vj\,max}$ = 150°C T_C = 25°C, $T_{vj\,max}$ = 150°C	$I_{C\,nom}$ I_C	15 20	A A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	20	A
Total power dissipation	T_C = 25°C, $T_{vj\,max}$ = 150	P_{tot}	105	W
Gate-emitter peak voltage		V_{GES}	+/-20	V

Characteristic Values

			min.	typ.	max.	
Collector-emitter saturation voltage	I_C = 15 A, V_{GE} = 15 V, T_{vj} = 25°C I_C = 15 A, V_{GE} = 15 V, T_{vj} = 125°C	$V_{CE\,sat}$		2,10 2,20	2,70	V V
Gate threshold voltage	I_C = 250 uA, V_{CE} = V_{GE}, T_{vj} = 25°C	V_{GEth}	4,0	5,0	6,0	V
Gate charge	V_{GE} = -15 V ... +15 V	Q_G		0,25		µC
Internal gate resistor	T_{vj} = 25°C	R_{Gint}		0,0		Ω
Input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V	C_{ies}		1,10		nF
Reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V	C_{res}		0,06		nF
Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, T_{vj} = 25°C	I_{CES}			250	uA
Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C	I_{GES}			200	nA
Turn-on delay time, inductive load	I_C = 15 A, V_{CE} = 600 V, T_{vj} = 25°C V_{GE} = ±15 V, T_{vj} = 125°C	$t_{d\,on}$		0,17 0,12		µs µs
Rise time, inductive load	I_C = 15 A, V_{CE} = 600 V, T_{vj} = 25°C V_{GE} = ±15 V, T_{vj} = 125°C	t_r		0,10 0,13		µs µs
Turn-off delay time, inductive load	I_C = 15 A, V_{CE} = 600 V, T_{vj} = 25°C V_{GE} = ±15 V, T_{vj} = 125°C	$t_{d\,off}$		0,42 0,52		µs µs
Fall time, inductive load	I_C = 15 A, V_{CE} = 600 V, T_{vj} = 25°C V_{GE} = ±15 V, T_{vj} = 125°C	t_f		0,12 0,18		µs µs
Turn-on energy loss per pulse	I_C = 15 A, V_{CE} = 600 V, L_S = 50 nH, T_{vj} = 25°C V_{GE} = ±15 V, T_{vj} = 125°C	E_{on}		1,50 2,10		mJ mJ
Turn-off energy loss per pulse	I_C = 15 A, V_{CE} = 600 V, L_S = 50 nH, T_{vj} = 25°C V_{GE} = ±15 V, T_{vj} = 125°C	E_{off}		1,10 1,50		mJ mJ
SC data	V_{GE} ≤ 15 V, V_{CC} = 900 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt, t_P ≤ 10 µs, T_{vj} = 125°C	I_{SC}		60		A
Thermal resistance, junction to case	IGBT / per IGBT	R_{thJC}			1,20	K/W
Thermal resistance, case to heatsink	IGBT / per IGBT λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		0,58		K/W
Temperature under switching conditions		$T_{vj\,op}$	-40		125	°C

Diode, Brake-Chopper

Maximum Rated Values

Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1200	V
Continuous DC forward current		I_F	15	A
Repetitive peak forward current	t_P = 1 ms	I_{FRM}	15	A
I^2t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C	I^2t	20,0	A^2s

Characteristic Values

				min.	typ.	max.	
Forward voltage	I_F = 10 A, V_{GE} = 0 V I_F = 10 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C	V_F		2,00 1,70	2,40	V V
Peak reverse recovery current	I_F = 10 A, - di_F/dt = 400 A/µs (T_{vj}=125°C) V_R = 600 V	T_{vj} = 25°C T_{vj} = 125°C	I_{RM}		14,0 15,0		A A
Recovered charge	I_F = 10 A, - di_F/dt = 400 A/µs (T_{vj}=125°C) V_R = 600 V	T_{vj} = 25°C T_{vj} = 125°C	Q_r		1,00 1,80		µC µC
Reverse recovery energy	I_F = 10 A, - di_F/dt = 400 A/µs (T_{vj}=125°C) V_R = 600 V	T_{vj} = 25°C T_{vj} = 125°C	E_{rec}		0,26 0,56		mJ mJ
Thermal resistance, junction to case	per diode		R_{thJC}			2,30	K/W
Thermal resistance, case to heatsink	per diode λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		1,10		K/W
Temperature under switching conditions			$T_{vj\,op}$	-40		125	°C

