

EconoPIM™3 module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode and NTC

Features

- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_{C\text{ nom}} = 150\text{ A} / I_{CRM} = 300\text{ A}$
 - TRENCHSTOP™ IGBT7
 - Overload operation up to 175°C
 - Low $V_{CE,sat}$
- Mechanical features
 - Integrated NTC temperature sensor
 - Solder contact technology
 - Copper base plate
 - Al_2O_3 substrate with low thermal resistance



Typical appearance

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

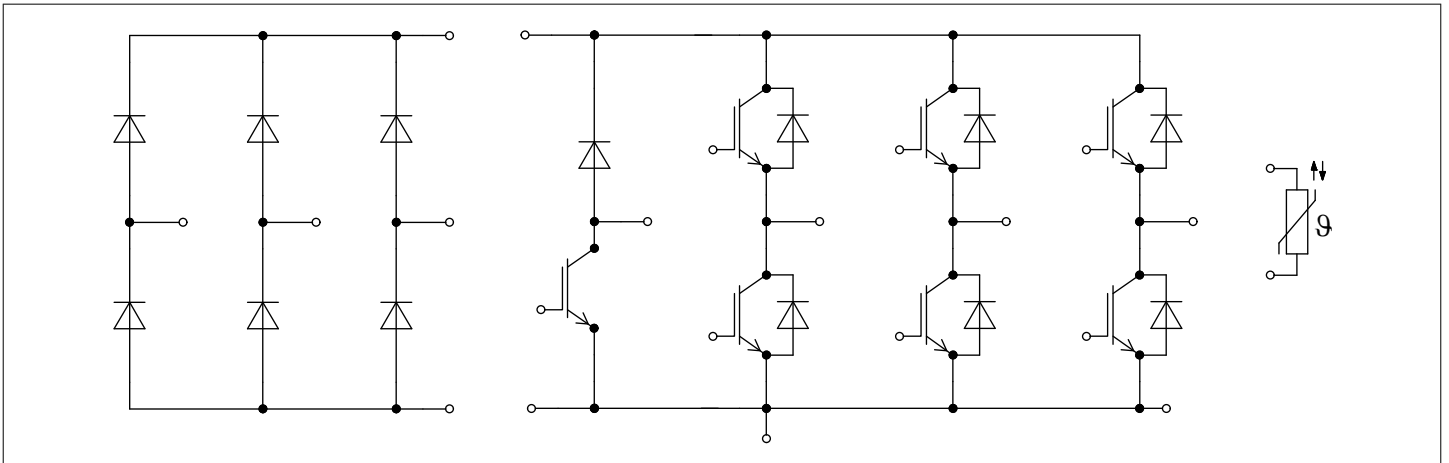


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1 Package

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	
Relative thermal index (electrical)	RTI	housing	140	°C

Table 2 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray inductance module	L_{sCE}			25		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_C = 25^\circ\text{C}$, per switch		1.1		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_C = 25^\circ\text{C}$, per switch		1.6		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting torque for module mounting	M	- Mounting according to valid application note	M5, Screw	3	6	Nm
Weight	G			300		g

Note: The current under continuous operation is limited to 50 A 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}		$T_{vj} = 25^\circ\text{C}$	1200	V
Continuous DC collector current	I_{CDC}	$T_{vj \max} = 175^\circ\text{C}$	$T_C = 80^\circ\text{C}$	150	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj \text{ op}}$		300	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	$V_{CE\ sat}$	$I_C = 150\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$		1.55	1.80	V
			$T_{vj} = 125\ ^\circ C$		1.69		
			$T_{vj} = 175\ ^\circ C$		1.77		
Gate threshold voltage	V_{GETh}	$I_C = 3.5\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$		5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CC} = 600\ V$			2.5		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$			1		Ω
Input capacitance	C_{ies}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			30.1		nF
Reverse transfer capacitance	C_{res}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.105		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$			0.012	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}	$I_C = 150\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 3.3\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.172		μs
			$T_{vj} = 125\ ^\circ C$		0.183		
			$T_{vj} = 175\ ^\circ C$		0.189		
Rise time (inductive load)	t_r	$I_C = 150\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 3.3\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.072		μs
			$T_{vj} = 125\ ^\circ C$		0.077		
			$T_{vj} = 175\ ^\circ C$		0.080		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 150\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 3.3\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.331		μs
			$T_{vj} = 125\ ^\circ C$		0.414		
			$T_{vj} = 175\ ^\circ C$		0.433		
Fall time (inductive load)	t_f	$I_C = 150\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 3.3\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.103		μs
			$T_{vj} = 125\ ^\circ C$		0.198		
			$T_{vj} = 175\ ^\circ C$		0.262		
Turn-on energy loss per pulse	E_{on}	$I_C = 150\ A, V_{CC} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 3.3\ \Omega, di/dt = 1700\ A/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		16.6		mJ
			$T_{vj} = 125\ ^\circ C$		24.9		
			$T_{vj} = 175\ ^\circ C$		29.6		
Turn-off energy loss per pulse	E_{off}	$I_C = 150\ A, V_{CC} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 3.3\ \Omega, dv/dt = 3200\ V/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		10.4		mJ
			$T_{vj} = 125\ ^\circ C$		15.9		
			$T_{vj} = 175\ ^\circ C$		19.9		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
SC data	I_{SC}	$V_{GE} \leq 15 \text{ V}, V_{CC} = 800 \text{ V}, V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$		520		A
				490		
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.290	K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 1 \text{ W/(m} \cdot \text{K)}$		0.0680		K/W
Temperature under switching conditions	$T_{vj op}$		-40		175	°C

