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} = 1200 V
  - $I_{C\ nom}$ = 2400 A / I_{CRM} = 4800 A
  - High current density
  - Low inductive design
  - Low $V_{CE,sat}$
  - $T_{vj,op}$ = 150°C
  - Overload operation up to 175°C
- Mechanical features
  - 4 kV AC 1 min insulation
  - High creepage and clearance distances
  - High power density

Potential applications

- Motor drives

Product validation

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

Description

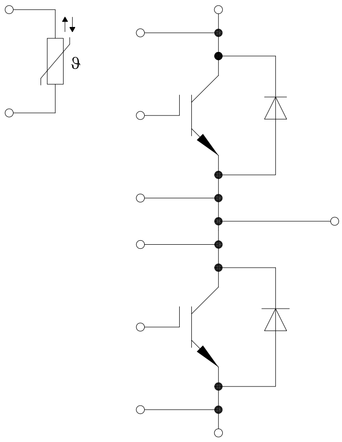


Table of contents

Description . . . 1
Features . . . 1
Potential applications . . . 1
Product validation . . . 1
Table of contents . . . 2
1 Package . . . 3
2 IGBT, Inverter . . . 3
3 Diode, Inverter . . . 5
4 NTC-Thermistor . . . 6
5 Characteristics diagrams . . . 7
6 Circuit diagram . . . 11
7 Package outlines . . . 12
8 Module label code . . . 13
Revision history . . . 14
Disclaimer . . . 15

1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, f = 50 Hz, t = 60 s	4.0	kV
Material of module baseplate			Cu	
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{Creep}	terminal to heatsink	36.0	mm
Creepage distance	d_{Creep}	terminal to terminal	28.0	mm
Clearance	d_{Clear}	terminal to heatsink	21.0	mm
Clearance	d_{Clear}	terminal to terminal	19.0	mm
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 °C, per switch			0.1		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_H = 25 °C, per switch			0.135		mΩ
Current slope at AC-terminals	$\|di/dt_{AC}\|$	Valid if AC-terminals are permanently part of commutation path				100	A/µs
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	1200	V

(table continues...)

Table 3 **(continued) Maximum rated values**

Parameter	Symbol	Note or test condition		Values	Unit
Implemented collector current	I_{CN}			2400	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 50 °C	2400	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		4800	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 = 2400 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.27	1.79	V
			T_{vj} = 125 °C		1.37	1.82	
			T_{vj} = 175 °C		1.43	1.85	
Gate threshold voltage	V_{GEth}	I_C = 48 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		5.15	5.80	6.45	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CC} = 600 V			38.1		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			0.33		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			325		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			1.92		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			5	mA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25 °C				400	nA
Turn-on delay time (inductive load)	t_{don}	I_C = 2400 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 0.2 Ω	T_{vj} = 25 °C		0.790		µs
			T_{vj} = 125 °C		0.840		
			T_{vj} = 175 °C		0.870		
Rise time (inductive load)	t_r	I_C = 2400 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 0.2 Ω	T_{vj} = 25 °C		0.120		µs
			T_{vj} = 125 °C		0.140		
			T_{vj} = 175 °C		0.150		
Turn-off delay time (inductive load)	t_{doff}	I_C = 2400 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 0.4 Ω	T_{vj} = 25 °C		0.940		µs
			T_{vj} = 125 °C		1.060		
			T_{vj} = 175 °C		1.120		
Fall time (inductive load)	t_f	I_C = 2400 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 0.4 Ω	T_{vj} = 25 °C		0.230		µs
			T_{vj} = 125 °C		0.430		
			T_{vj} = 175 °C		0.530		

(table continues...)

Table 4 **(continued) Characteristic values**

Parameter	Symbol	Note or test condition		Values Min.	Values Typ.	Values Max.	Unit
Turn-on energy loss per pulse	E_{on}	I_C = 2400 A, V_{CC} = 600 V, L_σ = 20 nH, V_{GE} = ±15 V, R_{Gon} = 0.2 Ω, di/dt = 15500 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		200		mJ
			T_{vj} = 125 °C		295		
			T_{vj} = 175 °C		380		
Turn-off energy loss per pulse	E_{off}	I_C = 2400 A, V_{CC} = 600 V, L_σ = 20 nH, V_{GE} = ±15 V, R_{Goff} = 0.4 Ω, dv/dt = 2200 V/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		355		mJ
			T_{vj} = 125 °C		510		
			T_{vj} = 175 °C		570		
SC data	I_{SC}	V_{GE} = 15 V, V_{CC} = 800 V, V_{CEmax}=V_{CES}-L_{sCE}*di/dt	t_P = 6 µs, T_{vj} = 150 °C		8500		A
			t_P = 6 µs, T_{vj} = 175 °C		8000		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, Valid with IFX pre-applied Thermal Interface Material				27.6	K/kW
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°C

Note: *Maximum RMS module DC-terminal current according to application note AN2009-08.*

$T_{vj\,op}$ > 150 °C is only allowed for operation at overload conditions. For detailed specifications please refer to AN2018-14. R_{thJH} max. value is valid for T_C= 110 °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 °C	1200	V
Continuous DC forward current	I_F			2400	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		4800	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	455	kA^2s
			T_{vj} = 175 °C	420	

