1200V 100A ECPIM 3A IGBT Module

Features

- Trench Field Stop technology
- Low saturation voltage
- 10μs Short Circuit current
- Low turn-off losses
- Positive temperature coefficient

Applications

- AC Motor Drives
- Motion / Servo Drives
- Inverter and Power supplies

■ Absolute Maximum Ratings T_j = 25°C unless otherwise noted

Item	Symbol	Parameter	Conditions	Value	Units
Diode Rectifier	VRRM	Repetitive Peak Reverse Voltage		1900	V
	IFAV	Forward Current per Diode	@ Tj = 150 °C, TC = 100 °C	75	A
	IFSM	Surge Forward Current (Chip level)	@ tP = 10 ms, half sine wave	960	A
	I2t	I2t - Value (Chip level)	@ tP = 10 ms, half sine wave	3528	A2S
	Tj	Operating Junction Temperature *(1)	-	-40 ~ 150	°C
IGBT Inverter	VCES	Collector-Emitter Breakdown Voltage	-	1200	V
	VGES	Gate-Emitter Peak Voltage	-	± 20	V
	IC	DC Collector Current	@ Tj = 150 °C, TC = 100 °C	100	A
			@ Tj = 150 °C, TC = 25 °C	125	A
	ICM	Repetitive Peak Forward Current	tp = 1ms	200	A
	PD	Maximum Power Dissipation	@ Tj = 175 °C, TC = 100 °C	515	W
	Tj	Operating Junction Temperature *(2)	-	-40 ~ 150	°C
Diode Inverter	VRRM	Repetitive Peak Reverse Voltage	-	1200	V
	IF	DC Forward Current	@ Tj = 150 °C,TC = 100 °C	100	A
	IFRM	Repetitive Peak Forward Current	@ tP = 1 ms	200	A
	I²t		@ Tj = 125 °C, t = 10ms,V_R=0V	600	A²S
	Tj	Operating Junction Temperature *(1)	-	-40 ~ 150	°C
IGBT Brake	VCES	Collector-Emitter Breakdown Voltage	-	1200	V
	VGES	Gate-Emitter Peak Voltage	-	± 20	V
	IC	DC Collector Current	@ Tj = 150 °C, TC = 100 °C	75	A
	Icpulse	Repetitive Peak Collector Current	@ tP = 1 ms	90	A
	PD	Maximum Power Dissipation	@ Tj = 150 °C, TC = 25 °C	280	W
	Tj	Operating Junction Temperature *(2)	-	-40 ~ 150	°C
Diode Brake	VRRM	Repetitive Peak Reverse Voltage	-	1200	V
	IF	DC Forward Current	@ Tj = 150 °C, TC = 100 °C	75	A
	IFRM	Repetitive Peak Forward Current	@ tP = 1 ms	150	A
	I²t		@ Tj = 125 °C, t = 10ms,V_R=0V	300	A²S
	Tj	Operating Junction Temperature *(1)	-	-40 ~ 150	°C
Module	Tstg	Storage Temperature	-	-40~125	°C
	Viso	Isolation Voltage	@ AC 1minute	2500	V
	W	Weight	-	310	g

■Electrical Characteristics of IGBT and Diode T_j = 25°C unless otherwise noted

◘ Diode Rectifier Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=75A , T_J =25℃	-	1.95	-	V
		I_F=75A , T_J =150℃	-	1.80		V
I_R	Reverse Leakage Current	V_R=1900V, T_J=25℃	-	-	-	uA
		V_R=1900V, T_J=150℃	-	-	5.0	uA

