

Final datasheet

PrimePACK™3+ B-series module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode and NTC / pre-applied thermal interface material

Features

- Electrical features
 - $V_{CES} = 2300 \text{ V}$
 - $I_{C \text{ nom}} = 1800 \text{ A} / I_{CRM} = 3600 \text{ A}$
 - TRENCHSTOP™ IGBT7
 - $T_{vj,op} = 150^\circ\text{C}$
 - Overload operation up to 175°C
 - Low $V_{CE,sat}$
 - Low switching losses
 - High current density
 - Low inductive design
- Mechanical features
 - Package with CTI > 400
 - High creepage and clearance distances
 - High power density
 - Pre-applied thermal interface material



Potential applications

- Three-level applications
- Solar applications

Product validation

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

Description

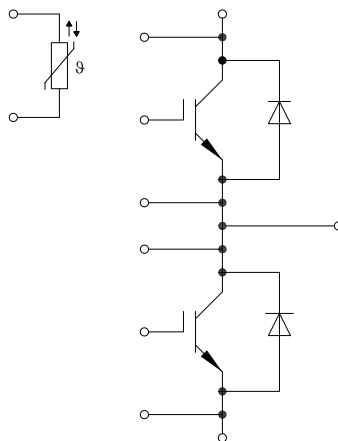




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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50$ Hz	4.0	kV
Material of module baseplate			Cu	
Comparative tracking index	CTI		> 400	

Table 2 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray inductance module	L_{sCE}				10		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_H = 25\text{ }^{\circ}\text{C}$, per switch			0.09		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25\text{ }^{\circ}\text{C}$, per switch			0.1		mΩ
Storage temperature	T_{stg}			-40		150	°C
Maximum baseplate operation temperature	T_{BPmax}					150	°C
Mounting torque for module mounting	M	- Mounting according to valid application note	M5, Screw	3		6	Nm
Terminal connection torque	M	- Mounting according to valid application note	M4, Screw	1.8		2.1	Nm
			M8, Screw	8		10	
Weight	G				1400		g

2 IGBT, Inverter

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		$T_{vj} = 25$ °C	2300	V
Implemented collector current	I_{CN}			1800	A
Continuous DC collector current	I_{CDC}	$T_{vj\ max} = 150$ °C	$T_H = 45$ °C	1420	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\ op}$		3600	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	$V_{CE\ sat}$	$I_C = 1800\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$		1.80	2.26	V
			$T_{vj} = 125\ ^\circ C$		2.15	2.94	
			$T_{vj} = 150\ ^\circ C$		2.25	3.13	
Gate threshold voltage	V_{GETh}	$I_C = 49.5\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$		5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CC} = 1200\ V, T_{vj} = 25\ ^\circ C$			14.6		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$			0.96		Ω
Input capacitance	C_{ies}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			225		nF
Reverse transfer capacitance	C_{res}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.54		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 2300\ V, V_{GE} = 0\ V$	$T_{vj} = 125\ ^\circ C$			30	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\ V, V_{GE} = 20\ V, T_{vj} = 25\ ^\circ C$				400	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 1800\ A, V_{CC} = 1200\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.1\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.53		μs
			$T_{vj} = 125\ ^\circ C$		0.55		
			$T_{vj} = 150\ ^\circ C$		0.56		
Rise time (inductive load)	t_r	$I_C = 1800\ A, V_{CC} = 1200\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.1\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.072		μs
			$T_{vj} = 125\ ^\circ C$		0.078		
			$T_{vj} = 150\ ^\circ C$		0.083		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 1800\ A, V_{CC} = 1200\ V, V_{GE} = \pm 15\ V, R_{Goff} = 1.5\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.955		μs
			$T_{vj} = 125\ ^\circ C$		1.05		
			$T_{vj} = 150\ ^\circ C$		1.08		
Fall time (inductive load)	t_f	$I_C = 1800\ A, V_{CC} = 1200\ V, V_{GE} = \pm 15\ V, R_{Goff} = 1.5\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.77		μs
			$T_{vj} = 125\ ^\circ C$		1.02		
			$T_{vj} = 150\ ^\circ C$		1.1		
Turn-on time (resistive load)	t_{on_R}	$I_C = 500\ A, V_{CC} = 2000\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.79			μs
Turn-on energy loss per pulse	E_{on}	$I_C = 1800\ A, V_{CC} = 1200\ V, L_\sigma = 20\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 0.1\ \Omega, di/dt = 17500\ A/\mu s (T_{vj} = 150\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		570		mJ
			$T_{vj} = 125\ ^\circ C$		815		
			$T_{vj} = 150\ ^\circ C$		915		
Turn-off energy loss per pulse	E_{off}	$I_C = 1800\ A, V_{CC} = 1200\ V, L_\sigma = 20\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 1.5\ \Omega, dv/dt = 4050\ V/\mu s (T_{vj} = 150\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		885		mJ
			$T_{vj} = 125\ ^\circ C$		1160		
			$T_{vj} = 150\ ^\circ C$		1240		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
SC data	I_{SC}	$V_{GE} \leq 15 \text{ V}$, $V_{CC} = 1200 \text{ V}$, $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ $t_p \leq 7 \mu\text{s}$, $T_{vj} = 150 \text{ }^\circ\text{C}$		8000		A
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, Valid with IFX pre-applied Thermal Interface Material			27.4	K/kW
Temperature under switching conditions	T_{vjop}		-40		150	$^\circ\text{C}$

Note: R_{thJH} max. value is valid for $T_C = 105 \text{ }^\circ\text{C}$.

3 Diode, Inverter

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25\text{ }^{\circ}\text{C}$	2300	V
Continuous DC forward current	I_F			1800	A
Repetitive peak forward current	I_{FRM}	$t_P = 1\text{ ms}$		3600	A
I^2t - value	I^2t	$t_P = 10\text{ ms}$, $V_R = 0\text{ V}$	$T_{vj} = 125\text{ }^{\circ}\text{C}$	220	kA^2s
			$T_{vj} = 150\text{ }^{\circ}\text{C}$	205	
Maximum power dissipation	P_{RQM}		$T_{vj} = 150\text{ }^{\circ}\text{C}$	2700	kW

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 1800 \text{ A}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	3.25	3.64	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$	3.00	3.33	
			$T_{vj} = 150 \text{ }^\circ\text{C}$	2.95	3.22	
Peak reverse recovery current	I_{RM}	$V_{CC} = 1200 \text{ V}$, $I_F = 1800 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 17500 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	1700		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1870		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	1880		
Recovered charge	Q_r	$V_{CC} = 1200 \text{ V}$, $I_F = 1800 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 17500 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	300		μC
			$T_{vj} = 125 \text{ }^\circ\text{C}$	625		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	740		

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Reverse recovery energy	E_{rec}	$V_{CC} = 1200 \text{ V}$, $I_F = 1800 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt =$ $17500 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ }^\circ\text{C}$)		240		mJ
				500		
				590		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material			53.6	K/kW
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	$^\circ\text{C}$

Note: R_{thJH} max. value is valid for $T_C = 90 \text{ }^\circ\text{C}$.

