

Preliminary datasheet

EasyPIM™ module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode and NTC

Features

- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_{C\text{ nom}} = 50\text{ A} / I_{CRM} = 100\text{ A}$
 - TRENCHSTOP™ IGBT7
 - Overload operation up to 175°C
 - Low $V_{CE,sat}$
- Mechanical features
 - Al_2O_3 substrate with low thermal resistance
 - Solder contact technology
 - High power density
 - Compact design
 - 2.5 kV AC 1 minute insulation



Potential applications

- Air conditioning
- Auxiliary inverters
- Motor drives

Product validation

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

Description

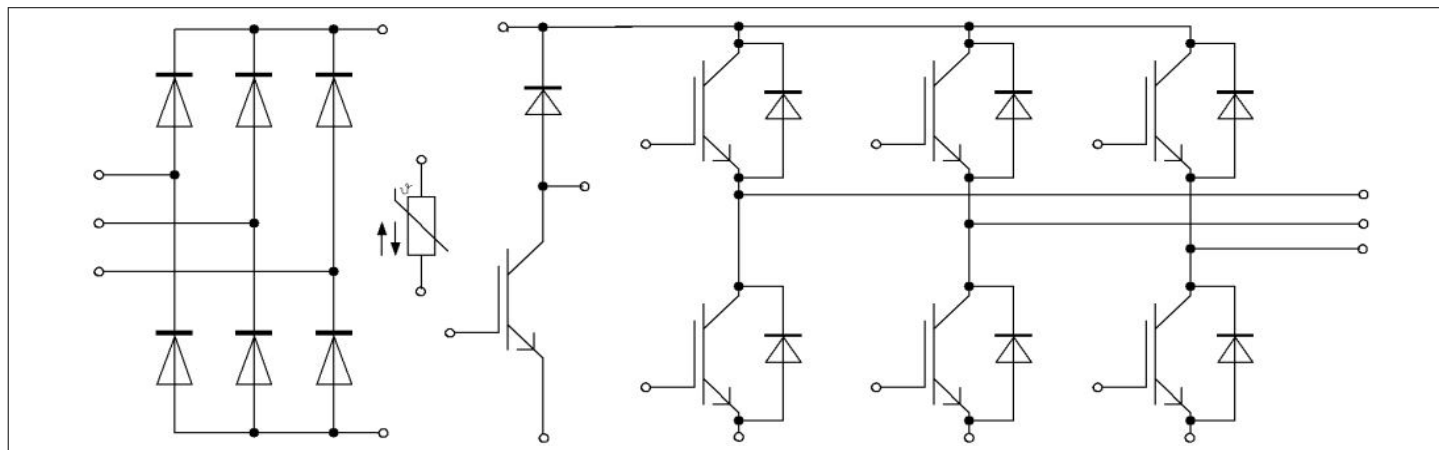


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	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
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}			30		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_H = 25 \text{ °C}$, per switch		6		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25 \text{ °C}$, per switch		5		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting force per clamp	F		40		80	N
Weight	G			39		g

Note: The current under continuous operation is limited to 30 A rms per connector pin. $T_{vj\text{ op}} > 150 \text{ °C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

2 IGBT, Inverter

Table 3 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}	$T_{vj\text{ max}} = 175 \text{ °C}$	$T_H = 80 \text{ °C}$	50	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\text{ op}}$		100	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	$V_{CE\ sat}$	$I_C = 50\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$		1.50	TBD	V
			$T_{vj} = 125\ ^\circ C$		1.64		
			$T_{vj} = 175\ ^\circ C$		1.72		
Gate threshold voltage	V_{GETh}	$I_C = 1.28\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$		5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CC} = 600\ V$			0.92		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$			0		Ω
Input capacitance	C_{ies}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			11.1		nF
Reverse transfer capacitance	C_{res}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.039		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$			0.008	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}	$I_C = 50\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 5.1\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.051		μs
			$T_{vj} = 125\ ^\circ C$		0.054		
			$T_{vj} = 175\ ^\circ C$		0.055		
Rise time (inductive load)	t_r	$I_C = 50\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 5.1\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.027		μs
			$T_{vj} = 125\ ^\circ C$		0.028		
			$T_{vj} = 175\ ^\circ C$		0.029		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 50\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 5.1\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.265		μs
			$T_{vj} = 125\ ^\circ C$		0.335		
			$T_{vj} = 175\ ^\circ C$		0.382		
Fall time (inductive load)	t_f	$I_C = 50\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 5.1\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.111		μs
			$T_{vj} = 125\ ^\circ C$		0.185		
			$T_{vj} = 175\ ^\circ C$		0.277		
Turn-on energy loss per pulse	E_{on}	$I_C = 50\ A, V_{CC} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 5.1\ \Omega, di/dt = 1700\ A/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		3.24		mJ
			$T_{vj} = 125\ ^\circ C$		4.49		
			$T_{vj} = 175\ ^\circ C$		5.21		
Turn-off energy loss per pulse	E_{off}	$I_C = 50\ A, V_{CC} = 600\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 5.1\ \Omega, dv/dt = 2900\ V/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		3.84		mJ
			$T_{vj} = 125\ ^\circ C$		5.54		
			$T_{vj} = 175\ ^\circ C$		6.63		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
SC data	I_{SC}	$V_{GE} \leq 15 \text{ V}$, $V_{CC} = 800 \text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$		190		A
				180		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, $\lambda_{grease} = 1 \text{ W/(m} \cdot \text{K)}$		0.910		K/W
Temperature under switching conditions	$T_{vj \text{ op}}$		-40		175	°C