◘ IGBT-Inverter Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BVCES	C-E Breakdown Voltage	VGE = 0 V, IC = 250 µA	1200	-		
ICES	C-E Cut-Off Current	VCE = VCES, VGE = 0 V	-	-	1.0	mA
IGES	G-E Leakage Current	VGE = VGES, VCE = 0 V	-	-	± 400	nA
VGE(th)	G-E Threshold Voltage	VGE = VCE, IC = 3.8mA	5.0	-	7.0	V
VCE(sat)	Collector to Emitter Saturation Voltage	IC = 100 A, VGE = 15 V, Tj = 25 °C	-	1.65	1.95	V
		IC = 100 A, VGE = 15 V, Tj = 150 °C	-	1.85	-	V
ISC	Short Current	VGE ≤15 V, VCC = 600 V VCE ≤ VCES, Tj = 125, TP ≤ 10us	-	300	-	A
Cies	Input Capacitance	VCE = 25 V, VGE = 0 V f = 1 MHz, Tj = 25 °C	-	8.30	-	nF
Coes	Output Capacitance		-	1.70	-	nF
Cres	Reverse Transfer Capacitance		-	0.29	-	nF
td(on)	Turn-On Delay Time	Tj = 125 °C, RG = 1.5 Ω L = 100 nH, VDC = 600 V VGE = 15 V ~ -15 V IC = 100 A	-	125	-	ns
tr	Rise Time		-	30	-	ns
td(off)	Turn-Off Delay Time		-	300	-	ns
tf	Fall Time		-	165	-	ns
Eon	Turn-On Switching Loss		-	2.40	-	mJ
Eoff	Turn-Off Switching Loss		-	7.50	-	mJ
Qg	Total Gate Charge	VGE = 15 V ~ -15 V	-	-	-	nC
Qge	Gate-Emitter Charge		-	-	-	nC
Qgc	Gate-Collector Charge		-	-	-	nC

◘ Diode-Inverter Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
VF	Diode Forward Voltage	IF = 100 A VGE = 0V	Tj = 25 °C	-	1.70	2.10	V
			Tj = 125 °C	-	-	-	
trr	Diode Reverse Recovery Time	IF= 100 A diF/dt = 200 A/µs VR = 600 V VGE = 15 V	Tj = 25 °C	-	105	-	ns
			Tj = 125 °C	-	-	-	
I_{RRM}	Diode Peak Reverse Recovery Current		Tj = 25 °C	-	46	-	A
			Tj = 125 °C	-	-	-	
Qrr	Diode Reverse Recovery Charge		Tj = 25 °C	-	4.05	-	µC
			Tj = 125 °C	-	-	-	
Err	Diode Reverse Recovery Energy		Tj = 25 °C	-	4.50	-	mJ
			Tj = 125 °C	-	-	-	

■Electrical Characteristics of IGBT and Diode Tj = 25°C unless otherwise noted

◘ IGBT-Brake Chopper Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BVCES	C-E Breakdown Voltage	VGE = 0 V, IC = 250 μA	1200	-		
ICES	C-E Cut-Off Current	VCE = VCES, VGE = 0 V	-	-	1.0	mA
IGES	G-E Leakage Current	VGE = VGES, VCE = 0 V	-	-	± 500	nA
VGE(th)	G-E Threshold Voltage	VGE = VCE, IC = 2.6mA	5.0	-	6.8	V
VCE(sat)	Collector to Emitter Saturation Voltage	IC = 75 A, VGE = 15 V, Tj = 25 °C	-	1.65	1.95	V
		IC = 75 A, VGE = 15 V, Tj = 125 °C	-	1.9	-	V
ISC	Short Current	VGE ≤15 V, VCC = 600 V VCE ≤ VCES, Tj = 125, TP ≤ 10us	-	60	-	A
Cies	Input Capacitance	VCE = 25 V, VGE = 0 V f = 1 MHz, Tj = 25 °C	-	6.000	-	nF
Coes	Output Capacitance		-	-	-	nF
Cres	Reverse Transfer Capacitance		-	0.210	-	nF
td(on)	Turn-On Delay Time	Tj = 25 °C, RG = 2.2 Ω L = 100 nH, VDC = 600 V VGE = 15 V ~ -15 V IC = 75 A	-	110	-	ns
tr	Rise Time		-	28	-	ns
td(off)	Turn-Off Delay Time		-	270	-	ns
tf	Fall Time		-	170	-	ns
Eon	Turn-On Switching Loss		-	2.30	-	mJ
Eoff	Turn-Off Switching Loss		-	5.50	-	mJ
Qg	Total Gate Charge	VGE = 15 V ~ -15 V	-	120	-	nC
Qge	Gate-Emitter Charge		-	-	-	nC
Qgc	Gate-Collector Charge		-	-	-	nC