4 IGBT, 3-Level

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	V_{CES}	$T_{vj} = 25 \text{ }^\circ\text{C}$	2300	V
Implemented collector current	I_{CN}		1800	A
Continuous DC collector current	I_{CDC}	$T_{vj\text{ max}} = 150 \text{ }^\circ\text{C}$ $T_H = 45 \text{ }^\circ\text{C}$	1420	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\text{ op}}$	3600	A
Gate-emitter peak voltage	V_{GES}		± 20	V

Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\text{ sat}}$	$I_C = 1800 \text{ A}$, $V_{GE} = 15 \text{ V}$		1.80	2.26	V
				2.15	2.94	
				2.25	3.13	
Gate threshold voltage	V_{GEth}	$I_C = 49.5 \text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25 \text{ }^\circ\text{C}$	5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 1200 \text{ V}$, $T_{vj} = 25 \text{ }^\circ\text{C}$		14.6		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25 \text{ }^\circ\text{C}$		0.96		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}$, $T_{vj} = 25 \text{ }^\circ\text{C}$, $V_{CE} = 25 \text{ V}$, $V_{GE} = 0 \text{ V}$		225		nF
Reverse transfer capacitance	C_{res}	$f = 100 \text{ kHz}$, $T_{vj} = 25 \text{ }^\circ\text{C}$, $V_{CE} = 25 \text{ V}$, $V_{GE} = 0 \text{ V}$		0.54		nF

(table continues...)

Table 8 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 2300 \text{ V}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 125 \text{ °C}$			30	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0 \text{ V}$, $V_{GE} = 20 \text{ V}$, $T_{vj} = 25 \text{ °C}$				400	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 1800 \text{ A}$, $V_{CC} = 600 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 0.1 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.555		μs
			$T_{vj} = 125 \text{ °C}$		0.58		
			$T_{vj} = 150 \text{ °C}$		0.59		
Rise time (inductive load)	t_r	$I_C = 1800 \text{ A}$, $V_{CC} = 600 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 0.1 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.19		μs
			$T_{vj} = 125 \text{ °C}$		0.205		
			$T_{vj} = 150 \text{ °C}$		0.215		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 1800 \text{ A}$, $V_{CC} = 600 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 1.5 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.885		μs
			$T_{vj} = 125 \text{ °C}$		0.955		
			$T_{vj} = 150 \text{ °C}$		0.98		
Fall time (inductive load)	t_f	$I_C = 1800 \text{ A}$, $V_{CC} = 600 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 1.5 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.63		μs
			$T_{vj} = 125 \text{ °C}$		0.875		
			$T_{vj} = 150 \text{ °C}$		0.93		
Turn-on energy loss per pulse	E_{on}	$I_C = 1800 \text{ A}$, $V_{CC} = 600 \text{ V}$, $L_\sigma = 50 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 0.1 \text{ } \Omega$, $di/dt = 6700 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$		240		mJ
			$T_{vj} = 125 \text{ °C}$		380		
			$T_{vj} = 150 \text{ °C}$		430		
Turn-off energy loss per pulse	E_{off}	$I_C = 1800 \text{ A}$, $V_{CC} = 600 \text{ V}$, $L_\sigma = 50 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 1.5 \text{ } \Omega$, $dv/dt = 3150 \text{ V}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$		490		mJ
			$T_{vj} = 125 \text{ °C}$		630		
			$T_{vj} = 150 \text{ °C}$		665		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, Valid with IFX pre-applied Thermal Interface Material				27.4	K/kW
Temperature under switching conditions	$T_{vj op}$			-40		150	°C

Note: R_{thJH} max. value is valid for $T_C = 105 \text{ °C}$.

5 Diode, 3-Level

Table 9 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25 \text{ °C}$	2300	V

(table continues...)

Table 9 (continued) Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Continuous DC forward current	I_F		1800	A
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$	3600	A

Table 10 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 1800 \text{ A}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$	3.25	3.64	V
			$T_{vj} = 125 \text{ °C}$	3.00	3.33	
			$T_{vj} = 150 \text{ °C}$	2.95	3.22	
Peak reverse recovery current	I_{RM}	$V_{CC} = 600 \text{ V}$, $I_F = 1800 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 8200 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	1120		A
			$T_{vj} = 125 \text{ °C}$	1450		
			$T_{vj} = 150 \text{ °C}$	1530		
Recovered charge	Q_r	$V_{CC} = 600 \text{ V}$, $I_F = 1800 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 8200 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	295		μC
			$T_{vj} = 125 \text{ °C}$	580		
			$T_{vj} = 150 \text{ °C}$	665		
Reverse recovery energy	E_{rec}	$V_{CC} = 600 \text{ V}$, $I_F = 1800 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 8200 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	170		mJ
			$T_{vj} = 125 \text{ °C}$	320		
			$T_{vj} = 150 \text{ °C}$	365		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material			53.6	K/kW
Temperature under switching conditions	$T_{vj op}$		-40		150	°C

Note: Dynamic data for 3-level valid in conjunction with FF2400RB12IP7.
 $T_{vj op}$ up to 175 °C is allowed for operations in overload conditions. For detailed specifications please refer to AN2021-11.
 R_{thJH} max. value is valid for $T_C = 90 \text{ °C}$.

6 NTC-Thermistor

Table 11 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	%

(table continues...)

Table 11 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
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

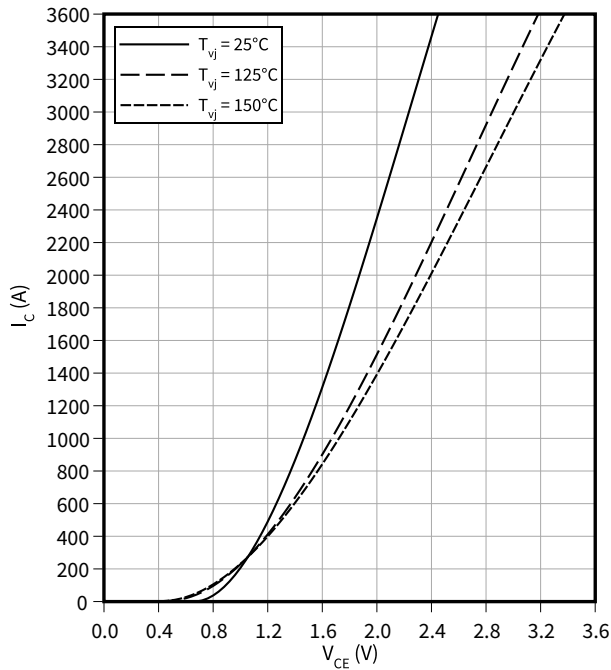
Note: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