NTC-Thermistor

Characteristic Values

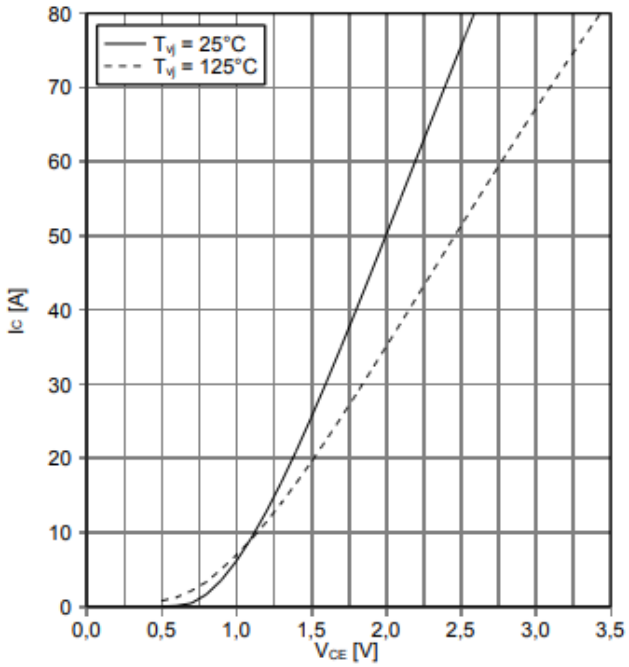
			min.	typ.	max.	
Rated resistance	T_C = 25°C	R_{25}		5,00		kΩ
Deviation of R100	T_C = 100°C, R_{100} = 493 Ω	ΔR/R	-5		5	%
Power dissipation	T_C = 25°C	P_{25}			20,0	mW
B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\ K))]$	$B_{25/50}$		3375		K
B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\ K))]$	$B_{25/80}$		3411		K
B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\ K))]$	$B_{25/100}$		3433		K

Specification according to the valid application note.