◘ Diode-Brake Chopper Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
VF	Diode Forward Voltage	IF = 75 A VGE = 0V	Tj = 25 °C	-	1.70	2.10	V
			Tj = 125 °C	-	1.70	-	
trr	Diode Reverse Recovery Time	IF= 75 A diF/dt = 2900A/μs VR = 600 V VGE = 15 V	Tj = 25 °C	-	95	-	ns
			Tj = 125 °C	-	-	-	
I_{RRM}	Diode Peak Reverse Recovery Current		Tj = 25 °C	-	15	-	A
			Tj = 125 °C	-	-	-	
Qrr	Diode Reverse Recovery Charge		Tj = 25 °C	-	1.70	-	μC
			Tj = 125 °C	-	-	-	
Err	Diode Reverse Recovery Energy		Tj = 25 °C	-	3.20	-	mJ
			Tj = 125 °C	-	-	-	

NTC Thermistor Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
R25	Rated resistance	TC =25°C	-	5.00		kΩ
ΔR/R	Deviation of R100	TC=10°C, R100=493 Ω	-5	-	5	%
P25	Power Dissipation	TC=25°C	-	-	20.0	mW
$B_{25/50}$	B-Value	$R_2=R_{25}\exp[B_{25/50}(1/T2-1/(298.15K))]$	-	3375	-	K
$B_{25/80}$		$R_2=R_{25}\exp[B_{25/80}(1/T2-1/(298.15K))]$	-	3411	-	K
$B_{25/100}$		$R_2=R_{25}\exp[B_{25/100}(1/T2-1/(298.15K))]$	-	3433	-	K

Thermal Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Rth(J-C)	Thermal Resistance (J-C)	Junction-to-Case	-	-	4.80	K/W
Rth(C-H)	Thermal Resistance (C-H)	Case-to-Heatsink	-	0.045	-	°C/W

Figure1. Output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$ V_{GE} = 15 V

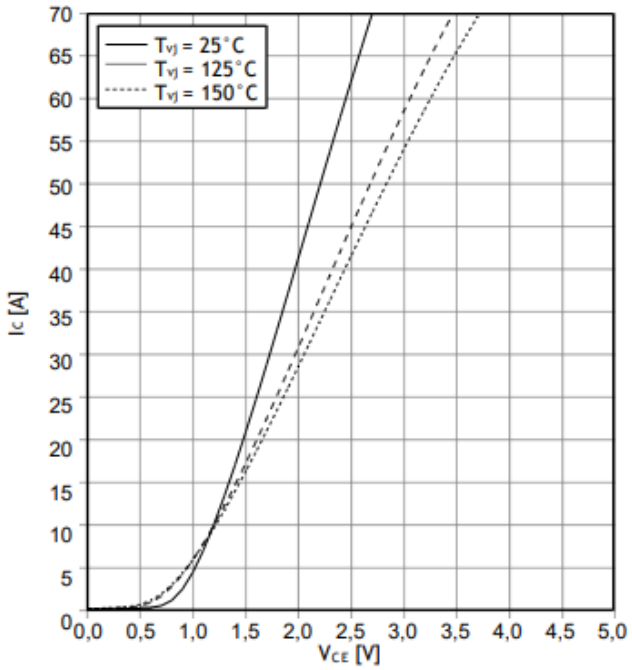


Figure2. Output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$ T_{vj} = 150°C