3 Diode, Inverter

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25\text{ °C}$	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	$t_P = 10\text{ ms}$, $V_R = 0\text{ V}$	$T_{vj} = 125\text{ °C}$	300	A^2s
			$T_{vj} = 175\text{ °C}$	250	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 50 \text{ A}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$	1.72	TBD	V
			$T_{vj} = 125 \text{ °C}$	1.59		
			$T_{vj} = 175 \text{ °C}$	1.52		
Peak reverse recovery current	I_{RM}	$V_{CC} = 600 \text{ V}$, $I_F = 50 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt =$ $1700 \text{ A/}\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	48.2		A
			$T_{vj} = 125 \text{ °C}$	65.5		
			$T_{vj} = 175 \text{ °C}$	77.8		
Recovered charge	Q_r	$V_{CC} = 600 \text{ V}$, $I_F = 50 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt =$ $1700 \text{ A/}\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	4.36		μC
			$T_{vj} = 125 \text{ °C}$	7.52		
			$T_{vj} = 175 \text{ °C}$	9.82		

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Reverse recovery energy	E_{rec}	$V_{CC} = 600\text{ V}$, $I_F = 50\text{ A}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 1700\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	1.57		mJ
			$T_{vj} = 125\text{ °C}$	2.95		
			$T_{vj} = 175\text{ °C}$	3.95		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		1.20		K/W
Temperature under switching conditions	$T_{vj,op}$		-40		175	°C

4 Diode, Rectifier

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25\text{ °C}$	1600	V
Maximum RMS forward current per chip	I_{FRMSM}	$T_H = 90\text{ °C}$		50	A
Maximum RMS current at rectifier output	I_{RMSM}	$T_H = 90\text{ °C}$		50	A
Surge forward current	I_{FSM}	$t_p = 10\text{ ms}$	$T_{vj} = 25\text{ °C}$	450	A
			$T_{vj} = 150\text{ °C}$	370	
I^2t - value	I^2t	$t_p = 10\text{ ms}$	$T_{vj} = 25\text{ °C}$	1010	A ² s
			$T_{vj} = 150\text{ °C}$	685	

Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 50\text{ A}$ $T_{vj} = 150\text{ °C}$		1.09		V
Reverse current	I_r	$T_{vj} = 150\text{ °C}$, $V_R = 1600\text{ V}$		0.18		mA
Thermal resistance, junction to heat sink	R_{thJH}	per diode, $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		1.24		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}	$T_{vj\text{ max}} = 175\text{ °C}$	$T_H = 90\text{ °C}$	35	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\text{ op}}$		70	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	$V_{CE\text{ sat}}$	$I_C = 35\text{ A}$, $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$		1.60	TBD	V
			$T_{vj} = 125\text{ °C}$		1.74		
			$T_{vj} = 175\text{ °C}$		1.82		
Gate threshold voltage	V_{GEth}	$I_C = 0.75\text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25\text{ °C}$		5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15\text{ V}$, $V_{CC} = 600\text{ V}$			0.548		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\text{ °C}$			0		Ω
Input capacitance	C_{ies}	$f = 100\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$			6.62		nF
Reverse transfer capacitance	C_{res}	$f = 100\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$			0.023		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\text{ V}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$			0.005	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}	$I_C = 35\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 5.6\text{ }\Omega$	$T_{vj} = 25\text{ °C}$		0.043		μs
			$T_{vj} = 125\text{ °C}$		0.046		
			$T_{vj} = 175\text{ °C}$		0.048		
Rise time (inductive load)	t_r	$I_C = 35\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 5.6\text{ }\Omega$	$T_{vj} = 25\text{ °C}$		0.036		μs
			$T_{vj} = 125\text{ °C}$		0.038		
			$T_{vj} = 175\text{ °C}$		0.039		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 35\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 5.6\text{ }\Omega$	$T_{vj} = 25\text{ °C}$		0.240		μs
			$T_{vj} = 125\text{ °C}$		0.310		
			$T_{vj} = 175\text{ °C}$		0.340		
Fall time (inductive load)	t_f	$I_C = 35\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 5.6\text{ }\Omega$	$T_{vj} = 25\text{ °C}$		0.120		μs
			$T_{vj} = 125\text{ °C}$		0.210		
			$T_{vj} = 175\text{ °C}$		0.270		

(table continues...)

Table 10 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-on energy loss per pulse	E_{on}	$I_C = 35\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 5.6\ \Omega$, $di/dt = 590\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	2.84		mJ
			$T_{vj} = 125\text{ °C}$	3.38		
			$T_{vj} = 175\text{ °C}$	3.61		
Turn-off energy loss per pulse	E_{off}	$I_C = 35\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 5.6\ \Omega$, $dv/dt = 3000\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	2.31		mJ
			$T_{vj} = 125\text{ °C}$	3.84		
			$T_{vj} = 175\text{ °C}$	4.28		
SC data	I_{SC}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 800\text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 8\ \mu\text{s}$, $T_{vj} = 150\text{ °C}$	110		A
			$t_p \leq 7\ \mu\text{s}$, $T_{vj} = 175\text{ °C}$	100		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, $\lambda_{grease} = 1\text{ W}/(\text{m} \cdot \text{K})$		1.09		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		175	°C

6 Diode, Brake-Chopper

Table 11 Maximum rated values

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

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	TBD	V
			$T_{vj} = 125\text{ °C}$	1.70		
			$T_{vj} = 175\text{ °C}$	1.63		

(table continues...)