Table 6 **Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 2400 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.70	2.03	V
			T_{vj} = 125 °C		1.65	1.96	
			T_{vj} = 175 °C		1.55	1.91	
Peak reverse recovery current	I_{RM}	V_{CC} = 600 V, I_F = 2400 A, V_{GE} = -15 V, -di$_F$/dt = 15500 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		1410		A
			T_{vj} = 125 °C		1720		
			T_{vj} = 175 °C		1850		
Recovered charge	Q_r	V_{CC} = 600 V, I_F = 2400 A, V_{GE} = -15 V, -di$_F$/dt = 15500 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		265		µC
			T_{vj} = 125 °C		455		
			T_{vj} = 175 °C		585		
Reverse recovery energy	E_{rec}	V_{CC} = 600 V, I_F = 2400 A, V_{GE} = -15 V, -di$_F$/dt = 15500 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		110		mJ
			T_{vj} = 125 °C		200		
			T_{vj} = 175 °C		250		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material				46.4	K/kW
Temperature under switching conditions	$T_{vj\ op}$			-40		175	°C

Note: *$T_{vj\ op}$ > 150 °C is only allowed for operation at overload conditions. For detailed specifications please refer to AN2018-14. R_{thJH} max. value is valid for T_C= 95 °C.*

4 NTC-Thermistor

Table 7 **Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	T_{NTC} = 25 °C		5		kΩ
Deviation of R_{100}	$\Delta R/R$	T_{NTC} = 100 °C, R_{100} = 493 Ω	-5		5	%
Power dissipation	P_{25}	T_{NTC} = 25 °C			20	mW
B-value	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2-1/(298,15\ K))]$		3375		K
B-value	$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2-1/(298,15\ K))]$		3411		K
B-value	$B_{25/100}$	$R_2 = R_{25} \exp[B_{25/100}(1/T_2-1/(298,15\ K))]$		3433		K

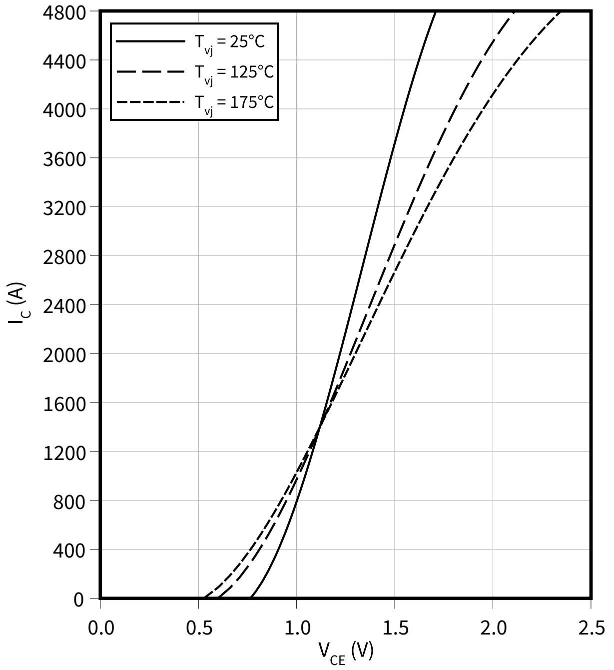
Note: *For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4*