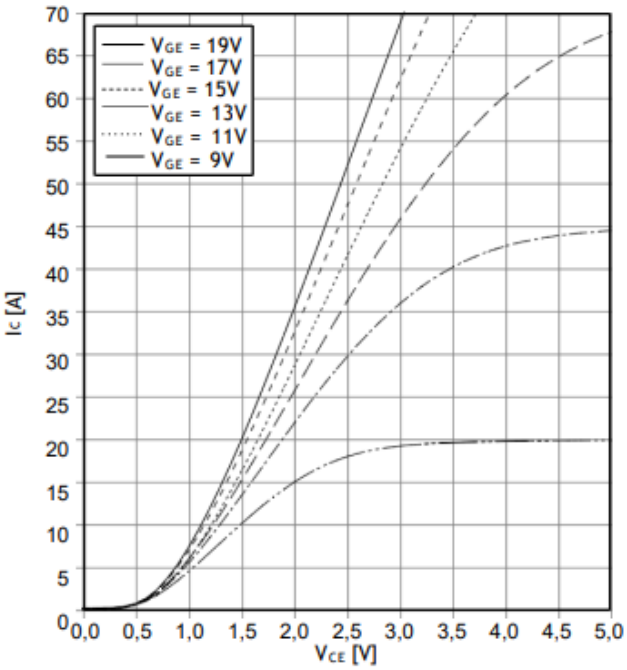


Figure3. Transfer characteristic IGBT,Inverter (typical)
$I_C = f(V_{GE})$ V_{CE} = 20 V

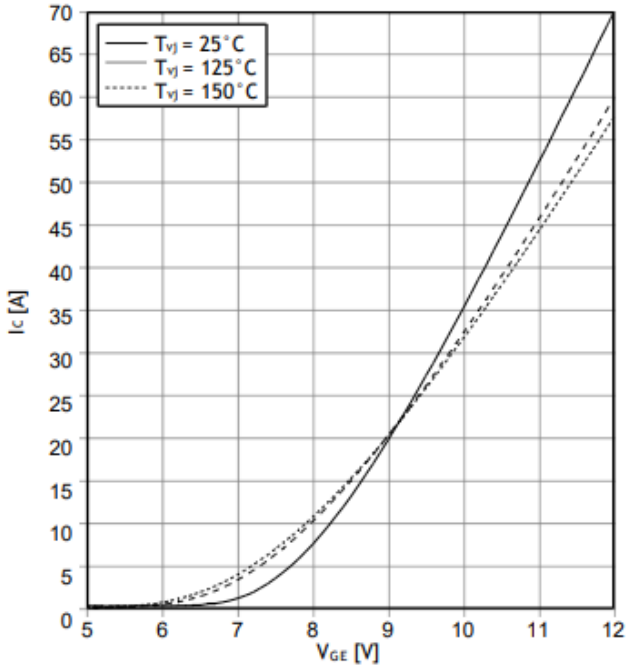


Figure4. Switching losses IGBT,Inverter (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 1.5 Ω, R_{Goff} = 1.5 Ω, V_{CE} = 600 V

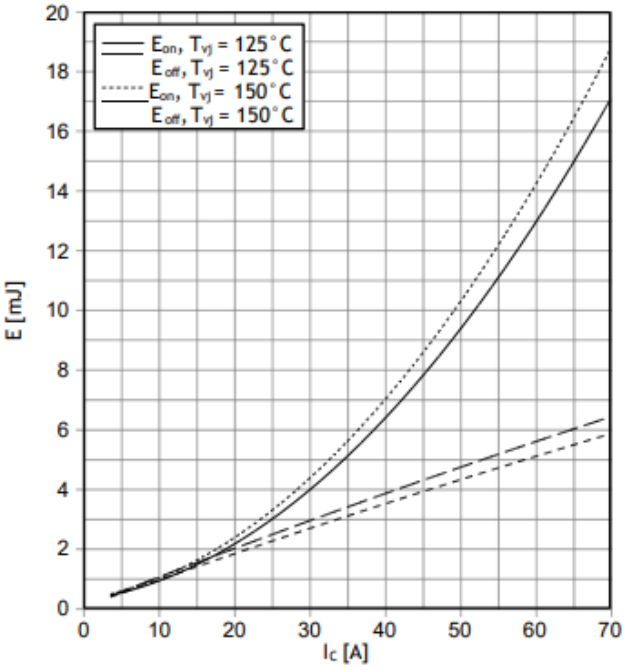


Figure5. Switching losses IGBT,Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$V_{GE} = \pm 15$ V, $I_C = 40$ A, $V_{CE} = 600$ V