Note: $T_{vj op} > 150^\circ\text{C}$ 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}	$T_{vj} = 25^\circ\text{C}$	1200	V
Continuous DC forward current	I_F		150	A
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$	300	A
I^2t - value	I^2t	$t_P = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125^\circ\text{C}$	A^2s
			$T_{vj} = 175^\circ\text{C}$	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 150 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^\circ\text{C}$	1.72	2.10	V
			$T_{vj} = 125^\circ\text{C}$	1.59		
			$T_{vj} = 175^\circ\text{C}$	1.52		
Peak reverse recovery current	I_{RM}	$V_{CC} = 600 \text{ V}, I_F = 150 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 1700 \text{ A}/\mu\text{s} (T_{vj} = 175^\circ\text{C})$	$T_{vj} = 25^\circ\text{C}$	65.3		A
			$T_{vj} = 125^\circ\text{C}$	91.8		
			$T_{vj} = 175^\circ\text{C}$	107		

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Recovered charge	Q_r	$V_{CC} = 600\text{ V}$, $I_F = 150\text{ A}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 1700\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	10.3		μC
			$T_{vj} = 125\text{ °C}$	21.7		
			$T_{vj} = 175\text{ °C}$	28.6		
Reverse recovery energy	E_{rec}	$V_{CC} = 600\text{ V}$, $I_F = 150\text{ A}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 1700\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	3.27		mJ
			$T_{vj} = 125\text{ °C}$	7.32		
			$T_{vj} = 175\text{ °C}$	9.88		
Thermal resistance, junction to case	R_{thJC}	per diode			0.463	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		0.0698		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}	$T_C = 100\text{ °C}$	150	A
Maximum RMS current at rectifier output	I_{RMSM}	$T_C = 100\text{ °C}$	150	A
Surge forward current	I_{FSM}	$t_P = 10\text{ ms}$	$T_{vj} = 25\text{ °C}$	A
			$T_{vj} = 150\text{ °C}$	
I^2t - value	I^2t	$t_P = 10\text{ ms}$	$T_{vj} = 25\text{ °C}$	A^2s
			$T_{vj} = 150\text{ °C}$	

Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 150\text{ A}$	$T_{vj} = 150\text{ °C}$	0.96		V
Reverse current	I_r	$T_{vj} = 150\text{ °C}$, $V_R = 1600\text{ V}$		1		mA

(table continues...)

Table 8 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction to case	R_{thJC}	per diode			0.333	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 1 \text{ W/(m}\cdot\text{K)}$		0.0670		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}	$T_{vj max} = 175 \text{ °C}$	$T_C = 90 \text{ °C}$	100	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj op}$		200	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	$V_{CE sat}$	$I_C = 100 \text{ A}, V_{GE} = 15 \text{ V}$	$T_{vj} = 25 \text{ °C}$		1.50	1.80	V
			$T_{vj} = 125 \text{ °C}$		1.64		
			$T_{vj} = 175 \text{ °C}$		1.72		
Gate threshold voltage	V_{GEth}	$I_C = 2.5 \text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25 \text{ °C}$		5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15 \text{ V}, V_{CC} = 600 \text{ V}$			1.8		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25 \text{ °C}$			1.5		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}, T_{vj} = 25 \text{ °C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$			21.7		nF
Reverse transfer capacitance	C_{res}	$f = 100 \text{ kHz}, T_{vj} = 25 \text{ °C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$			0.076		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200 \text{ V}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$			0.01	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = 20 \text{ V}, T_{vj} = 25 \text{ °C}$				100	nA

(table continues...)

Table 10 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-on delay time (inductive load)	t_{don}	$I_C = 100\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\ \Omega$	$T_{vj} = 25\text{ °C}$	0.169		μs
			$T_{vj} = 125\text{ °C}$	0.180		
			$T_{vj} = 175\text{ °C}$	0.187		
Rise time (inductive load)	t_r	$I_C = 100\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\ \Omega$	$T_{vj} = 25\text{ °C}$	0.063		μs
			$T_{vj} = 125\text{ °C}$	0.067		
			$T_{vj} = 175\text{ °C}$	0.070		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 100\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 4.3\ \Omega$	$T_{vj} = 25\text{ °C}$	0.310		μs
			$T_{vj} = 125\text{ °C}$	0.390		
			$T_{vj} = 175\text{ °C}$	0.410		
Fall time (inductive load)	t_f	$I_C = 100\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 4.3\ \Omega$	$T_{vj} = 25\text{ °C}$	0.110		μs
			$T_{vj} = 125\text{ °C}$	0.190		
			$T_{vj} = 175\text{ °C}$	0.250		
Turn-on energy loss per pulse	E_{on}	$I_C = 100\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\ \Omega$, $di/dt =$ $1100\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	7.12		mJ
			$T_{vj} = 125\text{ °C}$	11.7		
			$T_{vj} = 175\text{ °C}$	14.5		
Turn-off energy loss per pulse	E_{off}	$I_C = 100\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 4.3\ \Omega$, $dv/dt =$ $2800\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	6.93		mJ
			$T_{vj} = 125\text{ °C}$	10.6		
			$T_{vj} = 175\text{ °C}$	13.3		
SC data	I_{SC}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 800\text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 8\ \mu\text{s}$, $T_{vj} = 150\text{ °C}$	370		A
			$t_p \leq 7\ \mu\text{s}$, $T_{vj} = 175\text{ °C}$	350		
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.373	K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 1\text{ W}/(\text{m} \cdot \text{K})$		0.0680		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.

6 Diode, Brake-Chopper

Table 11 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25\text{ °C}$	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	$t_P = 10\text{ ms}, V_R = 0\text{ V}$	$T_{vj} = 125\text{ °C}$	220	A^2s
			$T_{vj} = 175\text{ °C}$	200	

Table 12 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 50\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$	1.72	2.10	V
			$T_{vj} = 125\text{ °C}$	1.59		
			$T_{vj} = 175\text{ °C}$	1.52		
Peak reverse recovery current	I_{RM}	$V_{CC} = 600\text{ V}, I_F = 50\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 550\text{ A}/\mu s (T_{vj} = 175\text{ °C})$	$T_{vj} = 25\text{ °C}$	37.3		A
			$T_{vj} = 125\text{ °C}$	44.3		
			$T_{vj} = 175\text{ °C}$	49.6		
Recovered charge	Q_r	$V_{CC} = 600\text{ V}, I_F = 50\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 550\text{ A}/\mu s (T_{vj} = 175\text{ °C})$	$T_{vj} = 25\text{ °C}$	3.86		μC
			$T_{vj} = 125\text{ °C}$	7.05		
			$T_{vj} = 175\text{ °C}$	10.1		
Reverse recovery energy	E_{rec}	$V_{CC} = 600\text{ V}, I_F = 50\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 550\text{ A}/\mu s (T_{vj} = 175\text{ °C})$	$T_{vj} = 25\text{ °C}$	1.13		mJ
			$T_{vj} = 125\text{ °C}$	2.34		
			$T_{vj} = 175\text{ °C}$	3.23		
Thermal resistance, junction to case	R_{thJC}	per diode			0.909	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 1\text{ W}/(m \cdot K)$		0.109		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		kΩ
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100\text{ °C}, R_{100} = 493\text{ Ω}$	-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

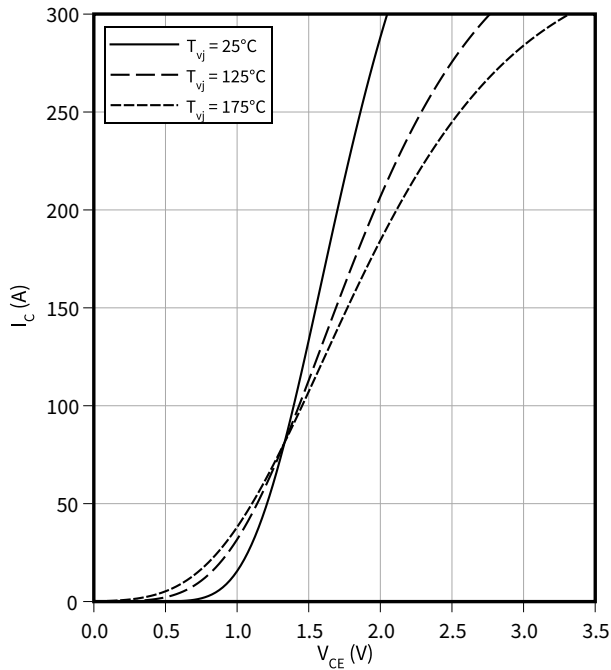
Note: Specification according to the valid application note.

8 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

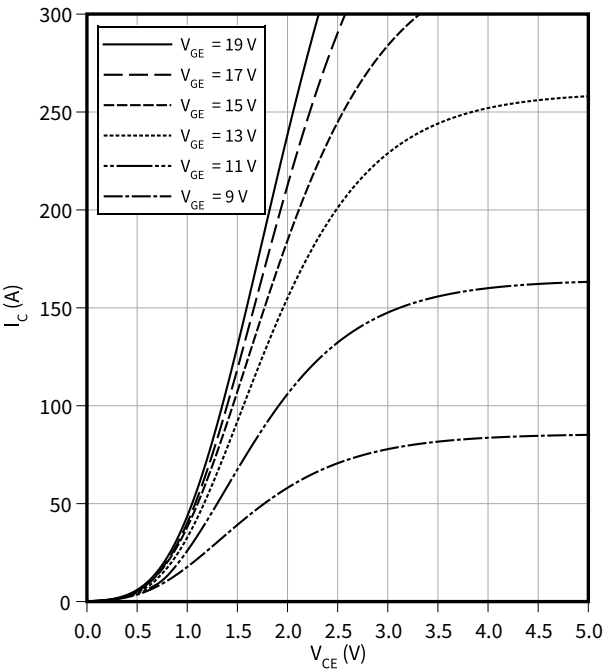
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

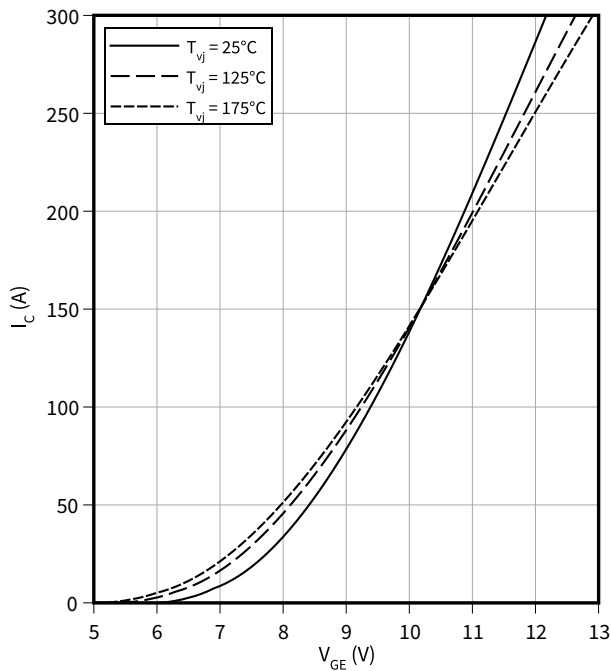
$T_{vj} = 175\text{ °C}$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

