Final datasheet

EasyPACK™ HD3 module with TRENCHSTOP™ H7 and CoolSiC™ Schottky diode and NTC

Features

- Electrical features
  - V_{CES} = 1200 V
  - $I_{C\ nom}$ = 280 A / I_{CRM} = 560 A
  - Low switching losses
  - TRENCHSTOP™ IGBT7
  - Suitable Infineon gate drivers can be found under https://www.infineon.com/gdfinder
- Mechanical features
  - Compact design
  - Integrated NTC temperature sensor
  - High power density
  - High current pin

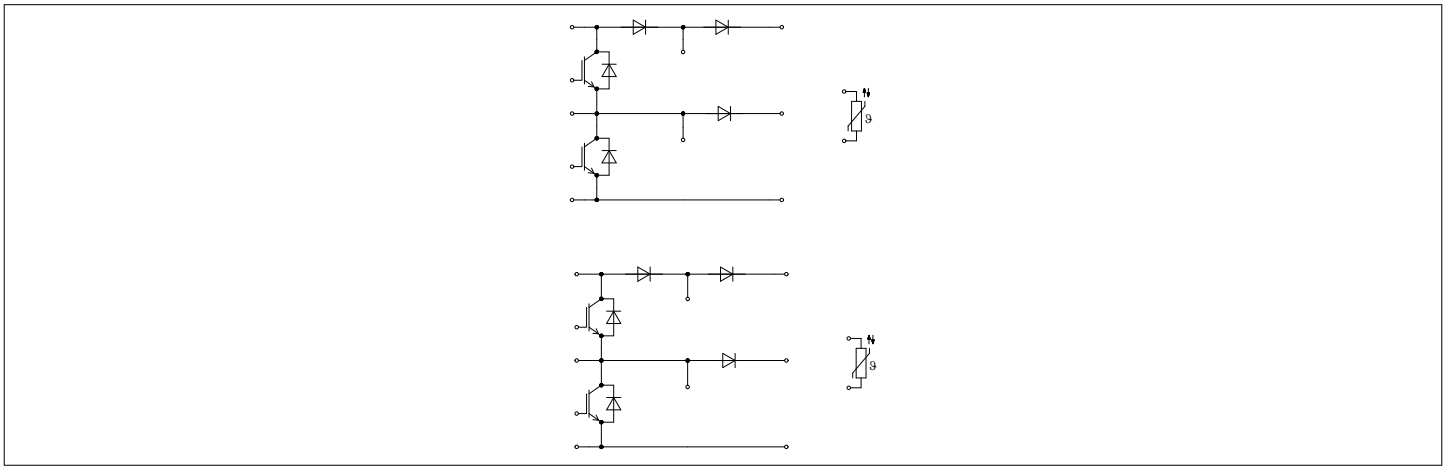
Potential applications

- 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, *t* = 1 min	4.0	kV
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, f = 50 Hz, *t* = 1 min	3.2	kV
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	$d_{Creep\ nom}$	terminal to baseplate, nom.	16.0	mm
Clearance	$d_{Clear\ nom}$	terminal to baseplate, nom.	18.8	mm
Comparative tracking index	*CTI*		600	
Relative thermal index (electrical)	*RTI*	frame	130	°C
		lid	140	

Table 2 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray inductance module	L_{sCE}				12		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_C = 25 °C, per switch			1.95		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*				275		g

***Note**: The current under continuous operation is limited to 50 A RMS per connector pin.*

2 IGBT, T11 / T12 / T21 / T22

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		T_{vj} = 25 °C	1200	V
Implemented collector current	I_{CN}			280	A
Continuous DC collector current	I_{CDC}	$T_{vj\ max}$ = 175 °C	T_C = 85 °C	195	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\ op}$		560	A
Gate-emitter peak voltage	V_{GES}			±23	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 = 70 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.22	1.61	V
			T_{vj} = 125 °C		1.24		
			T_{vj} = 175 °C		1.25		
Gate threshold voltage	V_{GEth}	I_C = 4.48 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		4.85	5.50	6.15	V
Gate charge	Q_G	V_{GE} = -5/15 V, V_{CC} = 600 V, T_{vj} = 25 °C			2.68		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			2.5		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			31.1		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.205		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			22	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25 °C				100	nA
Turn-on delay time (inductive load)	t_{don}	I_C = 70 A, V_{CC} = 600 V, V_{GE} = -5/15 V, R_{Gon} = 0.22 Ω	T_{vj} = 25 °C		0.144		µs
			T_{vj} = 125 °C		0.154		
			T_{vj} = 175 °C		0.159		
Rise time (inductive load)	t_r	I_C = 70 A, V_{CC} = 600 V, V_{GE} = -5/15 V, R_{Gon} = 0.22 Ω	T_{vj} = 25 °C		0.012		µs
			T_{vj} = 125 °C		0.014		
			T_{vj} = 175 °C		0.016		
Turn-off delay time (inductive load)	t_{doff}	I_C = 70 A, V_{CC} = 600 V, V_{GE} = -5/15 V, R_{Goff} = 0.22 Ω	T_{vj} = 25 °C		0.440		µs
			T_{vj} = 125 °C		0.580		
			T_{vj} = 175 °C		0.650		
Fall time (inductive load)	t_f	I_C = 70 A, V_{CC} = 600 V, V_{GE} = -5/15 V, R_{Goff} = 0.22 Ω	T_{vj} = 25 °C		0.019		µs
			T_{vj} = 125 °C		0.040		
			T_{vj} = 175 °C		0.056		
Turn-on energy loss per pulse	E_{on}	I_C = 70 A, V_{CC} = 600 V, L_σ = 15 nH, V_{GE} = -5/15 V, R_{Gon} = 0.22 Ω, di/dt = 4900 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		0.74		mJ
			T_{vj} = 125 °C		0.96		
			T_{vj} = 175 °C		1.07		
Turn-off energy loss per pulse	E_{off}	I_C = 70 A, V_{CC} = 600 V, L_σ = 15 nH, V_{GE} = -5/15 V, R_{Goff} = 0.22 Ω, dv/dt = 3000 V/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		1.96		mJ
			T_{vj} = 125 °C		3.73		
			T_{vj} = 175 °C		4.86		
Thermal resistance, junction to case	R_{thJC}	per IGBT				0.211	K/W