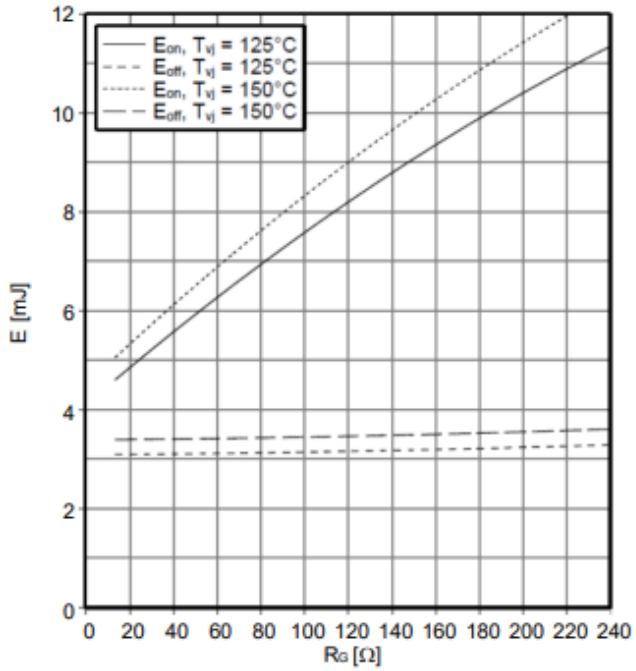


Figure6. Transient thermal impedance IGBT,Inverter
$Z_{thJC} = f(t)$

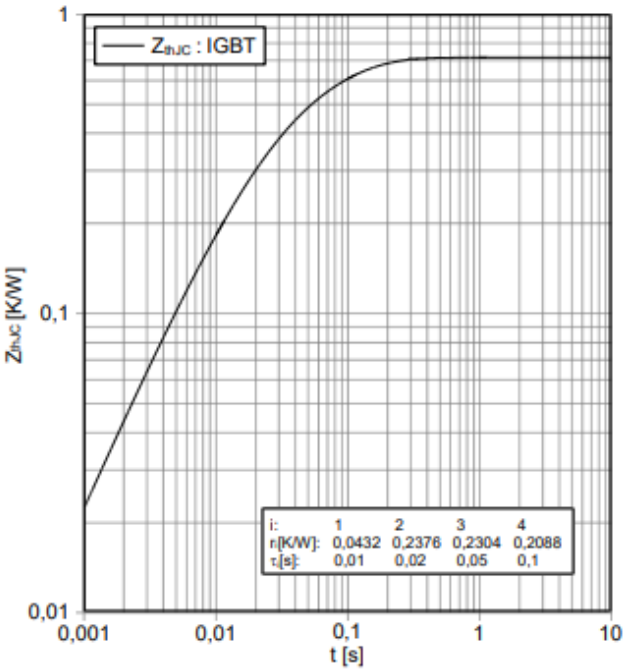


Figure7. Reverse bias safe operating area IGBT, Inverter (RBSOA)
$I_C = f(V_{CE})$
$V_{GE} = \pm 15$ V, $R_{Goff} = 1.5\ \Omega$, $T_{vj} = 150°C$