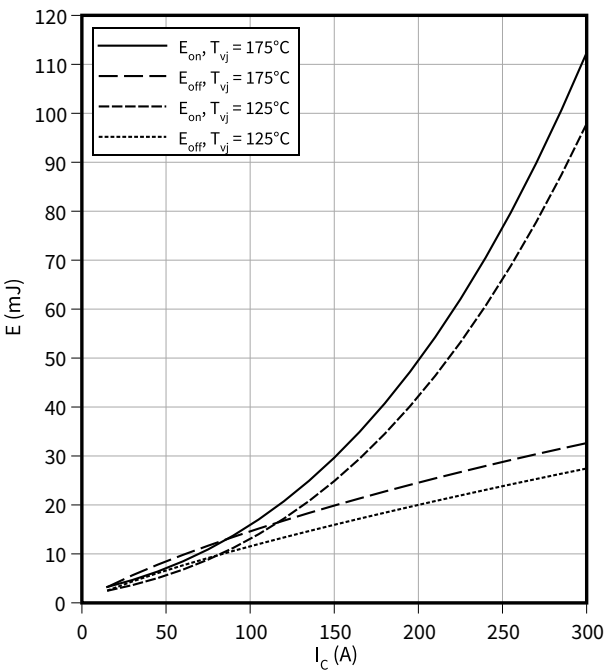
$V_{CE} = 20\text{ V}$



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

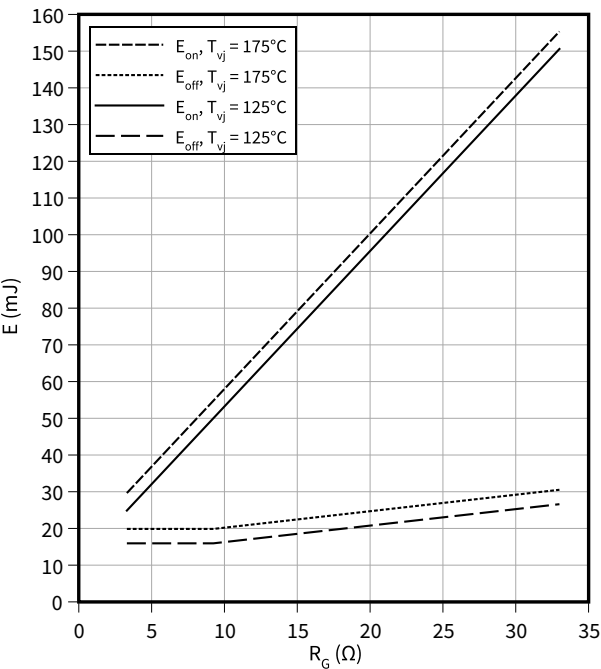
$R_{Goff} = 3.3\text{ }\Omega$, $R_{Gon} = 3.3\text{ }\Omega$, $V_{GE} = \pm 15\text{ V}$, $V_{CC} = 600\text{ V}$



8 Characteristics diagrams

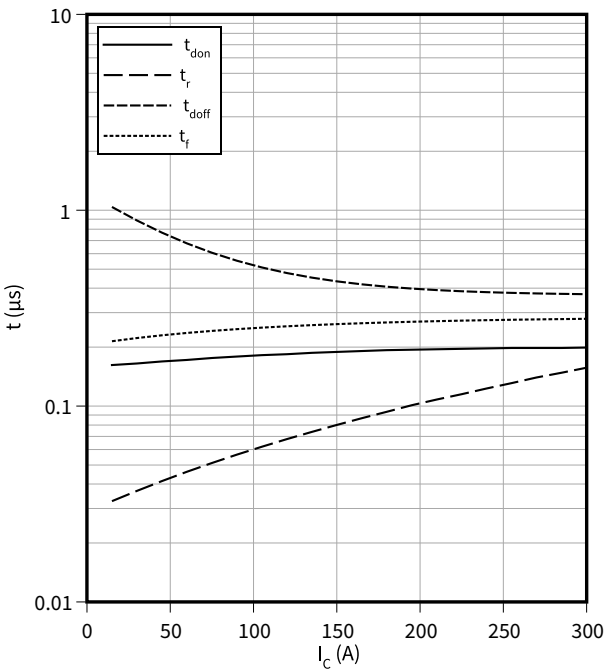
Switching losses (typical), IGBT, Inverter

$E = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 150\text{ A}$, $V_{CC} = 600\text{ V}$



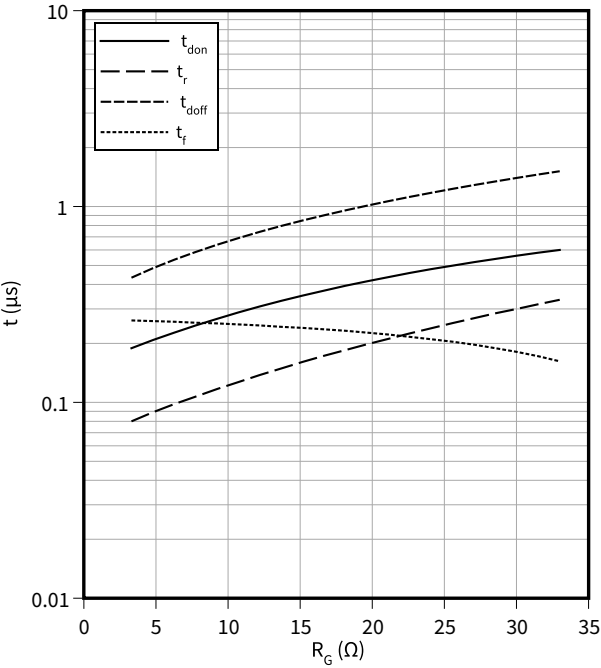
Switching times (typical), IGBT, Inverter

$t = f(I_C)$
 $R_{Goff} = 3.3\ \Omega$, $R_{Gon} = 3.3\ \Omega$, $V_{GE} = \pm 15\text{ V}$, $V_{CC} = 600\text{ V}$, $T_{vj} = 175\text{ °C}$



