

Preliminary

EasyPIM™ module with TRENCHSTOP™ IGBT7 and Emitter Controlled 7 diode and PressFIT / NTC

Features

- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_{C\text{nom}} = 25\text{ A} / I_{CRM} = 50\text{ A}$
 - TRENCHSTOP™ IGBT7
 - Overload operation up to 175°C
 - Low V_{CESat}
- Mechanical features
 - High power density
 - PressFIT contact technology
 - 2.5 kV AC 1 min insulation
 - Al_2O_3 substrate with low thermal resistance
 - Compact design



Potential applications

- Auxiliary inverters
- Air conditioning
- Motor drives

Product validation

- Qualified for industrial applications according to the relevant tests of IEC 60747, 60749 and 60068

Description

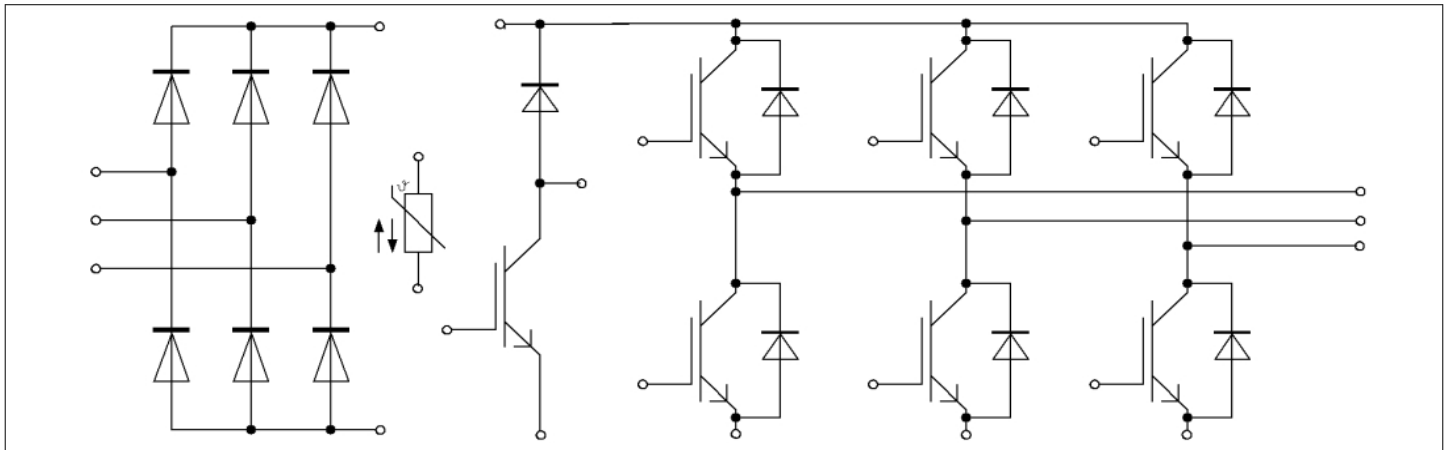


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1 Package

Table 1 Insulation Coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50$ Hz, $t = 1$ min	2.5	kV
Internal Isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{Creep}	terminal to heatsink	11.5	mm
Creepage distance	d_{Creep}	terminal to terminal	6.3	mm
Clearance	d_{Clear}	terminal to heatsink	10.0	mm
Clearance	d_{Clear}	terminal to terminal	5.0	mm
Comperative tracking index	CTI		> 200	
RTI Elec.	RTI	housing	140	°C

Table 2 Characteristic Values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray inductance module	L_{SCE}			30		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_H = 25^\circ C$, per switch		6		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25^\circ C$, per switch		8		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting force per clamp	F		20		50	N
Weight	G			24		g

Note: The current under continuous operation is limited to 25A rms per connector pin.

2 IGBT, Inverter

Table 3 Maximum Rated Values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	V_{CES}	$T_{vj} = 25^\circ C$	1200	V
Continous DC collector current	I_{CDC}	$T_{vj\ max} = 175^\circ C$ $T_H = 60^\circ C$	25	A
Repetitive peak collector current	I_{CRM}	$t_p = 1$ ms	50	A
Gate-emitter peak voltage	V_{GES}		±20	V

Table 4 Characteristic Values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Collector-emitter saturation voltage	$V_{CE\ sat}$	$I_C = 25\ A,$ $V_{GE} = 15\ V$		$T_{vj} = 25\ ^\circ C$	1.60	TBD	V
				$T_{vj} = 125\ ^\circ C$	1.74		
				$T_{vj} = 175\ ^\circ C$	1.82		
Gate threshold voltage	V_{GEth}	$I_C = 0.525\ mA,$ $V_{CE} = V_{GE},$ $T_{vj} = 25\ ^\circ C$	5.15	5.80	6.45	V	
Gate charge	Q_G	$V_{GE} = \pm 15\ V,$ $V_{CE} = 600\ V$		0.395		μC	
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$		0		Ω	
Input capacitance	C_{ies}	$f = 100\ kHz,$ $T_{vj} = 25\ ^\circ C,$ $V_{CE} = 25\ V,$ $V_{GE} = 0\ V$		4.77		nF	
Reverse transfer capacitance	C_{res}	$f = 100\ kHz,$ $T_{vj} = 25\ ^\circ C,$ $V_{CE} = 25\ V,$ $V_{GE} = 0\ V$		0.017		nF	
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\ V,$ $V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$		0.0056	mA	
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\ V,$ $V_{GE} = 20\ V,$ $T_{vj} = 25\ ^\circ C$			100	nA	
Turn-on delay time (inductive load)	t_{don}	$I_C = 25\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Gon} = 6.2\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.037		μs
				$T_{vj} = 125\ ^\circ C$	0.039		
				$T_{vj} = 175\ ^\circ C$	0.040		
Rise time (inductive load)	t_r	$I_C = 25\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Gon} = 6.2\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.020		μs
				$T_{vj} = 125\ ^\circ C$	0.024		
				$T_{vj} = 175\ ^\circ C$	0.025		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 25\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Goff} = 6.2\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.186		μs
				$T_{vj} = 125\ ^\circ C$	0.291		
				$T_{vj} = 175\ ^\circ C$	0.334		

Table 4 Characteristic Values (continued)

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Fall time (inductive load)	t_f	$I_C = 25\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 6.2\ \Omega$	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		0.173		μs
					0.220		
					0.285		
Turn-on energy loss per pulse	E_{on}	$I_C = 25\text{ A}$, $V_{CE} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 6.2\ \Omega$, $di/dt = 950\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		1.55		mJ
					2.1		
					2.45		
Turn-off energy loss per pulse	E_{off}	$I_C = 25\text{ A}$, $V_{CE} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 6.2\ \Omega$, $dv/dt = 2900\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		1.58		mJ
					2.45		
					3.05		
SC data	I_{SC}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 800\text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} * di/dt$	$t_p \leq 8\ \mu\text{s}$, $T_{vj} = 150\text{ }^\circ\text{C}$ $t_p \leq 7\ \mu\text{s}$, $T_{vj} = 175\text{ }^\circ\text{C}$		80		A
					75		
Thermal resistance, junction to heatsink	R_{thJH}	per IGBT		1.55		K/W	
Temperature under switching conditions	$T_{vj\text{op}}$			-40	175	$^\circ\text{C}$	