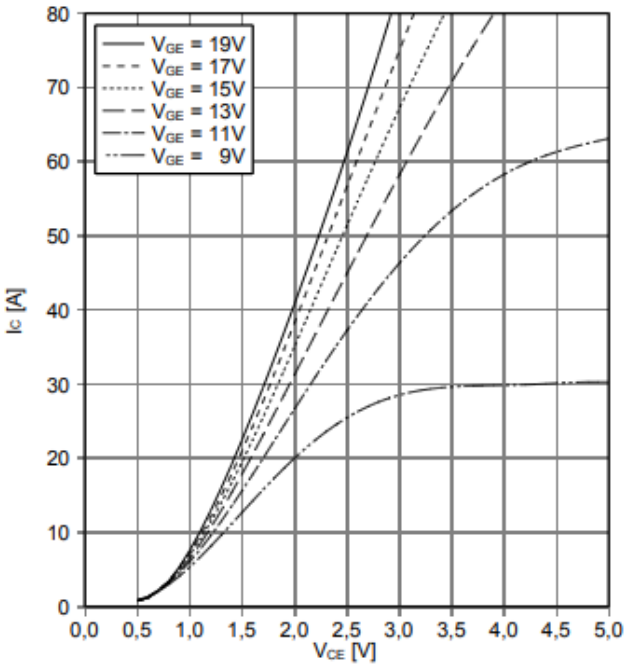
Module

Isolation test voltage	RMS, f = 50 Hz, t = 1 min	V_{ISOL}		2,5		kV
Material of module baseplate				Cu		
Internal isolation	(class 1, IEC 61140) basic insulation (class 1, IEC 61140)			Al_2O_3		
Creepage distance	terminal to heatsink terminal to terminal			10,0		mm
Clearance	terminal to heatsink terminal to terminal			7,5		mm
Comperative tracking index		CTI		> 200		
			min.	typ.	max.	
Thermal resistance, case to heatsink	per module λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		0,02		K/W
Stray inductance module		L_{sCE}		60		nH
Module lead resistance, terminals - chip	T_C = 25°C, per switch	$R_{CC'+EE'}$ $R_{AA'+CC'}$		4,00 3,00		mΩ
Maximum junction temperature	inverter, brake-chopper rectifier	$T_{vj\ max}$			150 150	°C °C
Temperature under switching conditions	inverter, brake-chopper rectifier	$T_{vj\ op}$	-40 -40		125 150	°C °C
Storage temperature		T_{stg}	-40		125	°C
Mounting torque for modul mounting	Screw M5 - Mounting according to valid application note	M	3,00	-	6,00	Nm
Weight		G		182		g

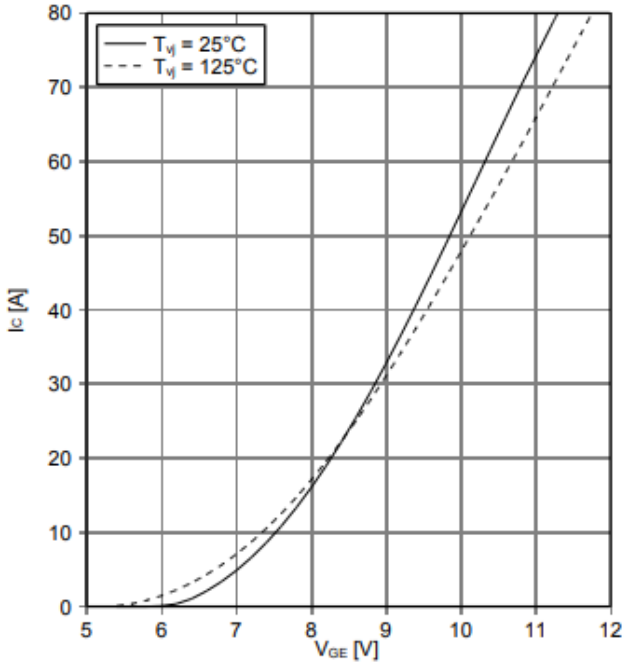
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



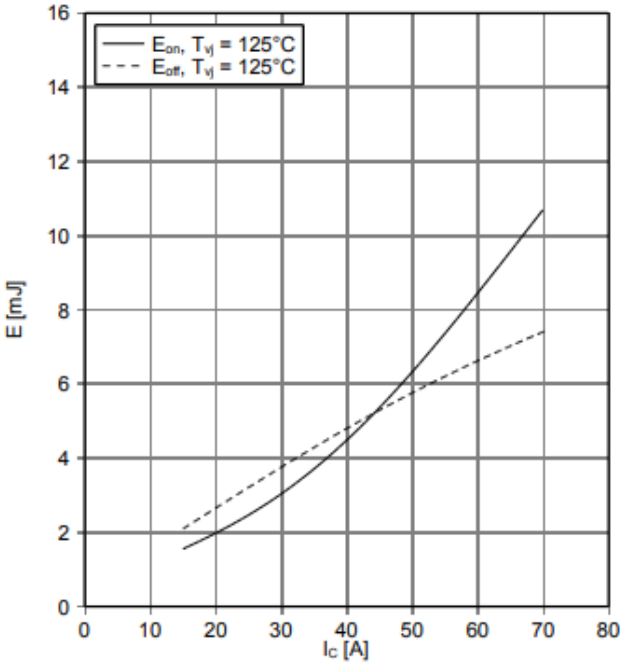
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
T_{vj} = 125°C



