

EconoPIM™3 module with Trench/Fieldstop IGBT4 and emitter controlled diode and NTC

Features

- Electrical features
 - $V_{CES} = 1700\text{ V}$
 - $I_{C\text{ nom}} = 75\text{ A} / I_{CRM} = 150\text{ A}$
 - Low $V_{CE,sat}$
 - Trench IGBT 4
 - $V_{CE,sat}$ with positive temperature coefficient
 - 2.2 kV rectifier diodes
- Mechanical features
 - Solder contact technology
 - Standard housing
 - Integrated NTC temperature sensor
 - Isolated base plate



Typical appearance

Potential applications

- Motor drives

Product validation

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

Description

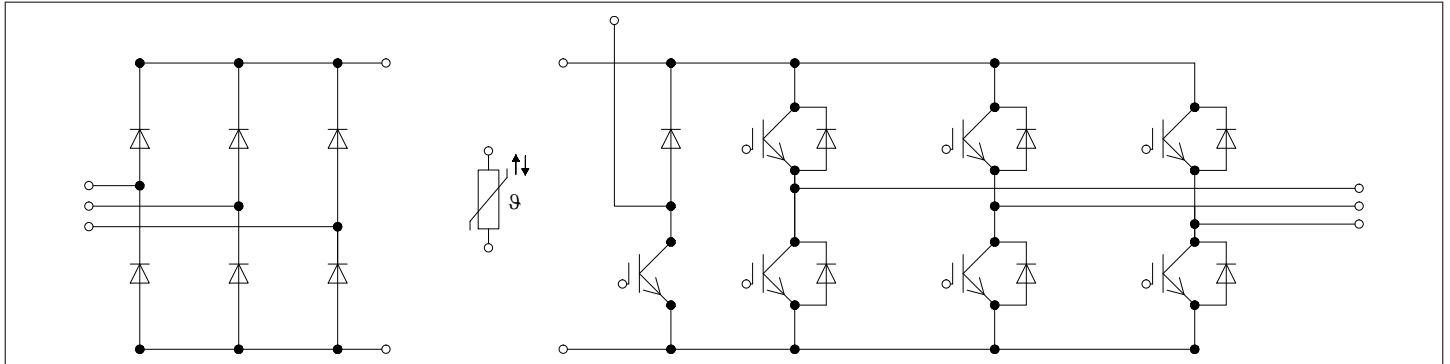


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 60 \text{ s}$	3.4	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}			40		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_C = 25^\circ\text{C}$, per switch		3		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_C = 25^\circ\text{C}$, per switch		4		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}	$T_{vj} = 25^\circ\text{C}$	1700	V
Continuous DC collector current	I_{CDC}	$T_{vj \max} = 175^\circ\text{C}$ $T_C = 100^\circ\text{C}$	75	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj \text{ op}}$	150	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	$V_{CE\ sat}$	$I_C = 75\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$		1.95	2.30	V
			$T_{vj} = 125\ ^\circ C$		2.35		
			$T_{vj} = 150\ ^\circ C$		2.45		
Gate threshold voltage	V_{GETh}	$I_C = 3\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$		5.25	5.80	6.35	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CC} = 900\ V$			0.9		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$			8.5		Ω
Input capacitance	C_{ies}	$f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			6.8		nF
Reverse transfer capacitance	C_{res}	$f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.22		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1700\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$			1	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}	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Gon} = 4.3\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.230		μs
			$T_{vj} = 125\ ^\circ C$		0.250		
			$T_{vj} = 150\ ^\circ C$		0.260		
Rise time (inductive load)	t_r	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Gon} = 4.3\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.036		μs
			$T_{vj} = 125\ ^\circ C$		0.040		
			$T_{vj} = 150\ ^\circ C$		0.045		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Goff} = 4.3\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.460		μs
			$T_{vj} = 125\ ^\circ C$		0.600		
			$T_{vj} = 150\ ^\circ C$		0.640		
Fall time (inductive load)	t_f	$I_C = 75\ A, V_{CC} = 900\ V, V_{GE} = \pm 15\ V, R_{Goff} = 4.3\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.080		μs
			$T_{vj} = 125\ ^\circ C$		0.150		
			$T_{vj} = 150\ ^\circ C$		0.160		
Turn-on energy loss per pulse	E_{on}	$I_C = 75\ A, V_{CC} = 900\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 4.3\ \Omega, di/dt = 2150\ A/\mu s (T_{vj} = 150\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		13.1		mJ
			$T_{vj} = 125\ ^\circ C$		18.8		
			$T_{vj} = 150\ ^\circ C$		20.2		
Turn-off energy loss per pulse	E_{off}	$I_C = 75\ A, V_{CC} = 900\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 4.3\ \Omega, dv/dt = 3000\ V/\mu s (T_{vj} = 150\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		14.7		mJ
			$T_{vj} = 125\ ^\circ C$		25.2		
			$T_{vj} = 150\ ^\circ C$		28.4		
SC data	I_{SC}	$V_{GE} \leq 15\ V, V_{CC} = 1000\ V, V_{CEmax} = V_{CES} - L_{sCE} * di/dt$	$t_P \leq 10\ \mu s, T_{vj} \leq 150\ ^\circ C$		350		A

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.327	K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 1 \text{ W/(m}\cdot\text{K)}$		0.0678		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	°C