Note: $T_{vj\text{op}} > 150\text{ }^\circ\text{C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

3 Diode, Inverter

Table 5 Maximum Rated Values

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = 25\text{ }^\circ\text{C}$	1200	V
Continuous DC forward current	I_F		25	A

Table 5 Maximum Rated Values (continued)

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$	50	A	
I^2t - value	I^2t	$V_R = 0 \text{ V}$, $t_P = 10 \text{ ms}$	$T_{vj} = 125 \text{ °C}$	72.5	A^2s
			$T_{vj} = 175 \text{ °C}$	63	

Table 6 Characteristic Values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	V_F	$I_F = 25 \text{ A}$, $V_{GE} = 0 \text{ V}$		$T_{vj} = 25 \text{ °C}$	1.83	TBD	V
				$T_{vj} = 125 \text{ °C}$	1.70		
				$T_{vj} = 175 \text{ °C}$	1.63		
Peak reverse recovery current	I_{RM}	$I_F = 25 \text{ A}$, $V_R = 600 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 950 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)		$T_{vj} = 25 \text{ °C}$	24.2		A
				$T_{vj} = 125 \text{ °C}$	32.4		
				$T_{vj} = 175 \text{ °C}$	37.6		
Recovered charge	Q_r	$I_F = 25 \text{ A}$, $V_R = 600 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 950 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)		$T_{vj} = 25 \text{ °C}$	2.25		μC
				$T_{vj} = 125 \text{ °C}$	3.82		
				$T_{vj} = 175 \text{ °C}$	4.95		
Reverse recovery energy	E_{rec}	$I_F = 25 \text{ A}$, $V_R = 600 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 950 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)		$T_{vj} = 25 \text{ °C}$	0.65		mJ
				$T_{vj} = 125 \text{ °C}$	1.41		
				$T_{vj} = 175 \text{ °C}$	1.87		
Thermal resistance, junction to heatsink	R_{thJH}	per diode		2.04		K/W	
Temperature under switching conditions	$T_{vj\text{op}}$		-40		175	$^{\circ}\text{C}$	

Note: $T_{vj\text{op}} > 150 \text{ °C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

4 Diode, Rectifier

Table 7 Maximum Rated Values

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = 25\text{ °C}$	1600	V	
Maximum RMS forward current per chip	I_{FRMSM}	$T_H = 100\text{ °C}$	25	A	
Maximum RMS current at rectifier output	I_{RMSM}	$T_H = 100\text{ °C}$	25	A	
Surge forward current	I_{FSM}	$t_p = 10\text{ ms}$	$T_{vj} = 25\text{ °C}$	300	A
			$T_{vj} = 150\text{ °C}$	245	
I^2t - value	I^2t	$t_p = 10\text{ ms}$	$T_{vj} = 25\text{ °C}$	450	A ² s
			$T_{vj} = 150\text{ °C}$	300	

Table 8 Characteristic Values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$T_{vj} = 150\text{ °C}$, $I_F = 10\text{ A}$		0.80		V
Reverse current	I_r	$T_{vj} = 150\text{ °C}$, $V_R = 1600\text{ V}$		1		mA
Thermal resistance, junction to heatsink	R_{thJH}	per diode		1.54		K/W
Temperature under switching conditions	$T_{vj, op}$		-40		150	°C

5 IGBT, Brake-Chopper

Table 9 Maximum Rated Values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	V_{CES}	$T_{vj} = 25\text{ °C}$	1200	V
Continuous DC collector current	I_{CDC}	$T_{vj\ max} = 175\text{ °C}$ $T_H = 60\text{ °C}$	25	A
Repetitive peak collector current	I_{CRM}	$t_p = 1\text{ ms}$	50	A
Gate-emitter peak voltage	V_{GES}		±20	V

Table 10 Characteristic Values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Collector-emitter saturation voltage	$V_{CE\ sat}$	$I_C = 25\ A,$ $V_{GE} = 15\ V$		$T_{vj} = 25\ ^\circ C$	1.60	TBD	V
				$T_{vj} = 125\ ^\circ C$	1.74		
				$T_{vj} = 175\ ^\circ C$	1.82		
Gate threshold voltage	V_{GEth}	$I_C = 0.525\ mA,$ $V_{CE} = V_{GE},$ $T_{vj} = 25\ ^\circ C$	5.15	5.80	6.45	V	
Gate charge	Q_G	$V_{GE} = \pm 15\ V,$ $V_{CE} = 600\ V$		0.395		μC	
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$		0		Ω	
Input capacitance	C_{ies}	$f = 100\ kHz,$ $T_{vj} = 25\ ^\circ C,$ $V_{CE} = 25\ V,$ $V_{GE} = 0\ V$		4.77		nF	
Reverse transfer capacitance	C_{res}	$f = 100\ kHz,$ $T_{vj} = 25\ ^\circ C,$ $V_{CE} = 25\ V,$ $V_{GE} = 0\ V$		0.017		nF	
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\ V,$ $V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$		0.0056	mA	
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\ V,$ $V_{GE} = 20\ V,$ $T_{vj} = 25\ ^\circ C$			100	nA	
Turn-on delay time (inductive load)	t_{don}	$I_C = 25\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Gon} = 10\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.058		μs
				$T_{vj} = 125\ ^\circ C$	0.060		
				$T_{vj} = 175\ ^\circ C$	0.061		
Rise time (inductive load)	t_r	$I_C = 25\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Gon} = 10\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.055		μs
				$T_{vj} = 125\ ^\circ C$	0.057		
				$T_{vj} = 175\ ^\circ C$	0.058		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 25\ A,$ $V_{CE} = 600\ V,$ $V_{GE} = \pm 15\ V,$ $R_{Goff} = 10\ \Omega$		$T_{vj} = 25\ ^\circ C$	0.205		μs
				$T_{vj} = 125\ ^\circ C$	0.310		
				$T_{vj} = 175\ ^\circ C$	0.353		

Table 10 Characteristic Values (continued)