7 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

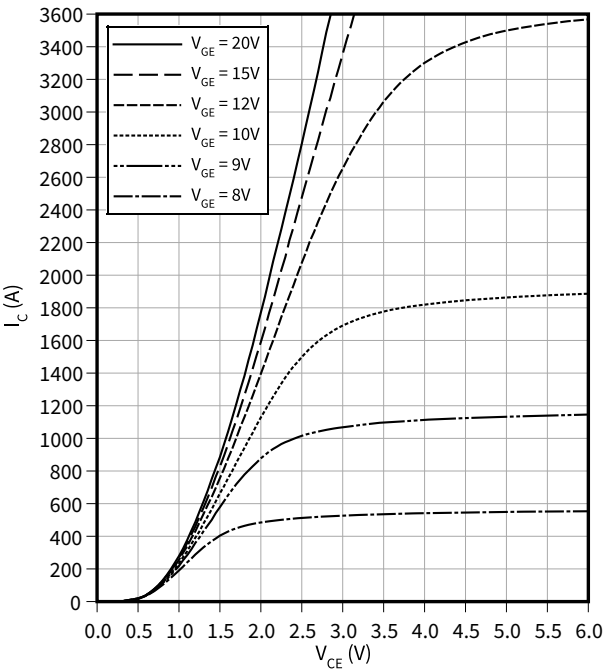
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

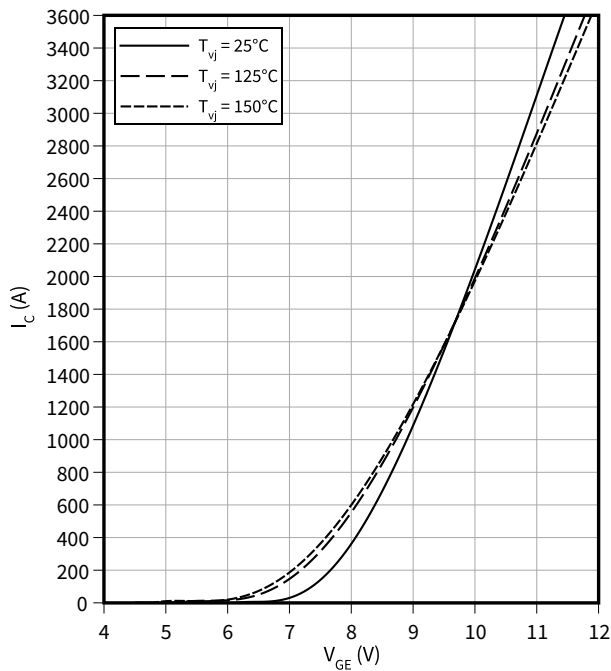
$T_{vj} = 150\text{ °C}$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

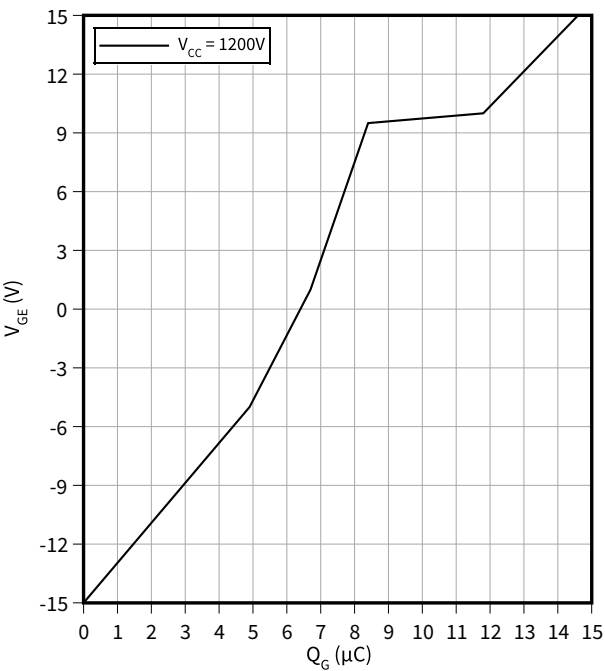
$V_{CE} = 20\text{ V}$



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

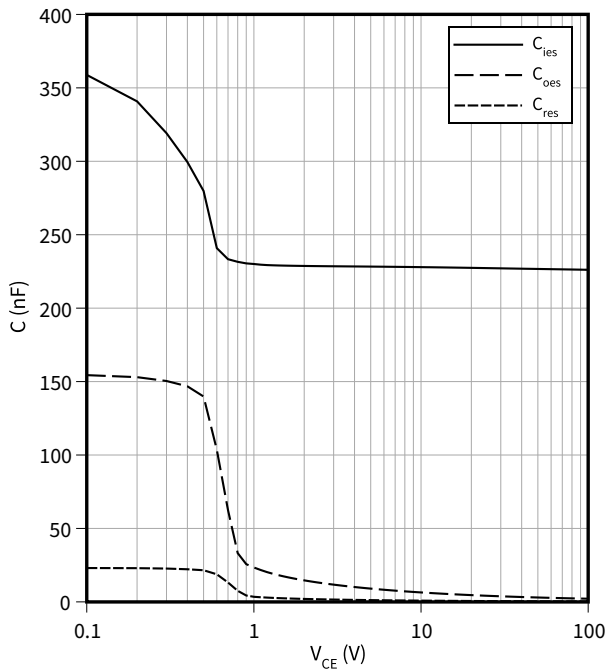
$I_C = 1800\text{ A}, T_{vj} = 25\text{ °C}$



7 Characteristics diagrams

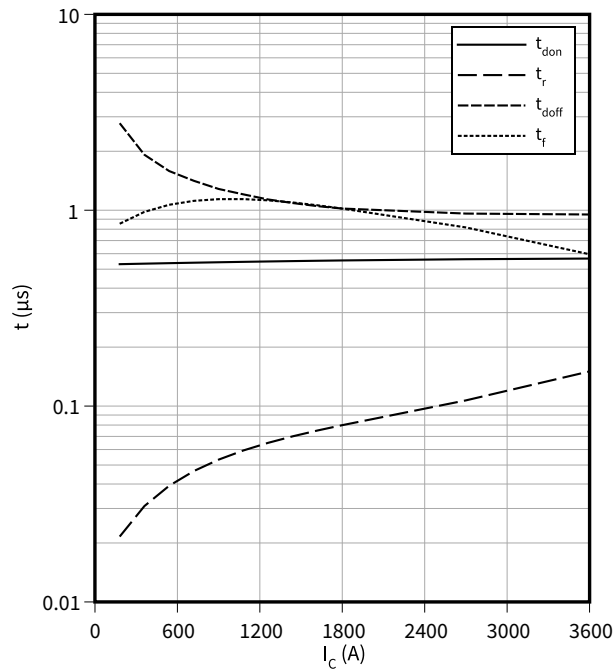
Capacity characteristic (typical), IGBT, Inverter