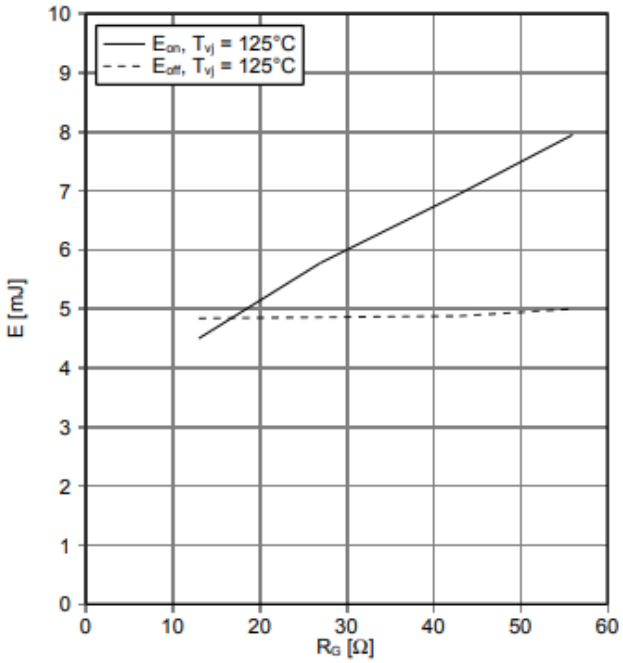
transfer characteristic IGBT,Inverter(typical)
$I_C = f(V_{GE})$
V_{CE} = 20 V



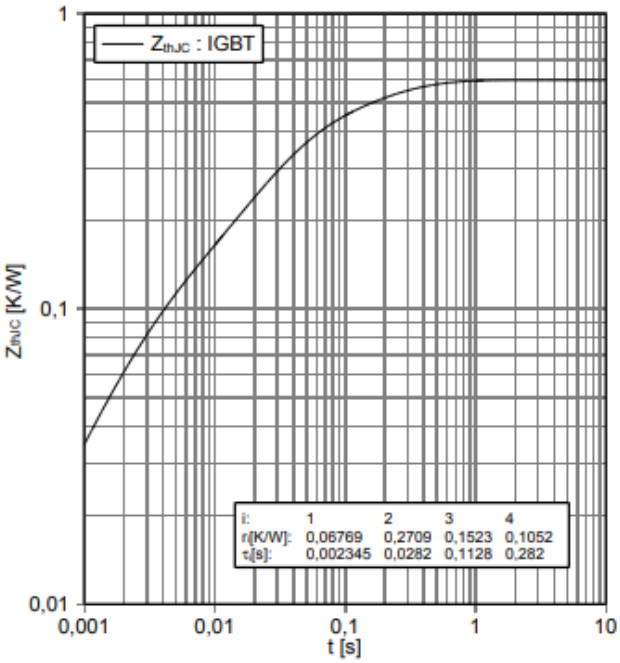
switching losses IGBT,Inverter (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 13 Ω, R_{Goff} = 13 Ω, V_{CE} = 600 V



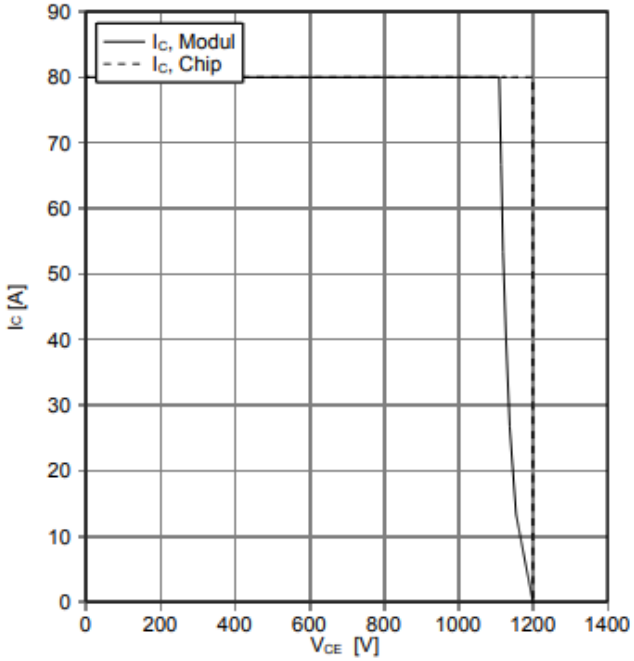
switching losses IGBT,Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$V_{GE} = \pm 15$ V, $I_C = 40$ A, $V_{CE} = 600$ V