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Fall time (inductive load)	t_f	$I_C = 25\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 10\ \Omega$	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		0.173		μs
					0.220		
					0.285		
Turn-on energy loss per pulse	E_{on}	$I_C = 25\text{ A}$, $V_{CE} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 10\ \Omega$, $di/dt = 320\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		2.15		mJ
					2.65		
					2.9		
Turn-off energy loss per pulse	E_{off}	$I_C = 25\text{ A}$, $V_{CE} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 10\ \Omega$, $dv/dt = 2900\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$ $T_{vj} = 125\text{ }^\circ\text{C}$ $T_{vj} = 175\text{ }^\circ\text{C}$		1.58		mJ
					2.45		
					3.05		
SC data	I_{SC}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 800\text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} * di/dt$	$t_p \leq 8\ \mu\text{s}$, $T_{vj} = 150\text{ }^\circ\text{C}$ $t_p \leq 7\ \mu\text{s}$, $T_{vj} = 175\text{ }^\circ\text{C}$		80		A
					75		
Thermal resistance, junction to heatsink	R_{thJH}	per IGBT		1.55		K/W	
Temperature under switching conditions	$T_{vj\text{op}}$			-40	175	$^\circ\text{C}$	

Note: $T_{vj\text{op}} > 150\text{ }^\circ\text{C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

6 Diode, Brake-Chopper

Table 11 Maximum Rated Values

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = 25\text{ }^\circ\text{C}$	1200	V
Continuous DC forward current	I_F		10	A

Table 11 Maximum Rated Values (continued)

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$	20	A	
I^2t - value	I^2t	$V_R = 0 \text{ V},$ $t_P = 10 \text{ ms}$	$T_{vj} = 125 \text{ °C}$	27.5	A^2s
			$T_{vj} = 175 \text{ °C}$	24	

Table 12 Characteristic Values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	V_F	$I_F = 10 \text{ A},$ $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$ $T_{vj} = 125 \text{ °C}$ $T_{vj} = 175 \text{ °C}$		1.72	TBD	V
					1.59		
					1.52		
Peak reverse recovery current	I_{RM}	$I_F = 10 \text{ A},$ $V_R = 600 \text{ V},$ $-di_F/dt = 300 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$ $T_{vj} = 125 \text{ °C}$ $T_{vj} = 175 \text{ °C}$		8.1		A
					10.1		
					11.7		
Recovered charge	Q_R	$I_F = 10 \text{ A},$ $V_R = 600 \text{ V},$ $-di_F/dt = 300 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$ $T_{vj} = 125 \text{ °C}$ $T_{vj} = 175 \text{ °C}$		0.74		μC
					1.37		
					1.84		
Reverse recovery energy	E_{rec}	$I_F = 10 \text{ A},$ $V_R = 600 \text{ V},$ $-di_F/dt = 300 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$ $T_{vj} = 125 \text{ °C}$ $T_{vj} = 175 \text{ °C}$		0.26		mJ
					0.52		
					0.72		
Thermal resistance, junction to heatsink	R_{thJH}	per diode		2.45		K/W	
Temperature under switching conditions	T_{vjop}		-40		175	$^{\circ}\text{C}$	

Note: $T_{vjop} > 150^{\circ}\text{C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

7 NTC-Thermistor

Table 13 Characteristic Values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25 \text{ °C}$		5		$k\Omega$

Table 13 **Characteristic Values (continued)**

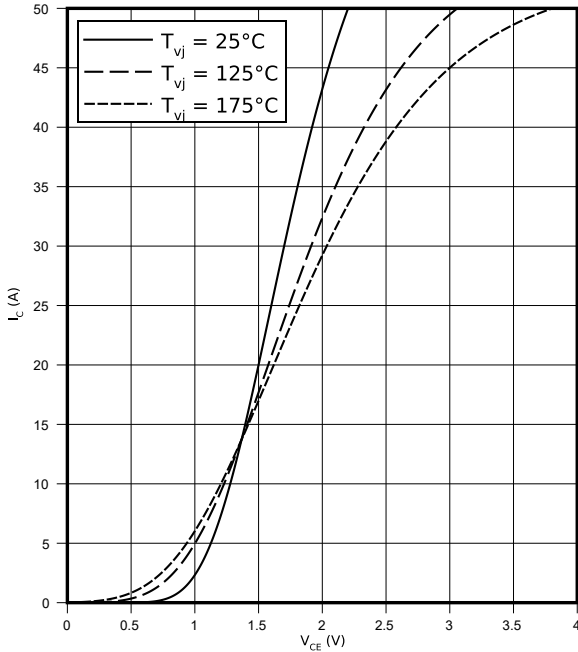
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100\text{ °C}$, $R_{100} = 493\ \Omega$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25\text{ °C}$			20	mW
B-value	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$		3375		K
B-value	$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$		3411		K
B-value	$B_{25/100}$	$R_2 = R_{25} \exp[B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$		3433		K

Note: *Specification according to the valid application note.*

8 Characteristics diagrams

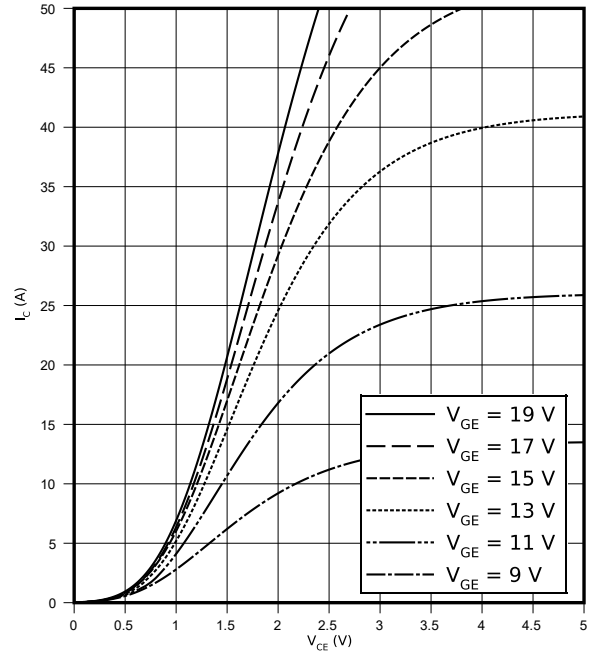
output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



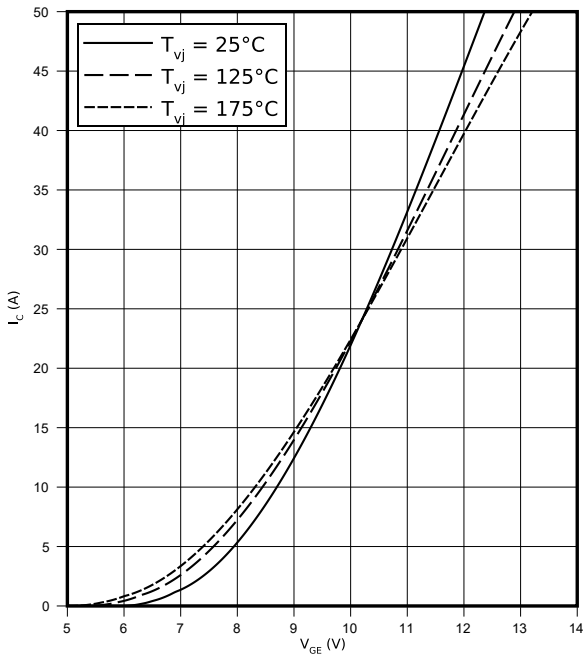
output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$
 $T_{vj} = 175\text{ °C}$