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



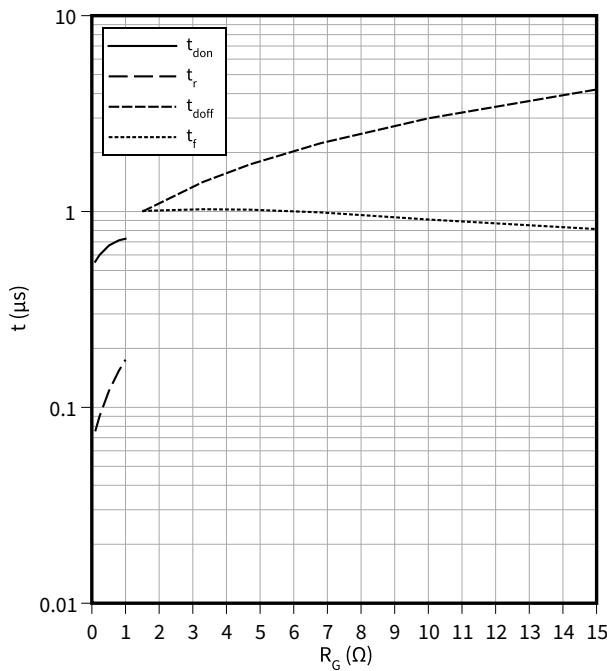
Switching times (typical), IGBT, Inverter

$t = f(I_C)$
 $R_{Goff} = 1.5 \text{ } \Omega$, $R_{Gon} = 0.1 \text{ } \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 1200 \text{ V}$,
 $T_{vj} = 150 \text{ }^{\circ}\text{C}$



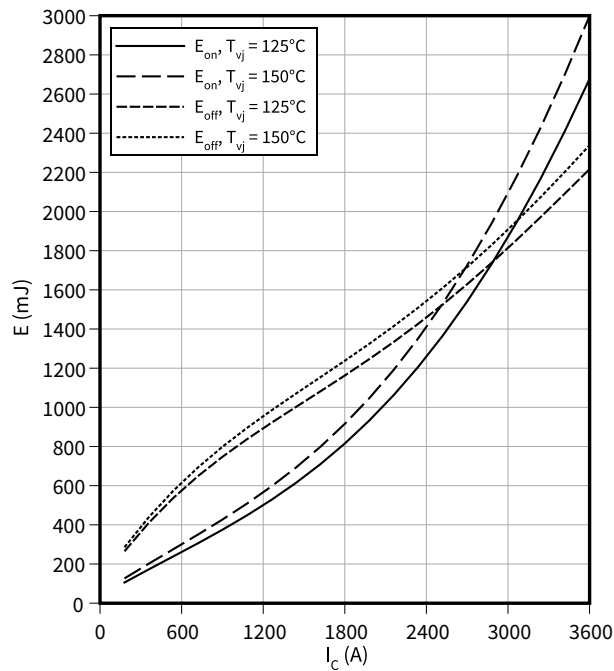
Switching times (typical), IGBT, Inverter

$t = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 1800 \text{ A}$, $V_{CC} = 1200 \text{ V}$, $T_{vj} = 150 \text{ }^{\circ}\text{C}$



Switching losses (typical), IGBT, Inverter

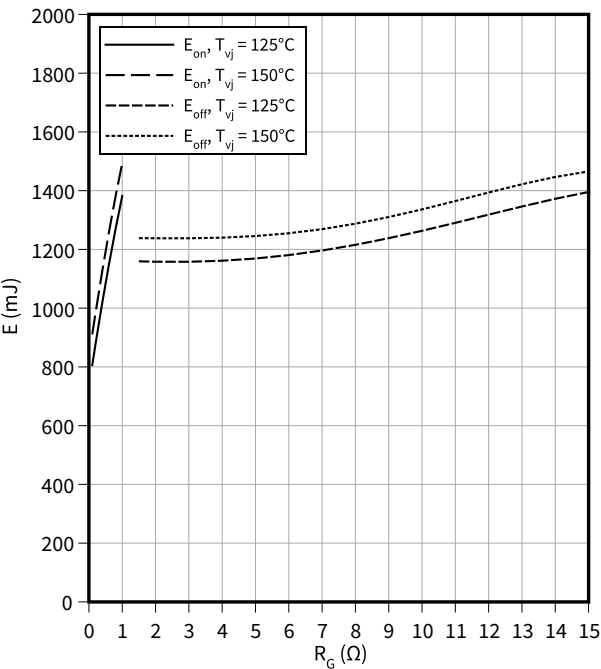
$E = f(I_C)$
 $R_{Goff} = 1.5 \text{ } \Omega$, $R_{Gon} = 0.1 \text{ } \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 1200 \text{ V}$



7 Characteristics diagrams

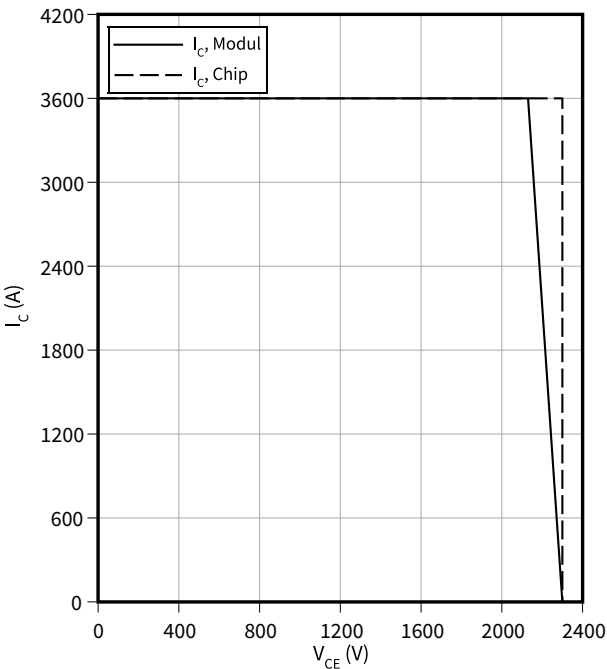
Switching losses (typical), IGBT, Inverter

$E = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 1800\text{ A}$, $V_{CC} = 1200\text{ V}$