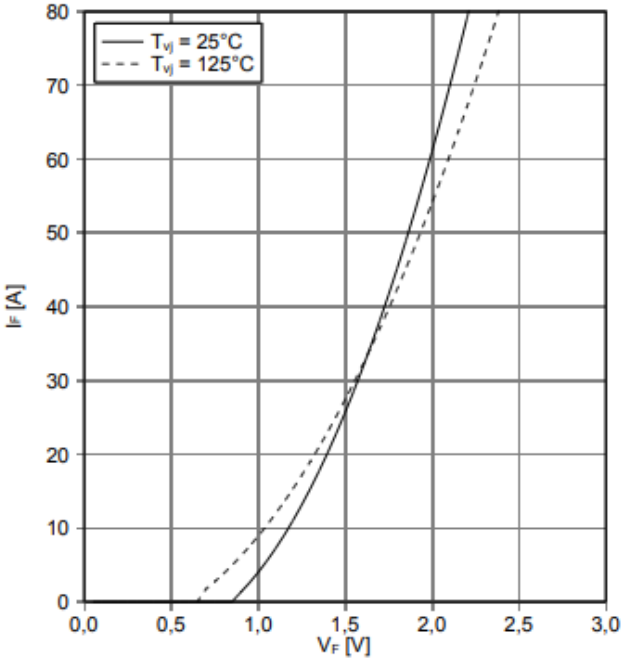
transient thermal impedance IGBT,Inverter
$Z_{thJC} = f(t)$



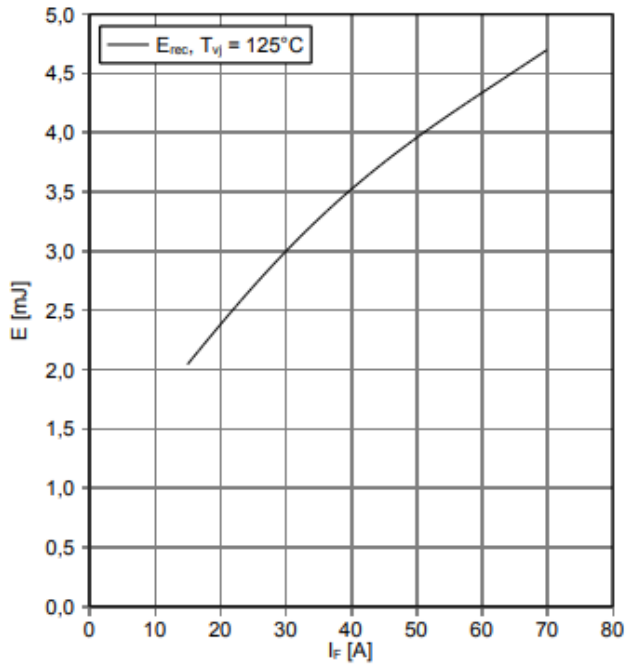
reverse bias safe operating area IGBT,Inverter (RBSOA)
$I_C = f(V_{CE})$
$V_{GE} = \pm 15$ V, $R_{Goff} = 13\ \Omega$, $T_{vj} = 125$°C



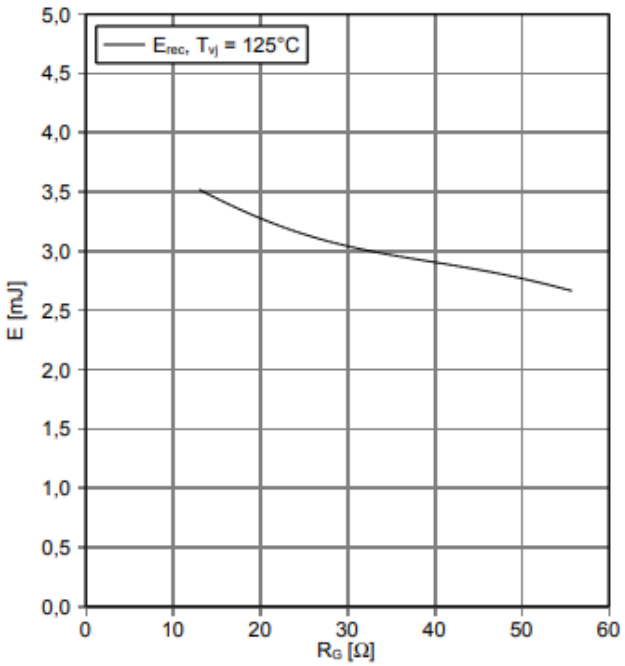
forward characteristic of Diode, Inverter (typical)
$I_F = f(V_F)$