Table 12 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Peak reverse recovery current	I_{RM}	$V_{CC} = 600 \text{ V}$, $I_F = 25 \text{ A}$, $-di_F/dt = 570 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	22.2		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$	29.2		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	33.9		
Recovered charge	Q_r	$V_{CC} = 600 \text{ V}$, $I_F = 25 \text{ A}$, $-di_F/dt = 570 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	1.63		μC
			$T_{vj} = 125 \text{ }^\circ\text{C}$	3.44		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	4.59		
Reverse recovery energy	E_{rec}	$V_{CC} = 600 \text{ V}$, $I_F = 25 \text{ A}$, $-di_F/dt = 570 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.38		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1.25		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	1.88		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$		2.02		K/W
Temperature under switching conditions	$T_{vj op}$		-40		175	$^\circ\text{C}$

7 NTC-Thermistor

Table 13 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25 \text{ }^\circ\text{C}$		5		k Ω
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100 \text{ }^\circ\text{C}$, $R_{100} = 493 \text{ } \Omega$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25 \text{ }^\circ\text{C}$			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

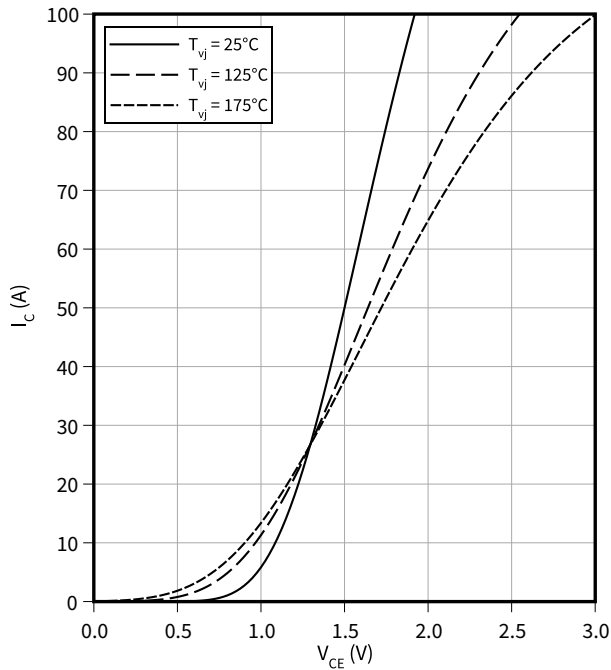
Note: Specification according to the valid application note.

8 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

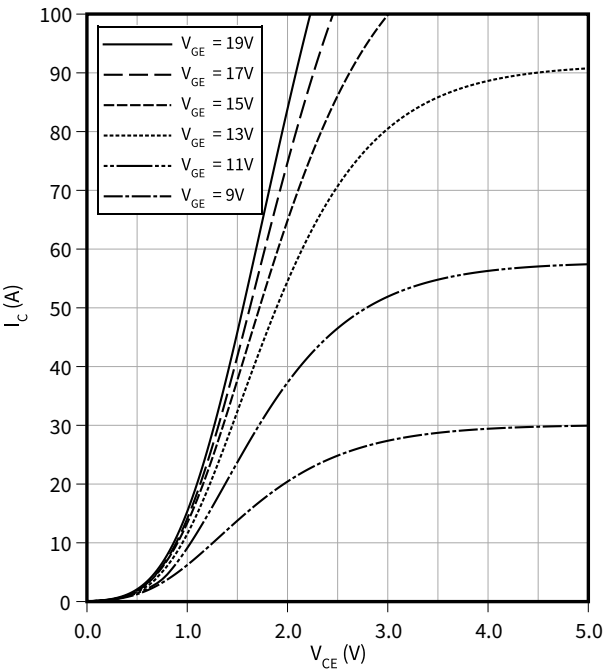
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

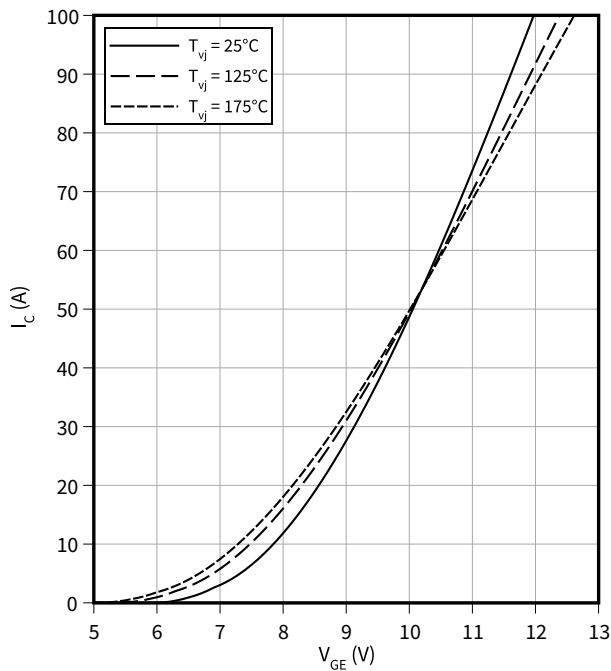
$T_{vj} = 175\text{ °C}$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