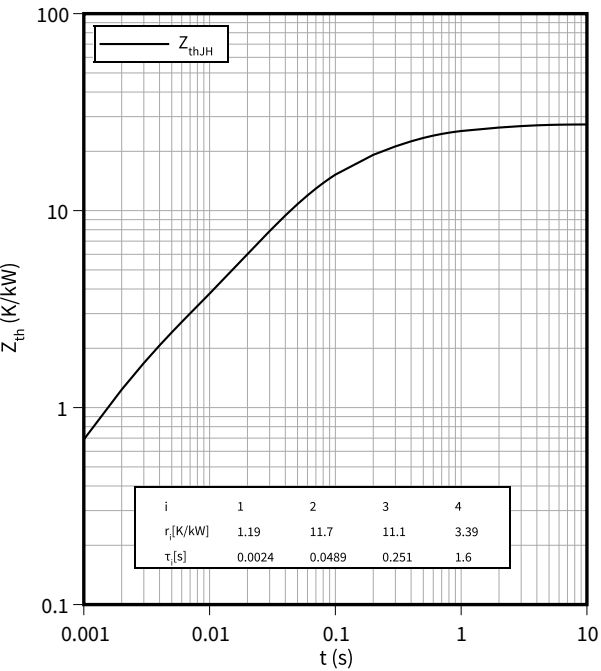
Reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$
 $R_{Goff} = 1.5\text{ }\Omega$, $V_{GE} = \pm 15\text{ V}$, $T_{vj} = 150\text{ }^\circ\text{C}$



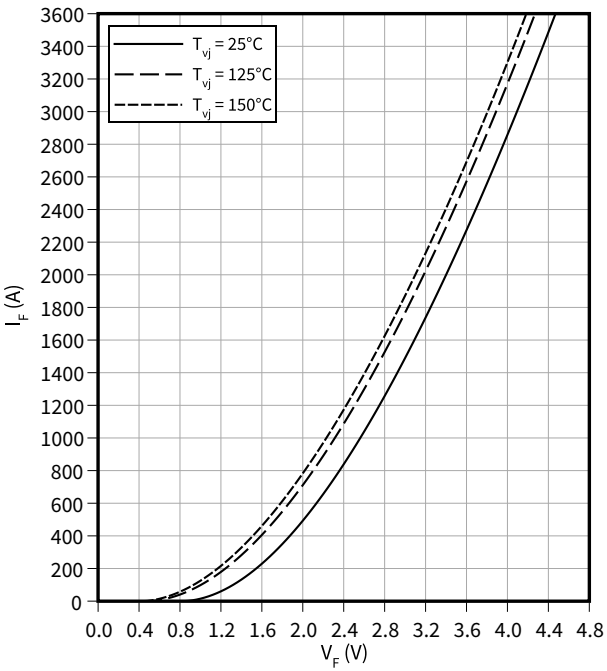
Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Inverter

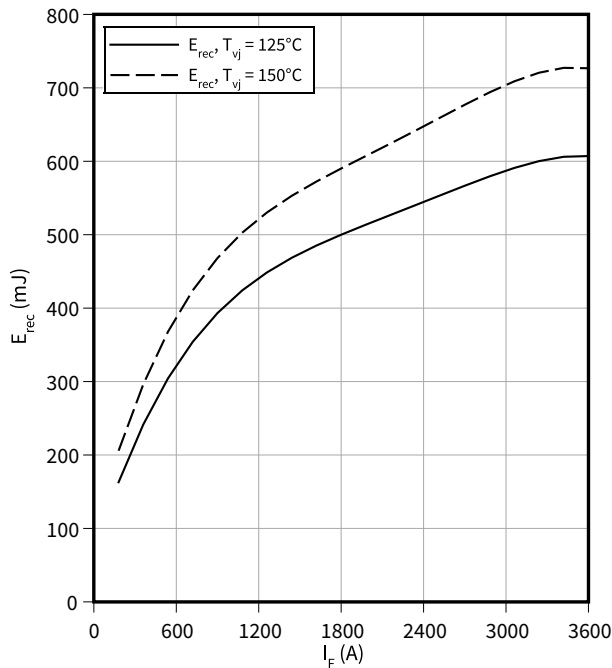
$I_F = f(V_F)$



7 Characteristics diagrams

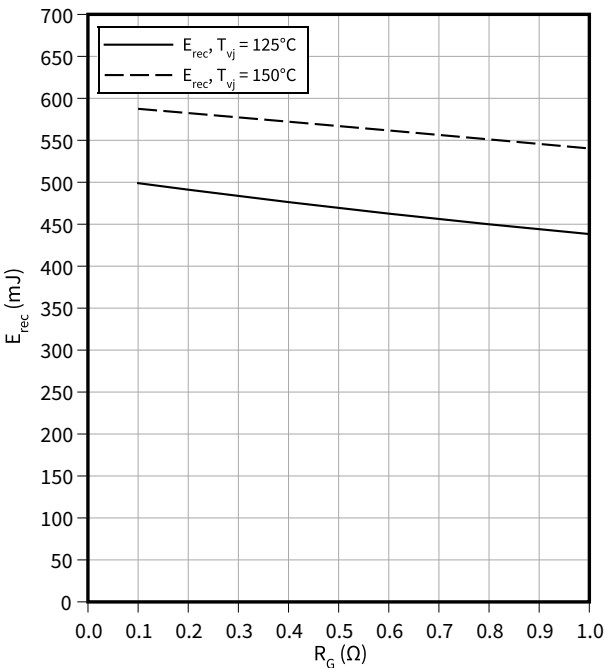
Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$
 $V_{CE} = 1200\text{ V}, R_{Gon} = R_{Gon}(IGBT)$



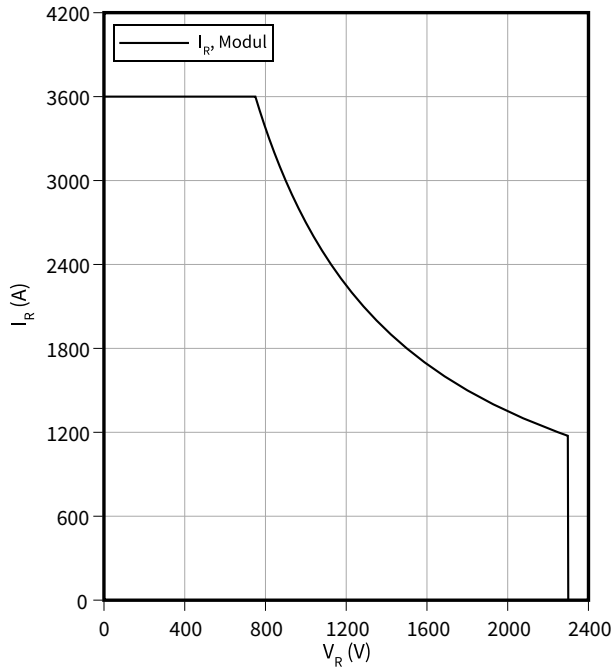
Switching losses (typical), Diode, Inverter