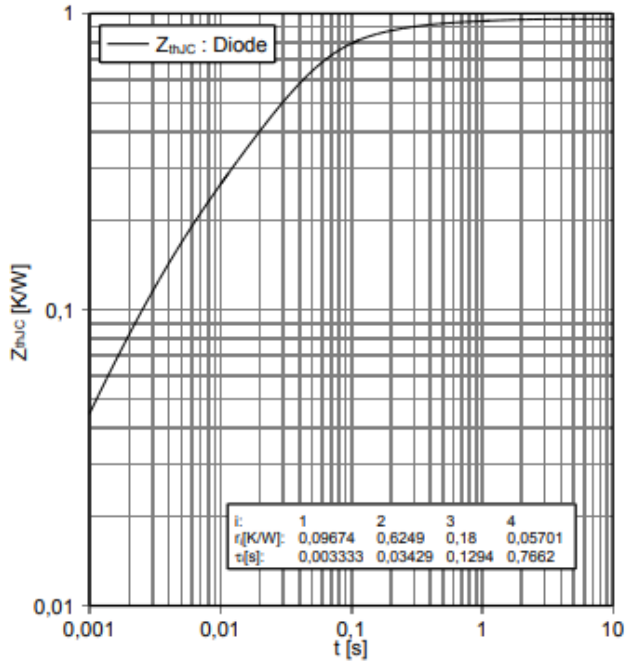
switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 13\ \Omega$, $V_{CE} = 600$ V



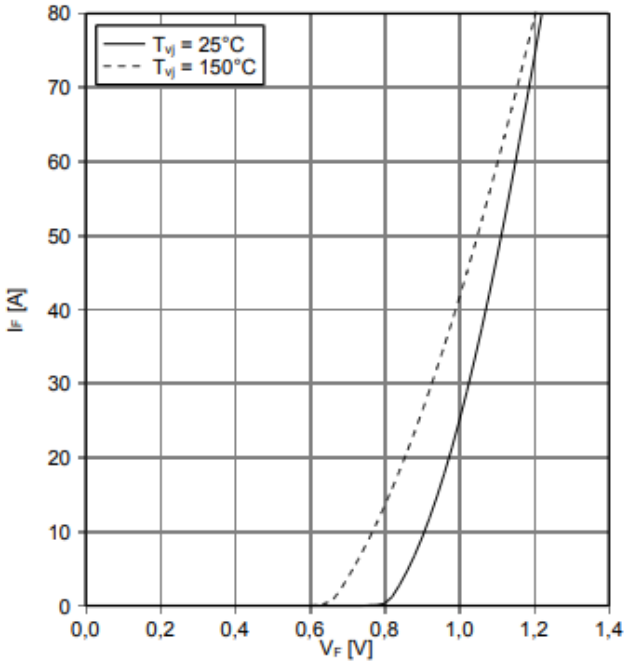
switching losses Diode, Inverter (typical)
$E_{rec} = f(R_G)$
$I_F = 40$ A, $V_{CE} = 600$ V