5 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

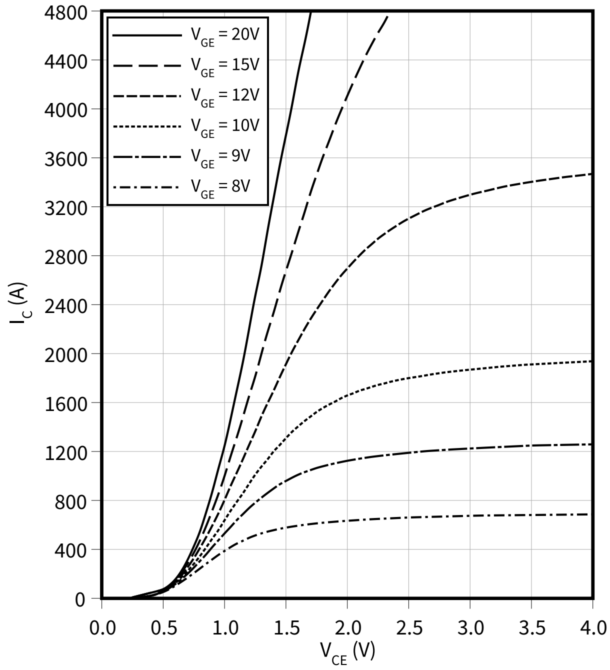
$V_{GE} = 15$ V



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

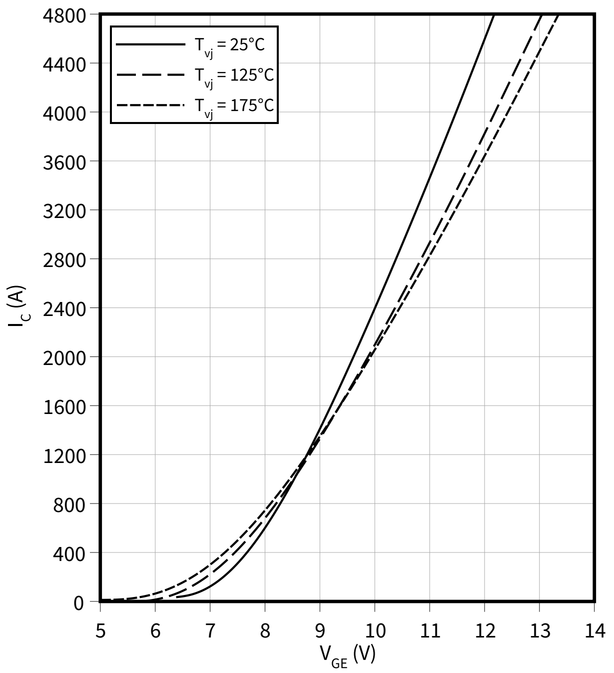
$T_{vj} = 175$ °C



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

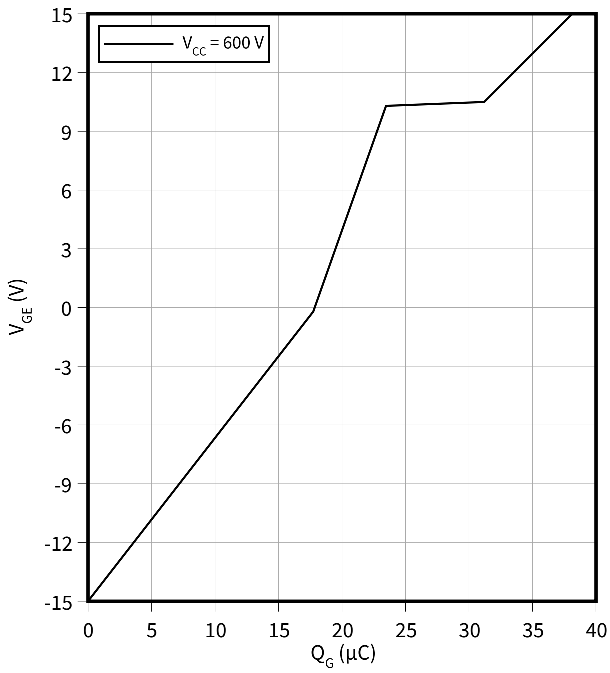
$V_{CE} = 20$ V



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

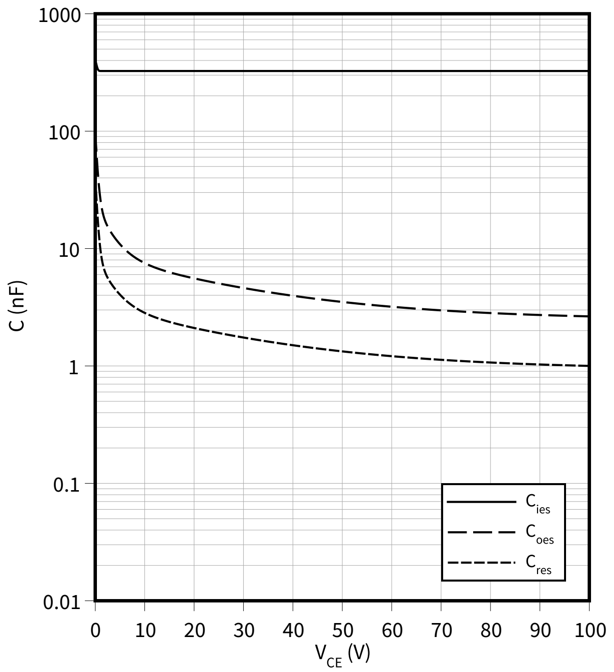
$I_C = 2400$ A, $T_{vj} = 25$ °C



Capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

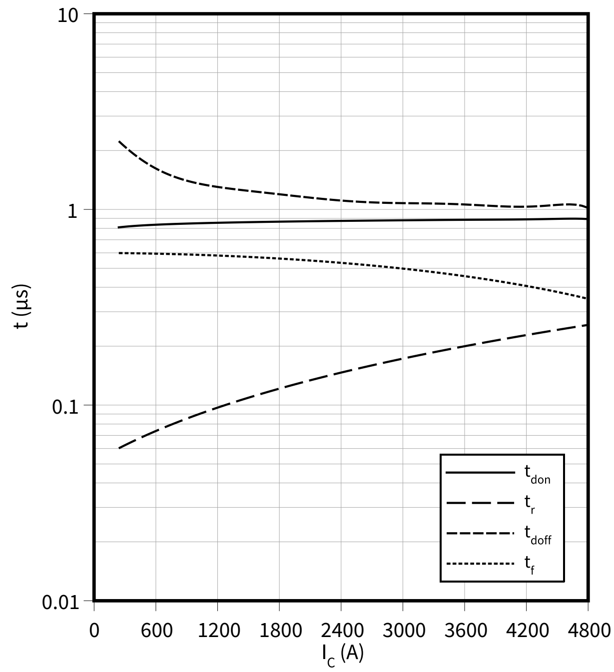
$f = 100\ kHz, V_{GE} = 0\ V, T_{vj} = 25\ °C$