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, λ_{grease} = 5 W/(m·K)		0.031		K/W
Temperature under switching conditions	$T_{vj\,op}$		-40		175	°C

3 Diode, D15 / D25

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			100	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		200	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	300	A^2s
			T_{vj} = 175 °C	220	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 100 A, V_{GE} = 0 V	T_{vj} = 25 °C		2.50	3.05	V
			T_{vj} = 125 °C		2.18		
			T_{vj} = 175 °C		1.98		
Reverse current	I_R					4.9	µA
Thermal resistance, junction to case	R_{thJC}	per diode				0.835	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, λ_{grease} = 5 W/(m·K)			0.05		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°C

4 Diode, D11 / D12 / D21 / D22

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		T_{vj} = 25 °C	1600	V
Continuous DC forward current[1)]	I_F			75	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		100	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	950	A^2s
			T_{vj} = 175 °C	790	

1) T_C = 85 °C

Table 8 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 75 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.07	1.43	V
			T_{vj} = 125 °C		1.01		
			T_{vj} = 175 °C		0.97		
Thermal resistance, junction to case	R_{thJC}	per diode				0.822	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, λ_{grease} = 5 W/(m·K)			0.064		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°C

5 Diode, D13 / D14 / D23 / D24

Table 9 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			80	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		160	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	520	A^2s
			T_{vj} = 175 °C	290	

Table 10 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 70 A	T_{vj} = 25 °C		1.39	1.68	V
			T_{vj} = 125 °C		1.62		
			T_{vj} = 175 °C		1.84		
Reverse current	I_R					6.3	mA
Peak reverse recovery current	I_{RM}	V_{CC} = 600 V, I_F = 70 A, -di$_F$/dt = 4900 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		46.7		A
			T_{vj} = 125 °C		43		
			T_{vj} = 175 °C		41		
Recovered charge	Q_r	V_{CC} = 600 V, I_F = 70 A, -di$_F$/dt = 4900 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		0.61		µC
			T_{vj} = 125 °C		0.6		
			T_{vj} = 175 °C		0.6		
Reverse recovery time	t_{rr}	V_{CC} = 600 V, I_F = 70 A, -di$_F$/dt = 4900 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		0.113		µs
			T_{vj} = 125 °C		0.105		
			T_{vj} = 175 °C		0.104		
Reverse recovery energy	E_{rec}	V_{CC} = 600 V, I_F = 70 A, -di$_F$/dt = 4900 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		0.123		mJ
			T_{vj} = 125 °C		0.109		
			T_{vj} = 175 °C		0.103		
Thermal resistance, junction to case	R_{thJC}	per diode				0.432	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, λ_{grease} = 5 W/(m·K)			0.0337		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°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 °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

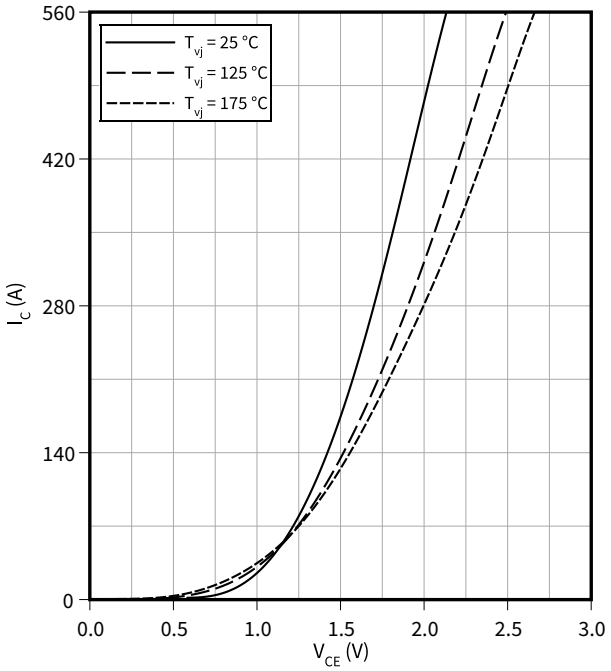
***Note**: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.*