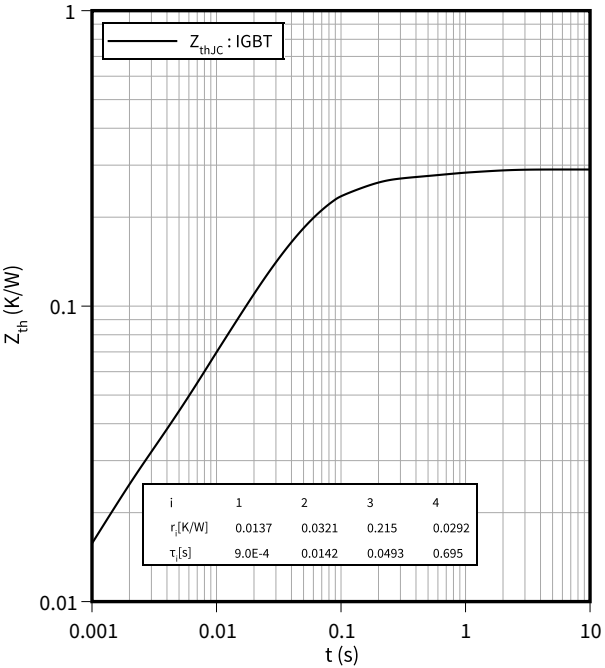
Switching times (typical), IGBT, Inverter

$t = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 150\text{ A}$, $V_{CC} = 600\text{ V}$, $T_{vj} = 175\text{ °C}$



Transient thermal impedance , IGBT, Inverter

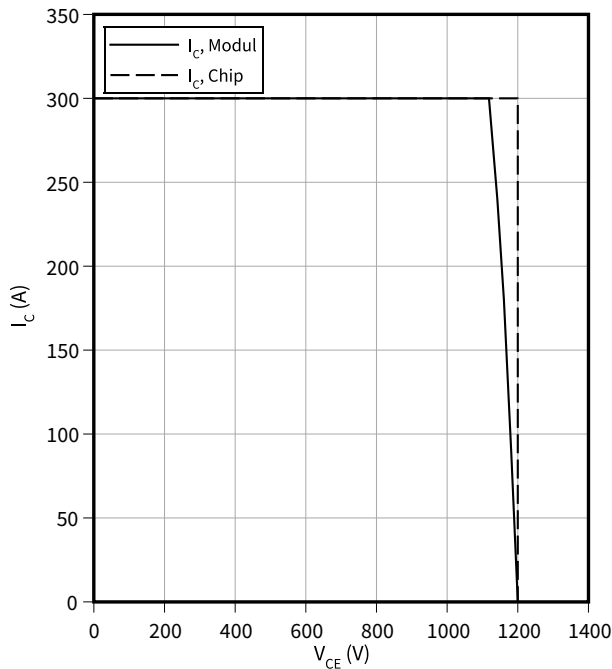
$Z_{th} = f(t)$



8 Characteristics diagrams

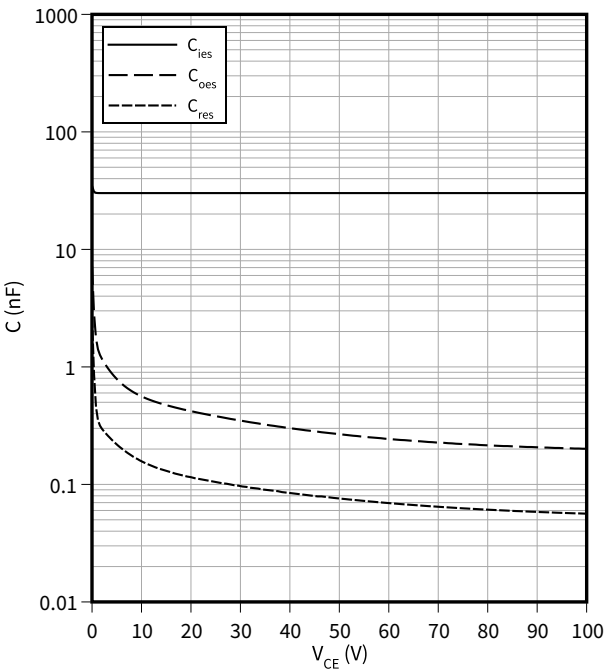
Reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$
 $R_{Goff} = 3.3 \Omega$, $V_{GE} = 15 \text{ V}$, $T_{vj} = 175 \text{ }^\circ\text{C}$



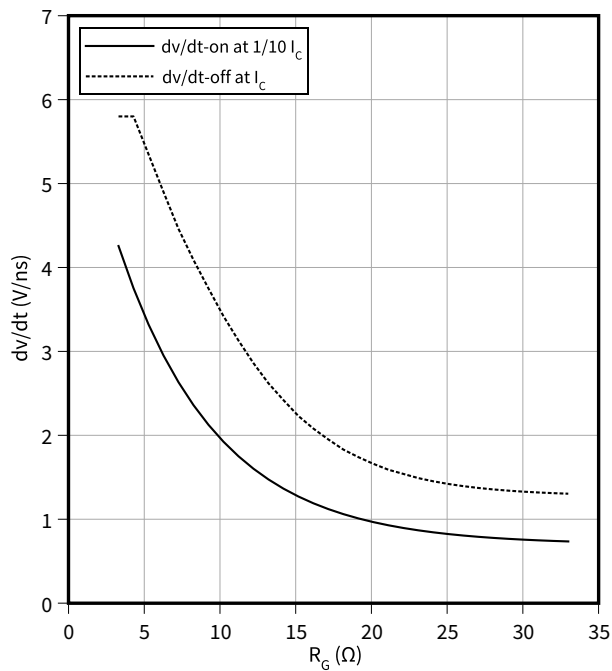
Capacity characteristic (typical), IGBT, Inverter