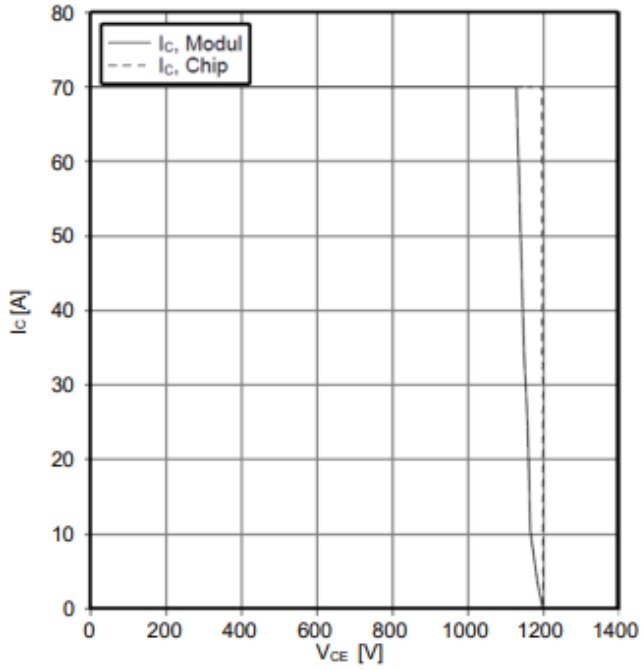


Figure8. Forward characteristic of Diode, Inverter (typical)
$I_F = f(V_F)$

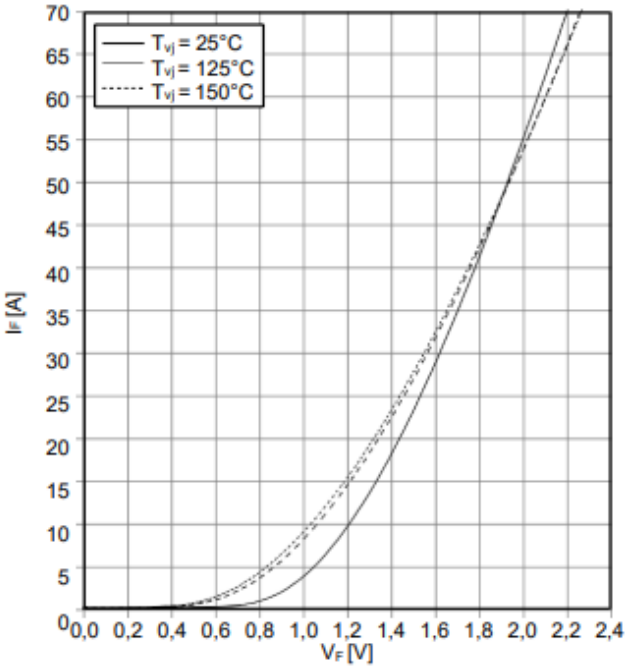


Figure9. Switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 1.5\ \Omega$, $V_{CE} = 600$ V

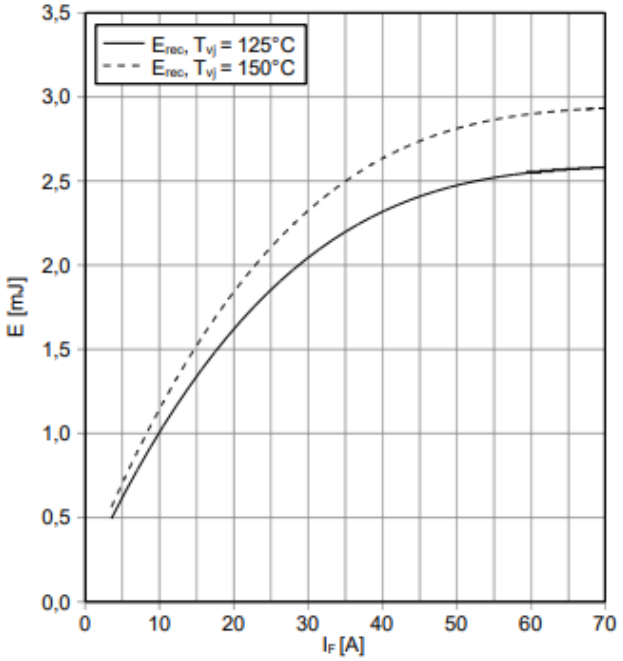


Figure10. Switching losses Diode, Inverter (typical)
$E_{rec} = f(R_G)$
$I_F = 50$ A, $V_{CE} = 600$ V