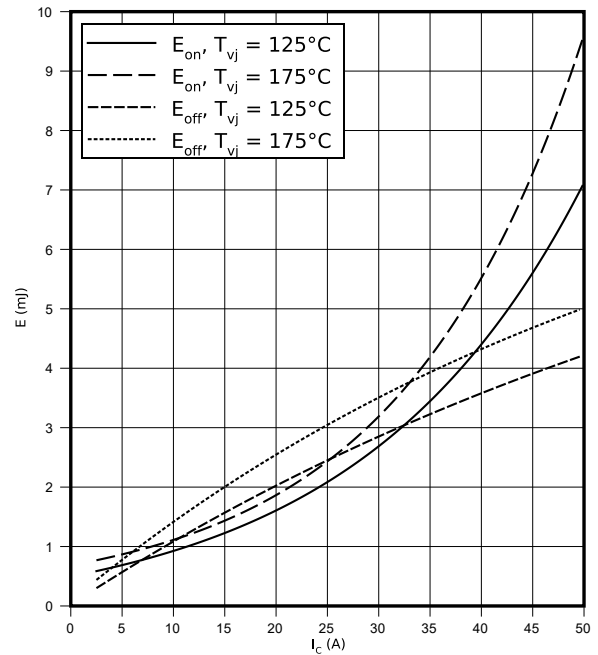
transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



switching losses (typical), IGBT, Inverter

$E = f(I_C)$
 $R_{Goff} = 6.2\ \Omega$, $R_{Gon} = 6.2\ \Omega$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$

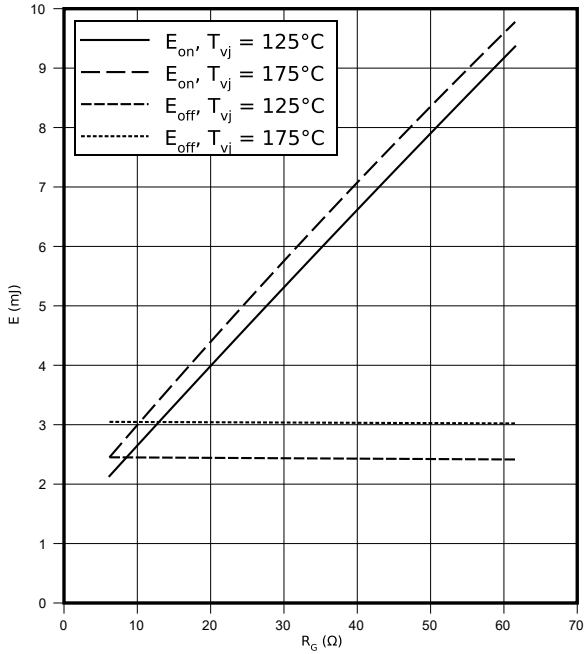


8 Characteristics diagrams

switching losses (typical), IGBT, Inverter

$E = f(R_G)$

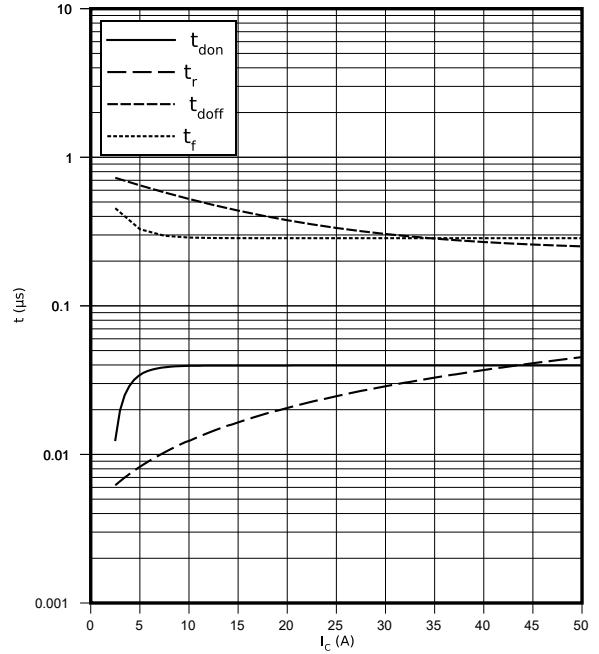
$I_C = 25 \text{ A}, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}$



switching times (typical), IGBT, Inverter

$t = f(I_C)$

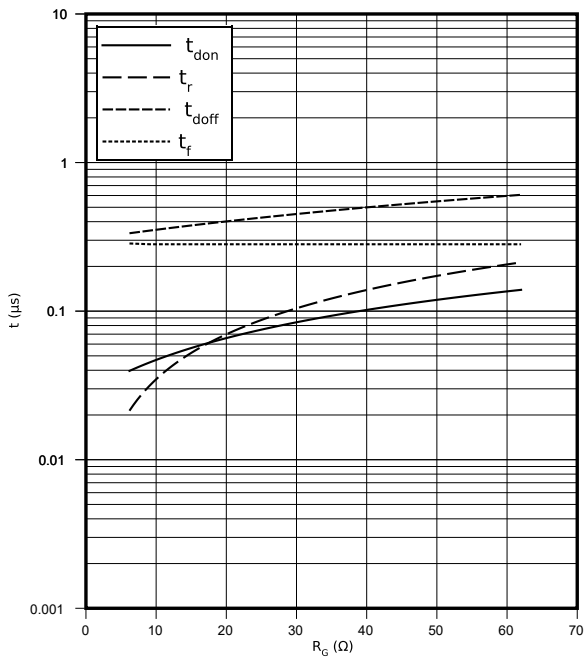
$R_{Goff} = 6.2 \Omega, R_{Gon} = 6.2 \Omega, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 175 \text{ °C}$



