Final datasheet

EasyPACK™ 1B module with Trench/Fieldstop IGBT H5 and CoolSiC™ Schottky diode and NTC

Features

Typical appearance

- Electrical features
  - V_{CES} = 650 V
  - $I_{C\ nom}$ = 100 A / I_{CRM} = 200 A
  - CoolSiC™ Schottky diode gen 5
  - Low switching losses
- Mechanical features
  - Al_2O_3 substrate with low thermal resistance
  - Compact design
  - Solder contact technology
  - Rugged mounting due to integrated mounting clamps

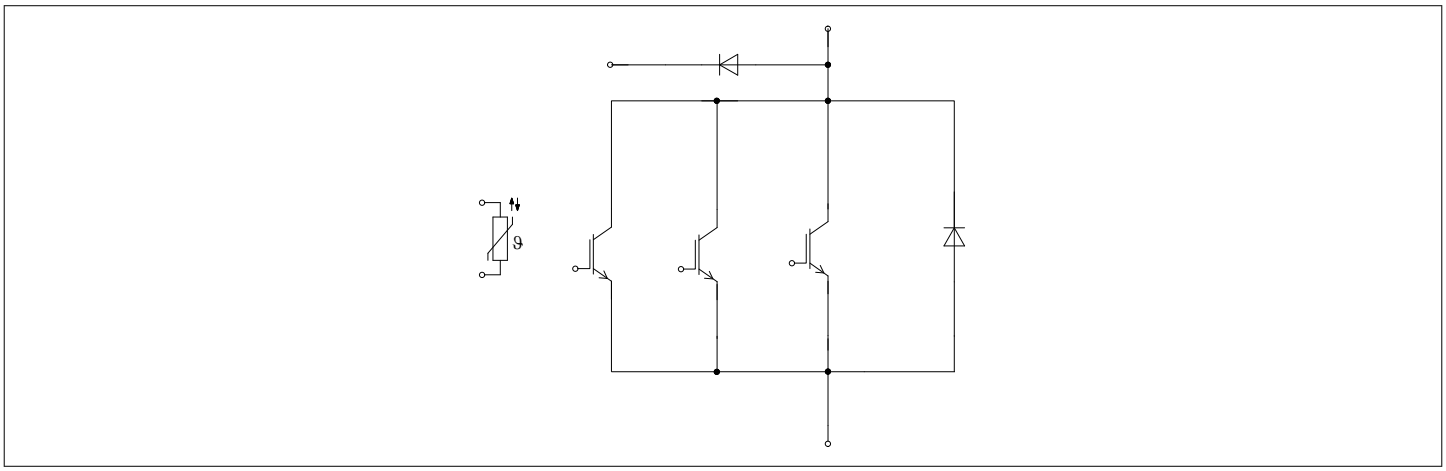
Potential applications

- Auxiliary inverters
- Inductive heating and welding
- Air conditioning
- 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 Hz, *t* = 1 min	2.5	kV
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, f = 50 Hz, *t* = 1 min	2.5	kV
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
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}			16		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	T_H = 25 °C, per switch		1.8		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_H = 25 °C, per switch		1		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting force per clamp	*F*		20		50	N
Weight	*G*			24		g

***Note**: The current under continuous operation is limited to 30A rms per connector pin.*

2 Diode, Chopper

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		T_{vj} = 25 °C	650	V
Continuous DC forward current	I_F			40	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		80	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	340	A^2s
			T_{vj} = 150 °C	332	

Table 4 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 40 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.45	1.85	V
			T_{vj} = 125 °C		1.60		
			T_{vj} = 150 °C		1.65		
Peak reverse recovery current	I_{RM}	V_{CC} = 300 V, I_F = 40 A, -di$_F$/dt = 3100 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		9.67		A
			T_{vj} = 125 °C		9.67		
			T_{vj} = 150 °C		9.67		
Recovered charge	Q_r	V_{CC} = 300 V, I_F = 40 A, -di$_F$/dt = 3100 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		0.22		µC
			T_{vj} = 125 °C		0.22		
			T_{vj} = 150 °C		0.22		
Reverse recovery energy	E_{rec}	V_{CC} = 300 V, I_F = 40 A, -di$_F$/dt = 3100 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		0.025		mJ
			T_{vj} = 125 °C		0.025		
			T_{vj} = 150 °C		0.025		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 5 W/(m·K)			1.03		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