3 Diode, Inverter

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25 \text{ °C}$	1700	V
Continuous DC forward current	I_F			75	A
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$		150	A
I^2t - value	I^2t	$t_P = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ °C}$	1350	A^2s
			$T_{vj} = 150 \text{ °C}$	1150	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 75 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$	1.80	2.20	V
			$T_{vj} = 125 \text{ °C}$	1.90		
			$T_{vj} = 150 \text{ °C}$	1.95		
Peak reverse recovery current	I_{RM}	$V_{CC} = 900 \text{ V}, I_F = 75 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2150 \text{ A/}\mu\text{s} (T_{vj} = 150 \text{ °C})$	$T_{vj} = 25 \text{ °C}$	105		A
			$T_{vj} = 125 \text{ °C}$	125		
			$T_{vj} = 150 \text{ °C}$	130		
Recovered charge	Q_r	$V_{CC} = 900 \text{ V}, I_F = 75 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2150 \text{ A/}\mu\text{s} (T_{vj} = 150 \text{ °C})$	$T_{vj} = 25 \text{ °C}$	13.5		μC
			$T_{vj} = 125 \text{ °C}$	25.4		
			$T_{vj} = 150 \text{ °C}$	29.4		
Reverse recovery energy	E_{rec}	$V_{CC} = 900 \text{ V}, I_F = 75 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2150 \text{ A/}\mu\text{s} (T_{vj} = 150 \text{ °C})$	$T_{vj} = 25 \text{ °C}$	8.6		mJ
			$T_{vj} = 125 \text{ °C}$	17.2		
			$T_{vj} = 150 \text{ °C}$	20.2		

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction to case	R_{thJC}	per diode			0.529	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 1 \text{ W/(m}\cdot\text{K)}$		0.0730		K/W
Temperature under switching conditions	$T_{vj, op}$		-40		150	°C

4 Diode, Rectifier

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25 \text{ °C}$	2200	V
Maximum RMS forward current per chip	I_{FRMSM}	$T_C = 105 \text{ °C}$		81	A
Maximum RMS current at rectifier output	I_{RMSM}	$T_C = 105 \text{ °C}$		140	A
Surge forward current	I_{FSM}	$t_P = 10 \text{ ms}$	$T_{vj} = 25 \text{ °C}$	670	A
			$T_{vj} = 125 \text{ °C}$	585	
			$T_{vj} = 150 \text{ °C}$	540	
I^2t - value	I^2t	$t_P = 10 \text{ ms}$	$T_{vj} = 25 \text{ °C}$	2240	A ² s
			$T_{vj} = 125 \text{ °C}$	1710	
			$T_{vj} = 150 \text{ °C}$	1460	

Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 75 \text{ A}$	$T_{vj} = 25 \text{ °C}$	1.15		V
			$T_{vj} = 125 \text{ °C}$	1.10		
			$T_{vj} = 150 \text{ °C}$	1.10		
Thermal resistance, junction to case	R_{thJC}	per diode			0.651	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 1 \text{ W/(m}\cdot\text{K)}$		0.0800		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}		$T_{vj} = 25\text{ °C}$	1700	V
Continuous DC collector current	I_{CDC}	$T_{vj\text{ max}} = 175\text{ °C}$	$T_C = 100\text{ °C}$	75	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\text{ op}}$		150	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	$V_{CE\text{ sat}}$	$I_C = 75\text{ A}$, $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$		1.95	2.30	V
			$T_{vj} = 125\text{ °C}$		2.35		
			$T_{vj} = 150\text{ °C}$		2.45		
Gate threshold voltage	V_{GETh}	$I_C = 3\text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25\text{ °C}$		5.25	5.80	6.35	V
Gate charge	Q_G	$V_{GE} = \pm 15\text{ V}$, $V_{CC} = 900\text{ V}$			0.9		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\text{ °C}$			8.5		Ω
Input capacitance	C_{ies}	$f = 1000\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$			6.8		nF
Reverse transfer capacitance	C_{res}	$f = 1000\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$			0.22		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1700\text{ V}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$			1	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}	$I_C = 75\text{ A}$, $V_{CC} = 900\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\text{ }\Omega$	$T_{vj} = 25\text{ °C}$		0.230		μs
			$T_{vj} = 125\text{ °C}$		0.250		
			$T_{vj} = 150\text{ °C}$		0.260		
Rise time (inductive load)	t_r	$I_C = 75\text{ A}$, $V_{CC} = 900\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\text{ }\Omega$	$T_{vj} = 25\text{ °C}$		0.036		μs
			$T_{vj} = 125\text{ °C}$		0.040		
			$T_{vj} = 150\text{ °C}$		0.045		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 75\text{ A}$, $V_{CC} = 900\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 4.3\text{ }\Omega$	$T_{vj} = 25\text{ °C}$		0.460		μs
			$T_{vj} = 125\text{ °C}$		0.600		
			$T_{vj} = 150\text{ °C}$		0.640		

(table continues...)

Table 10 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Fall time (inductive load)	t_f	$I_C = 75 \text{ A}$, $V_{CC} = 900 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 4.3 \Omega$	$T_{vj} = 25 \text{ °C}$	0.080		μs
			$T_{vj} = 125 \text{ °C}$	0.150		
			$T_{vj} = 150 \text{ °C}$	0.160		
Turn-on energy loss per pulse	E_{on}	$I_C = 75 \text{ A}$, $V_{CC} = 900 \text{ V}$, $L_\sigma = 35 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 4.3 \Omega$, $di/dt = 2150 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	13		mJ
			$T_{vj} = 125 \text{ °C}$	19		
			$T_{vj} = 150 \text{ °C}$	20		
Turn-off energy loss per pulse	E_{off}	$I_C = 75 \text{ A}$, $V_{CC} = 900 \text{ V}$, $L_\sigma = 35 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 4.3 \Omega$, $dv/dt = 3000 \text{ V}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	14.5		mJ
			$T_{vj} = 125 \text{ °C}$	25.2		
			$T_{vj} = 150 \text{ °C}$	28.5		
SC data	I_{SC}	$V_{GE} \leq 15 \text{ V}$, $V_{CC} = 1000 \text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 10 \mu\text{s}$, $T_{vj} \leq 150 \text{ °C}$	350		A
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.327	K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 1 \text{ W}/(\text{m} \cdot \text{K})$		0.0678		K/W
Temperature under switching conditions	$T_{vj op}$		-40		150	°C