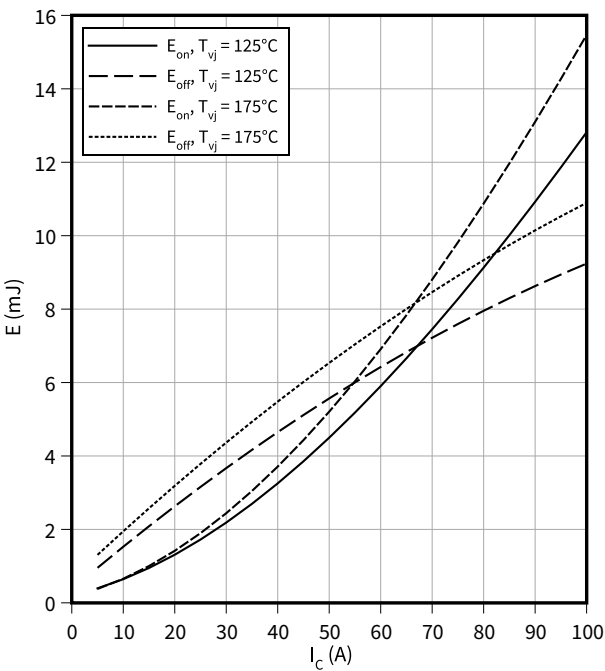
$V_{CE} = 20\text{ V}$



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

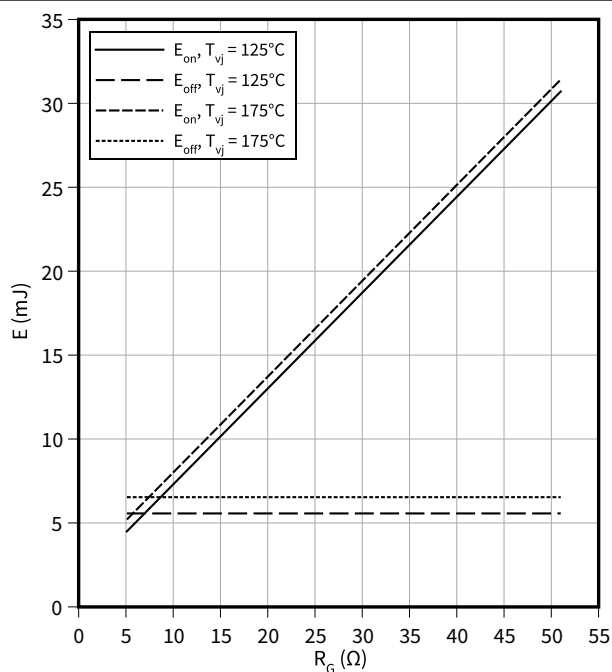
$R_{Goff} = 5.1\text{ }\Omega$, $R_{Gon} = 5.1\text{ }\Omega$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$



Switching losses (typical), IGBT, Inverter

$$E = f(R_G)$$

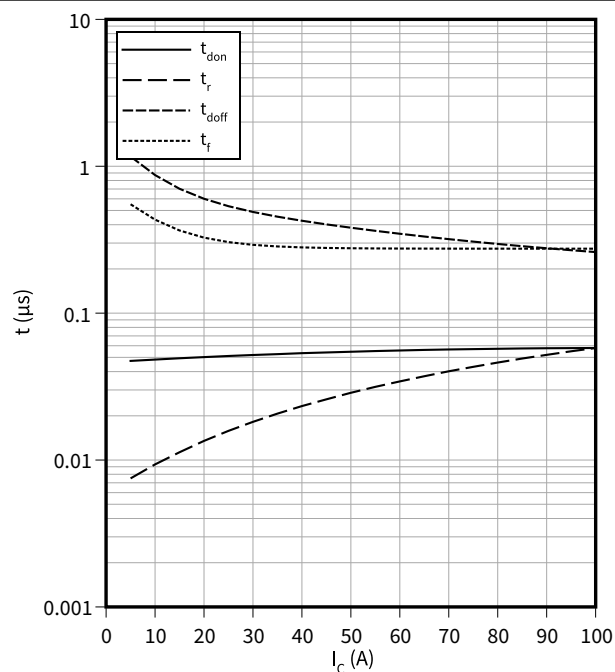
$$I_C = 50 \text{ A}, V_{CC} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}$$



Switching times (typical), IGBT, Inverter

$$t = f(I_C)$$

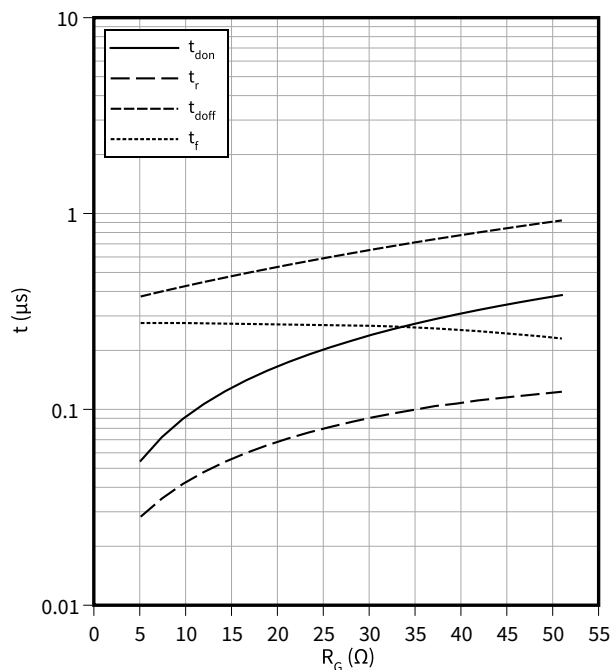
$$R_{Goff} = 5.1 \Omega, R_{Gon} = 5.1 \Omega, V_{CC} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 175^\circ \text{C}$$



Switching times (typical), IGBT, Inverter

$$t = f(R_G)$$

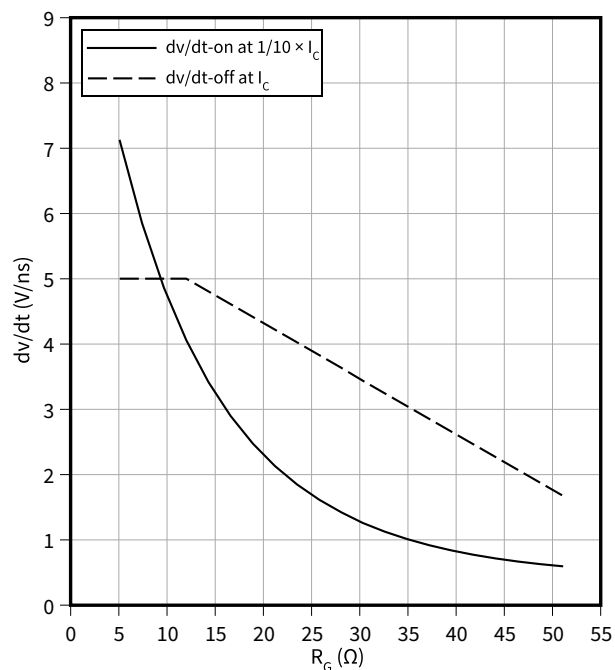
$$I_C = 50 \text{ A}, V_{CC} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 175^\circ \text{C}$$



Voltage slope (typical), IGBT, Inverter

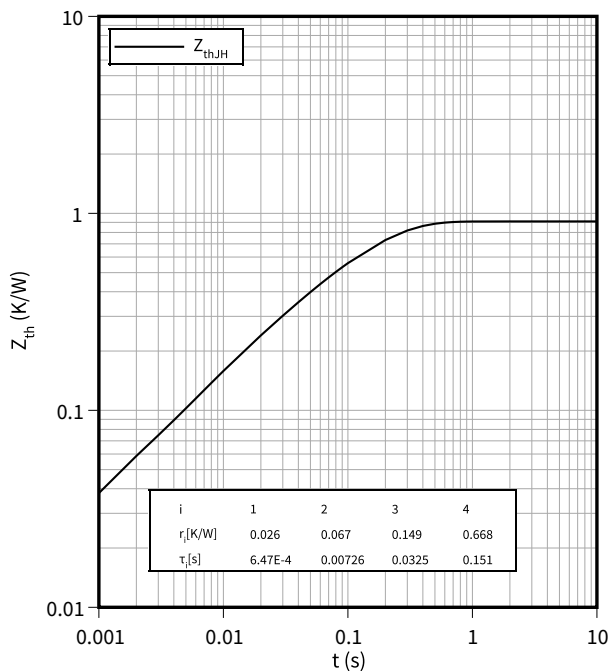
$$dv/dt = f(R_G)$$

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



Transient thermal impedance , IGBT, Inverter

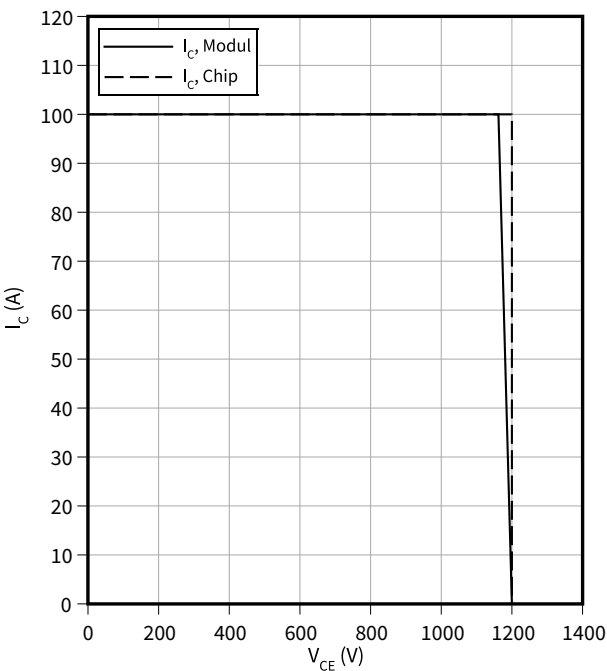
$Z_{th} = f(t)$



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

$I_C = f(V_{CE})$

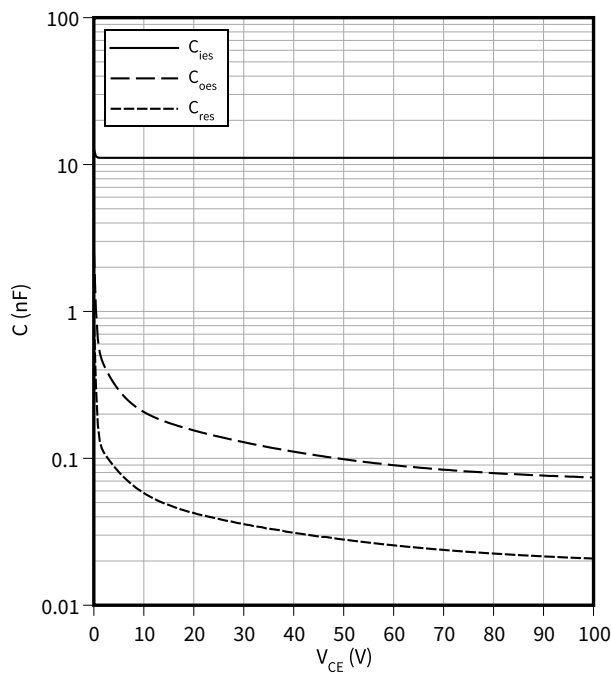
$R_{Goff} = 5.1 \Omega, V_{GE} = \pm 15 V, T_{vj} = 175 \text{ }^\circ\text{C}$



Capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

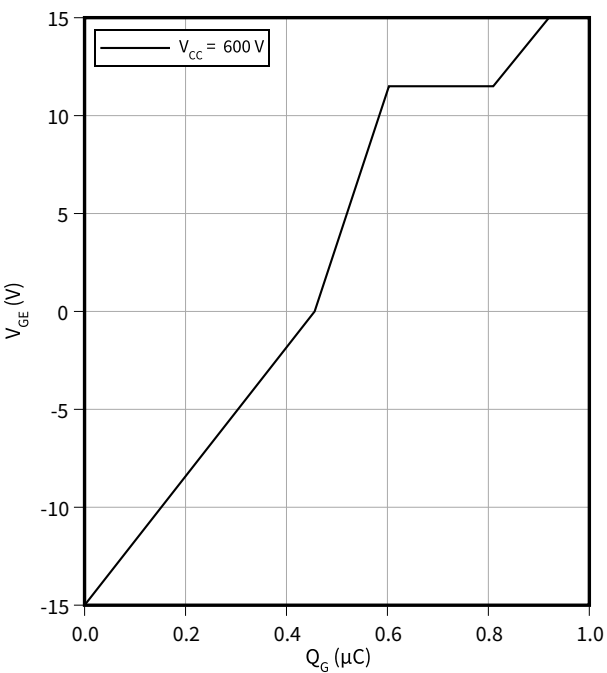
$f = 100 \text{ kHz}, V_{GE} = 0 V, T_{vj} = 25 \text{ }^\circ\text{C}$



Gate charge characteristic (typical), IGBT, Inverter

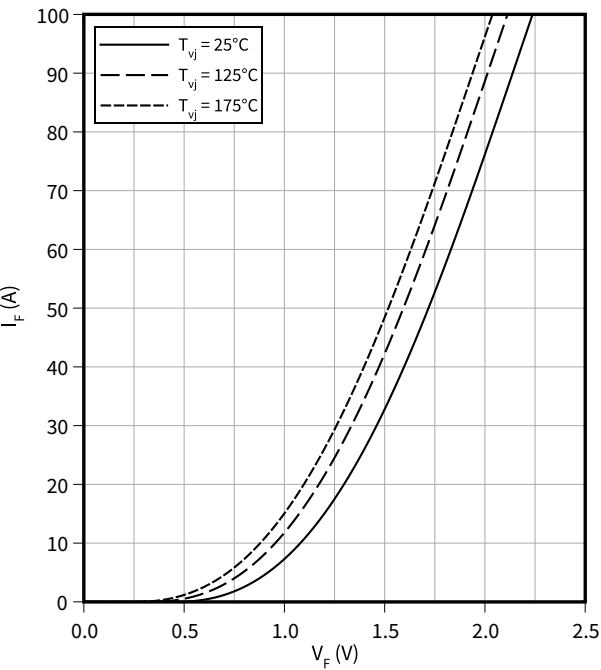
$V_{GE} = f(Q_G)$

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



Forward characteristic (typical), Diode, Inverter

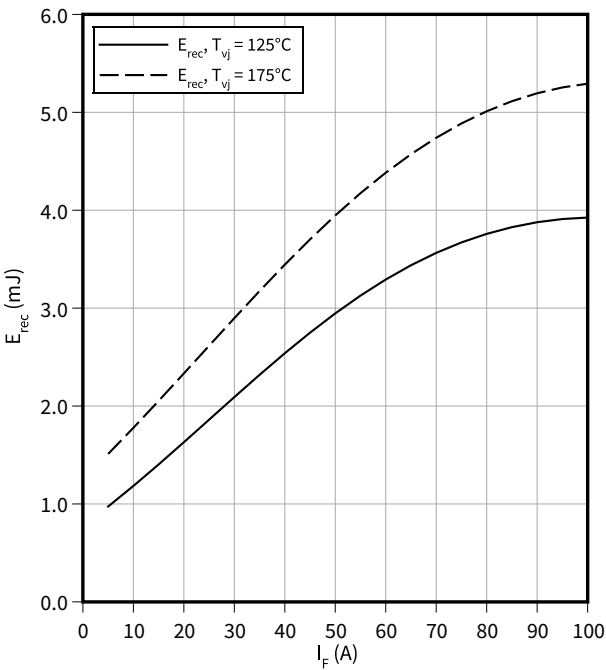
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

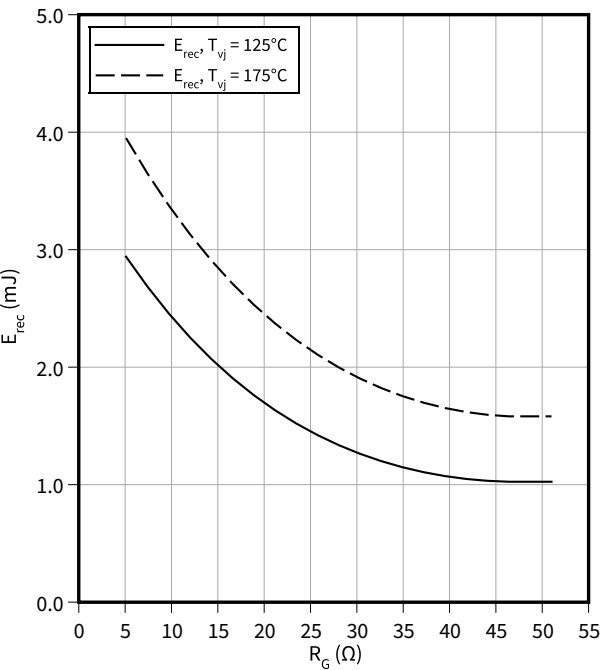
$R_{Gon} = 5.1\ \Omega$, $V_{CC} = 600\ \text{V}$