7 Characteristics diagrams

Output characteristic (typical), IGBT, T11 / T12 / T21 / T22

$I_C = f(V_{CE})$

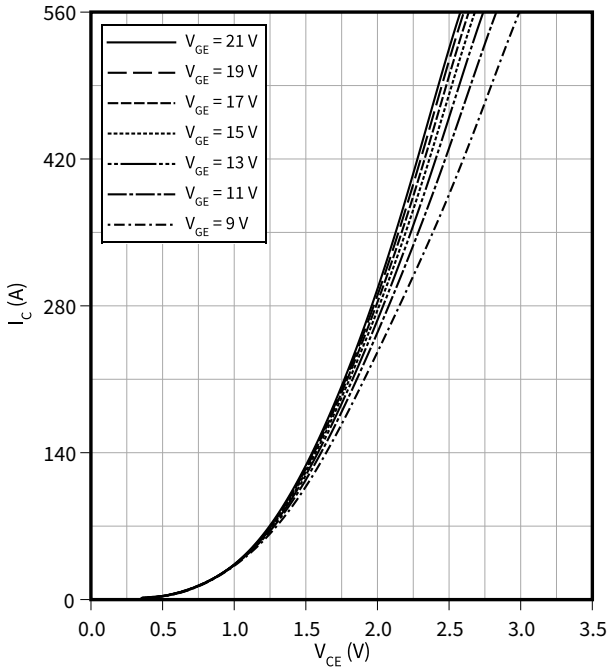
V_{GE} = 15 V



Output characteristic field (typical), IGBT, T11 / T12 / T21 / T22

$I_C = f(V_{CE})$

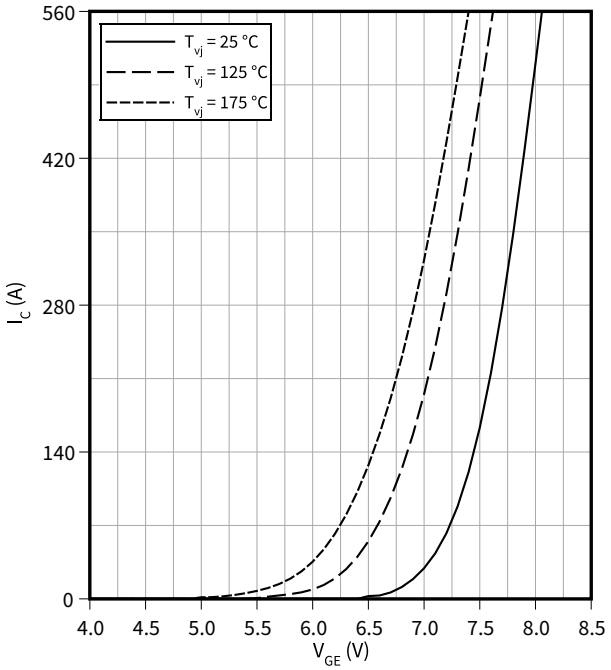
T_{vj} = 175 °C



Transfer characteristic (typical), IGBT, T11 / T12 / T21 / T22

$I_C = f(V_{GE})$

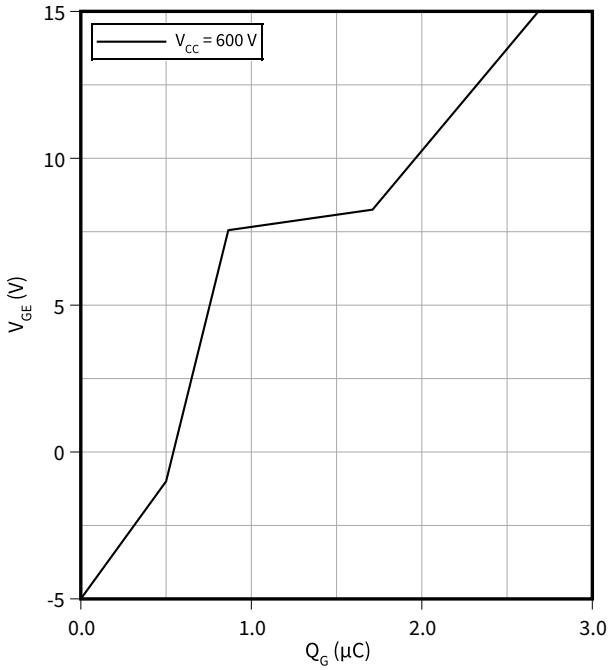
V_{CE} = 20 V



Gate charge characteristic (typical), IGBT, T11 / T12 / T21 / T22

$V_{GE} = f(Q_G)$

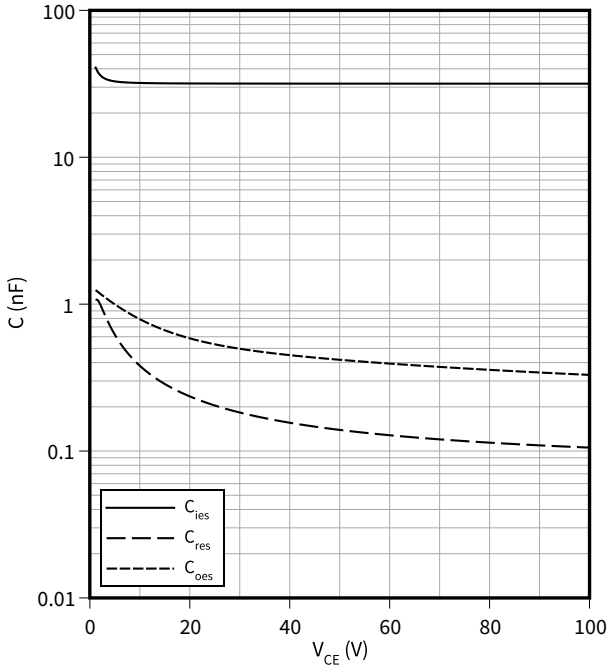
T_{vj} = 25 °C, I_C = 280 A



Capacity characteristic (typical), IGBT, T11 / T12 / T21 / T22

$C = f(V_{CE})$

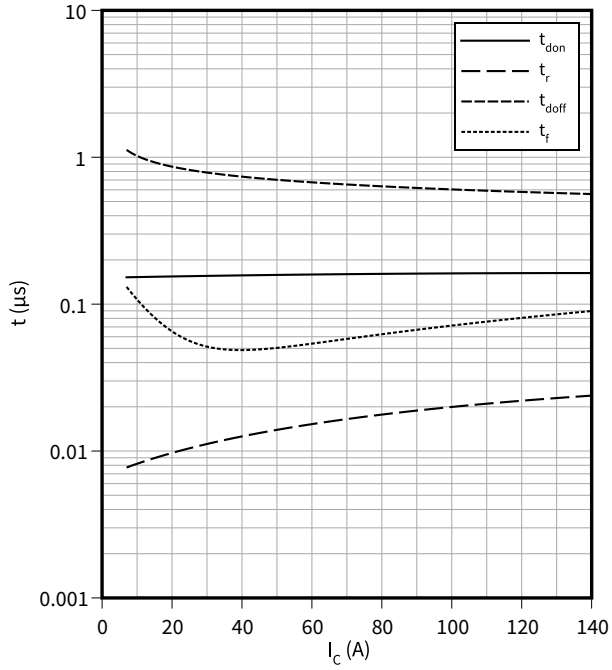
$f = 100\ kHz$, $V_{GE} = 0\ V$, $T_{vj} = 25\ °C$