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



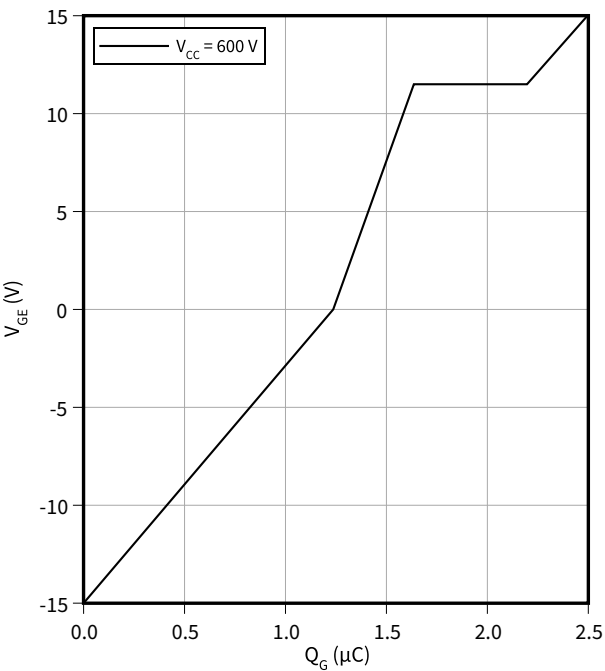
Voltage slope (typical), IGBT, Inverter

$dv/dt = f(R_G)$
 $I_C = 150 \text{ A}$, $V_{CC} = 600 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 25 \text{ }^\circ\text{C}$



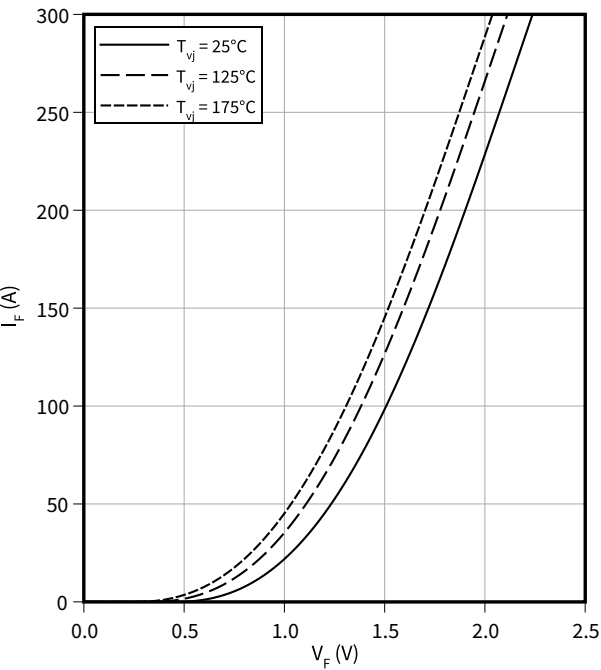
Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$
 $I_C = 150 \text{ A}$, $T_{vj} = 25 \text{ }^\circ\text{C}$



Forward characteristic (typical), Diode, Inverter

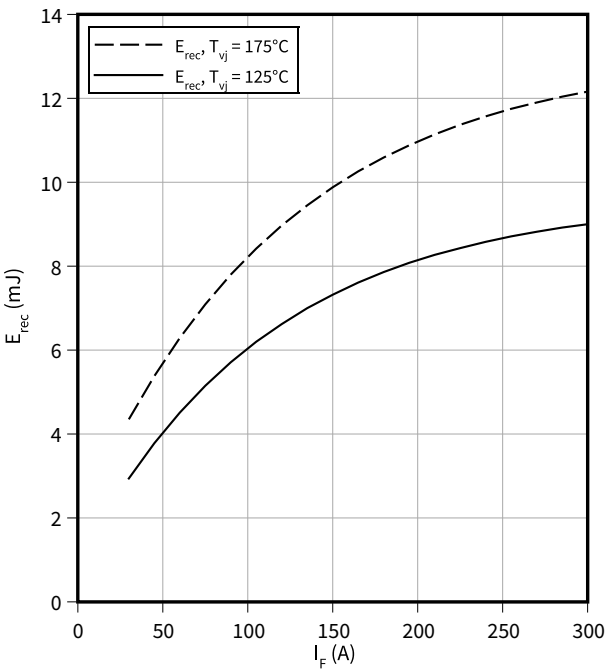
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