Switching times (typical), IGBT, Inverter

$t = f(I_C)$

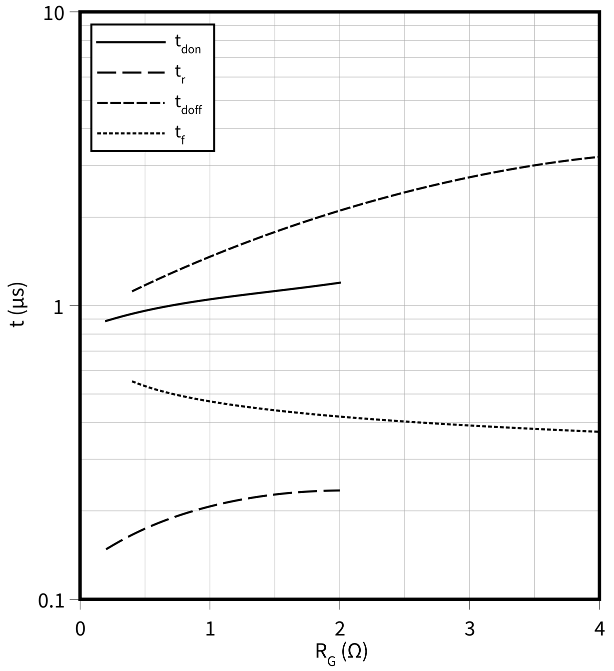
$R_{Goff} = 0.4\ \Omega, R_{Gon} = 0.2\ \Omega, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, T_{vj} = 175\ °C$



Switching times (typical), IGBT, Inverter

$t = f(R_G)$

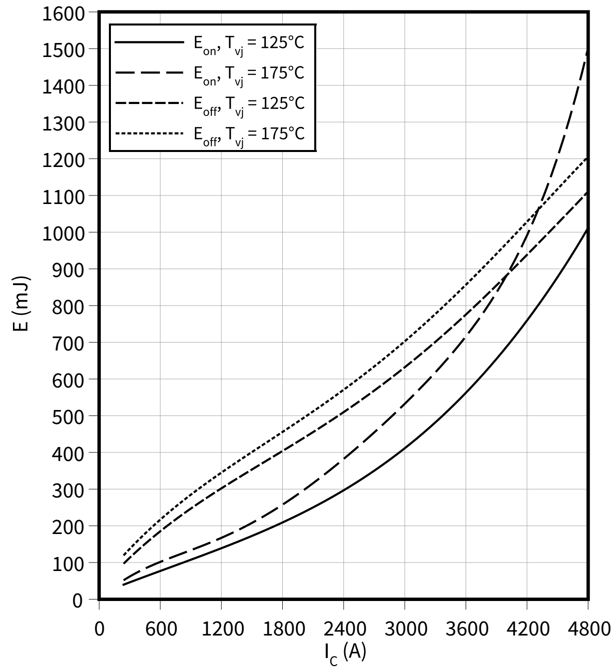
$I_C = 2400\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, T_{vj} = 175\ °C$



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

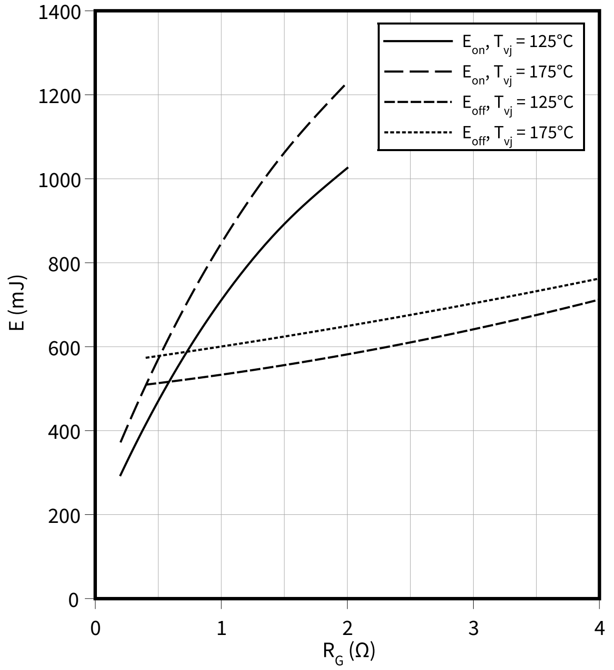
$R_{Goff} = 0.4\ \Omega, R_{Gon} = 0.2\ \Omega, V_{CC} = 600\ V, V_{GE} = \pm 15\ V$



Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

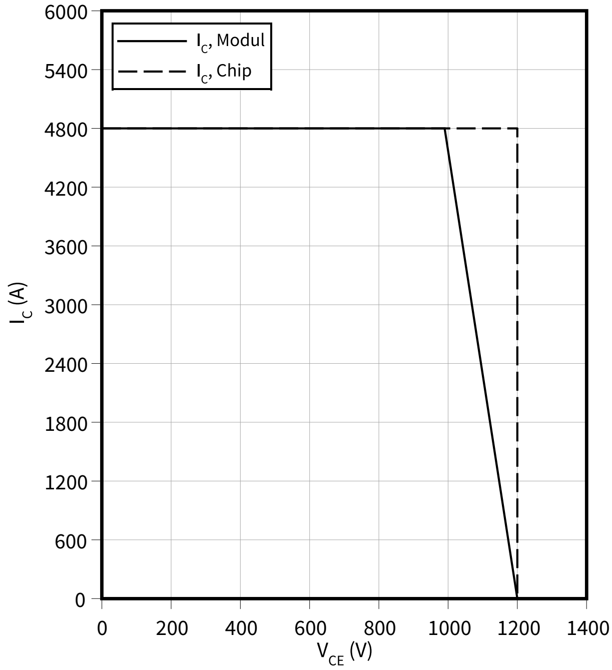
$I_C = 2400$ A, $V_{CC} = 600$ V, $V_{GE} = \pm 15$ V



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

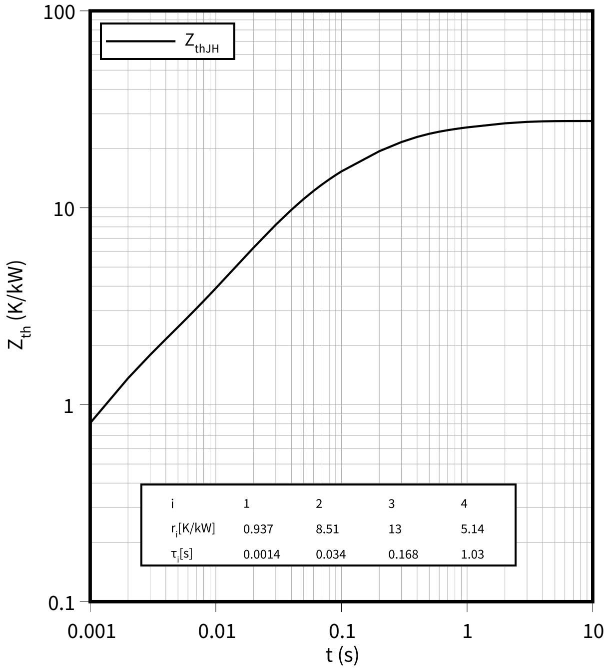
$I_C = f(V_{CE})$

$R_{Goff} = 0.4$ Ω, $V_{GE} = 15$ V, $T_{vj} = 175$ °C



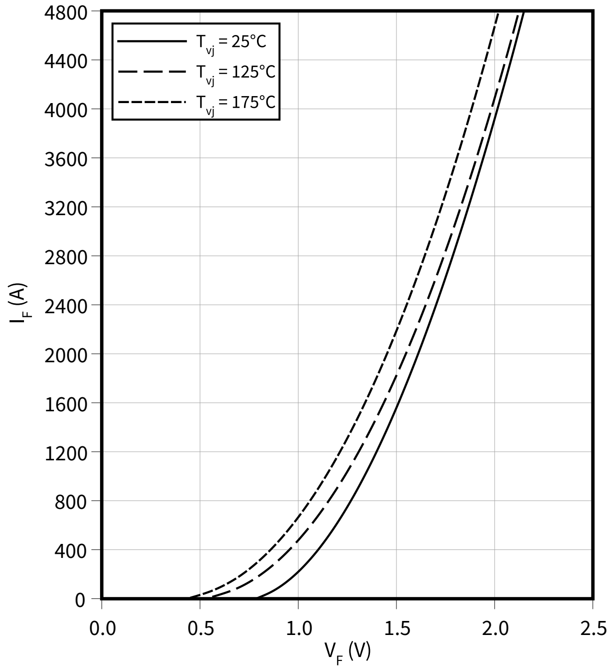
Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$