Switching times (typical), IGBT, T11 / T12 / T21 / T22

$t = f(I_C)$

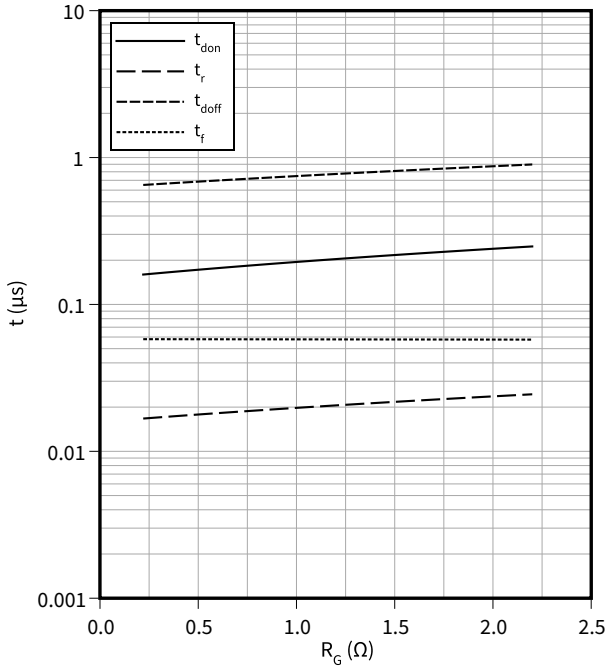
$R_{Goff} = 0.22\ \Omega$, $R_{Gon} = 0.22\ \Omega$, $V_{GE} = -5/15\ V$, $V_{CC} = 600\ V$, $T_{vj} = 175\ °C$



Switching times (typical), IGBT, T11 / T12 / T21 / T22

$t = f(R_G)$

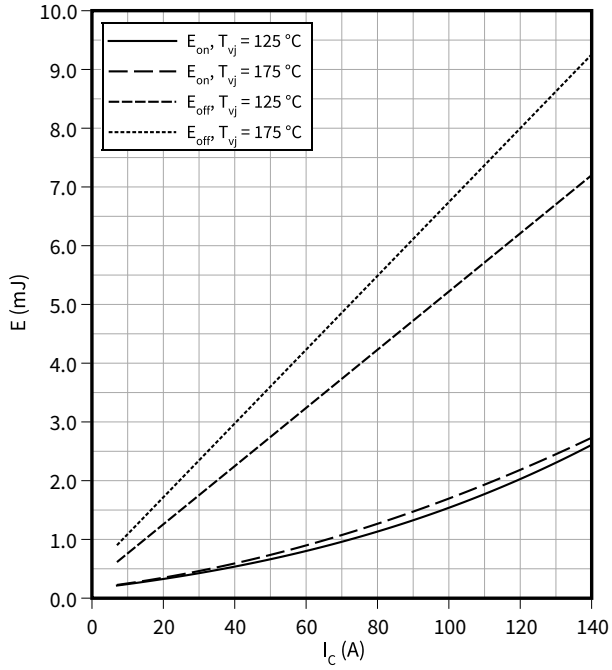
$V_{GE} = -5/15\ V$, $I_C = 70\ A$, $V_{CC} = 600\ V$, $T_{vj} = 175\ °C$



Switching losses (typical), IGBT, T11 / T12 / T21 / T22

$E = f(I_C)$

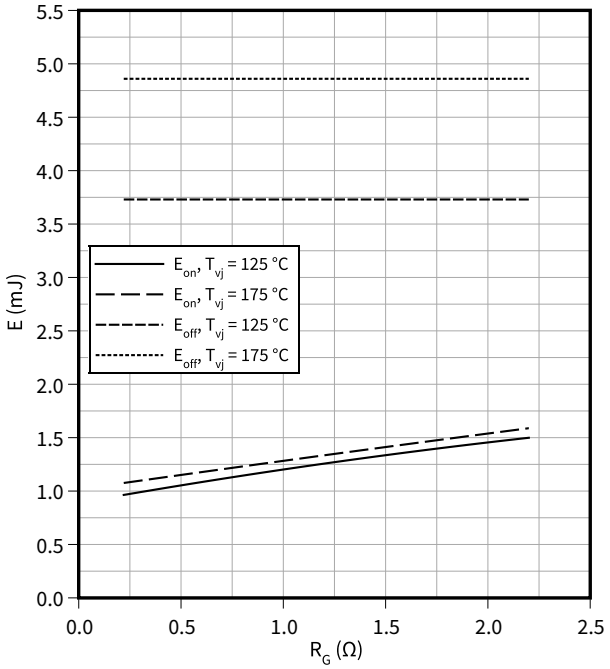
$R_{Goff} = 0.22\ \Omega$, $R_{Gon} = 0.22\ \Omega$, $V_{GE} = -5/15\ V$, $V_{CC} = 600\ V$



Switching losses (typical), IGBT, T11 / T12 / T21 / T22

$E = f(R_G)$

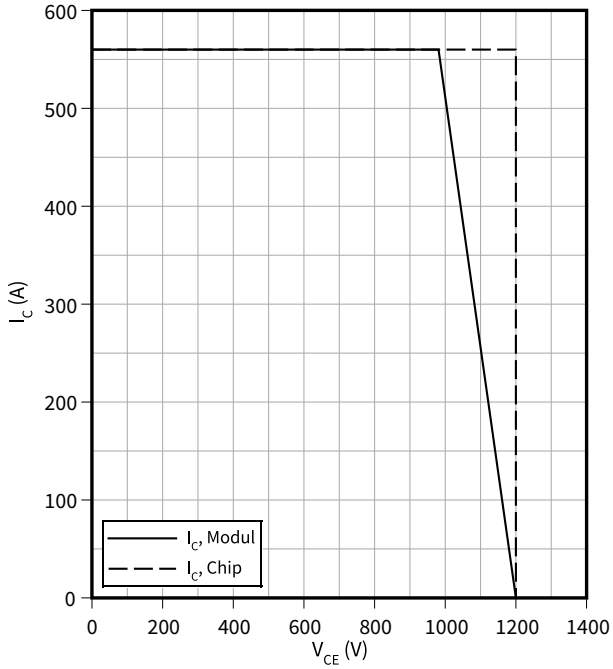
V_{GE} = -5/15 V, I_C = 70 A, V_{CC} = 600 V



Reverse bias safe operating area (RBSOA), IGBT, T11 / T12 / T21 / T22

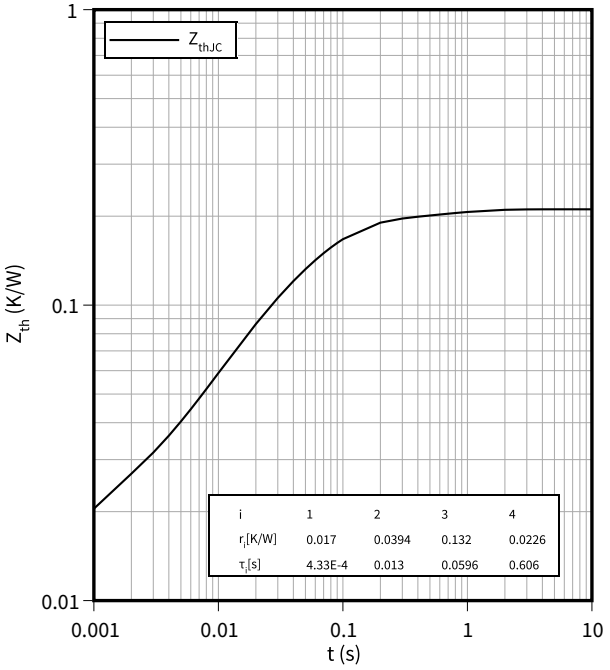
$I_C = f(V_{CE})$

R_{Goff} = 0.22 Ω, V_{GE} = -5/15 V, T_{vj} = 175 °C



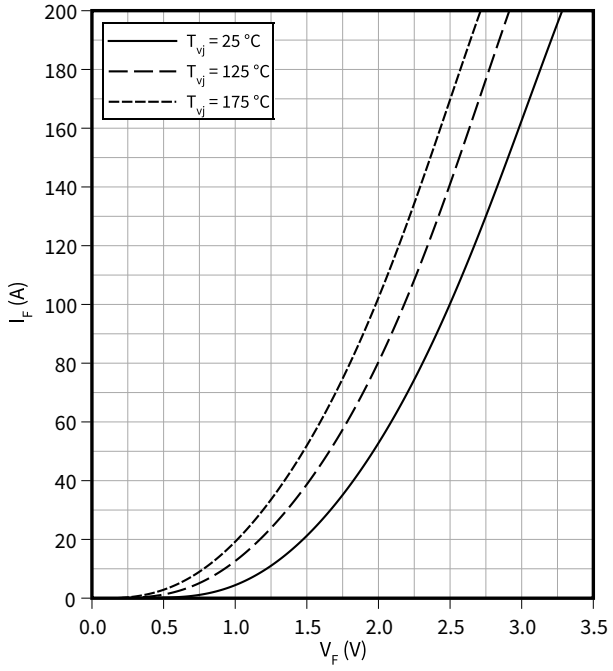
Transient thermal impedance, IGBT, T11 / T12 / T21 / T22

$Z_{th} = f(t)$



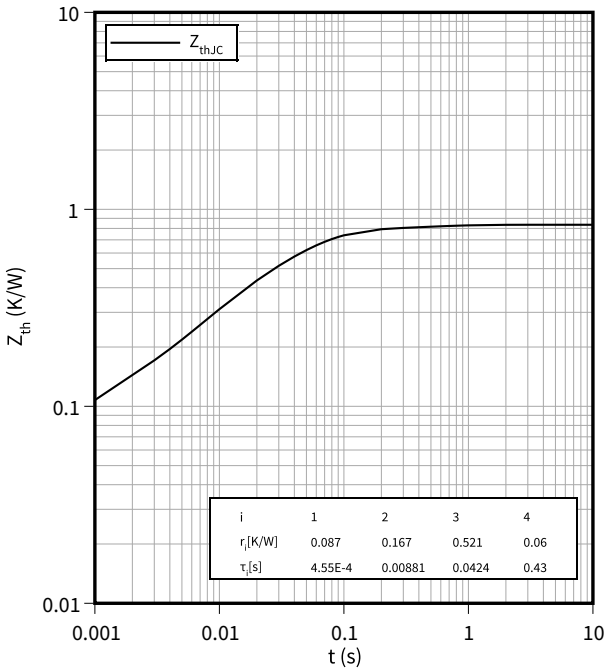
Forward characteristic (typical), Diode, D15 / D25

$I_F = f(V_F)$



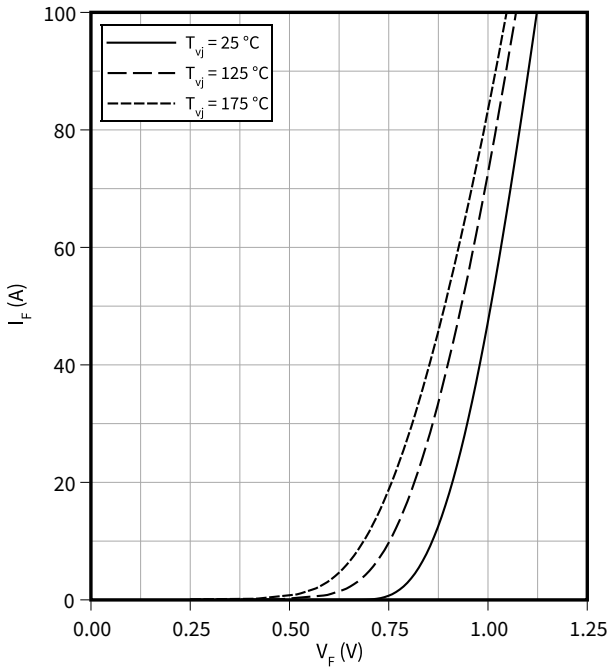
Transient thermal impedance, Diode, D15 / D25

$Z_{th} = f(t)$



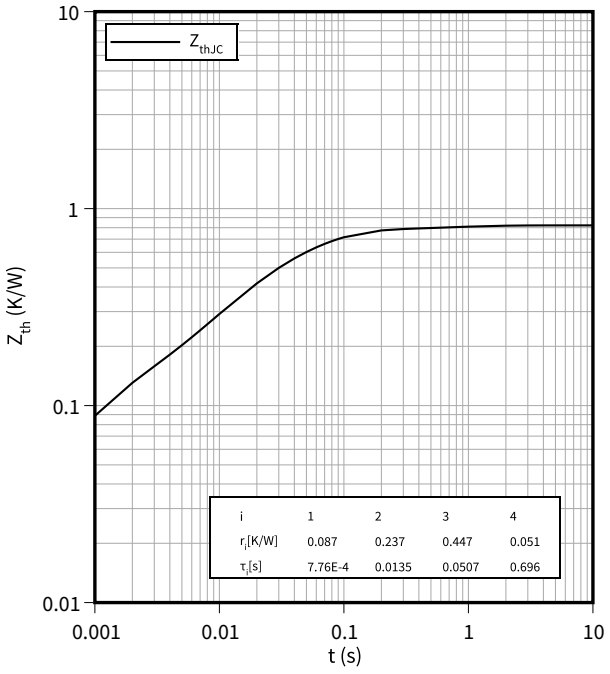
Forward characteristic (typical), Diode, D11 / D12 / D21 / D22

$I_F = f(V_F)$



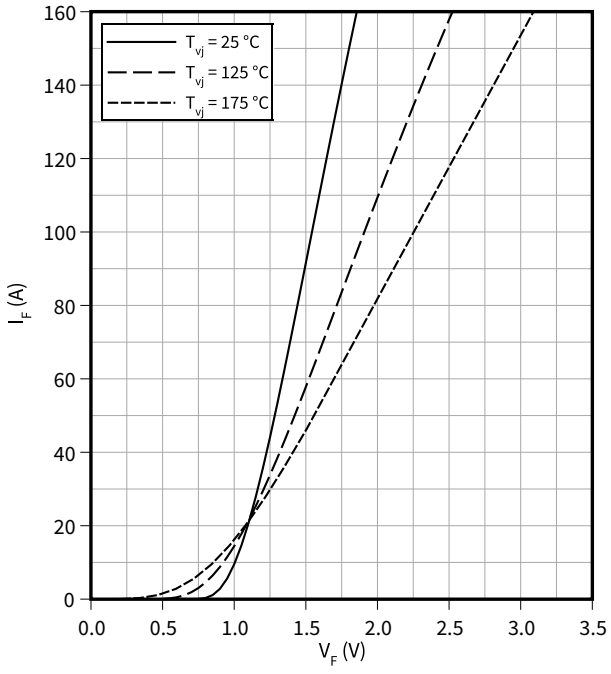
Transient thermal impedance, Diode, D11 / D12 / D21 / D22

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D13 / D14 / D23 / D24

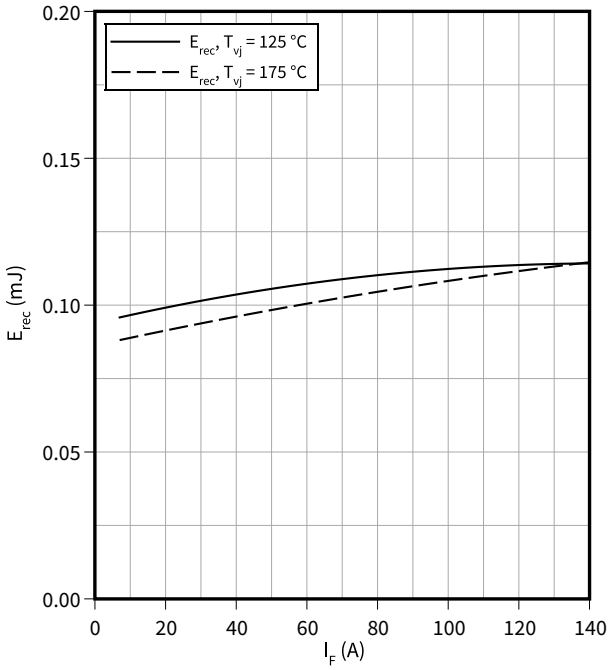
$I_F = f(V_F)$



Switching losses (typical), Diode, D13 / D14 / D23 / D24

$E_{rec} = f(I_F)$

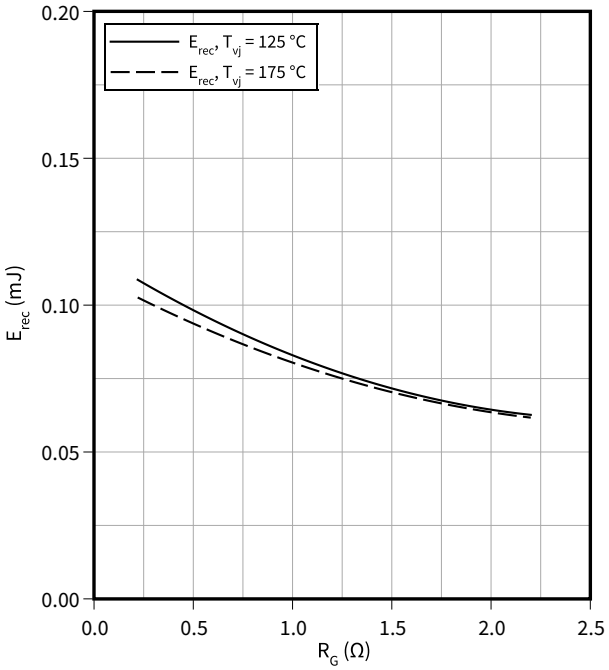
$R_{Gon} = 0.22\ \Omega$, $V_{CC} = 600\ V$