3 IGBT, T1

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		T_{vj} = 25 °C	650	V
Implemented collector current	I_{CN}			100	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 65 °C	50	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		200	A
Gate-emitter peak voltage	V_{GES}			±20	V

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\,sat}$	I_C = 40 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.18	1.46	V
			T_{vj} = 125 °C		1.22		
			T_{vj} = 150 °C		1.23		
Gate threshold voltage	V_{GEth}	I_C = 1 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		3.85	4.60	5.35	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CC} = 400 V, T_{vj} = 25 °C			0.434		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			0		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			5.67		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.02		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 650 V, V_{GE} = 0 V	T_{vj} = 25 °C			15	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 = 40 A, V_{CC} = 300 V, V_{GE} = ±15 V, R_{Gon} = 6.8 Ω	T_{vj} = 25 °C		0.017		µs
			T_{vj} = 125 °C		0.016		
			T_{vj} = 150 °C		0.016		
Rise time (inductive load)	t_r	I_C = 40 A, V_{CC} = 300 V, V_{GE} = ±15 V, R_{Gon} = 6.8 Ω	T_{vj} = 25 °C		0.008		µs
			T_{vj} = 125 °C		0.009		
			T_{vj} = 150 °C		0.011		
Turn-off delay time (inductive load)	t_{doff}	I_C = 40 A, V_{CC} = 300 V, V_{GE} = ±15 V, R_{Goff} = 24 Ω	T_{vj} = 25 °C		0.219		µs
			T_{vj} = 125 °C		0.246		
			T_{vj} = 150 °C		0.265		
Fall time (inductive load)	t_f	I_C = 40 A, V_{CC} = 300 V, V_{GE} = ±15 V, R_{Goff} = 24 Ω	T_{vj} = 25 °C		0.017		µs
			T_{vj} = 125 °C		0.018		
			T_{vj} = 150 °C		0.019		
Turn-on energy loss per pulse	E_{on}	I_C = 40 A, V_{CC} = 300 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Gon} = 6.8 Ω, di/dt = 3100 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		0.626		mJ
			T_{vj} = 125 °C		0.675		
			T_{vj} = 150 °C		0.675		
Turn-off energy loss per pulse	E_{off}	I_C = 40 A, V_{CC} = 300 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Goff} = 24 Ω, dv/dt = 6700 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		0.177		mJ
			T_{vj} = 125 °C		0.281		
			T_{vj} = 150 °C		0.281		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, λ_{grease} = 5 W/(m·K)			0.723		K/W

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Temperature under switching conditions	$T_{vj\,op}$		-40		150	°C

4 Diode, D1

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		T_{vj} = 25 °C	650	V
Continuous DC forward current	I_F			150	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		300	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	2720	A^2s
			T_{vj} = 150 °C	1860	

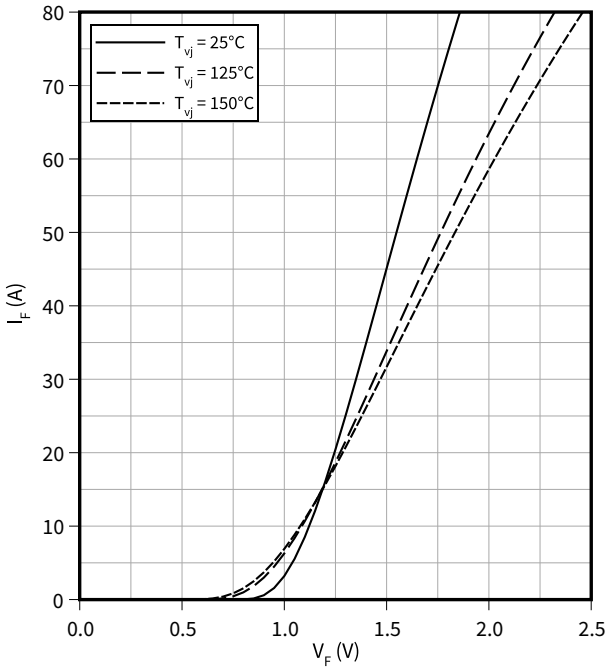
Table 8 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 150 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.55	1.95	V
			T_{vj} = 125 °C		1.49		
			T_{vj} = 150 °C		1.46		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 5 W/(m·K)			0.328		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