6 Diode, Brake-Chopper

Table 11 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25 \text{ °C}$	1700	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	$t_p = 10 \text{ ms}$, $V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ °C}$	310	A^2s
			$T_{vj} = 150 \text{ °C}$	260	

Table 12 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 50 \text{ A}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$	1.80	2.20	V
			$T_{vj} = 125 \text{ °C}$	1.90		
			$T_{vj} = 150 \text{ °C}$	1.95		
Peak reverse recovery current	I_{RM}	$V_{CC} = 900 \text{ V}$, $I_F = 50 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 1500 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	55		A
			$T_{vj} = 125 \text{ °C}$	64		
			$T_{vj} = 150 \text{ °C}$	68		
Recovered charge	Q_r	$V_{CC} = 900 \text{ V}$, $I_F = 50 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 1500 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	15		μC
			$T_{vj} = 125 \text{ °C}$	21.3		
			$T_{vj} = 150 \text{ °C}$	24.3		
Reverse recovery energy	E_{rec}	$V_{CC} = 900 \text{ V}$, $I_F = 50 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 1500 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	10		mJ
			$T_{vj} = 125 \text{ °C}$	13.5		
			$T_{vj} = 150 \text{ °C}$	16		
Thermal resistance, junction to case	R_{thJC}	per diode			0.692	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$		0.0840		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	°C

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

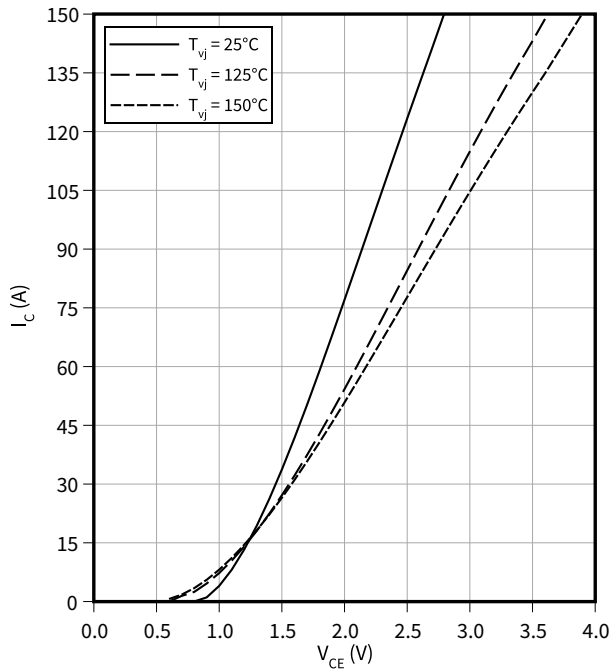
Note: Specification according to the valid application note.

8 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

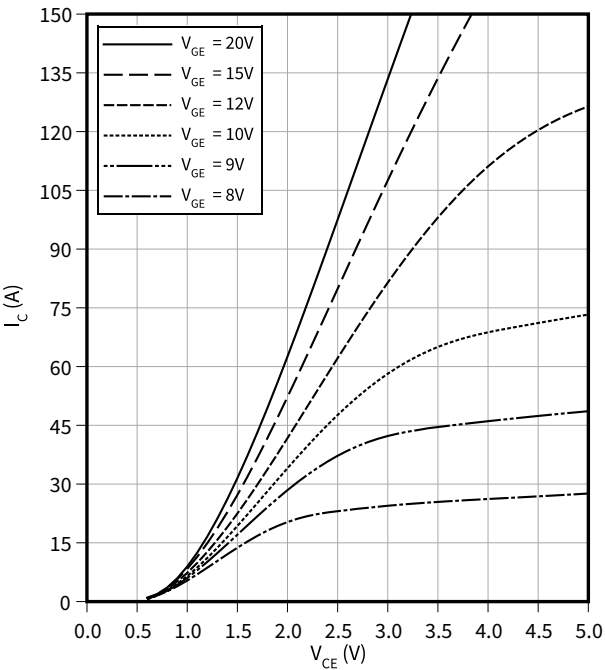
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

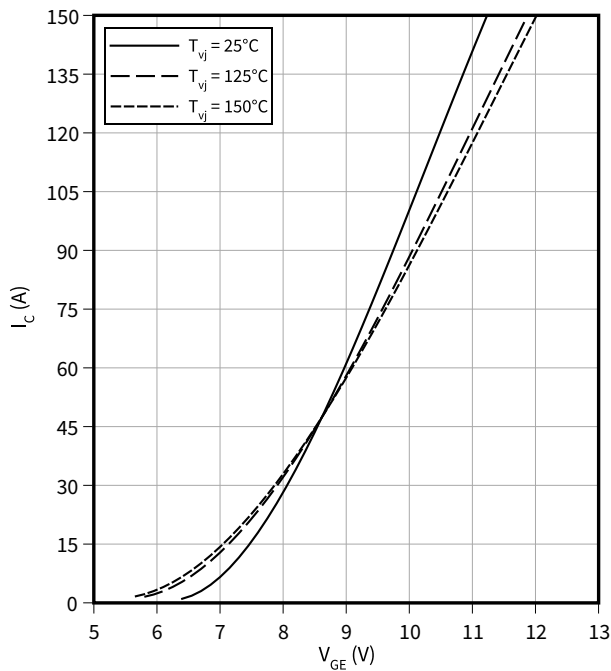
$T_{vj} = 150\text{ °C}$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