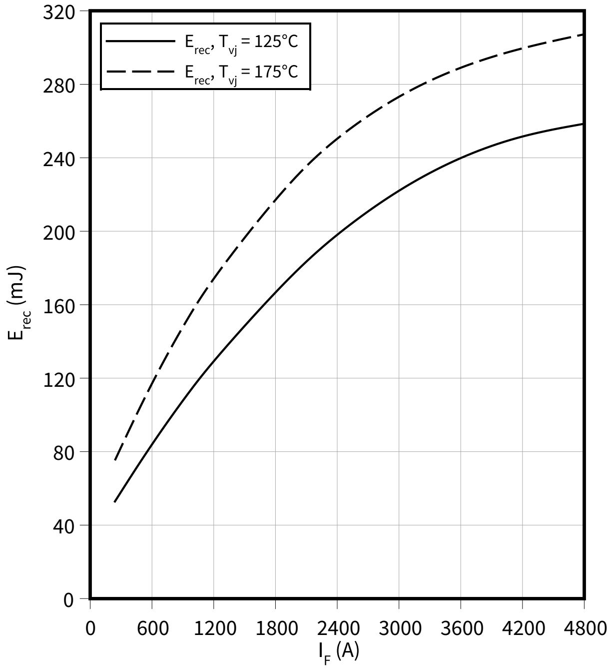


Forward characteristic (typical), Diode, Inverter

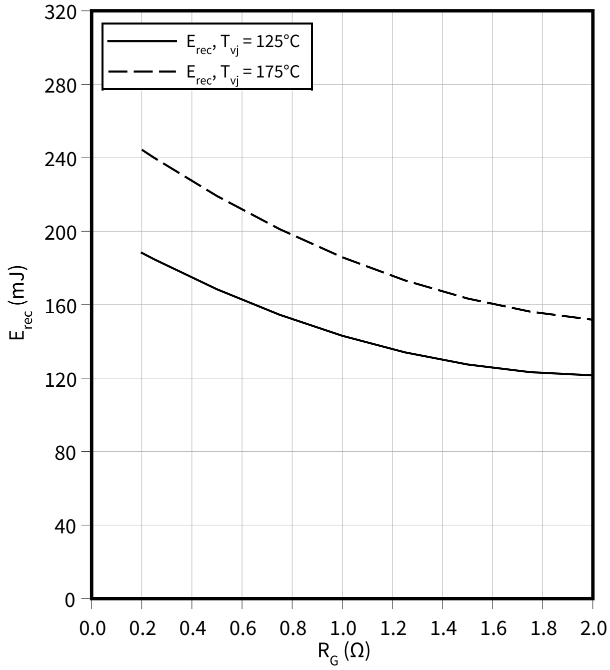
$I_F = f(V_F)$



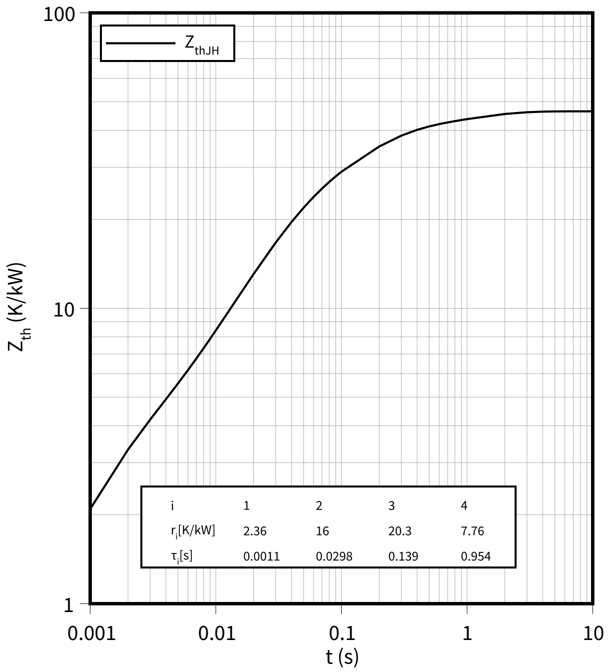
Switching losses (typical), Diode, Inverter
$E_{rec} = f(I_F)$
$V_{CE} = 600\ V$, $R_{Gon} = R_{Gon}(IGBT)$



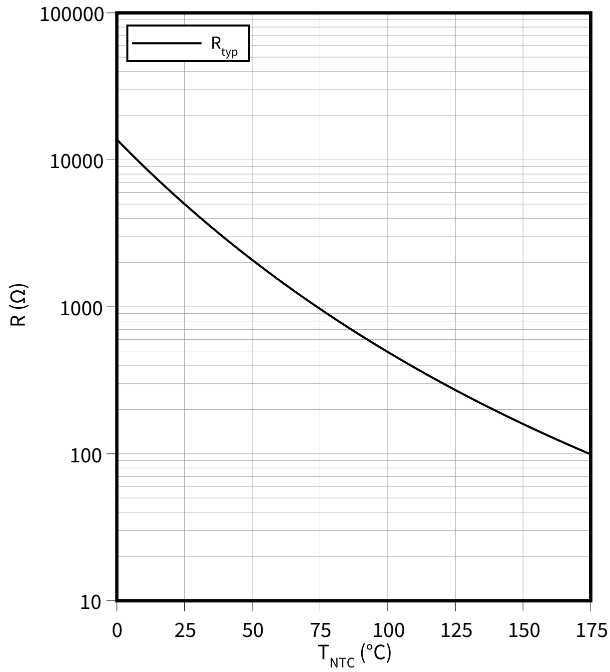
Switching losses (typical), Diode, Inverter
$E_{rec} = f(R_G)$
$V_{CE} = 600\ V$, $I_F = 2400\ A$