Switching losses (typical), Diode, D13 / D14 / D23 / D24

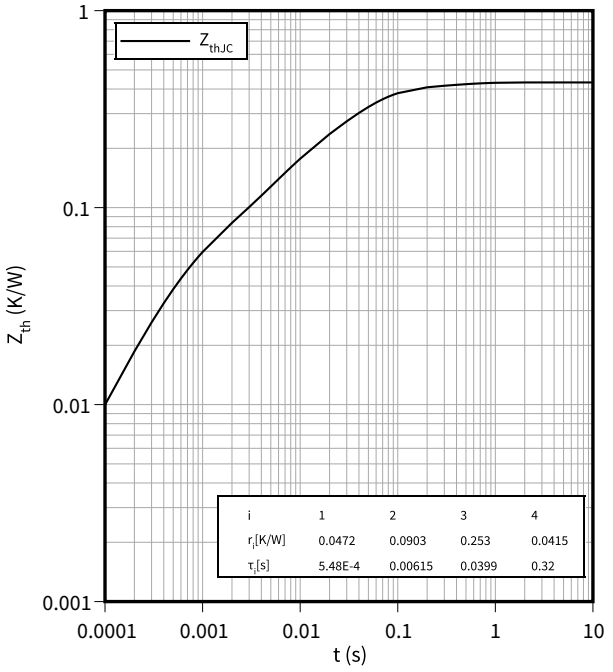
$E_{rec} = f(R_G)$

$I_F = 70\ A$, $V_{CC} = 600\ V$



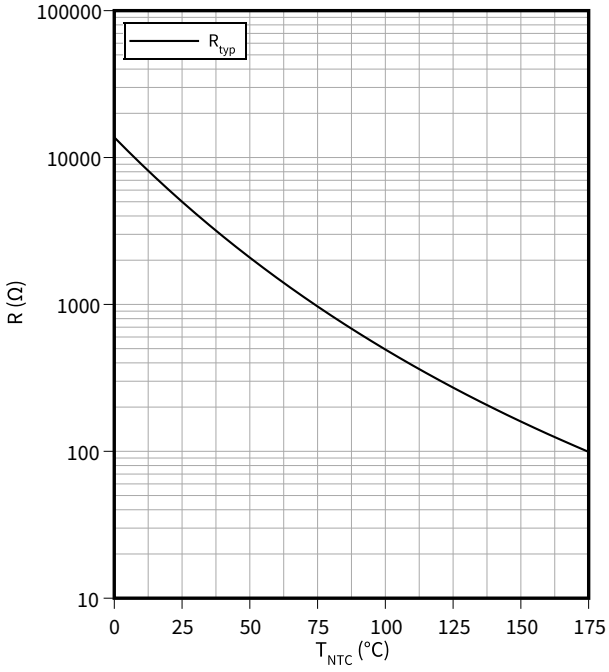
Transient thermal impedance, Diode, D13 / D14 / D23 / D24