$E_{rec} = f(R_G)$
 $I_F = 1800\text{ A}, V_{CE} = 1200\text{ V}$



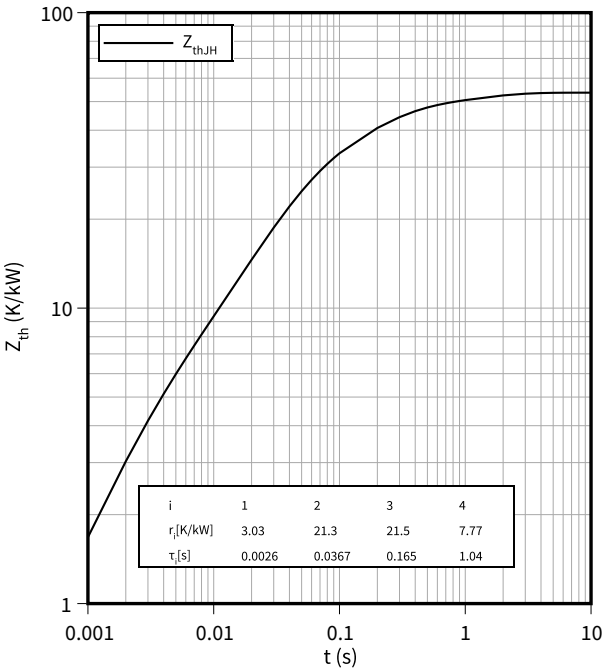
Safe operating area (SOA), Diode, Inverter

$I_R = f(V_R)$
 $T_{vj} = 150\text{ °C}$



Transient thermal impedance, Diode, Inverter

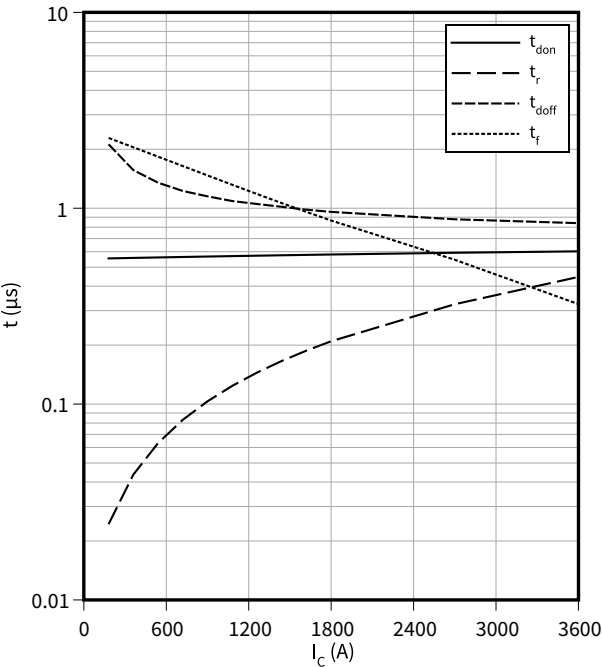
$Z_{th} = f(t)$



7 Characteristics diagrams

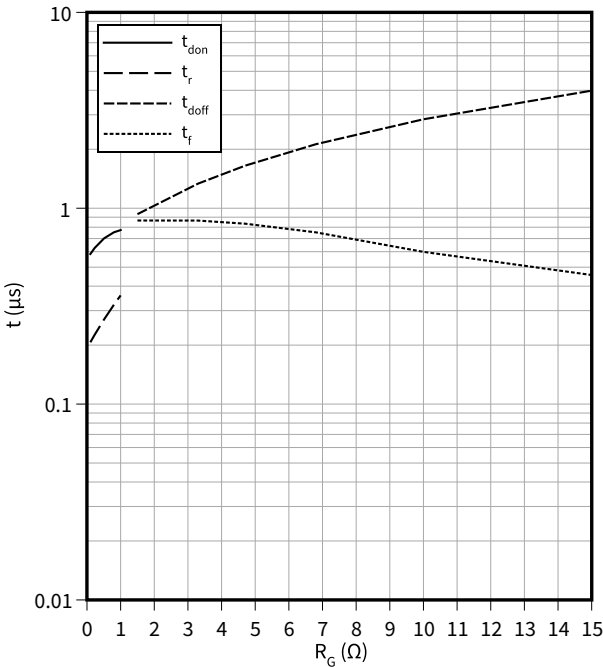
Switching times (typical), IGBT, 3-Level

$t = f(I_C)$
 $R_{Goff} = 1.5 \, \Omega$, $R_{Gon} = 0.1 \, \Omega$, $V_{GE} = \pm 15 \, V$, $V_{CC} = 600 \, V$,
 $T_{vj} = 150 \, ^\circ C$



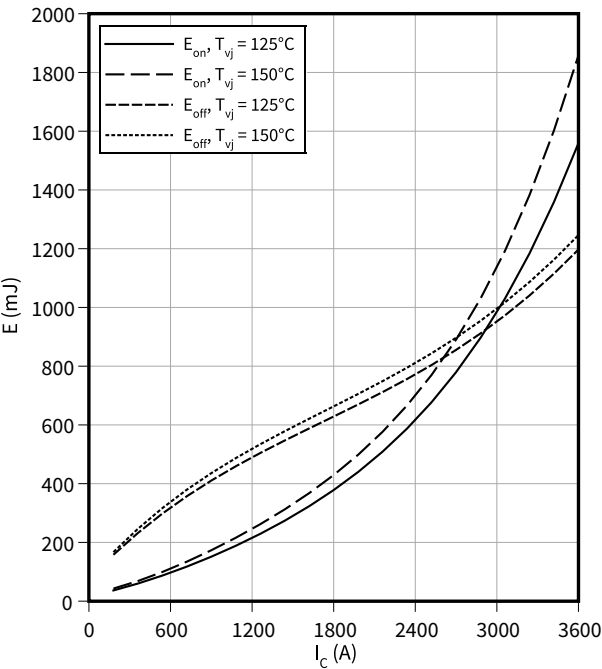
Switching times (typical), IGBT, 3-Level

$t = f(R_G)$
 $V_{GE} = \pm 15 \, V$, $I_C = 1800 \, A$, $V_{CC} = 600 \, V$, $T_{vj} = 150 \, ^\circ C$