switching times (typical), IGBT, Inverter

$t = f(R_G)$

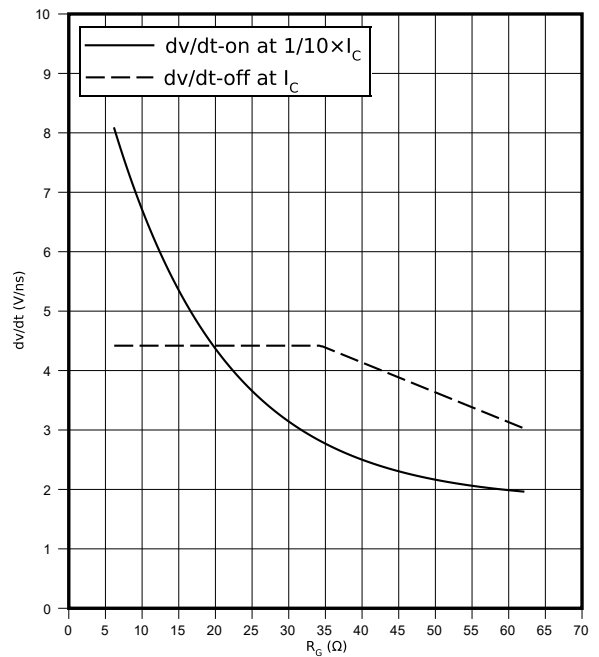
$I_C = 25 \text{ A}, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 175 \text{ °C}$



dv/dt (typical), IGBT, Inverter

$dv/dt = f(R_G)$

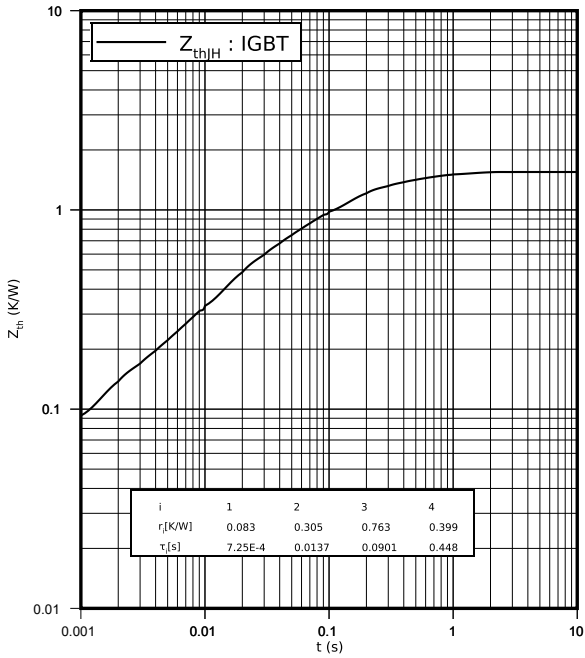
$I_C = 25 \text{ A}, V_{CE} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 25 \text{ °C}$



8 Characteristics diagrams

transient thermal impedance , IGBT, Inverter

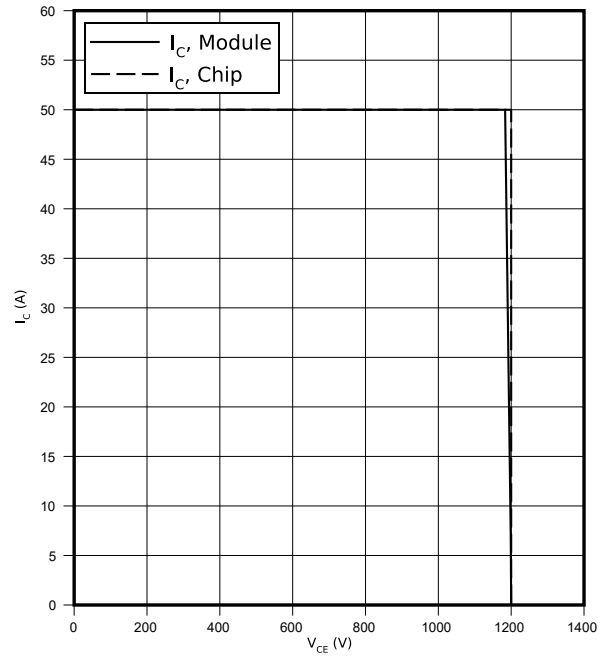
$Z_{th} = f(t)$



reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$

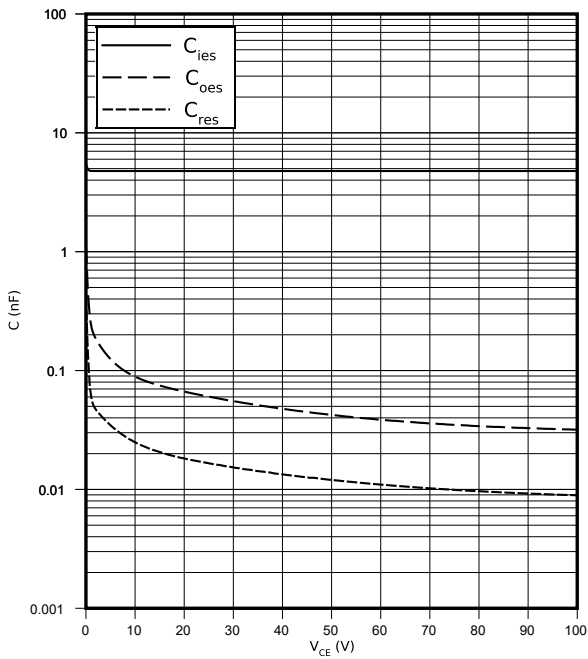
$R_{Goff} = 6.2 \Omega, V_{GE} = \pm 15 V, T_{vj} = 175 \text{ }^\circ\text{C}$



capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

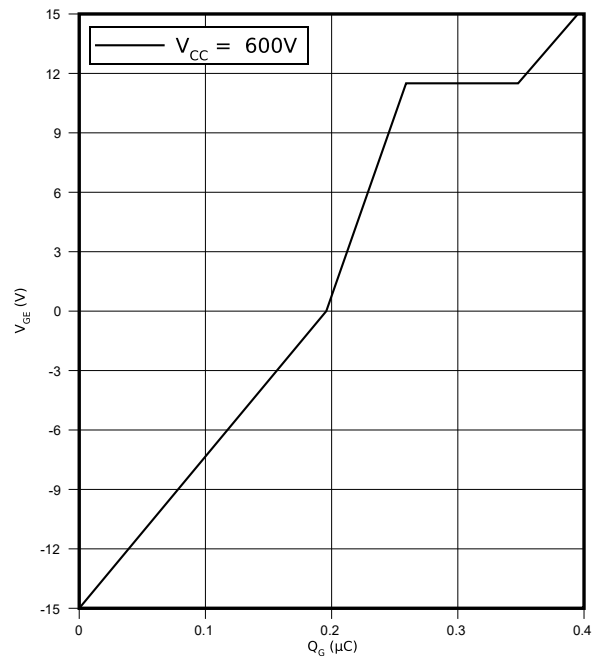
$V_{GE} = 0 V, f = 100 \text{ kHz}, T_{vj} = 25 \text{ }^\circ\text{C}$



gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

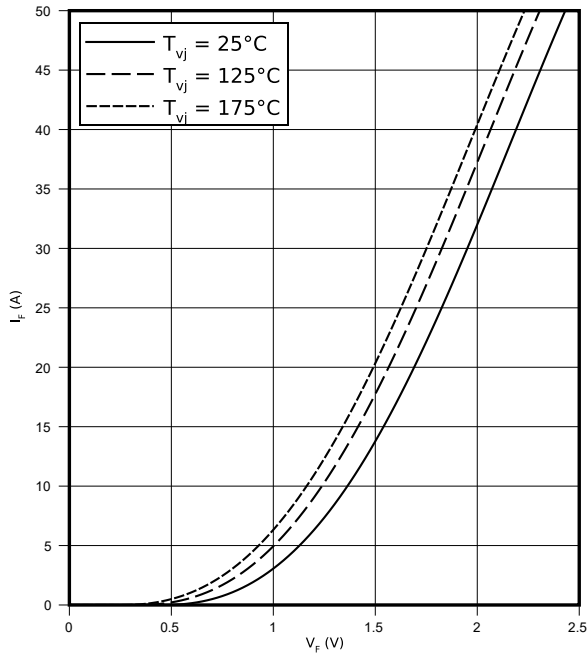
$I_C = 25 A, T_{vj} = 25 \text{ }^\circ\text{C}$