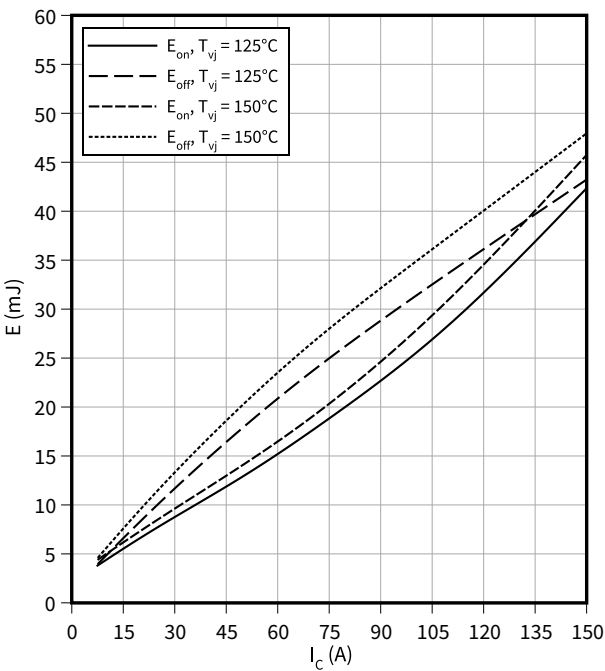
$V_{CE} = 20\text{ V}$



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

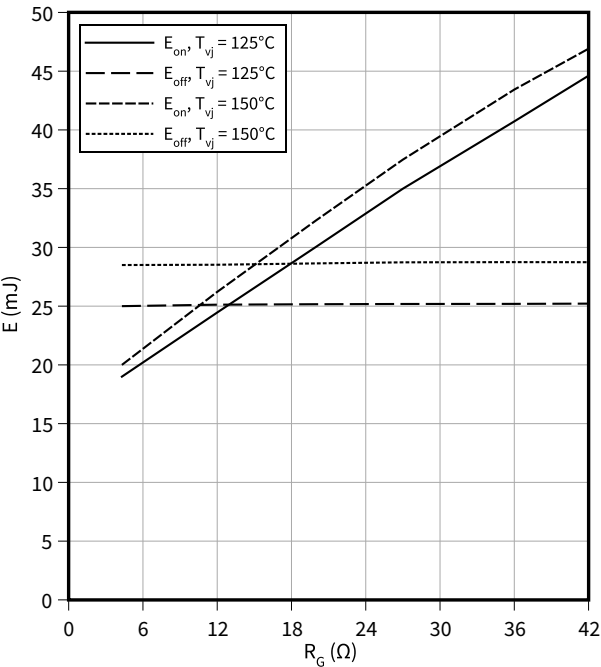
$R_{Goff} = 4.3\text{ }\Omega$, $R_{Gon} = 4.3\text{ }\Omega$, $V_{CC} = 900\text{ V}$, $V_{GE} = \pm 15\text{ V}$



8 Characteristics diagrams

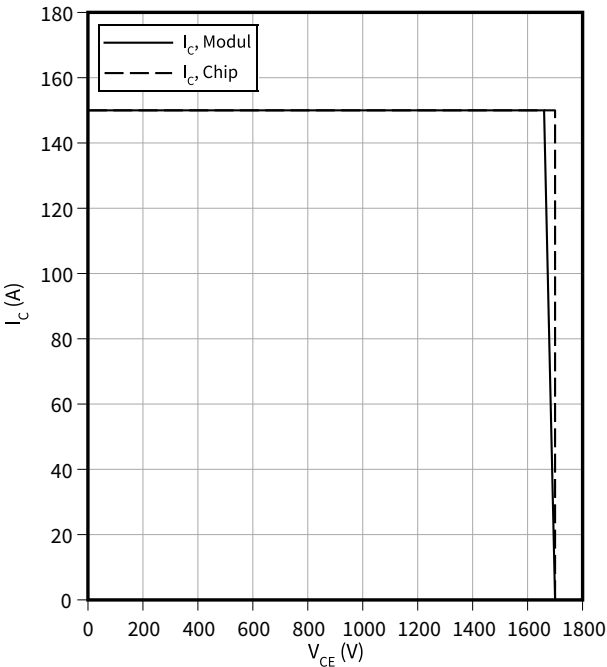
Switching losses (typical), IGBT, Inverter

$E = f(R_G)$
 $I_C = 75\text{ A}, V_{CC} = 900\text{ V}, V_{GE} = \pm 15\text{ V}$



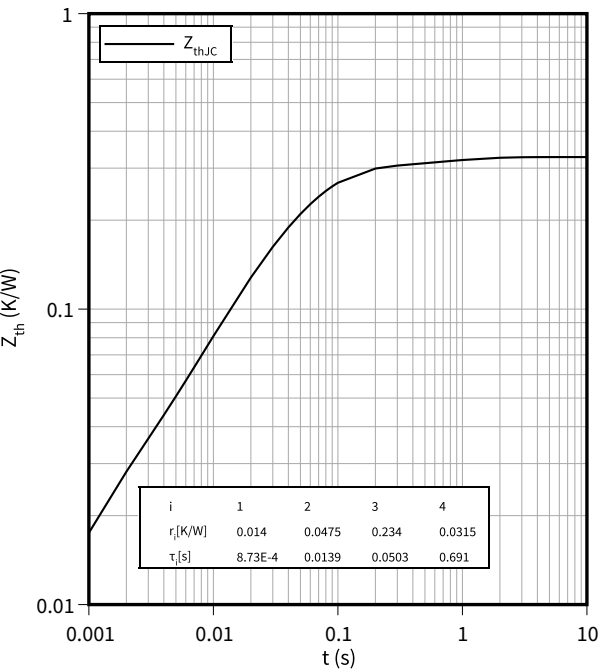
Reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$
 $R_{Goff} = 4.3\text{ }\Omega, V_{GE} = \pm 15\text{ V}, T_{vj} = 150\text{ }^\circ\text{C}$



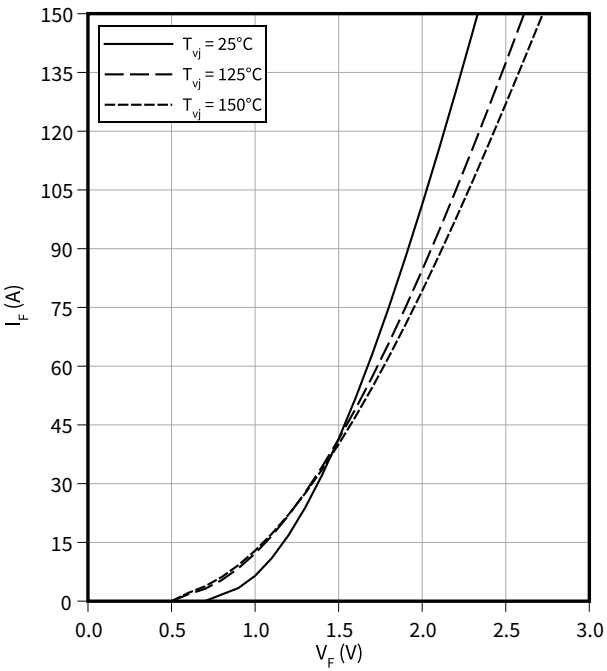
Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Inverter

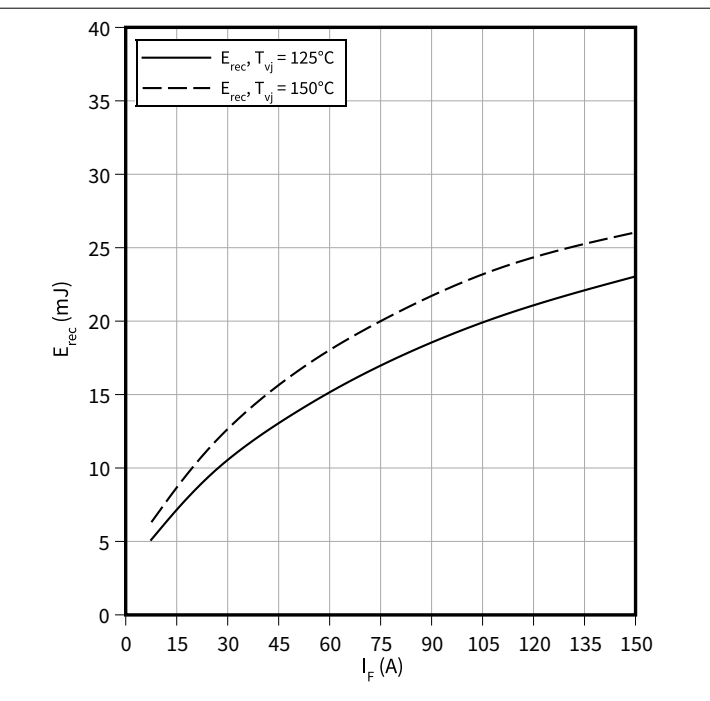
$I_F = f(V_F)$



8 Characteristics diagrams

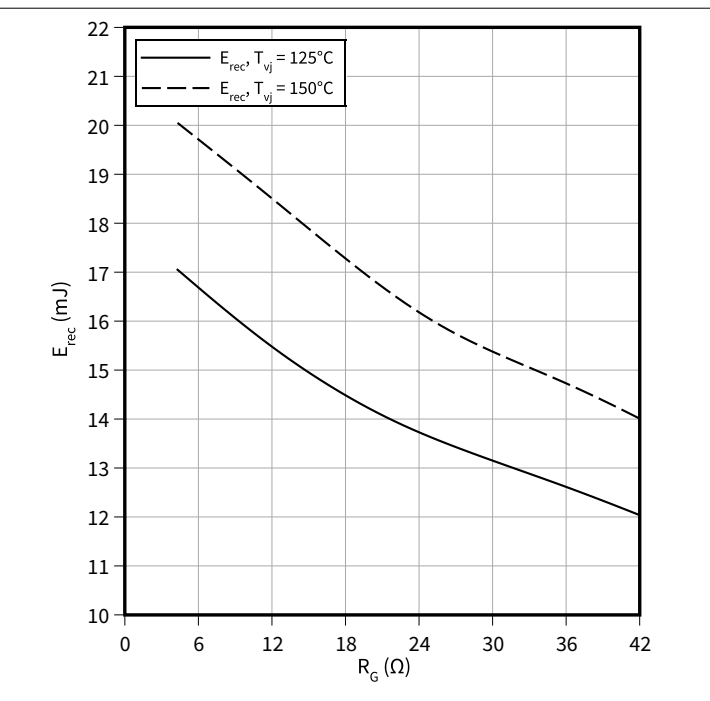
Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$
 $R_{Gon} = R_{Gon}(IGBT) , V_{CC} = 900\text{ V}$



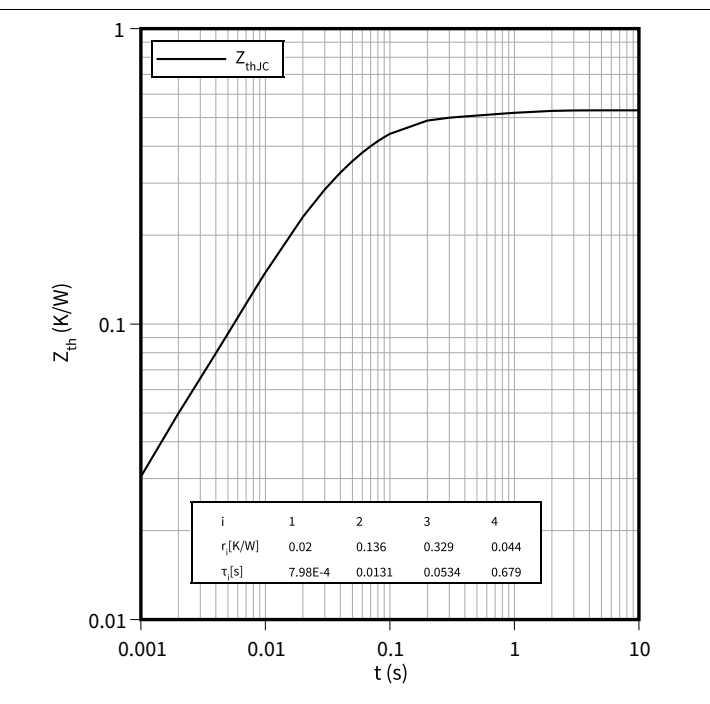
Switching losses (typical), Diode, Inverter