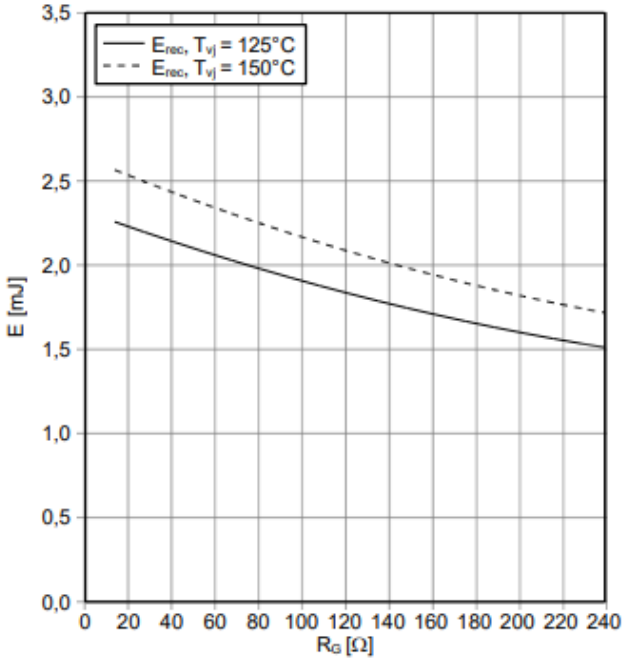


Figure11. Transient thermal impedance Diode, Inverter
$Z_{thJC} = f(t)$

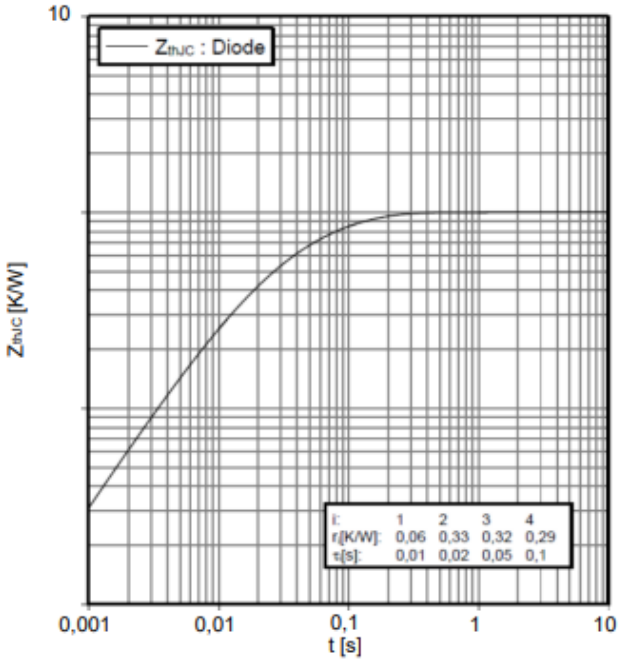


Figure12. Forward characteristic of Diode, Rectifier (typical)
$I_F = f(V_F)$

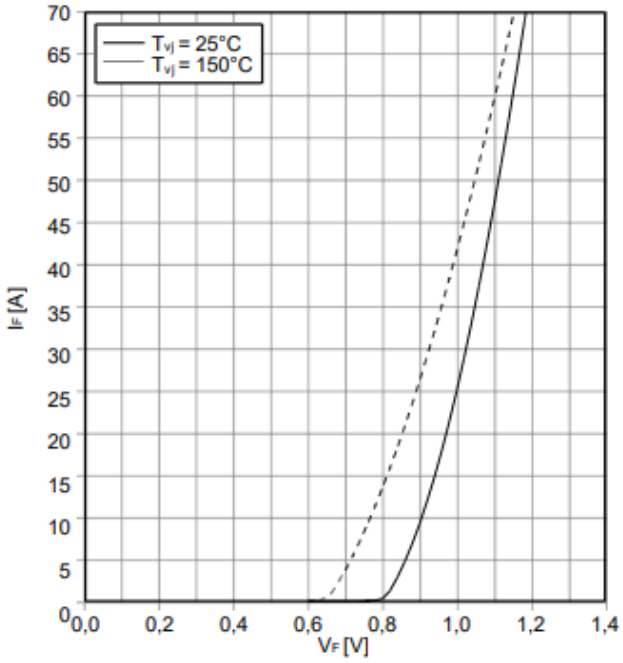


Figure13. Output characteristic IGBT, Brake-Chopper (typical)
$I_C = f(V_{CE})$ $V_{GE} = 15$ V

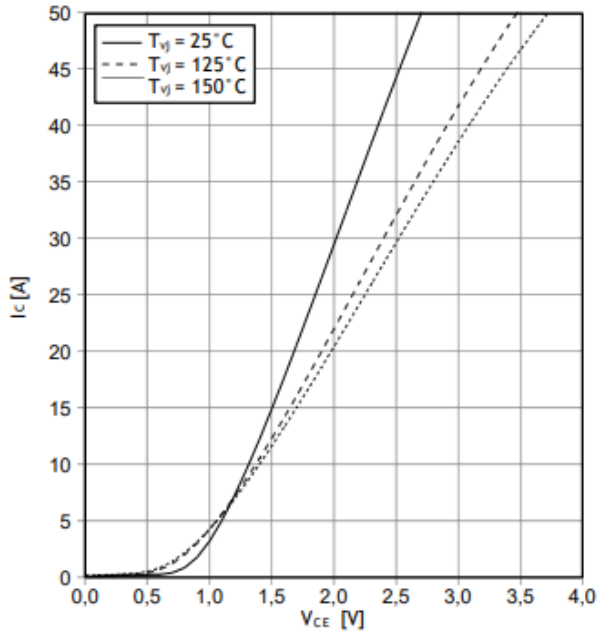


Figure14. Forward characteristic of Diode, Brake-Chopper (typical)
$I_F = f(V_F)$