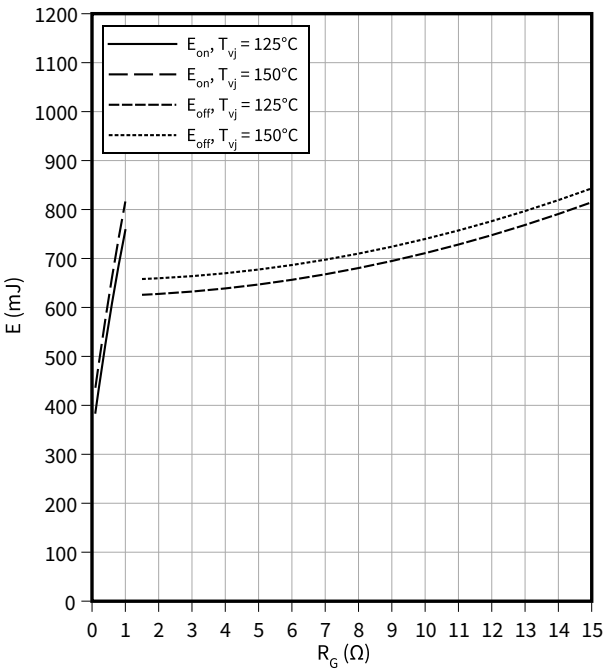
Switching losses (typical), IGBT, 3-Level

$E = f(I_C)$
 $R_{Goff} = 1.5 \, \Omega$, $R_{Gon} = 0.1 \, \Omega$, $V_{GE} = \pm 15 \, V$, $V_{CC} = 600 \, V$



Switching losses (typical), IGBT, 3-Level

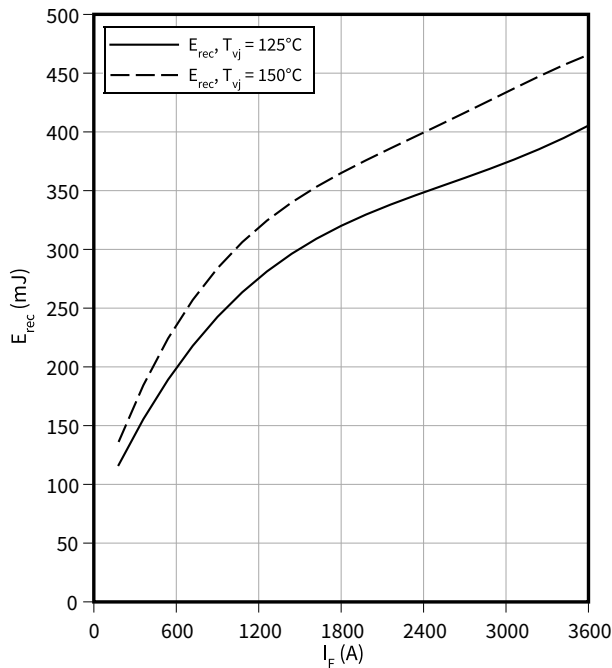
$E = f(R_G)$
 $V_{GE} = \pm 15 \, V$, $I_C = 1800 \, A$, $V_{CC} = 600 \, V$



7 Characteristics diagrams

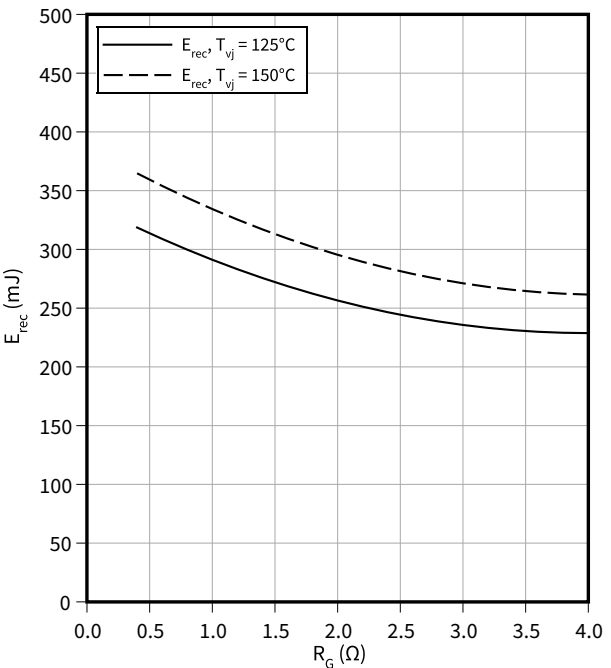
Switching losses (typical), Diode, 3-Level

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



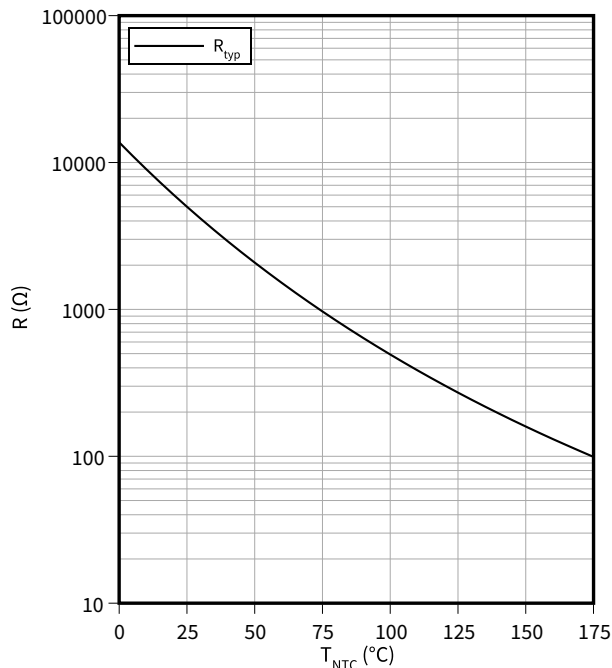
Switching losses (typical), Diode, 3-Level

$E_{rec} = f(R_G)$
 $V_{CE} = 600\text{ V}$, $I_F = 1800\text{ A}$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