$E_{rec} = f(R_G)$
 $I_F = 75\text{ A}, V_{CC} = 900\text{ V}$



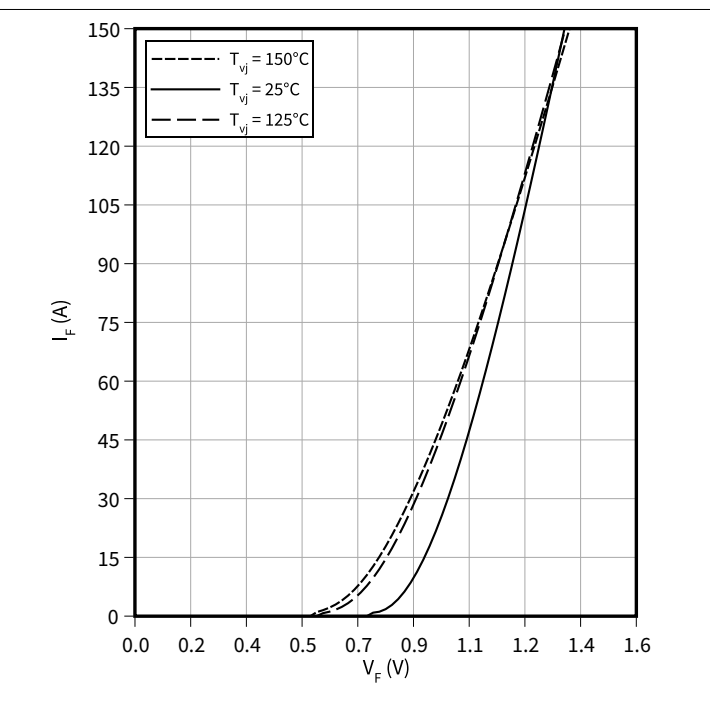
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Rectifier