5 Characteristics diagrams

Forward characteristic (typical), Diode, Chopper

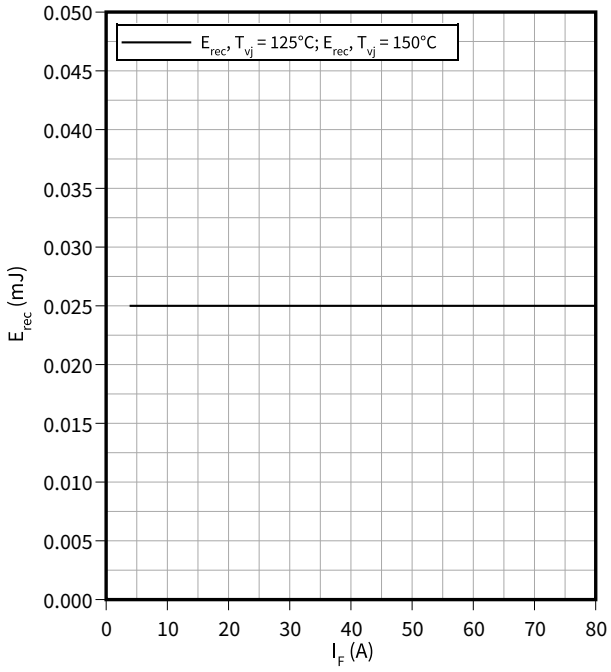
$I_F = f(V_F)$



Switching losses (typical), Diode, Chopper

$E_{rec} = f(I_F)$

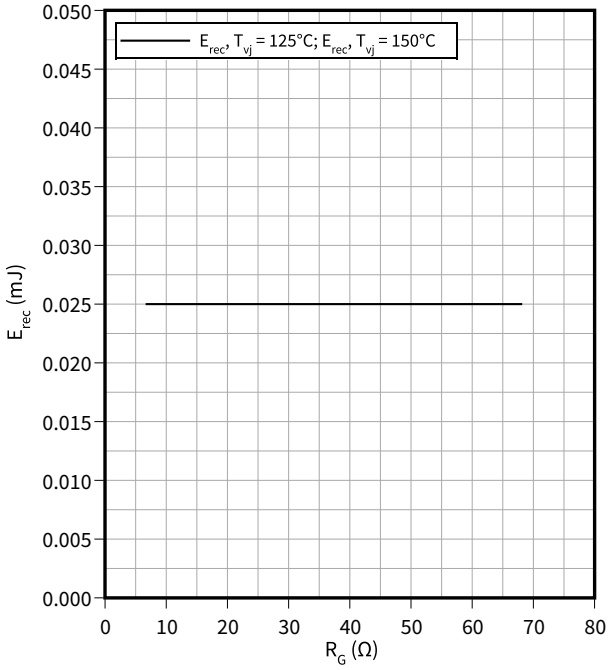
$R_{Gon} = 7.5\ \Omega$, $V_{CC} = 300\ V$