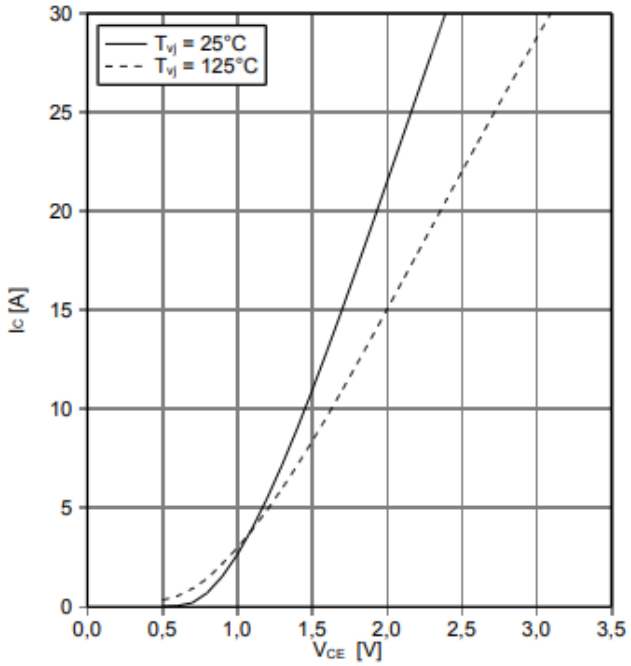
transient thermal impedance Diode, Inverter
$Z_{thJC} = f(t)$



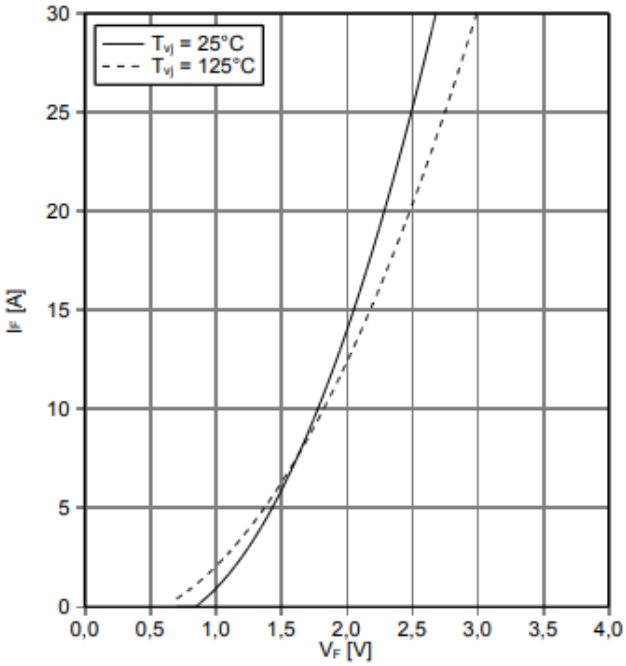
forward characteristic of Diode, Rectifier (typical)
$I_F = f(V_F)$



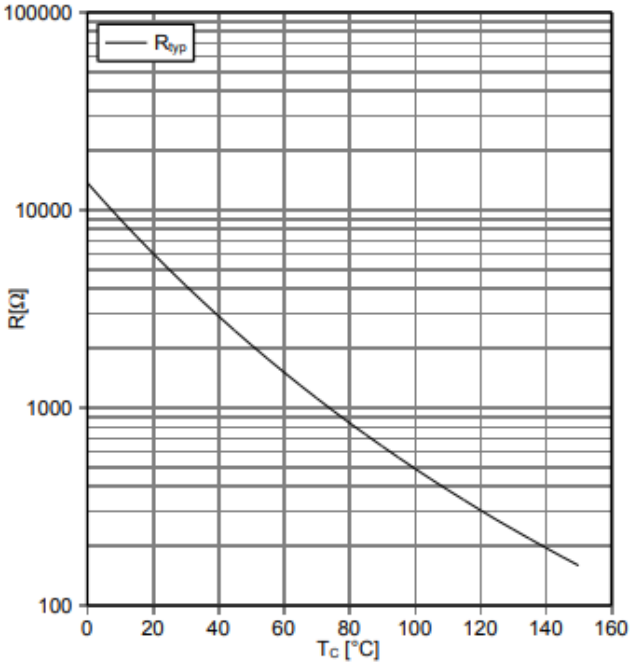
output characteristic IGBT, Brake-Chopper (typical)
$I_C = f(V_{CE})$
$V_{GE} = 15\ V$



forward characteristic of Diode, Brake-Chopper (typical)
$I_F = f(V_F)$



NTC-Thermistor-temperature characteristic (typical)
$R = f(T)$



Internal Circuit: