

EconoPIM™2 module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode and PressFIT / NTC / TIM

Features

- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_{C\text{ nom}} = 50\text{ A} / I_{CRM} = 100\text{ A}$
 - TRENCHSTOP™ IGBT7
 - Low $V_{CE,sat}$
 - Overload operation up to 175°C
- Mechanical features
 - High power and thermal cycling capability
 - Integrated NTC temperature sensor
 - Copper base plate
 - Al_2O_3 substrate with low thermal resistance
 - PressFIT contact technology
 - Pre-applied thermal interface material



Potential applications

- Auxiliary inverters
- Motor drives
- Servo drives

Product validation

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

Description

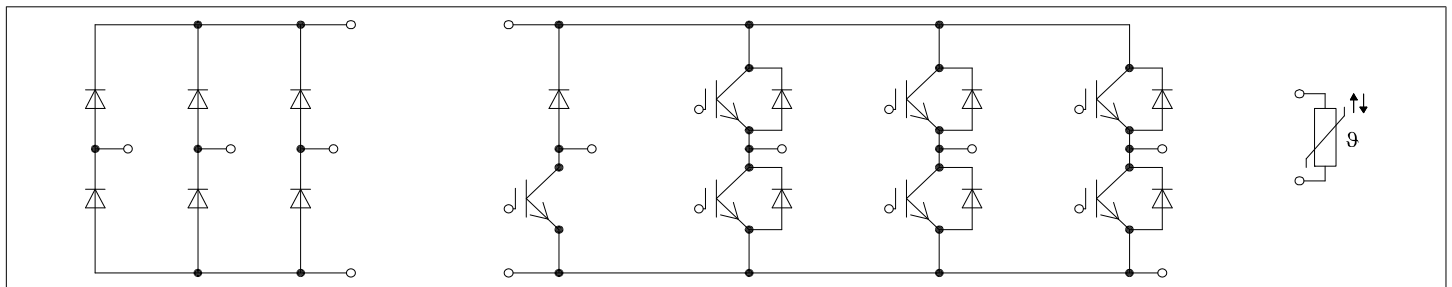


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	2.5	kV
Material of module baseplate			Cu	
Internal Isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{Creep}	terminal to heatsink	10.0	mm
Clearance	d_{Clear}	terminal to heatsink	7.5	mm
Comparative 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}			35		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_H = 25^\circ\text{C}$, per switch		5.5		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25^\circ\text{C}$, per switch		4.8		mΩ
Storage temperature	T_{stg}		-40		125	°C
Maximum baseplate operation temperature	T_{BPmax}				125	°C
Mounting torque for modul mounting	M	- Mounting according to valid application note	M5, Screw	3	6	Nm
Weight	G			180		g

Note: The current under continuous operation is limited to 50 A rms per connector pin.
Storage and shipment of modules with TIM => see AN2012-07

2 IGBT, Inverter

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	V_{CES}	$T_{vj} = 25^\circ\text{C}$	1200	V
Continous DC collector current	I_{CDC}	$T_{vj \max} = 175^\circ\text{C}$ $T_H = 95^\circ\text{C}$	50	A
Repetitive peak collector current	I_{CRM}	$t_P = 1 \text{ ms}$	100	A

Table 3 Maximum rated values (continued)

Parameter	Symbol	Note or test condition	Values	Unit
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	$V_{CE\ sat}$	$I_C = 50\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$	1.50	1.80	V
			$T_{vj} = 125\ ^\circ C$	1.64		
			$T_{vj} = 175\ ^\circ C$	1.72		
Gate threshold voltage	V_{GETh}	$I_C = 2\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$	5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CE} = 600\ V$		0.92		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$		0		Ω
Input capacitance	C_{ies}	$f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		11.1		nF
Reverse transfer capacitance	C_{res}	$f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		0.039		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$		0.01	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}	$I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 7.5\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.059		μs
			$T_{vj} = 125\ ^\circ C$	0.061		
			$T_{vj} = 175\ ^\circ C$	0.062		
Rise time (inductive load)	t_r	$I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 7.5\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.043		μs
			$T_{vj} = 125\ ^\circ C$	0.047		
			$T_{vj} = 175\ ^\circ C$	0.049		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 7.5\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.290		μs
			$T_{vj} = 125\ ^\circ C$	0.380		
			$T_{vj} = 175\ ^\circ C$	0.420		
Fall time (inductive load)	t_f	$I_C = 50\ A, V_{CE} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 7.5\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.110		μs
			$T_{vj} = 125\ ^\circ C$	0.200		
			$T_{vj} = 175\ ^\circ C$	0.270		
Turn-on energy loss per pulse	E_{on}	$I_C = 50\ A, V_{CE} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 7.5\ \Omega, di/dt = 900\ A/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$	5.07		mJ
			$T_{vj} = 125\ ^\circ C$	6.76		
			$T_{vj} = 175\ ^\circ C$	7.72		
Turn-off energy loss per pulse	E_{off}	$I_C = 50\ A, V_{CE} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 7.5\ \Omega, dv/dt = 2900\ V/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$	3.37		mJ
			$T_{vj} = 125\ ^\circ C$	5.31		
			$T_{vj} = 175\ ^\circ C$	6.58		

Table 4 Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
SC data	I_{SC}	$V_{GE} \leq 15 \text{ V}, V_{CC} = 800 \text{ V}, V_{CEmax}=V_{CES}-L_{sCE} \cdot di/dt$	$t_P \leq 8 \mu\text{s}, T_{vj} = 150 \text{ }^\circ\text{C}$	190		A
			$t_P \leq 7 \mu\text{s}, T_{vj} = 175 \text{ }^\circ\text{C}$	180		
Thermal resistance, junction to heatsink	R_{thJH}	per IGBT, Valid with IFX pre-applied Thermal Interface Material			0.777	K/W
Temperature under switching conditions	$T_{vj \text{ op}}$		-40		175	$^\circ\text{C}$

Note: $T_{vj \text{ op}} > 150^\circ\text{C}$ 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		50	A
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$	100	A
I^2t - value	I^2t	$V_R = 0 \text{ V}, t_P = 10 \text{ ms}$	$T_{vj} = 125 \text{ }^\circ\text{C}$	465
			$T_{vj} = 175 \text{ }^\circ\text{C}$	420

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 50 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	1.72	2.10	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1.59		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	1.52		
Peak reverse recovery current	I_{RM}	$I_F = 35 \text{ A}, V_R = 600 \text{ V}, V_{GE} = -15 \text{ V}, -di_F/dt = 900 \text{ A}/\mu\text{s} (T_{vj} = 175 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	31		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$	39		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	45		

Table 6 Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Recovered charge	Q_r	$I_F = 50 \text{ A}$, $V_R = 600 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 900 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	3.96		μC
			$T_{vj} = 125 \text{ }^\circ\text{C}$	7.37		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	9.89		
Reverse recovery energy	E_{rec}	$I_F = 50 \text{ A}$, $V_R = 600 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 900 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	1.31		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	2.52		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	3.46		
Thermal resistance, junction to heatsink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material			1.13	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.

4 Diode, Rectifier

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = 25 \text{ }^\circ\text{C}$	1600	V
Maximum RMS forward current per chip	I_{FRMSM}	$T_H = 60 \text{ }^\circ\text{C}$	70	A
Maximum RMS current at rectifier output	I_{RMSM}	$T_H = 60 \text{ }^\circ\text{C}$	100	A
Surge forward current	I_{FSM}	$t_p = 10 \text{ ms}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	A
			$T_{vj} = 150 \text{ }^\circ\text{C}$	
I^2t - value	I^2t	$t_p = 10 \text{ ms}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	A^2s
			$T_{vj} = 150 \text{ }^\circ\text{C}$	

Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 50 \text{ A}$ $T_{vj} = 150 \text{ }^\circ\text{C}$		1.05		V
Reverse current	I_r	$T_{vj} = 150 \text{ }^\circ\text{C}$, $V_R = 1600 \text{ V}$		1		mA
Thermal resistance, junction to heatsink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material			1.10	K/W

Table 8 Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Temperature under switching conditions	$T_{vj, op}$		-40		150	°C

5 IGBT-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}	$T_{vj, max} = 175\text{ °C}$ $T_H = 110\text{ °C}$	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	$V_{CE sat}$	$I_C = 25\text{ A}$, $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$	1.60	1.85	V
			$T_{vj} = 125\text{ °C}$	1.74		
			$T_{vj} = 175\text{ °C}$	1.82		
Gate threshold voltage	V_{GETh}	$I_C = 0.525\text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25\text{ °C}$	5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15\text{ V}$, $V_{CE} = 600\text{ V}$		0.395		µC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\text{ °C}$		0		Ω
Input capacitance	C_{ies}	$f = 1000\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$		4.77		nF
Reverse transfer capacitance	C_{res}	$f = 1000\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$		0.017		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\text{ V}$, $V_{GE} = 0\text{ V}$ $T_{vj} = 25\text{ °C}$			0.004	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = 20\text{ V}$, $T_{vj} = 25\text{ °C}$			100	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 25\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 9.1\text{ Ω}$	$T_{vj} = 25\text{ °C}$	0.041		µs
			$T_{vj} = 125\text{ °C}$	0.043		
			$T_{vj} = 175\text{ °C}$	0.044		
Rise time (inductive load)	t_r	$I_C = 25\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 9.1\text{ Ω}$	$T_{vj} = 25\text{ °C}$	0.025		µs
			$T_{vj} = 125\text{ °C}$	0.028		
			$T_{vj} = 175\text{ °C}$	0.030		

Table 10 Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off delay time (inductive load)	t_{doff}	$I_C = 25 \text{ A}$, $V_{\text{CE}} = 600 \text{ V}$, $V_{\text{GE}} = \pm 15 \text{ V}$, $R_{\text{Goff}} = 9.1 \Omega$	$T_{\text{vj}} = 25 \text{ }^\circ\text{C}$	0.230		μs
			$T_{\text{vj}} = 125 \text{ }^\circ\text{C}$	0.320		
			$T_{\text{vj}} = 175 \text{ }^\circ\text{C}$	0.350		
Fall time (inductive load)	t_f	$I_C = 25 \text{ A}$, $V_{\text{CE}} = 600 \text{ V}$, $V_{\text{GE}} = \pm 15 \text{ V}$, $R_{\text{Goff}} = 9.1 \Omega$	$T_{\text{vj}} = 25 \text{ }^\circ\text{C}$	0.140		μs
			$T_{\text{vj}} = 125 \text{ }^\circ\text{C}$	0.220		
			$T_{\text{vj}} = 175 \text{ }^\circ\text{C}$	0.280		
Turn-on energy loss per pulse	E_{on}	$I_C = 25 \text{ A}$, $V_{\text{CE}} = 600 \text{ V}$, $L_\sigma = 35 \text{ nH}$, $V_{\text{GE}} = \pm 15 \text{ V}$, $R_{\text{Gon}} = 9.1 \Omega$, $di/dt = 780 \text{ A}/\mu\text{s}$ ($T_{\text{vj}} = 175 \text{ }^\circ\text{C}$)	$T_{\text{vj}} = 25 \text{ }^\circ\text{C}$	1.47		mJ
			$T_{\text{vj}} = 125 \text{ }^\circ\text{C}$	2.05		
			$T_{\text{vj}} = 175 \text{ }^\circ\text{C}$	2.39		
Turn-off energy loss per pulse	E_{off}	$I_C = 25 \text{ A}$, $V_{\text{CE}} = 600 \text{ V}$, $L_\sigma = 35 \text{ nH}$, $V_{\text{GE}} = \pm 15 \text{ V}$, $R_{\text{Goff}} = 9.1 \Omega$, $dv/dt = 3120 \text{ V}/\mu\text{s}$ ($T_{\text{vj}} = 175 \text{ }^\circ\text{C}$)	$T_{\text{vj}} = 25 \text{ }^\circ\text{C}$	1.65		mJ
			$T_{\text{vj}} = 125 \text{ }^\circ\text{C}$	2.58		
			$T_{\text{vj}} = 175 \text{ }^\circ\text{C}$	3.13		
SC data	I_{SC}	$V_{\text{GE}} \leq 15 \text{ V}$, $V_{\text{CC}} = 800 \text{ V}$, $V_{\text{CEmax}} = V_{\text{CES}} - L_{\text{sCE}} \cdot di/dt$	$t_P \leq 8 \mu\text{s}$, $T_{\text{vj}} = 150 \text{ }^\circ\text{C}$	90		A
			$t_P \leq 7 \mu\text{s}$, $T_{\text{vj}} = 175 \text{ }^\circ\text{C}$	85		
Thermal resistance, junction to heatsink	R_{thJH}	per IGBT, Valid with IFX pre-applied Thermal Interface Material			1.19	K/W
Temperature under switching conditions	$T_{\text{vj op}}$		-40		175	$^\circ\text{C}$

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

6 Diode, Chopper

Table 11 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{\text{vj}} = 25 \text{ }^\circ\text{C}$	1200	V
Continuous DC forward current	I_F			25	A
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$		50	A
I^2t - value	I^2t	$V_R = 0 \text{ V}$, $t_P = 10 \text{ ms}$	$T_{\text{vj}} = 125 \text{ }^\circ\text{C}$	125	A^2s
			$T_{\text{vj}} = 175 \text{ }^\circ\text{C}$	95	

Table 12 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	2.28	V
			$T_{vj} = 125 \text{ °C}$	1.70		
			$T_{vj} = 175 \text{ °C}$	1.63		
Peak reverse recovery current	I_{RM}	$I_F = 25 \text{ A}$, $V_R = 600 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 395 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	18		A
			$T_{vj} = 125 \text{ °C}$	25		
			$T_{vj} = 175 \text{ °C}$	29		
Recovered charge	Q_r	$I_F = 25 \text{ A}$, $V_R = 600 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 395 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	2.79		μC
			$T_{vj} = 125 \text{ °C}$	3.36		
			$T_{vj} = 175 \text{ °C}$	4.41		
Reverse recovery energy	E_{rec}	$I_F = 25 \text{ A}$, $V_R = 600 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 395 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	1.36		mJ
			$T_{vj} = 125 \text{ °C}$	1.54		
			$T_{vj} = 175 \text{ °C}$	2.03		
Thermal resistance, junction to heatsink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material			1.63	K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		175	°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.

7 NTC-Thermistor

Table 13 Characteristic values

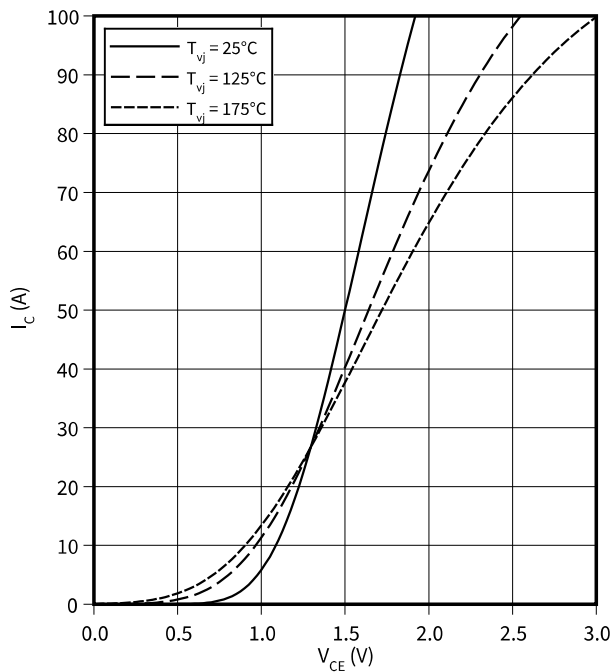
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25 \text{ °C}$		5		k Ω
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100 \text{ °C}$, $R_{100} = 493 \text{ }\Omega$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25 \text{ °C}$			20	mW
B-value	$B_{25/50}$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

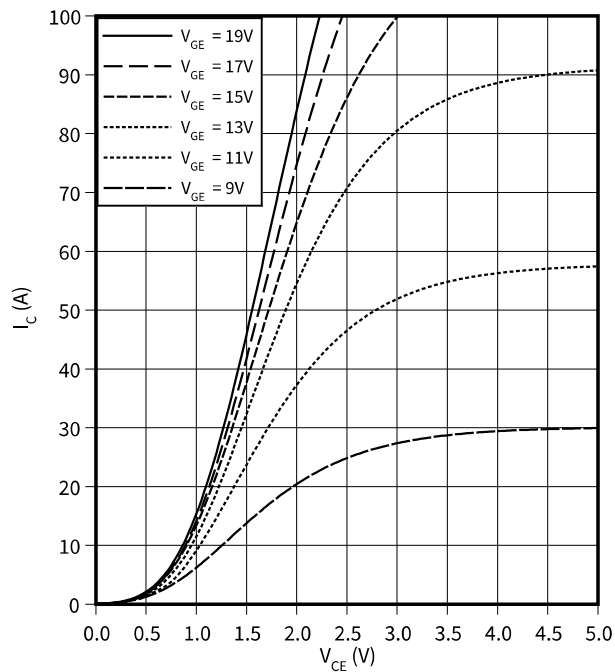
output characteristic (typical), IGBT, Inverter

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



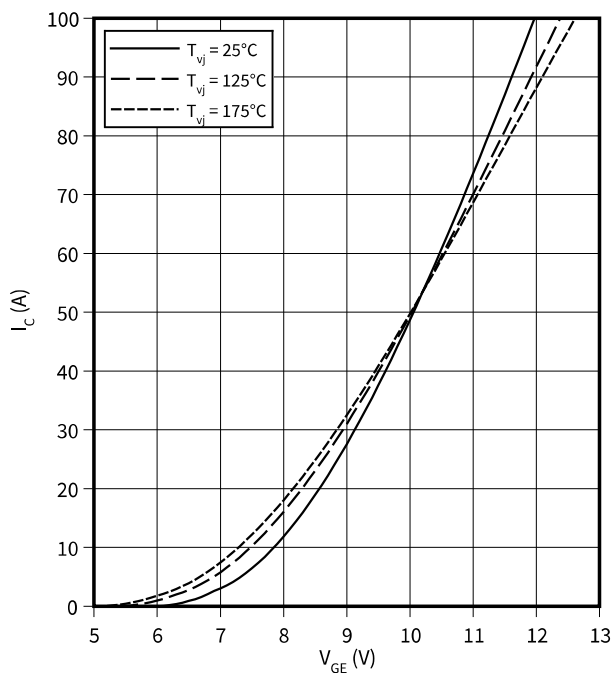
output characteristic (typical), IGBT, Inverter

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



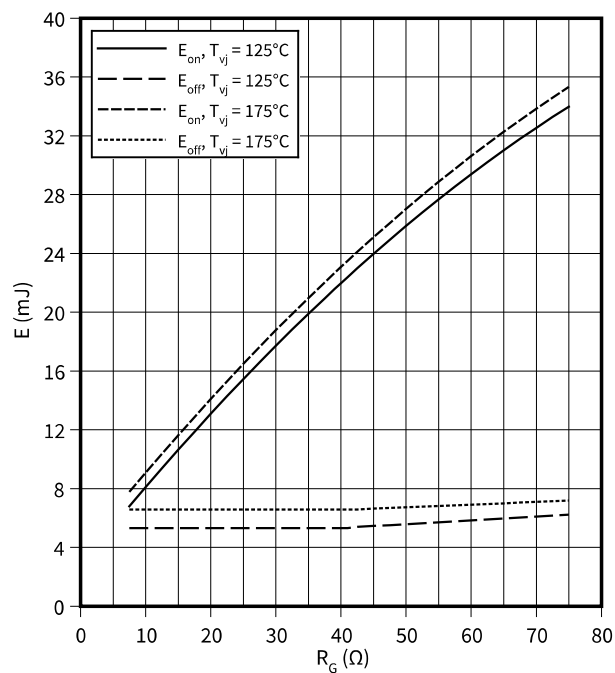
transfer characteristic (typical), IGBT, Inverter

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



switching losses (typical), IGBT, Inverter

$E = f(R_G)$
 $I_C = 50\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$

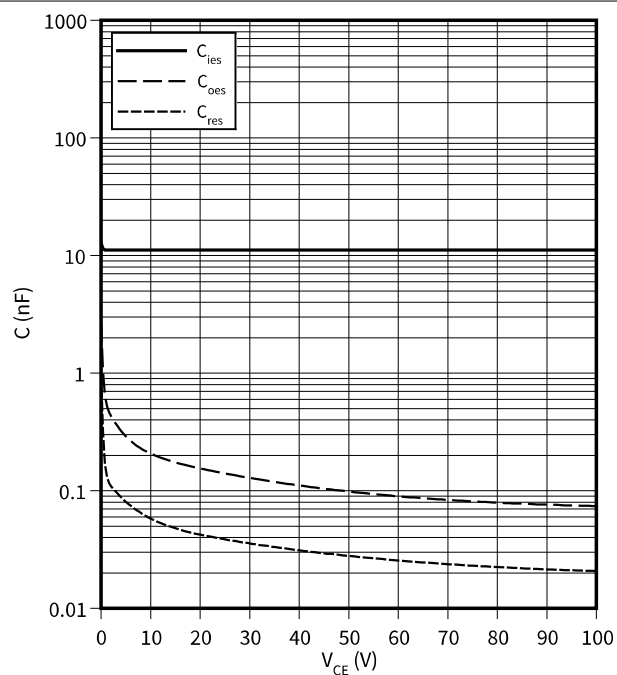


8 Characteristics diagrams

capacity characteristic (typical), IGBT, Inverter

$$C = f(V_{CE})$$

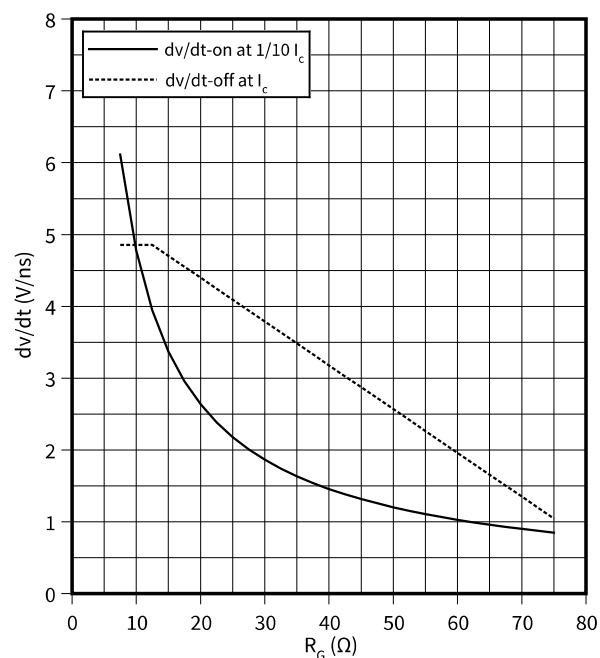
$f = 100 \text{ kHz}$, $V_{GE} = 0 \text{ V}$, $T_{vj} = 25 \text{ }^{\circ}\text{C}$



dv/dt (typical), IGBT, Inverter

$$dv/dt = f(R_G)$$

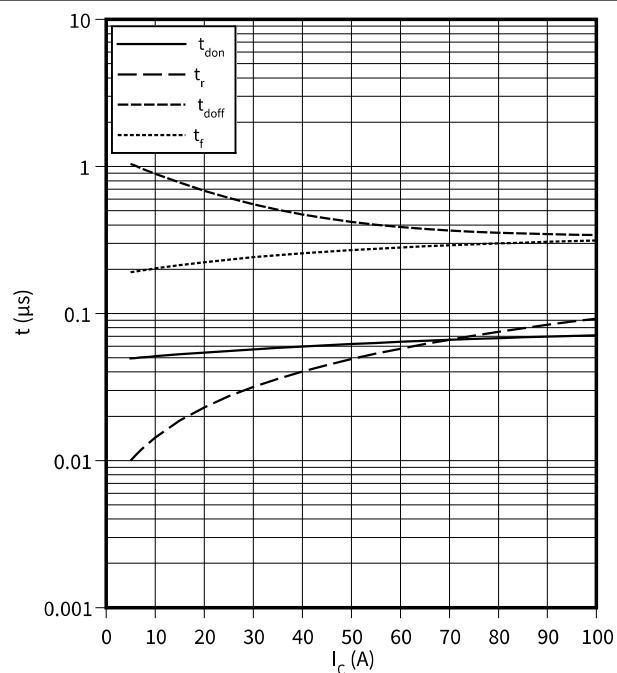
$I_C = 50 \text{ A}$, $V_{CE} = 600 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 25 \text{ }^{\circ}\text{C}$



switching times (typical), IGBT, Inverter

$$t = f(I_C)$$

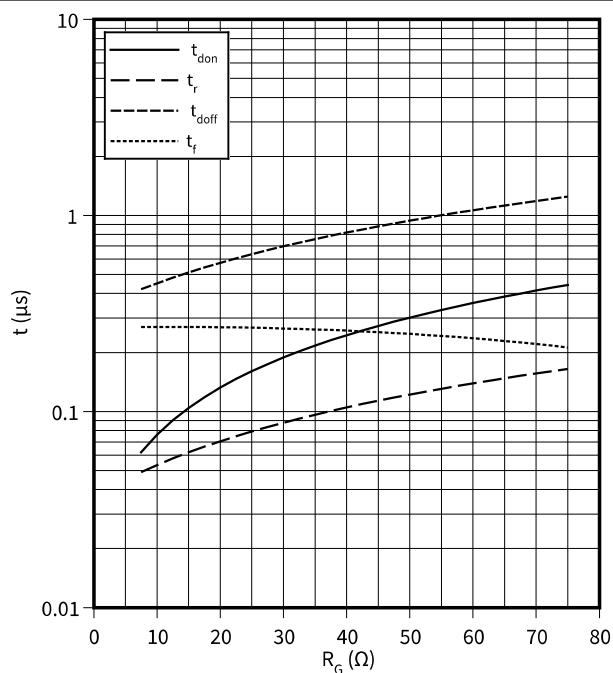
$R_{Goff} = 7.5 \text{ } \Omega$, $R_{Gon} = 7.5 \text{ } \Omega$, $V_{CE} = 600 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 175 \text{ }^{\circ}\text{C}$



switching times (typical), IGBT, Inverter

$$t = f(R_G)$$

$I_C = 50 \text{ A}$, $V_{CE} = 600 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 175 \text{ }^{\circ}\text{C}$

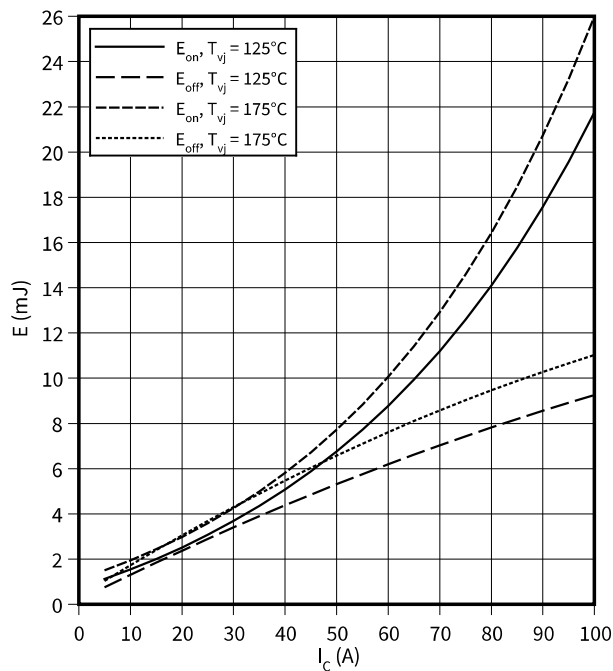


8 Characteristics diagrams

switching losses (typical), IGBT, Inverter

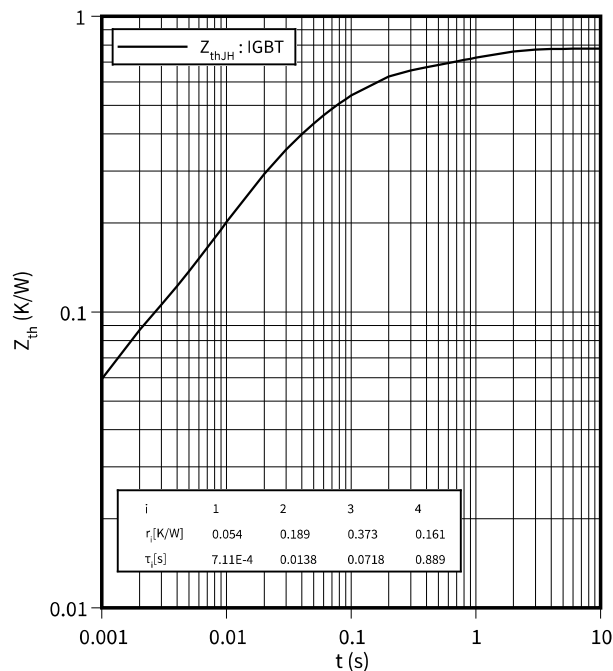
$E = f(I_C)$

$R_{Goff} = 7.5 \, \Omega$, $R_{Gon} = 7.5 \, \Omega$, $V_{CE} = 600 \, V$, $V_{GE} = \pm 15 \, V$



transient thermal impedance , IGBT, Inverter

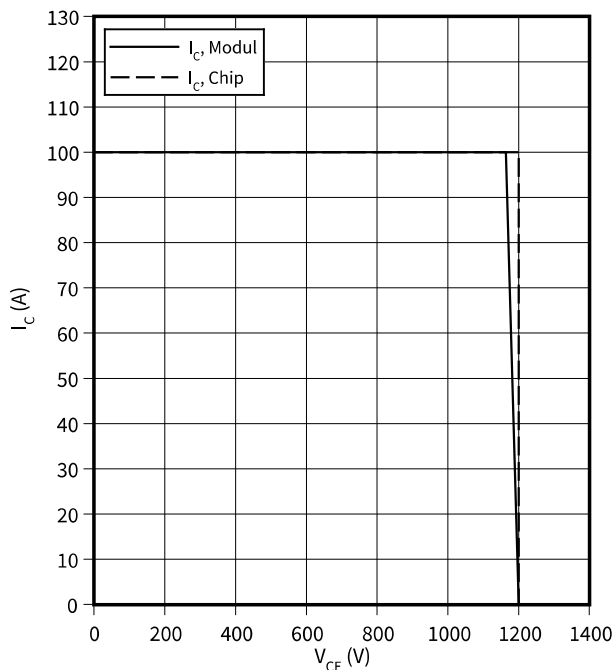
$Z_{th} = f(t)$



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

$I_C = f(V_{CE})$

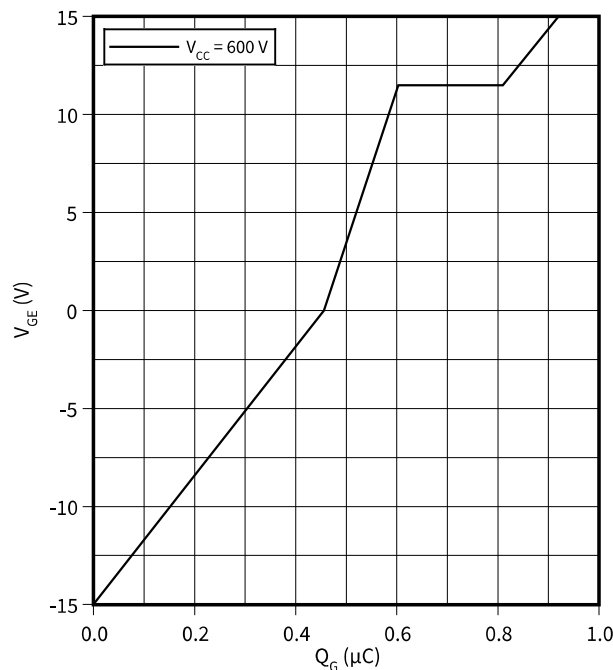
$R_{Goff} = 7.5 \, \Omega$, $V_{GE} = \pm 15 \, V$, $T_{vj} = 175 \, ^\circ C$



gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

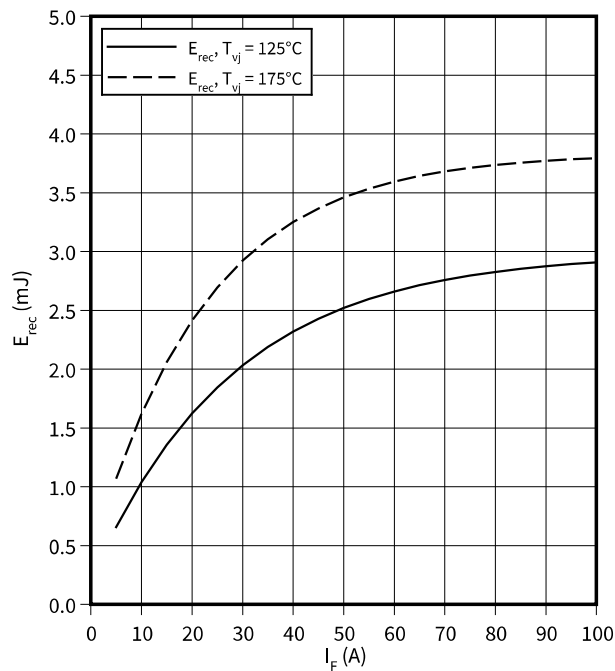
$I_C = 50 \, A$, $T_{vj} = 25 \, ^\circ C$



8 Characteristics diagrams

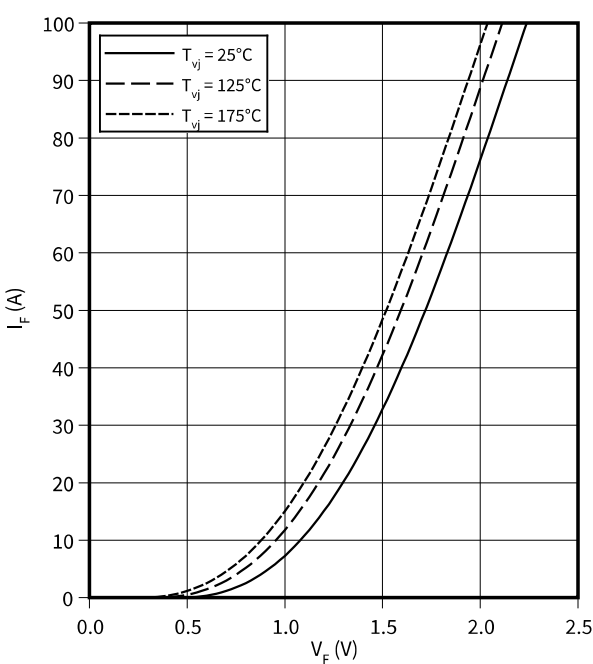
switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$
 $R_{Gon} = 7.5 \Omega, V_{CE} = 600 V$



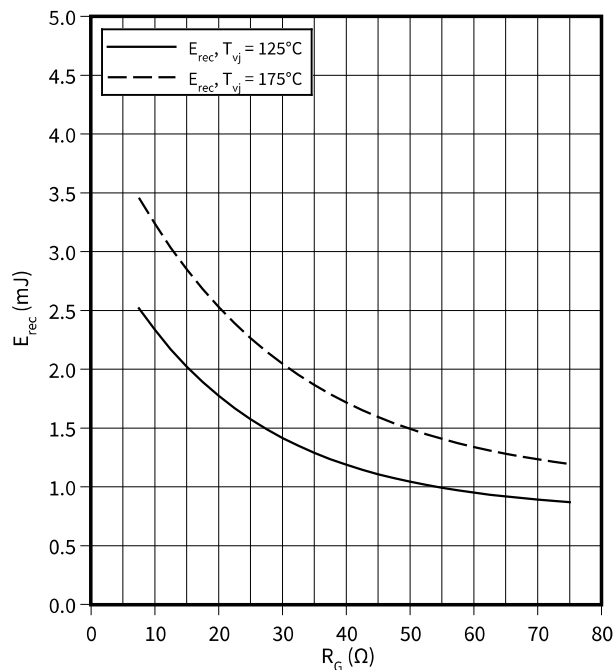
forward characteristic (typical), Diode, Inverter

$I_F = f(V_F)$



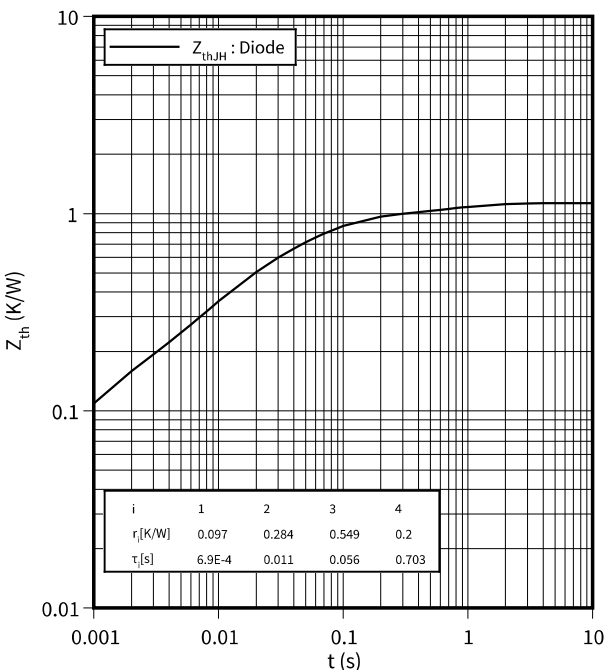
switching losses (typical), Diode, Inverter

$E_{rec} = f(R_G)$
 $V_{CE} = 600 V, I_F = 50 A$



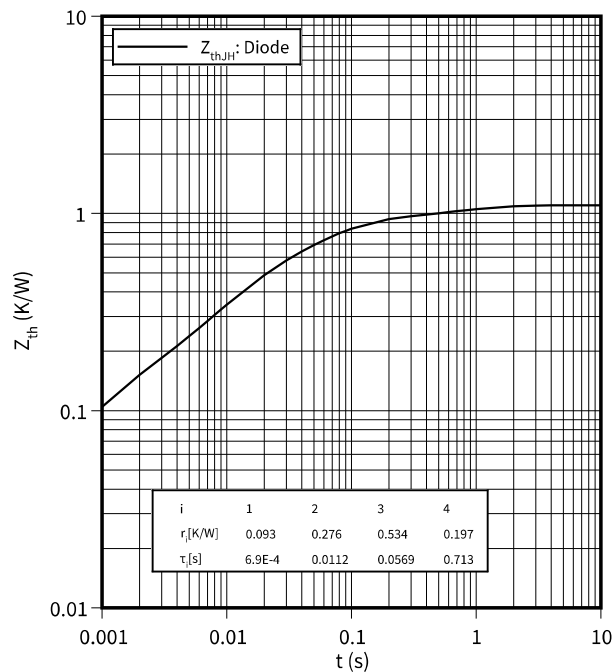
transient thermal impedance , Diode, Inverter

$Z_{th} = f(t)$

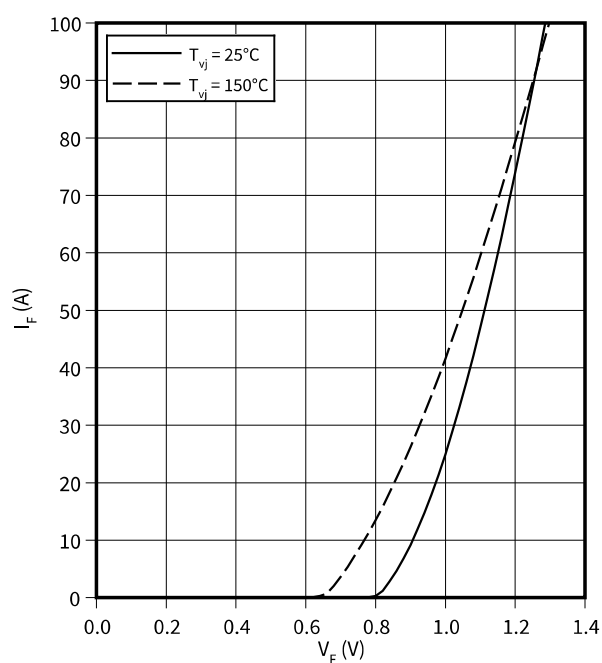


8 Characteristics diagrams

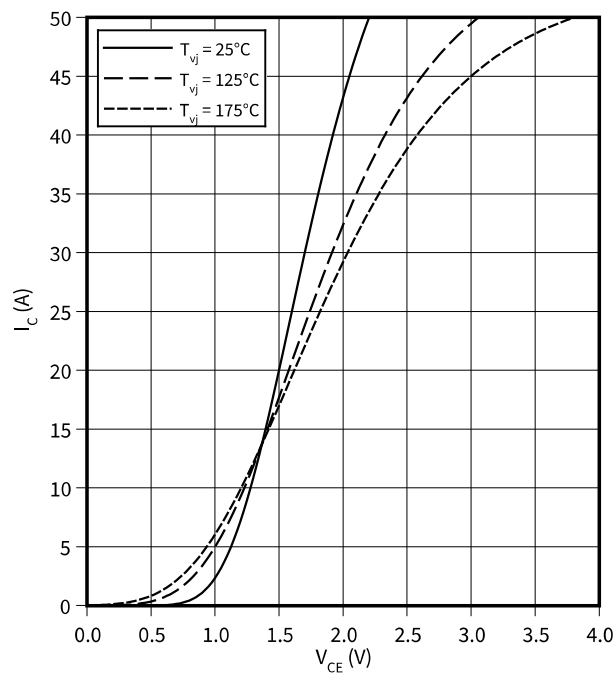
transient thermal impedance , Diode, Rectifier
 $Z_{th} = f(t)$