Switching losses (typical), Diode, Chopper

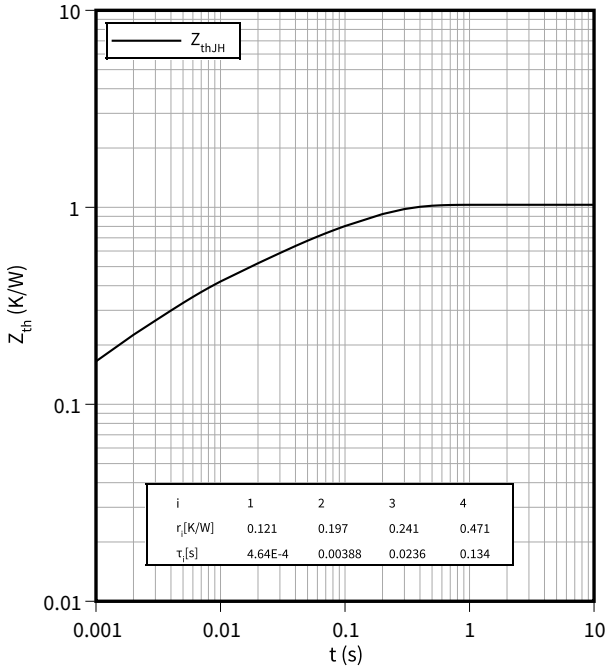
$E_{rec} = f(R_G)$

$I_F = 40\ A$, $V_{CC} = 300\ V$



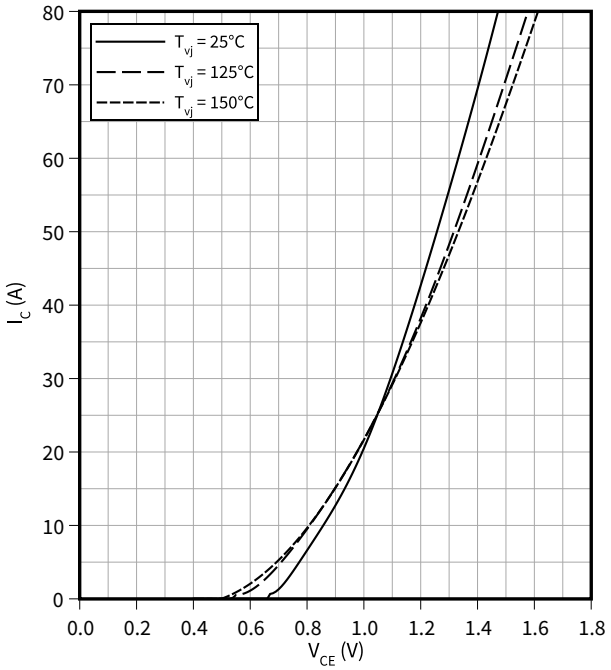
Transient thermal impedance, Diode, Chopper

$Z_{th} = f(t)$



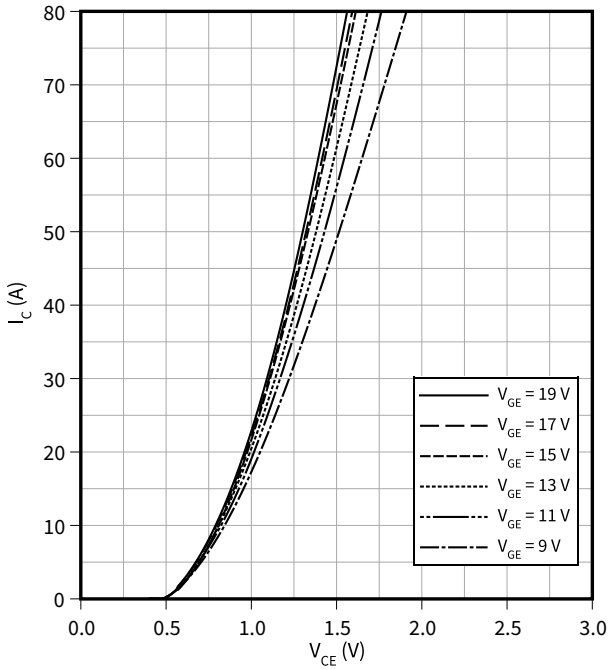
Output characteristic (typical), IGBT, T1

$I_C = f(V_{CE})$
$V_{GE} = 15$ V



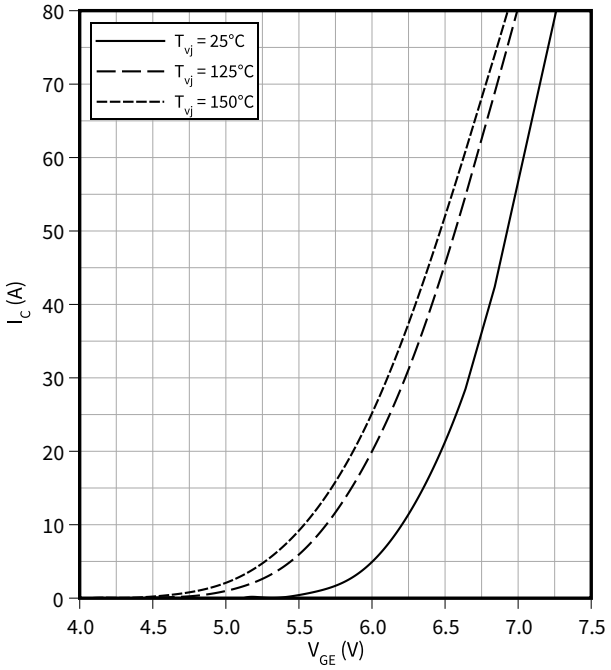
Output characteristic field (typical), IGBT, T1