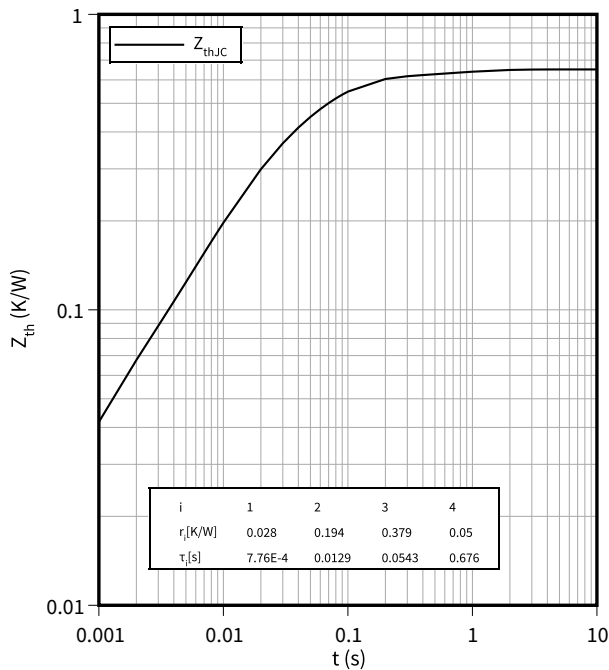
$I_F = f(V_F)$



8 Characteristics diagrams

Transient thermal impedance, Diode, Rectifier

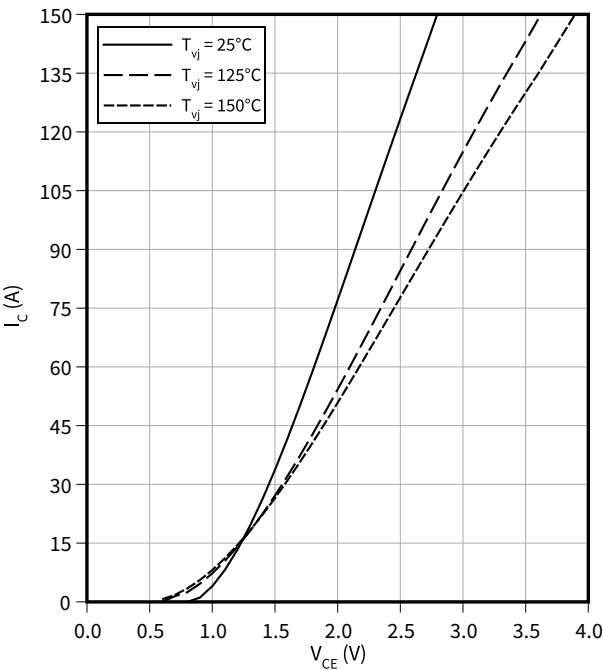
$Z_{th} = f(t)$



Output characteristic (typical), IGBT, Brake-Chopper

$I_C = f(V_{CE})$

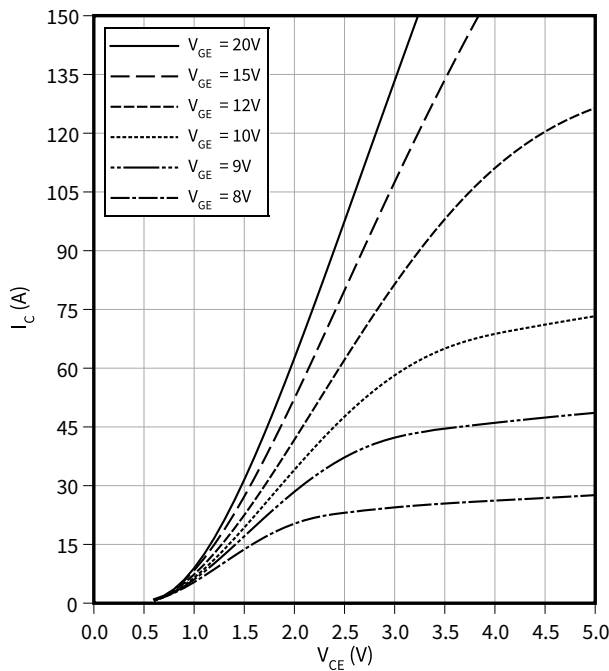
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Brake-Chopper