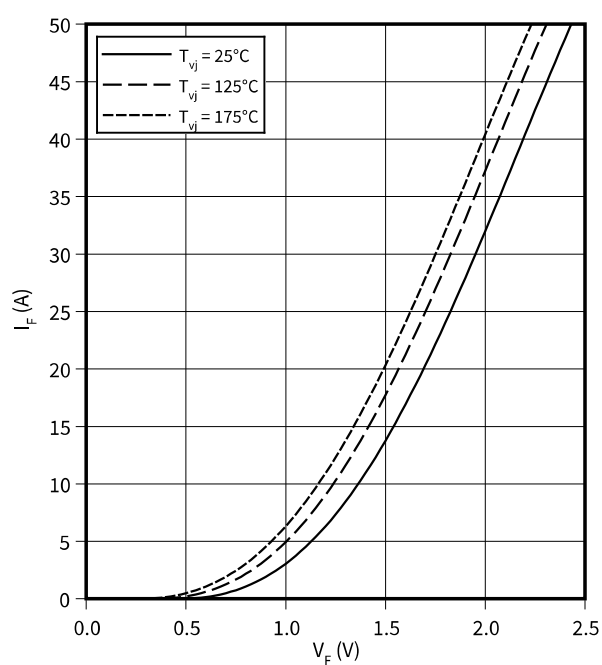
forward characteristic (typical), Diode, Rectifier
 $I_F = f(V_F)$



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



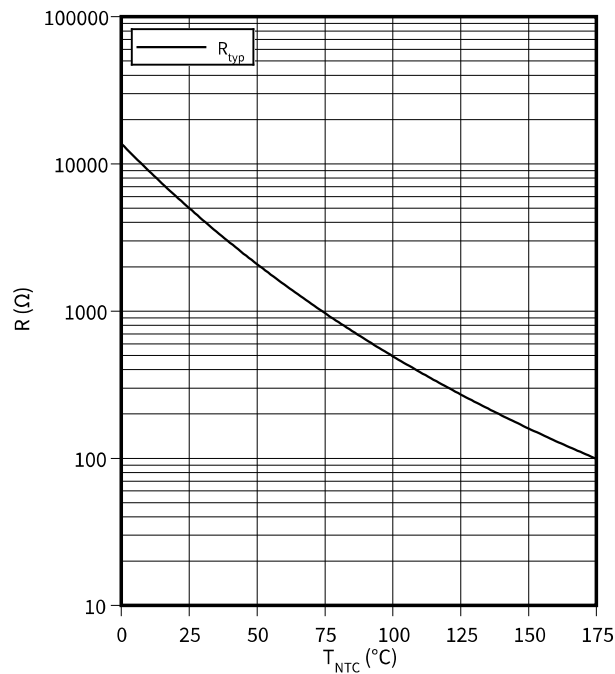
forward characteristic (typical), Diode, Chopper
 $I_F = f(V_F)$



8 Characteristics diagrams

temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



9 **Circuit diagram**

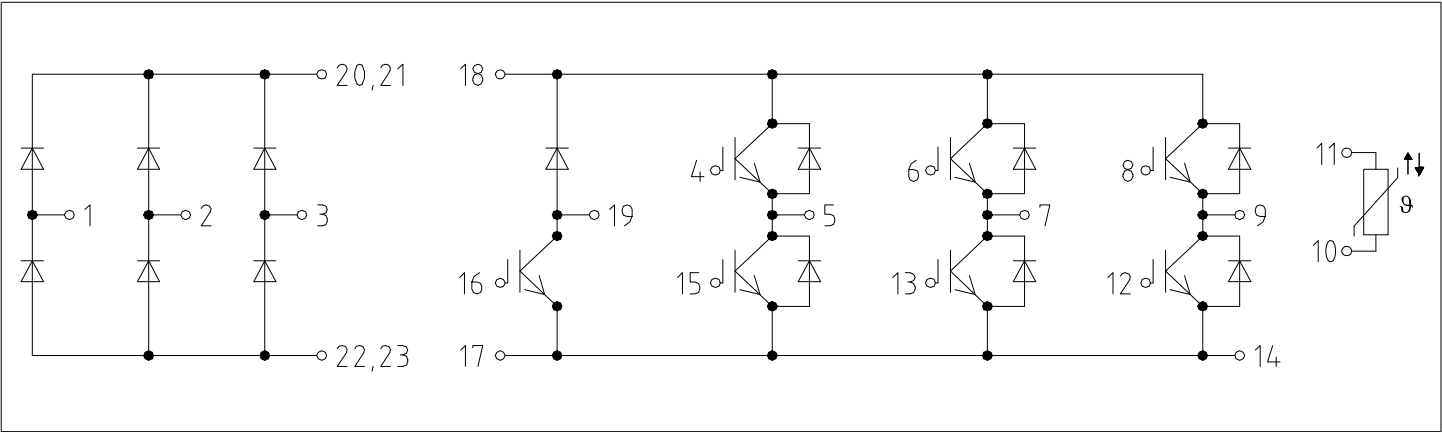


Figure 2



Revision history

Revision history

Document revision	Date of release	Description of changes
1.00	2021-09-22	Initial version

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