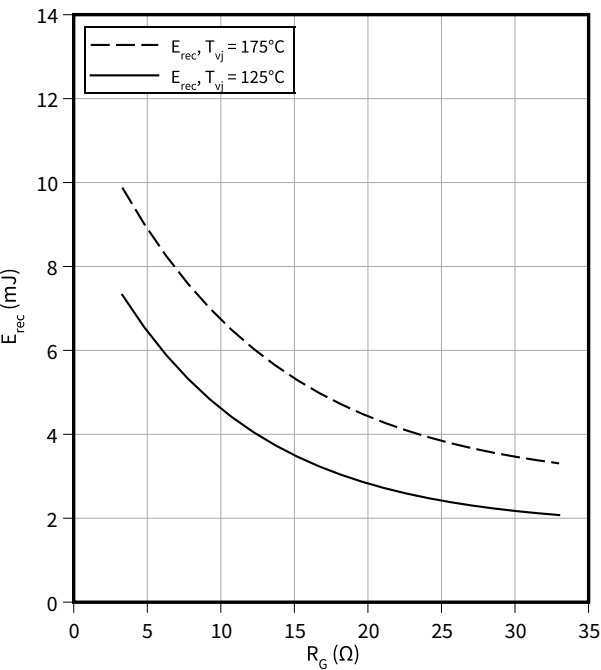
$R_{Gon} = 3.3$, $V_{CC} = 600$ V



Switching losses (typical), Diode, Inverter

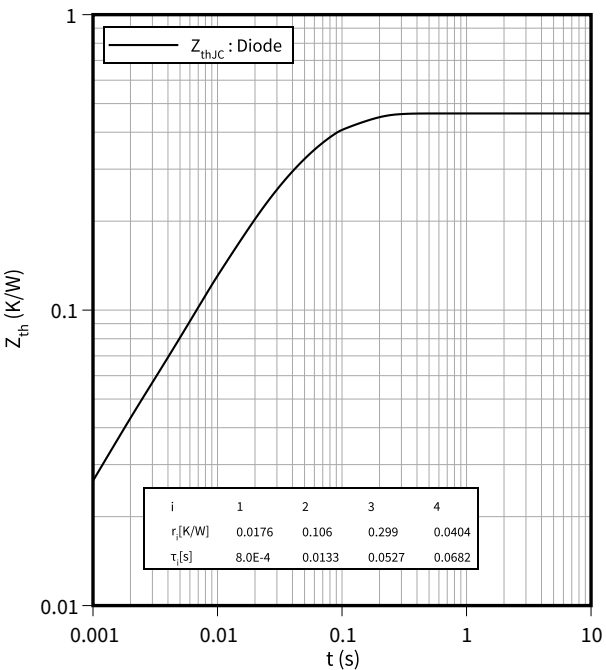
$E_{rec} = f(R_G)$

$I_F = 150$ A, $V_{CC} = 600$ V



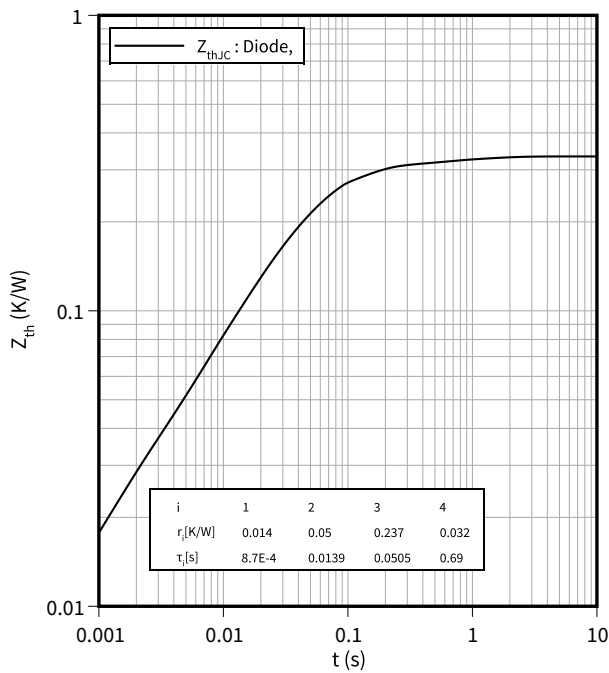
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



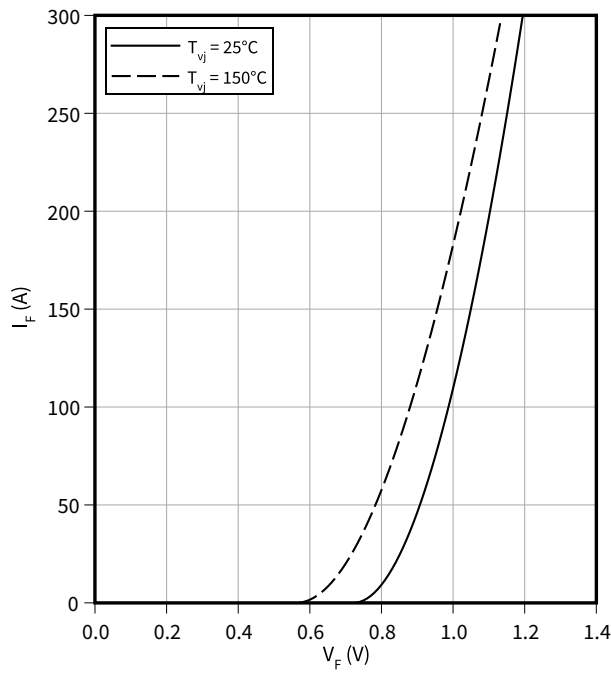
Transient thermal impedance, Diode, Rectifier