8 Characteristics diagrams

forward characteristic (typical), Diode, Inverter

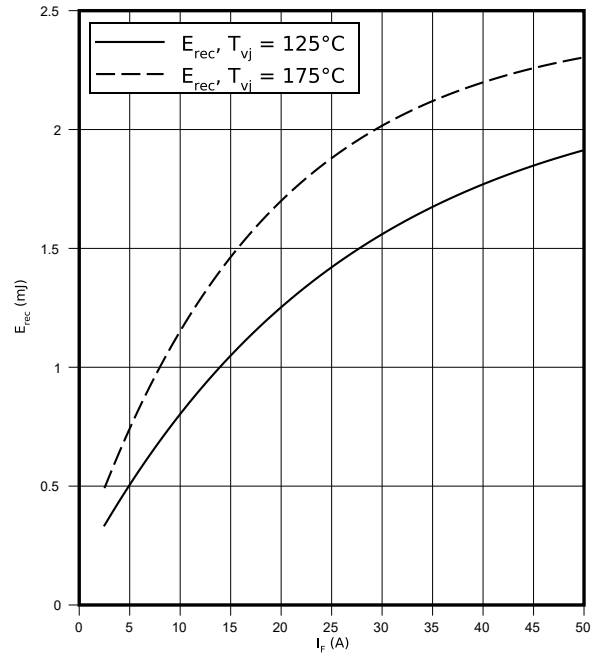
$I_F = f(V_F)$



switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

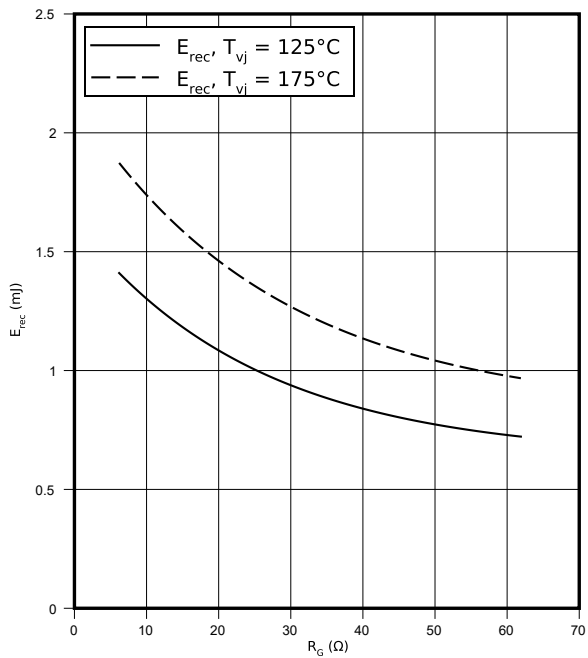
$R_{Gon} = 6.2 \Omega, V_{CE} = 600 V$



switching losses (typical), Diode, Inverter

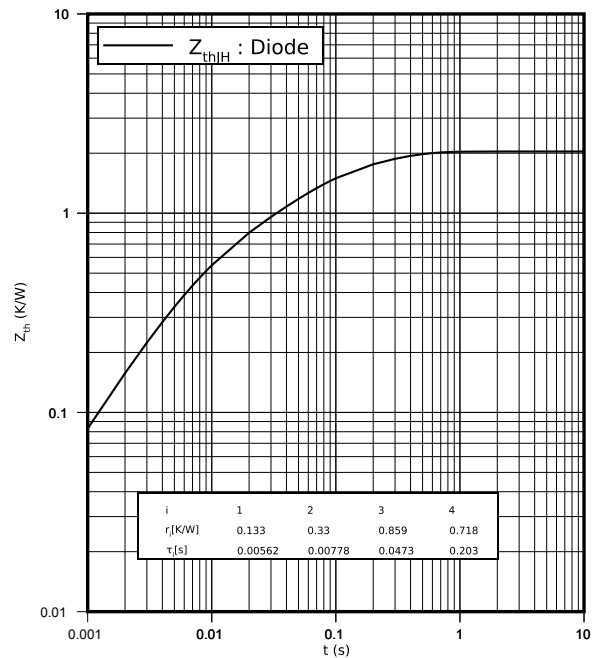
$E_{rec} = f(R_G)$

$V_{CE} = 600 V, I_F = 25 A$



transient thermal impedance, Diode, Inverter

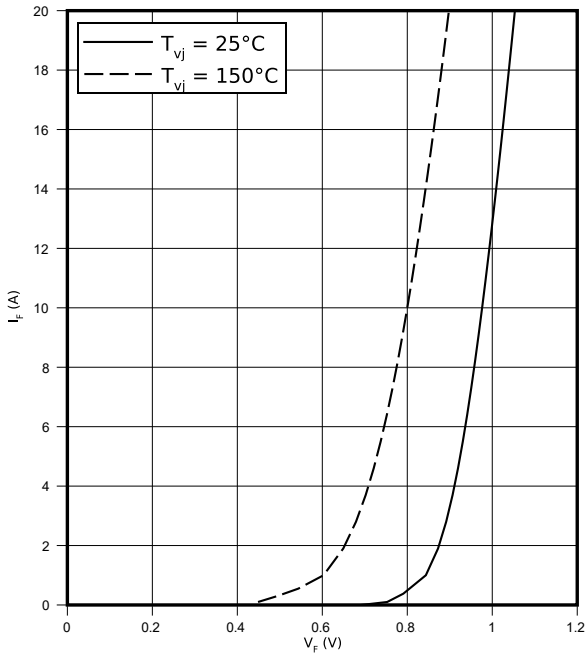
$Z_{th} = f(t)$



8 Characteristics diagrams

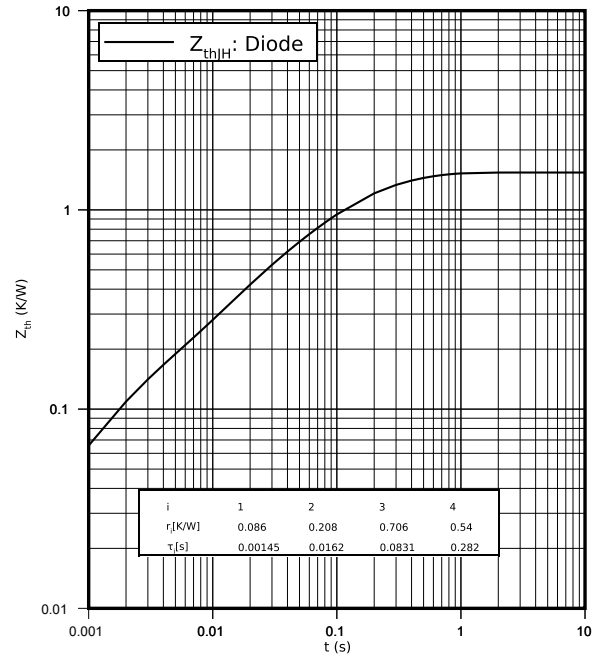
forward characteristic (typical), Diode, Rectifier

$I_F = f(V_F)$



transient thermal impedance, Diode, Rectifier

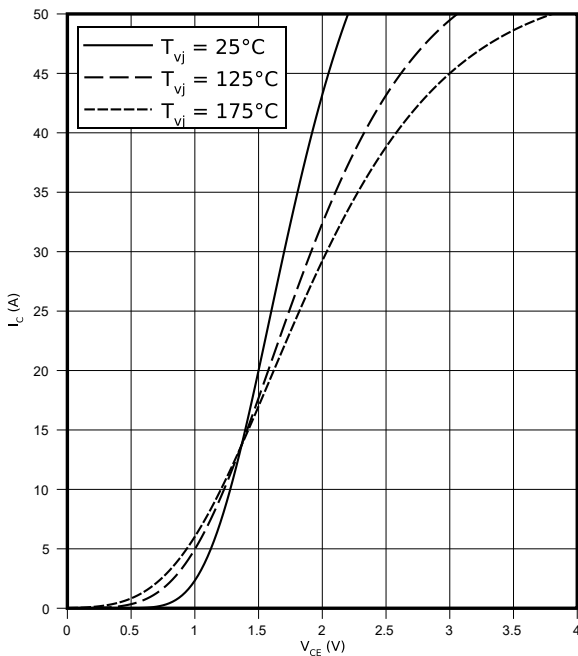
$Z_{th} = f(t)$



output characteristic (typical), IGBT, Brake-Chopper

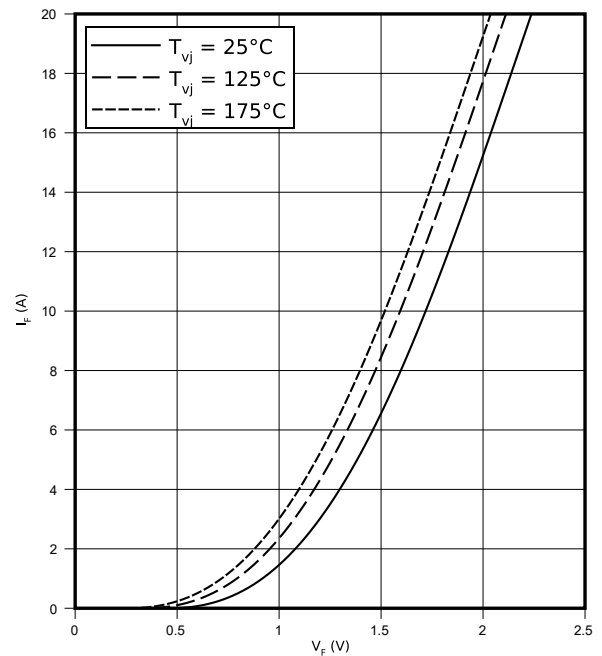
$I_C = f(V_{CE})$

$V_{GE} = 15 \text{ V}$



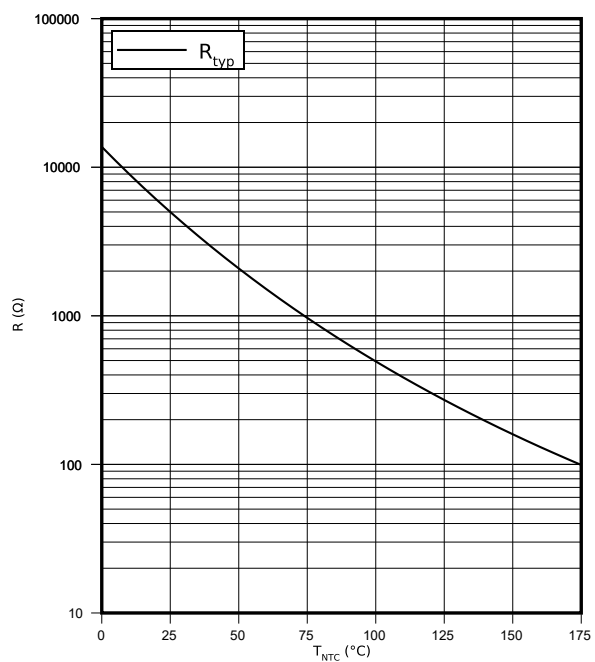
forward characteristic (typical), Diode, Brake-Chopper

$I_F = f(V_F)$



temperature characteristic (typical), NTC-Thermistor

$$R = f(T_{NTC})$$



9 Circuit diagram

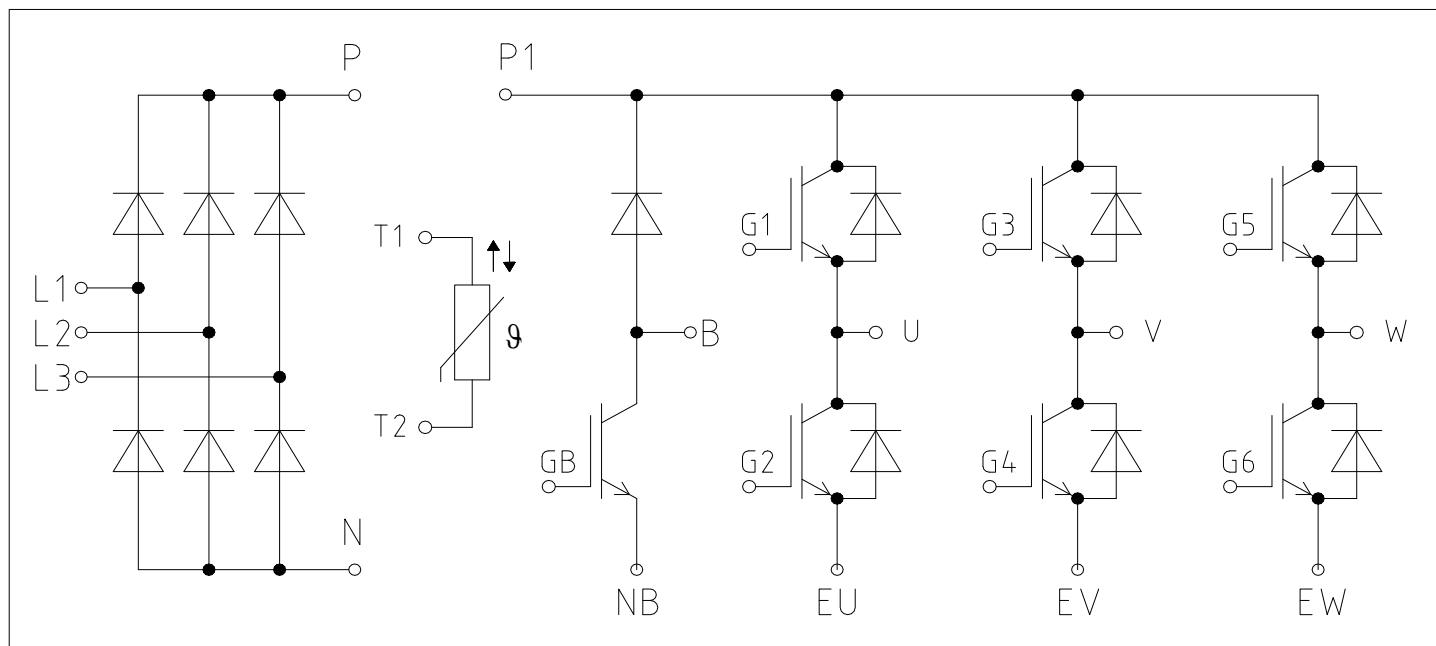


Figure 2

10 Package outlines

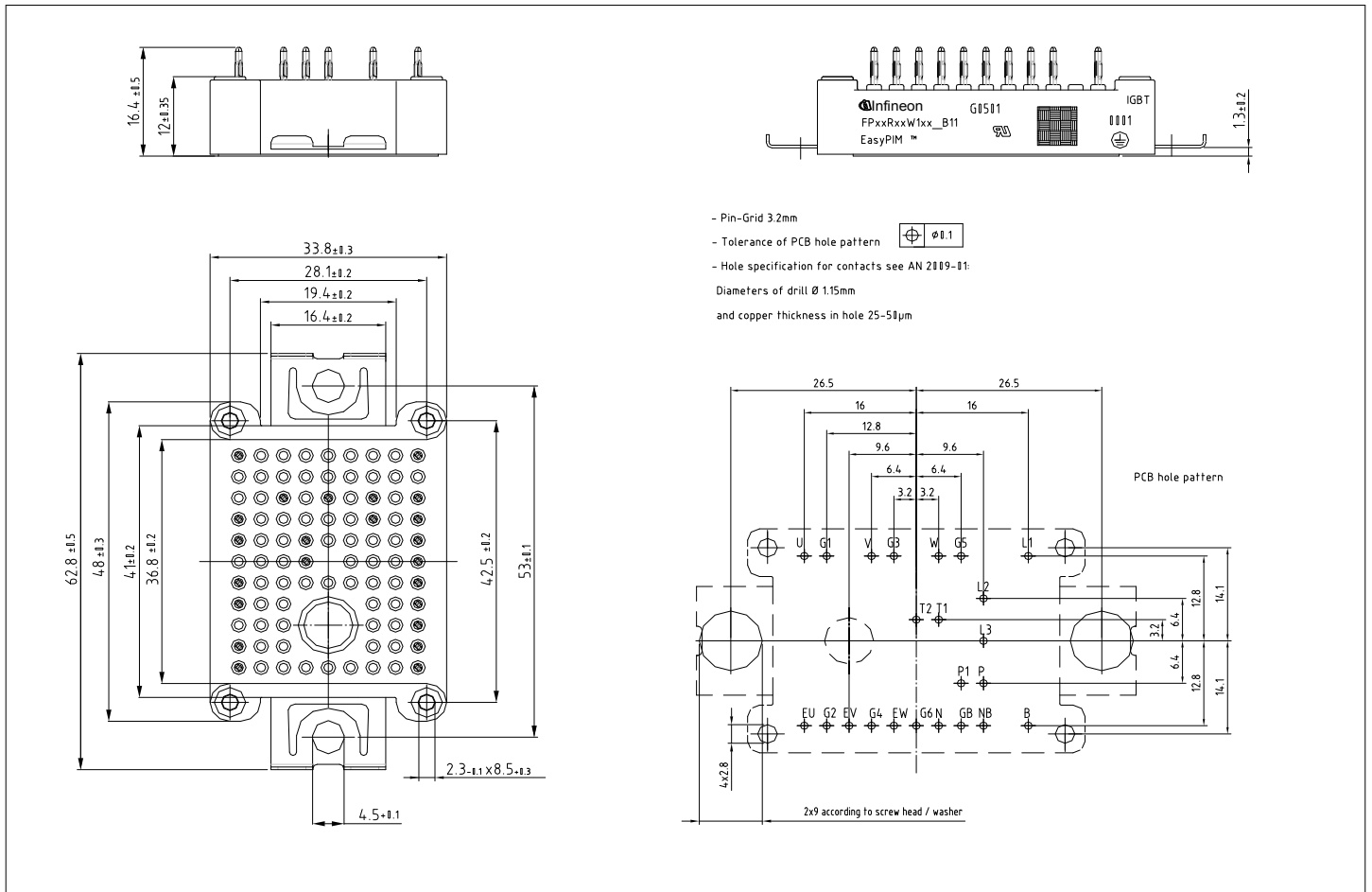


Figure 3

11 Module label code



Module label code			
Code format	Data Matrix	Barcode Code128	
Encoding	ASCII text	Code Set A	
Symbol size	16x16	23 digits	
Standard	IEC24720 and IEC16022	IEC8859-1	
Code content	<i>Content</i>	<i>Digit</i>	<i>Example</i>
	Module serial number	1 - 5	71549
	Module material number	6 - 11	142846
	Production order number	12 - 19	55054991
	Date code (production year)	20 - 21	15
	Date code (production week)	22 - 23	30
Example	 		
	71549142846550549911530		71549142846550549911530

Figure 4

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