$I_C = f(V_{CE})$

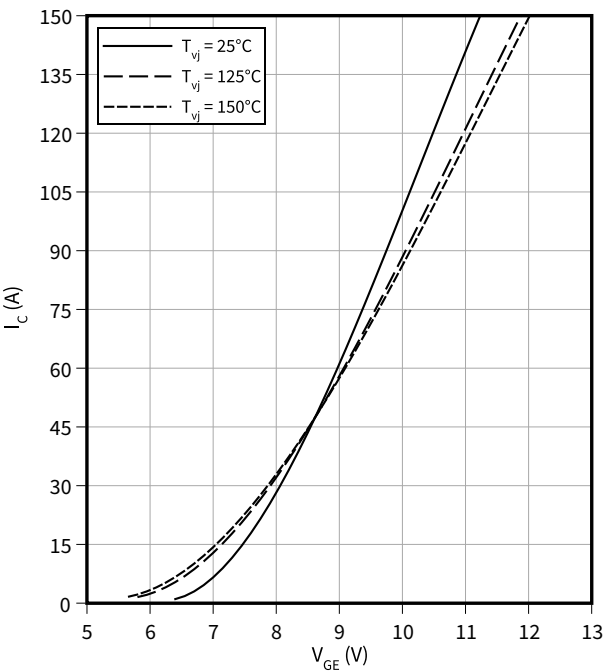
$T_{vj} = 150\text{ }^{\circ}\text{C}$



Transfer characteristic (typical), IGBT, Brake-Chopper

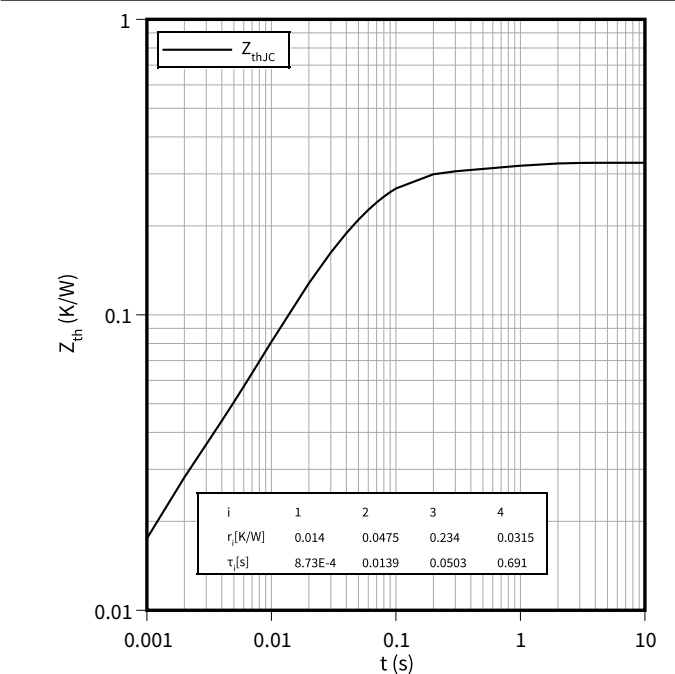
$I_C = f(V_{GE})$

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

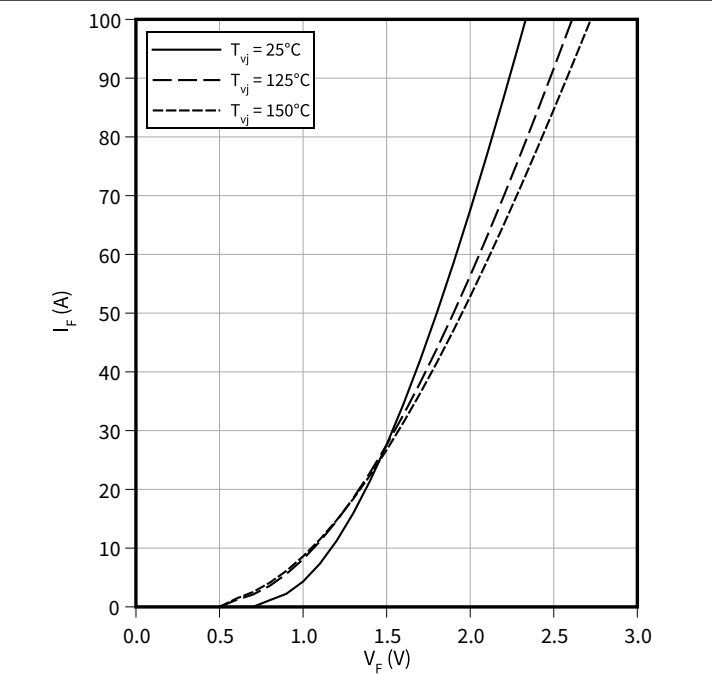


8 Characteristics diagrams

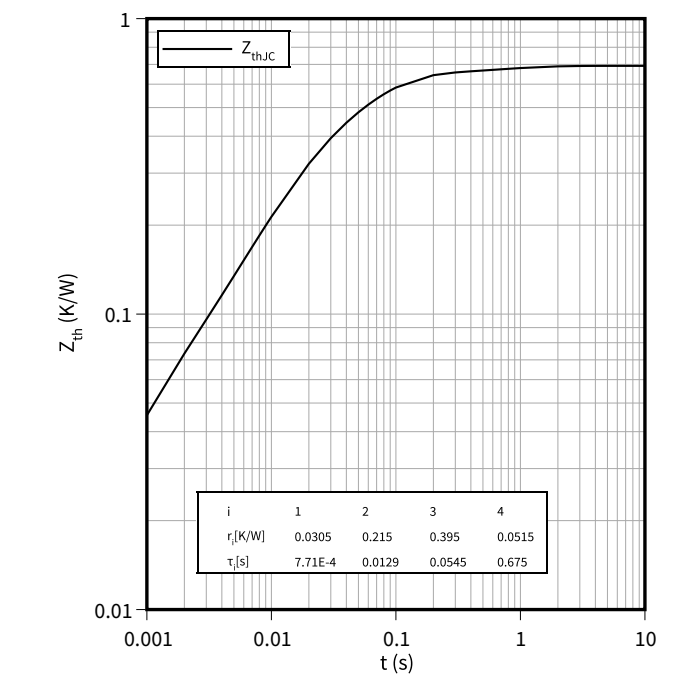
Transient thermal impedance, IGBT, Brake-Chopper
 $Z_{th} = f(t)$



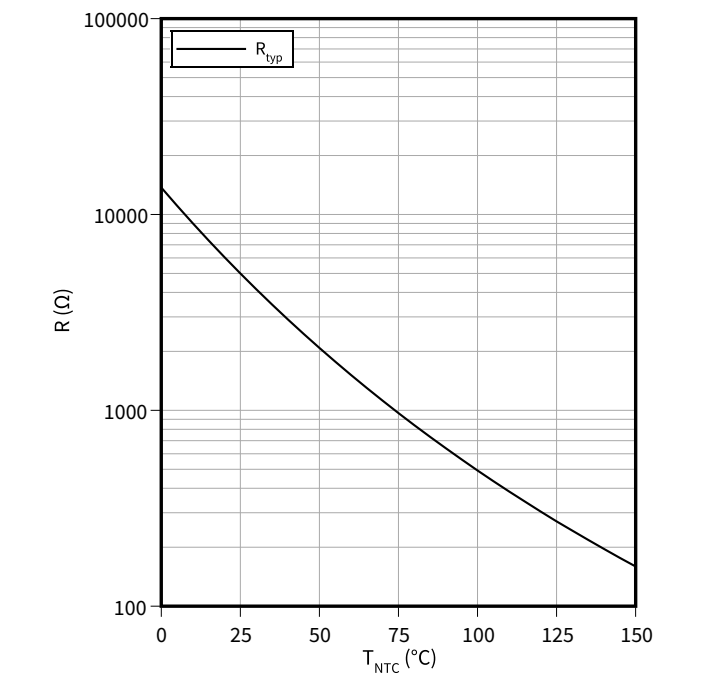
Forward characteristic (typical), Diode, Brake-Chopper
 $I_F = f(V_F)$



Transient thermal impedance, Diode, Brake-Chopper
 $Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor
 $R = f(T_{NTC})$



9 Circuit diagram

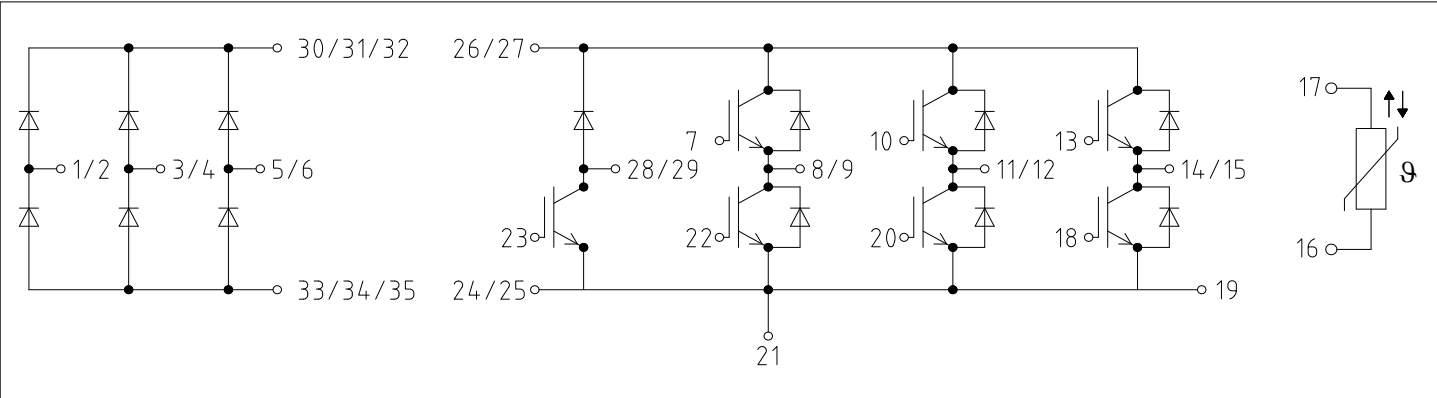


Figure 1

Figure 2

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

Revision history

Document revision	Date of release	Description of changes
0.10	2021-12-16	Initial version
1.00	2024-07-03	Final datasheet

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