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Rectifier

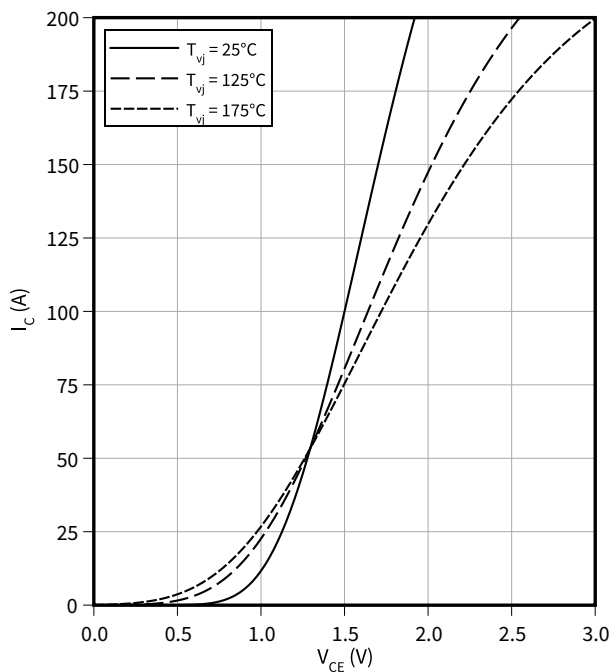
$I_F = f(V_F)$



Output characteristic (typical), IGBT, Brake-Chopper

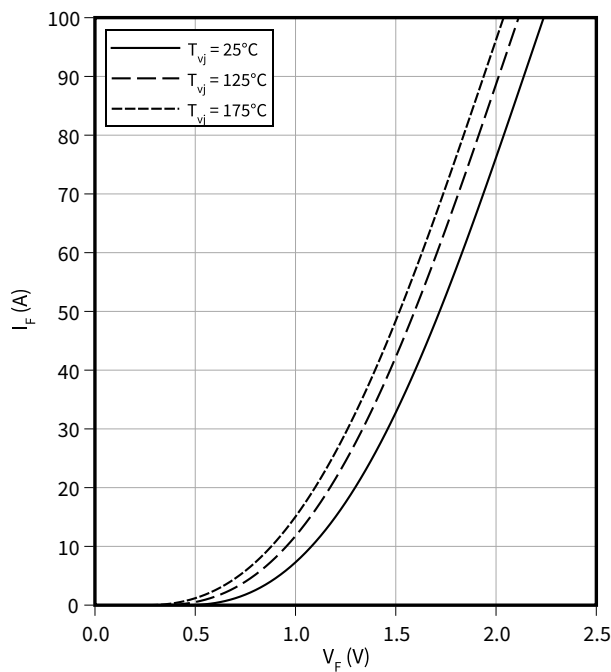
$I_C = f(V_{CE})$

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



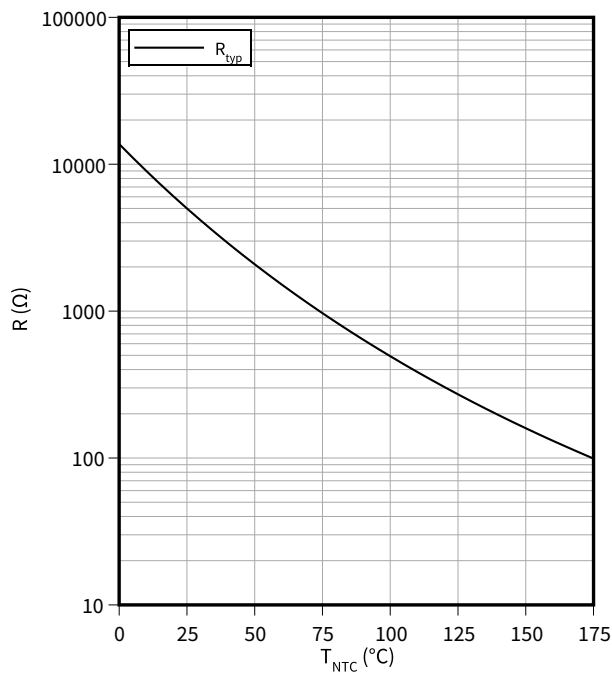
Forward characteristic (typical), Diode, Brake-Chopper

$I_F = f(V_F)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



9 **Circuit diagram**

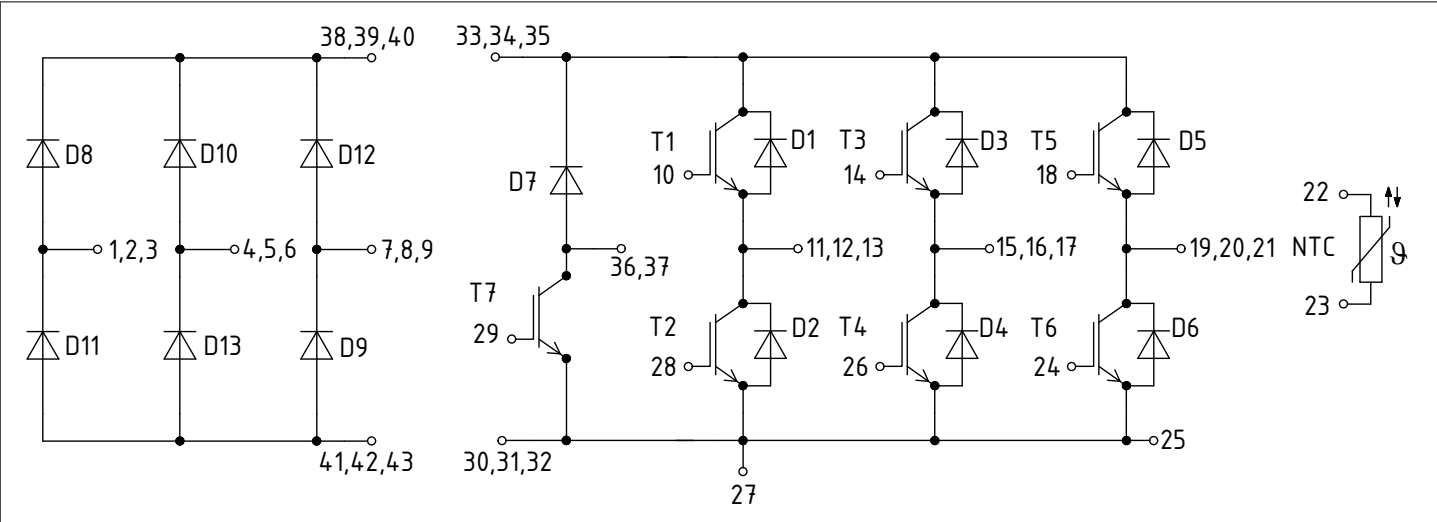


Figure 1



Revision 1.00
2022-07-13

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 3

Revision history

Document revision	Date of release	Description of changes
V1.0	2018-07-16	Target datasheet
V1.1	2019-08-19	Target datasheet
n/a	2020-09-01	Datasheet migrated to a new system with a new layout and new revision number schema: target or preliminary datasheet = 0.xy; final datasheet = 1.xy
0.10	2021-02-09	
1.00	2022-07-13	Final datasheet

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