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



8 Circuit diagram

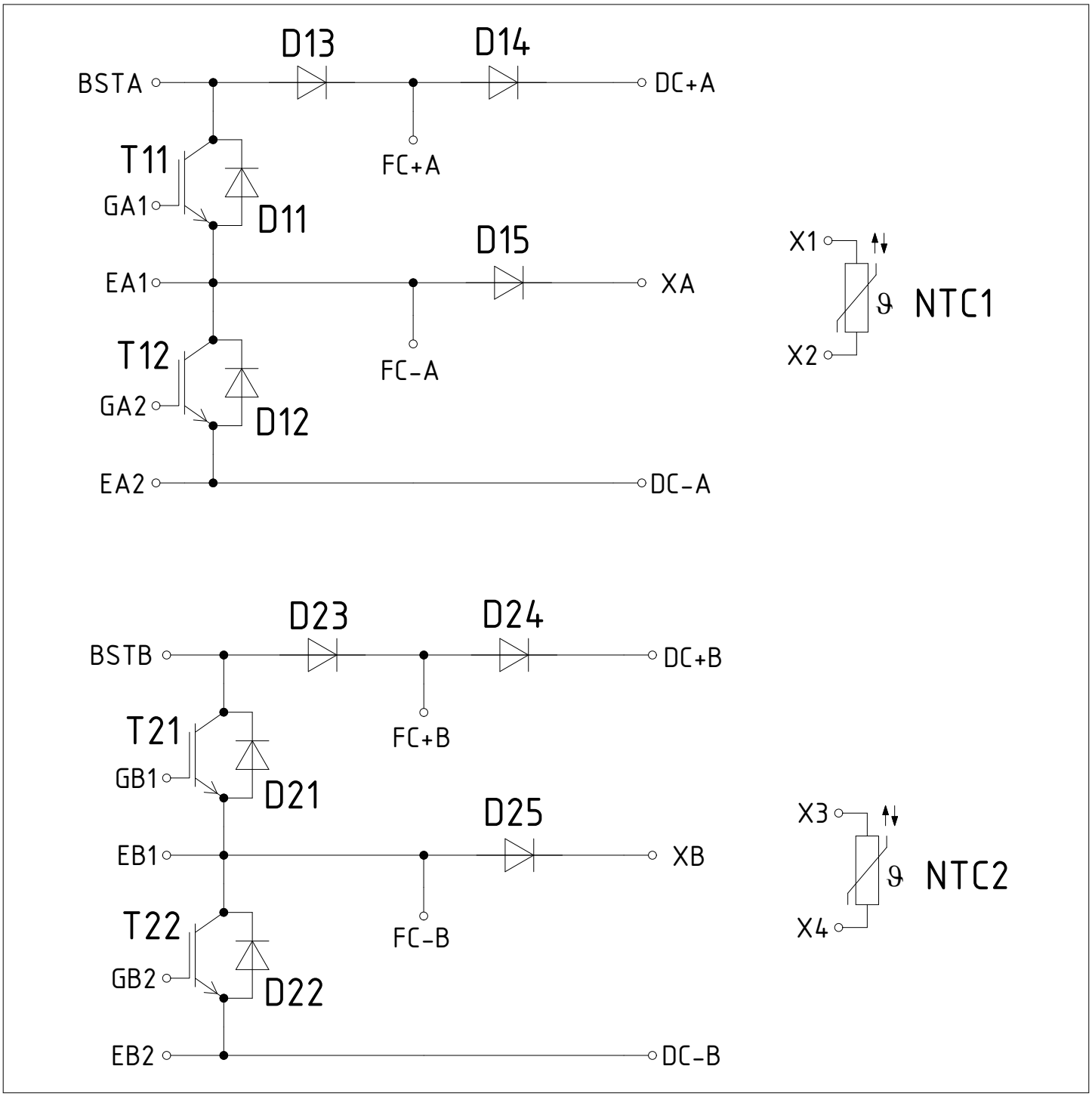


Figure 1

9 Package outlines

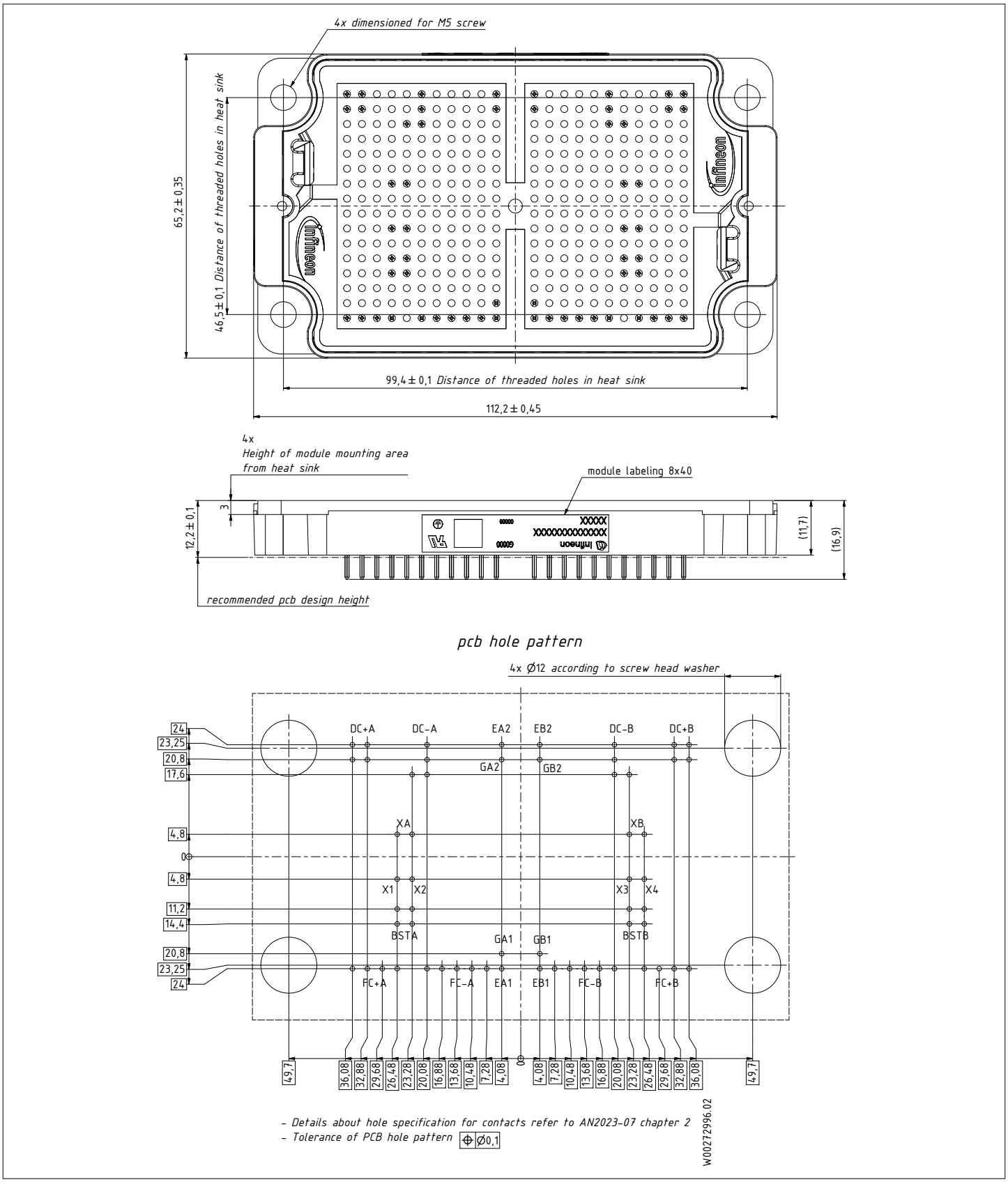


Figure 2

10 Module label code

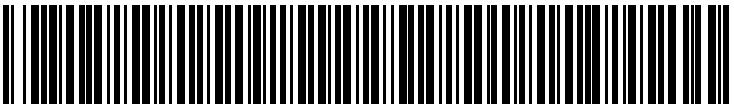
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production week)	*Digit* 1 – 5 6 - 11 12 - 19 20 – 21 22 – 23	*Example* 71549 142846 55054991 15 30
Example	 7154914284655054991530	 7154914284655054991530	

Figure 3

Revision history

Document version	Date of release	Description of changes
1.00	2026-02-02	Initial version
1.10	2026-02-18	Final Datasheet

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