Transient thermal impedance, Diode, Inverter
$Z_{th} = f(t)$



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



6 Circuit diagram

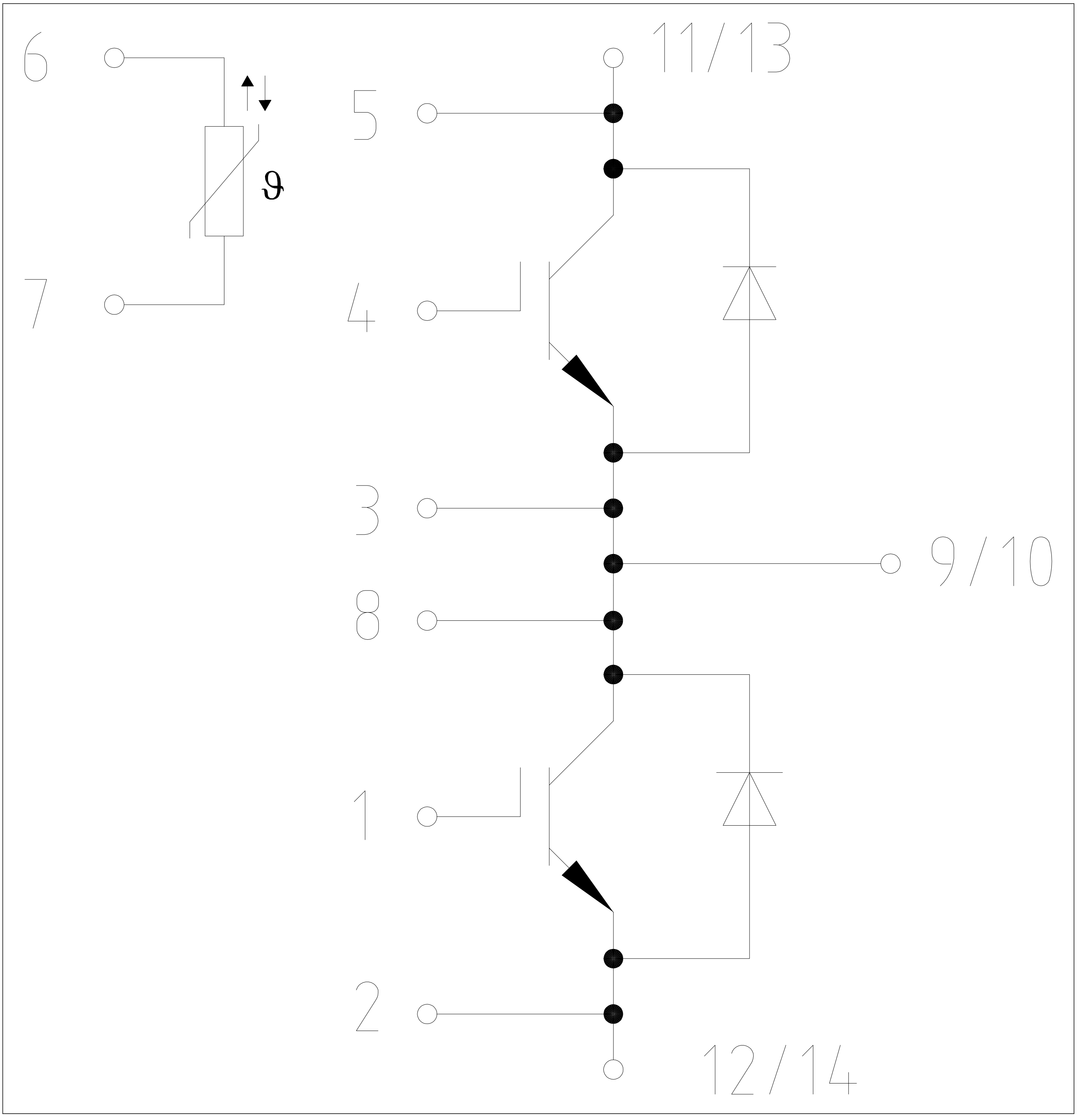


Figure 1

7 Package outlines

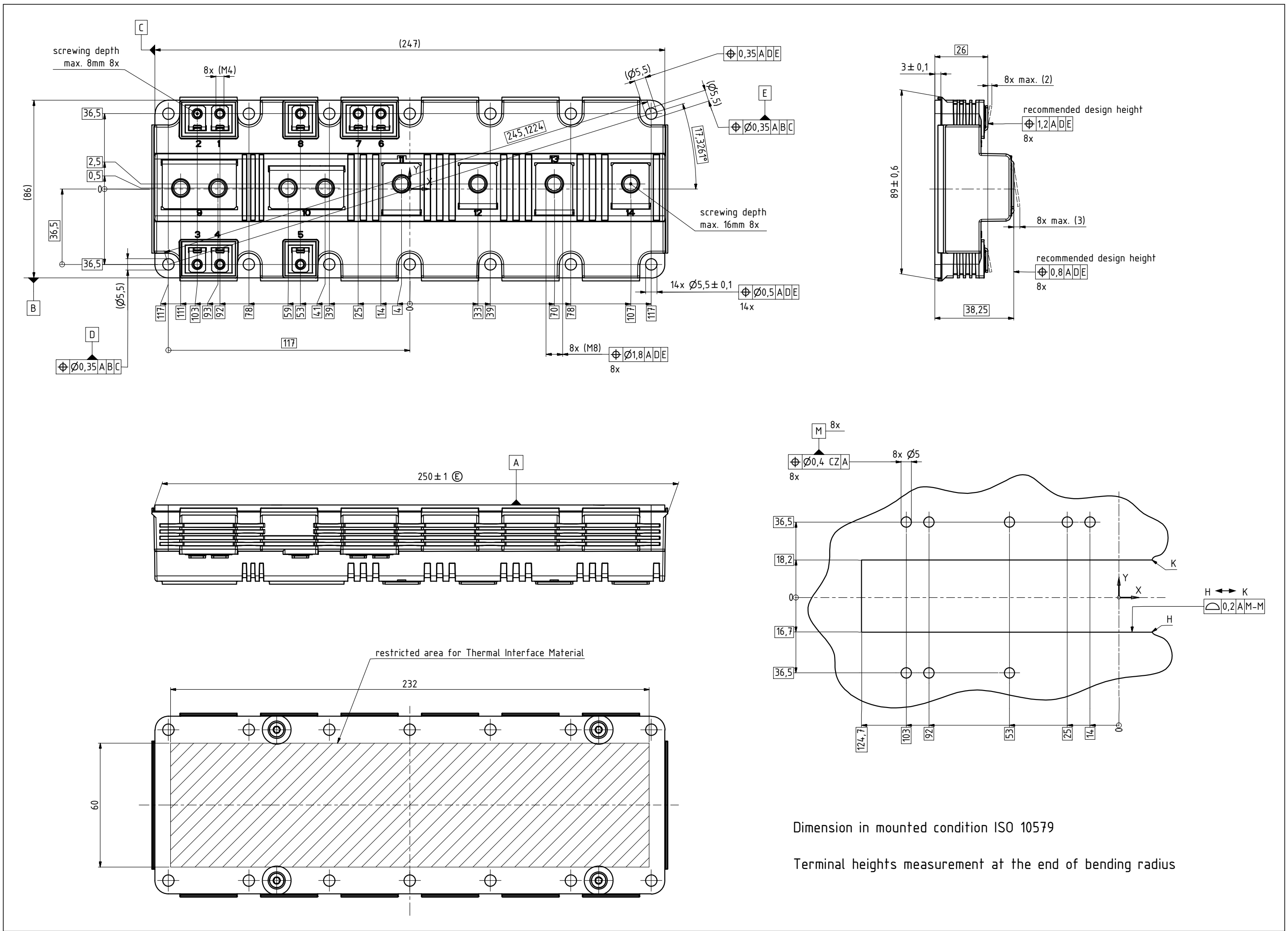


Figure 2

8 Module label code

<table>
<tr><th colspan="4">Module label code</th></tr>
<tr><td>Code format</td><td colspan="2">Data Matrix</td><td>Barcode Code128</td></tr>
<tr><td>Encoding</td><td colspan="2">ASCII text</td><td>Code Set A</td></tr>
<tr><td>Symbol size</td><td colspan="2">16x16</td><td>23 digits</td></tr>
<tr><td>Standard</td><td colspan="2">IEC24720 and IEC16022</td><td>IEC8859-1</td></tr>
<tr><td>Code content</td><td>Content
Module serial number
Module material number
Production order number
Date code (production year)
Date code (production week)</td><td>Digit
1 – 5
6 - 11
12 - 19
20 – 21
22 – 23</td><td>Example
71549
142846
55054991
15
30</td></tr>
<tr><td>Example</td><td colspan="2">71549142846550549911530</td><td>71549142846550549911530</td></tr>
</table>

Figure 3

Revision history

Document revision	Date of release	Description of changes
1.00	2023-06-09	Initial version