$I_C = f(V_{CE})$
$T_{vj} = 150$ °C



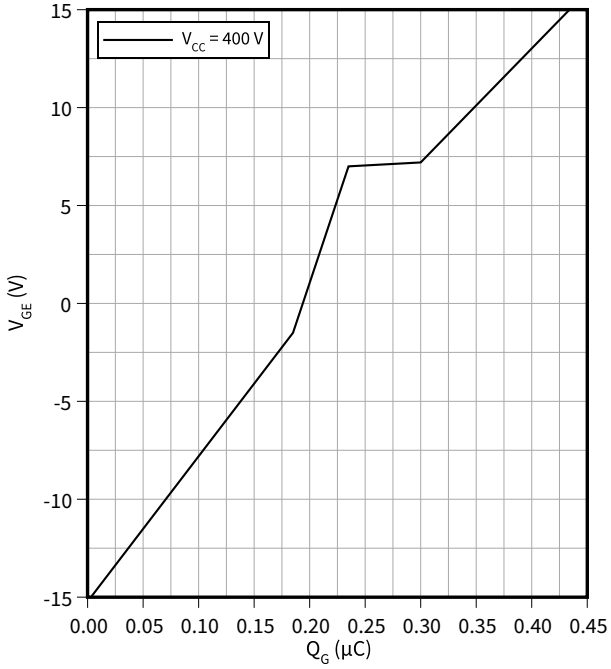
Transfer characteristic (typical), IGBT, T1

$I_C = f(V_{GE})$
$V_{CE} = 20$ V



Gate charge characteristic (typical), IGBT, T1

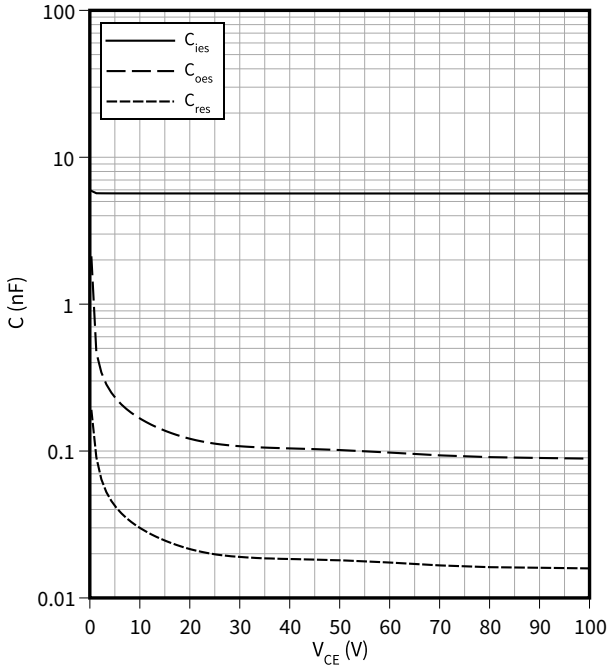
$V_{GE} = f(Q_G)$



Capacity characteristic (typical), IGBT, T1

$C = f(V_{CE})$

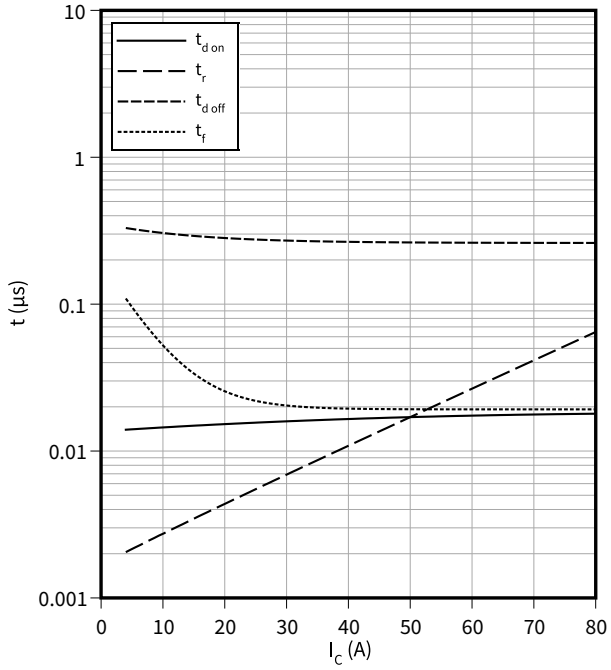
$f = 100$ kHz, $V_{GE} = 0$ V, $T_{vj} = 25$ °C