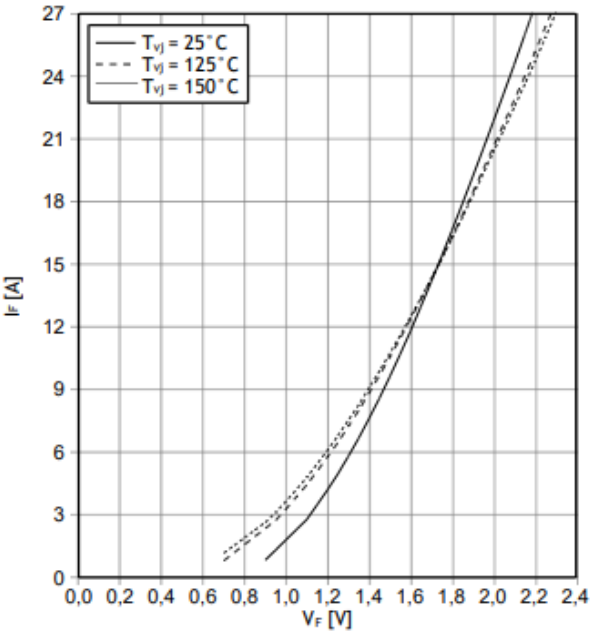
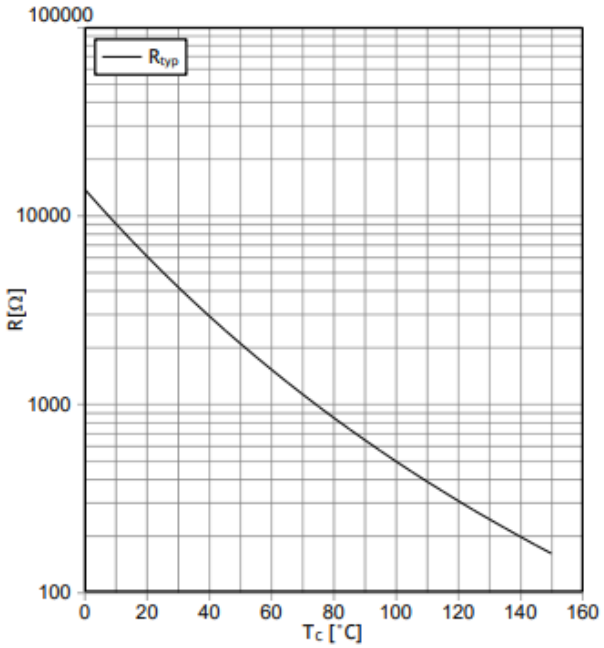
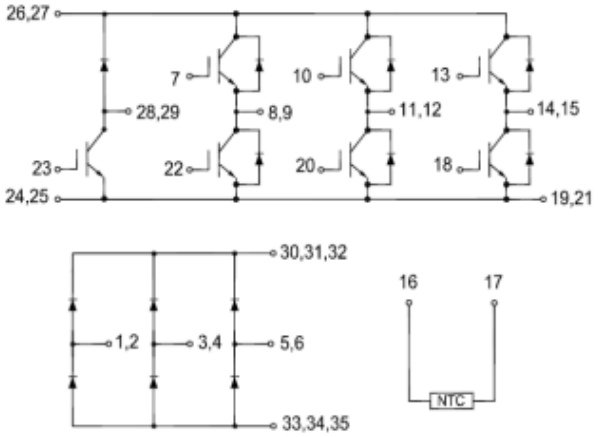


Figure15. NTC-Thermistor-temperature characteristic (typical)
$R = f(T)$



Internal Circuit:



Package Outline (Unit: mm):