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Edition 2023-06-09

Published by

Infineon Technologies AG

81726 Munich, Germany

Do you have a question about any aspect of this document?

Email: erratum@infineon.com

Document reference
IFX-AAD907-001

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for IGBT Modules ***category:***

Click to view products by Infineon ***manufacturer:***

Other Similar products are found below :

F3L400R07ME4_B22 F3L400R12PT4_B26 FB20R06W1E3_B11 FD300R12KE3 FD300R12KS4_B5 FD400R12KE3 FF100R12KS4 FF150R12KE3G FF200R06KE3 FF200R06YE3 FF300R06KE3_B2 FF600R12IP4V FF800R17KP4_B2 FF900R12IE4V FP06R12W1T4_B3 FP100R07N3E4 FP100R07N3E4_B11 FP10R06W1E3_B11 FP10R12W1T4_B11 FP10R12YT3 FP15R12W2T4 FP15R12YT3 FP20R06W1E3 FP30R06W1E3 FP40R12KT3G FP75R06KE3 FS10R12YE3 FS150R07PE4 FS150R12PT4 FS150R17N3E4_B11 FS20R06W1E3_B11 FS30R06W1E3_B11 FS75R12KE3G FS75R12W2T4_B11 FZ1600R17HP4_B2 FZ300R12KE3G FZ400R17KE3 FZ400R17KE4 FZ600R65KE3 DF1000R17IE4D_B2 APTGT75DA60T1G DZ800S17K3 F12-25R12KT4G F3L200R12W2H3_B11 F3L300R12ME4_B22 F3L75R07W2E3_B11 F4-150R12KS4 F475R07W1H3B11ABOMA1 FD1400R12IP4D FD400R12KE3_B5