Switching losses (typical), Diode, Inverter

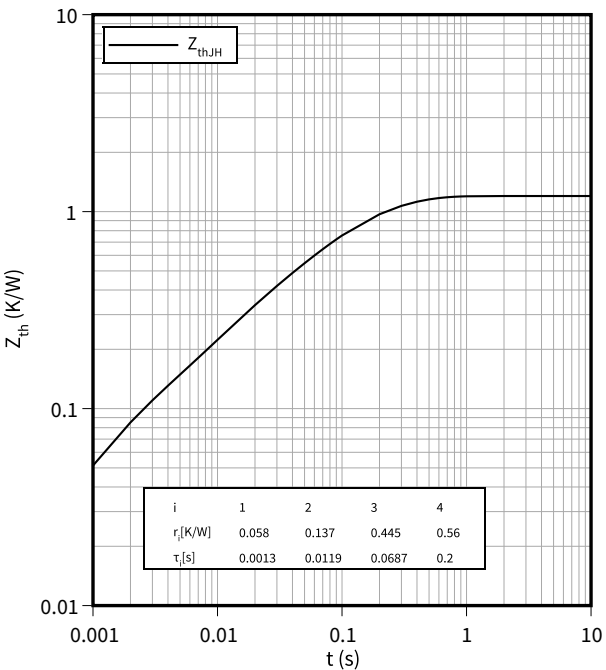
$E_{rec} = f(R_G)$

$I_F = 50\ \text{A}$, $V_{CC} = 600\ \text{V}$



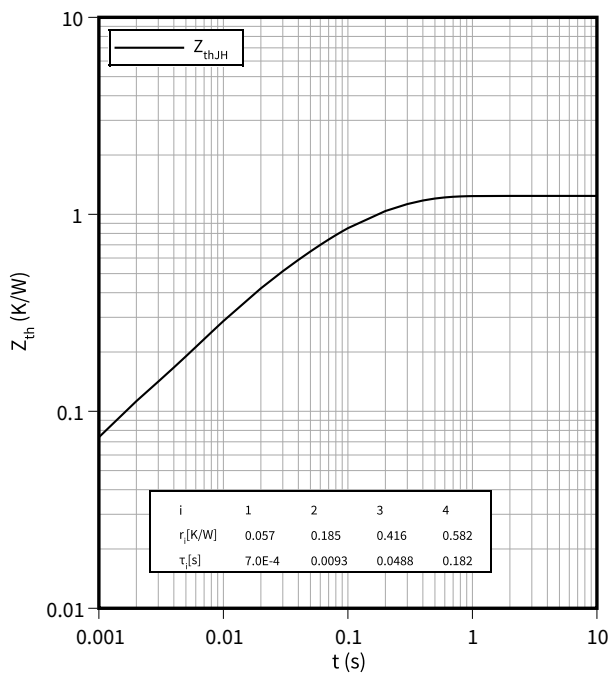
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



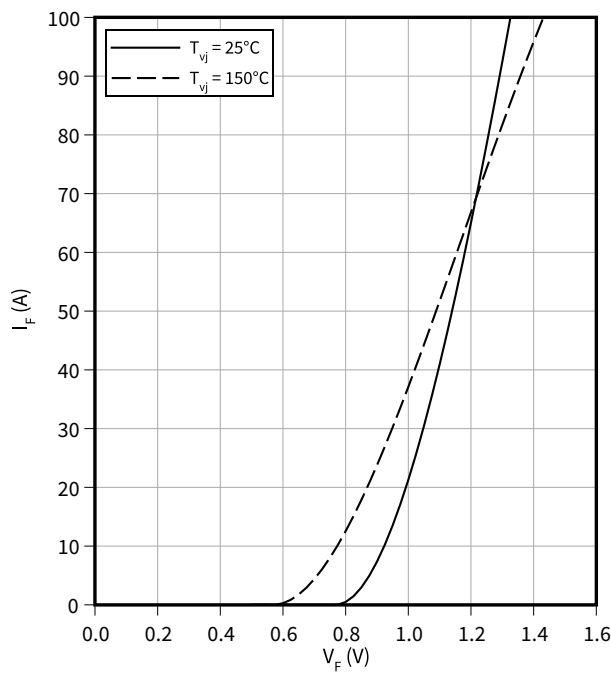
Transient thermal impedance, Diode, Rectifier