8 Circuit diagram

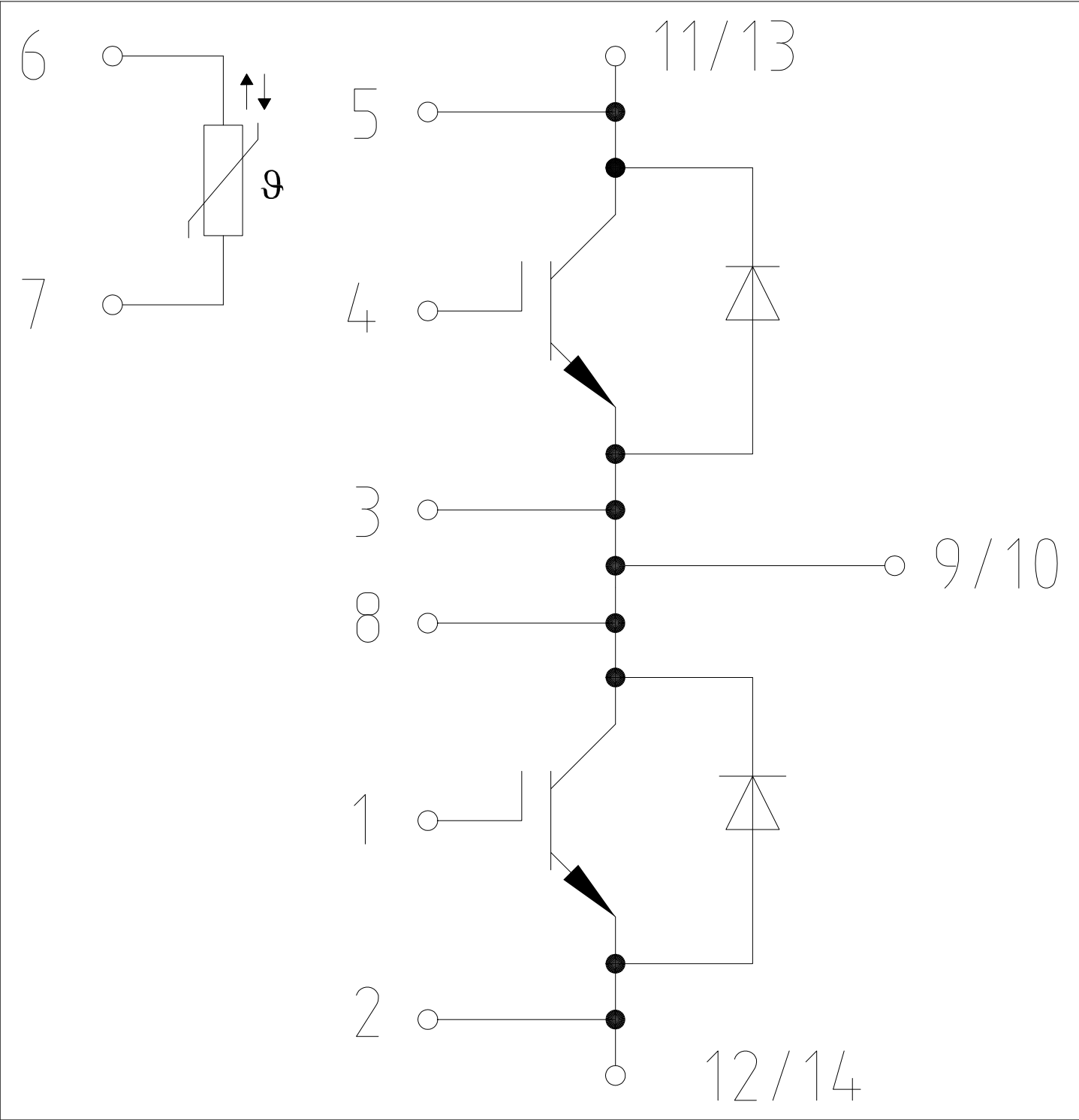


Figure 1

9 Package outlines

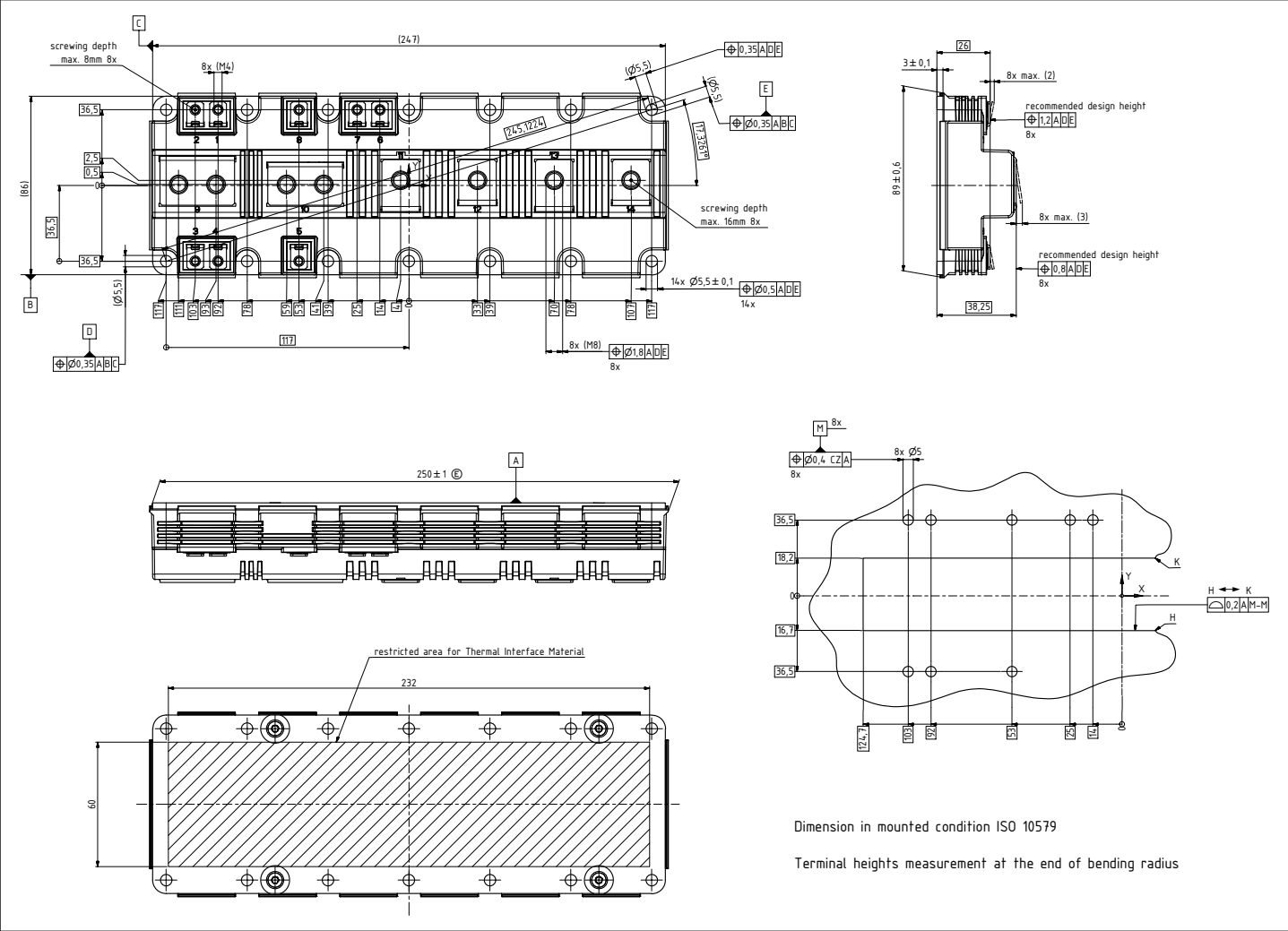


Figure 2

10 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
1.00	2022-05-03	Final datasheet
1.10	2023-07-13	Final datasheet - Correction/ addition of capacity characteristics; Updates of commentary
1.20	2026-06-09	Harmonization of insulation coordination information

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