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Rectifier

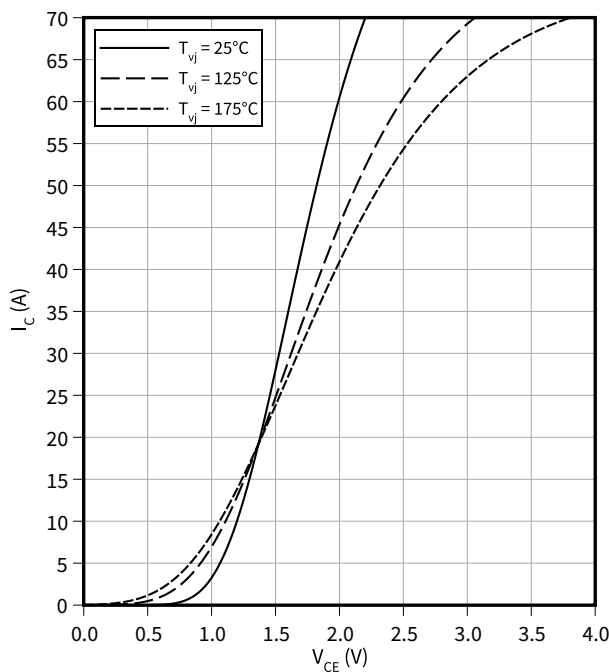
$I_F = f(V_F)$



Output characteristic (typical), IGBT, Brake-Chopper

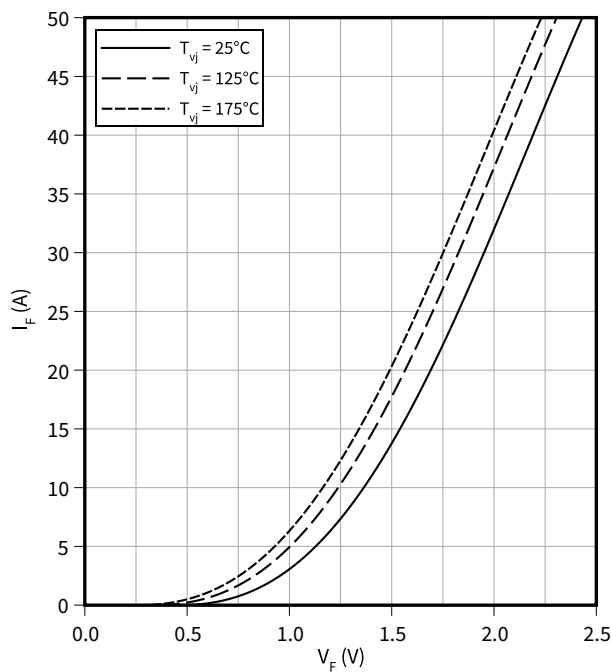
$I_C = f(V_{CE})$

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



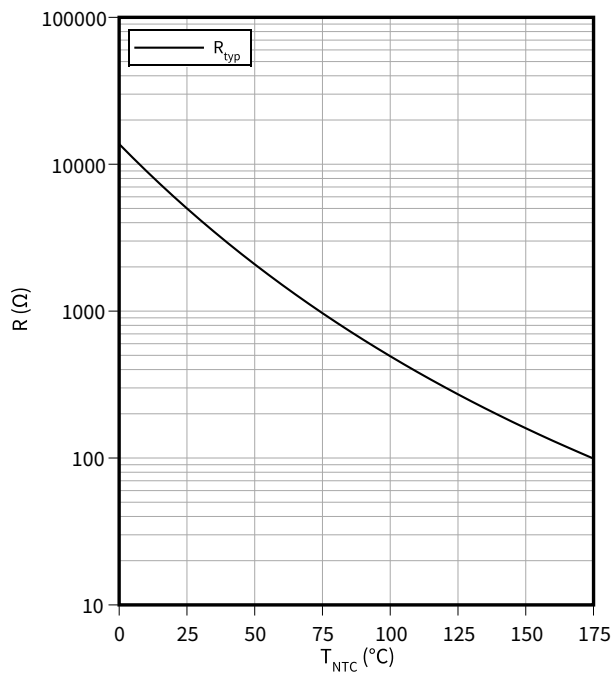
Forward characteristic (typical), Diode, Brake-Chopper

$I_F = f(V_F)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



9 **Circuit diagram**

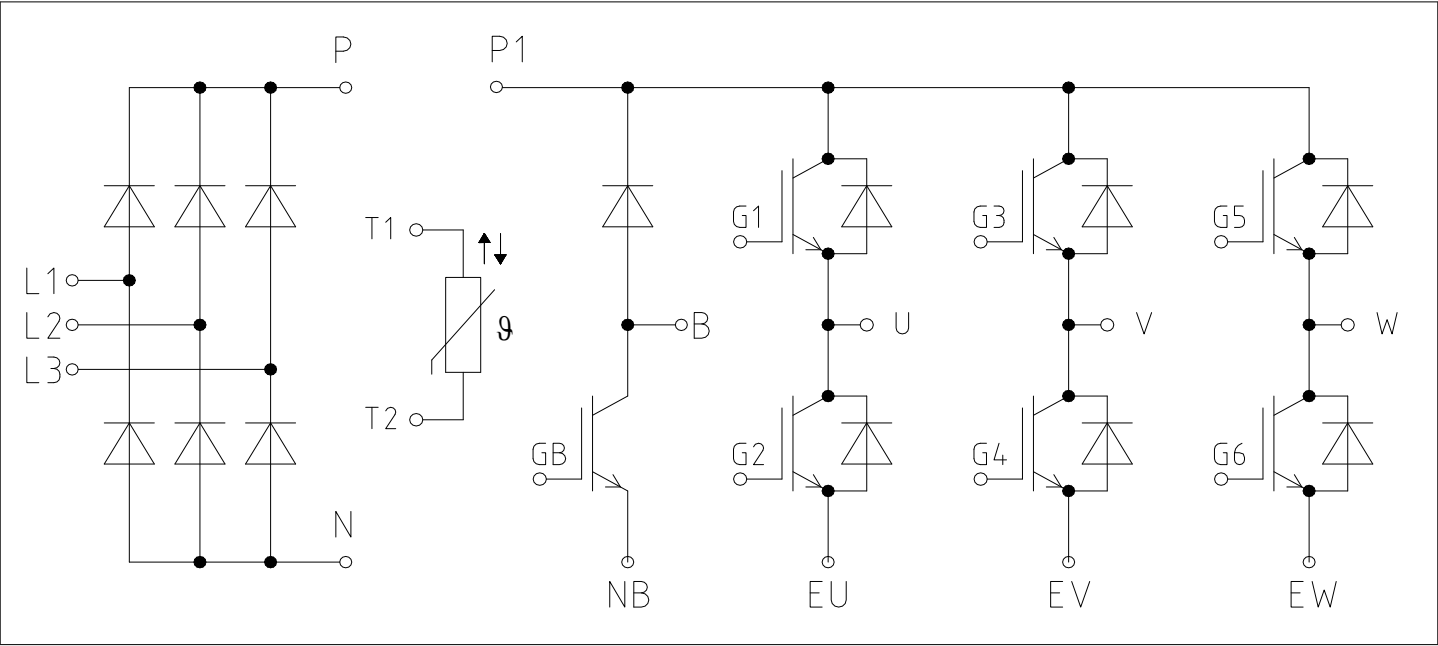


Figure 1



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	Content	Digit	Example
	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	 7154914284655054991153071549142846550549911530		

Figure 3

Revision history

Document revision	Date of release	Description of changes
V2.0	2020-05-08	Preliminary 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
0.20	2023-02-14	Preliminary datasheet

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