Switching times (typical), IGBT, T1

$t = f(I_C)$

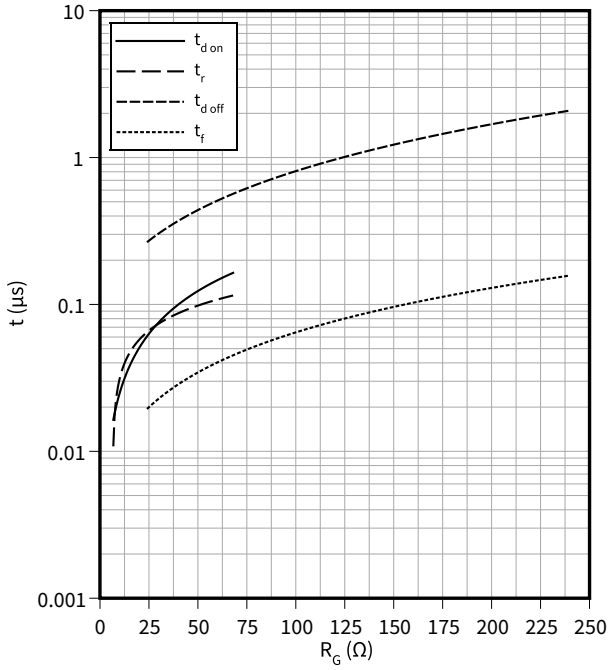
$R_{Goff} = 24\ \Omega$, $R_{Gon} = 6.8\ \Omega$, $V_{GE} = \pm 15$ V, $V_{CC} = 300$ V, $T_{vj} = 150$ °C



Switching times (typical), IGBT, T1

$t = f(R_G)$

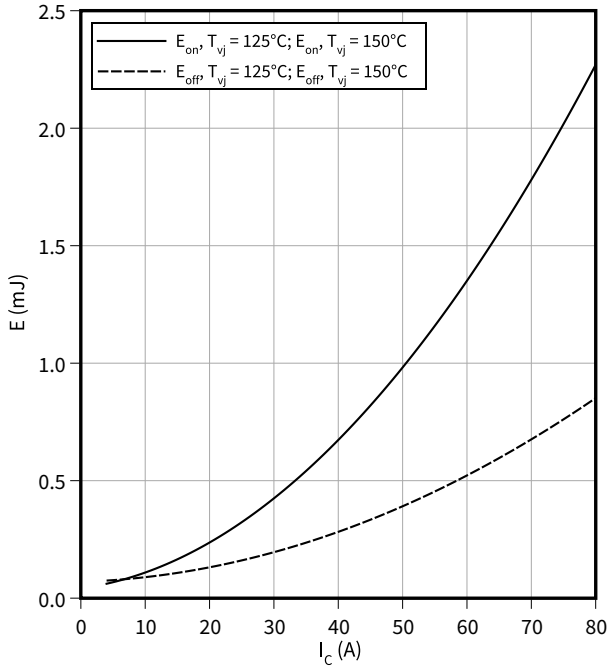
$V_{GE} = \pm 15$ V, $I_C = 40$ A, $V_{CC} = 300$ V, $T_{vj} = 150$ °C



Switching losses (typical), IGBT, T1

$E = f(I_C)$

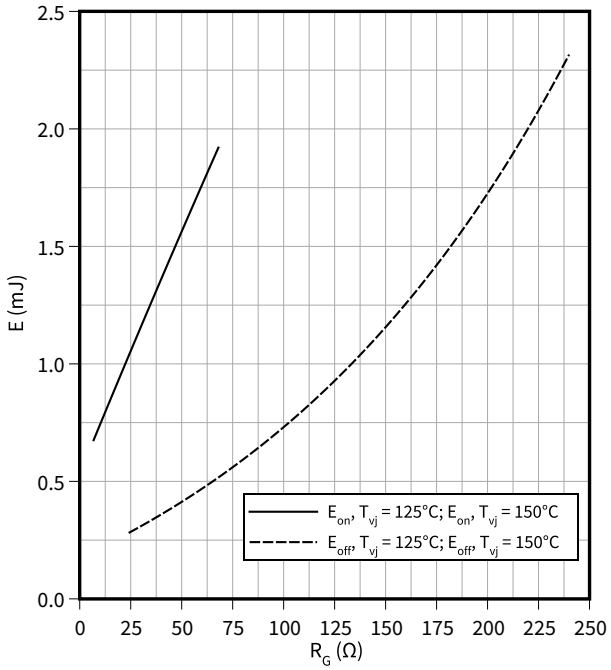
$R_{Goff} = 24\ \Omega$, $R_{Gon} = 6.8\ \Omega$, $V_{GE} = \pm 15$ V, $V_{CC} = 300$ V



Switching losses (typical), IGBT, T1

$E = f(R_G)$

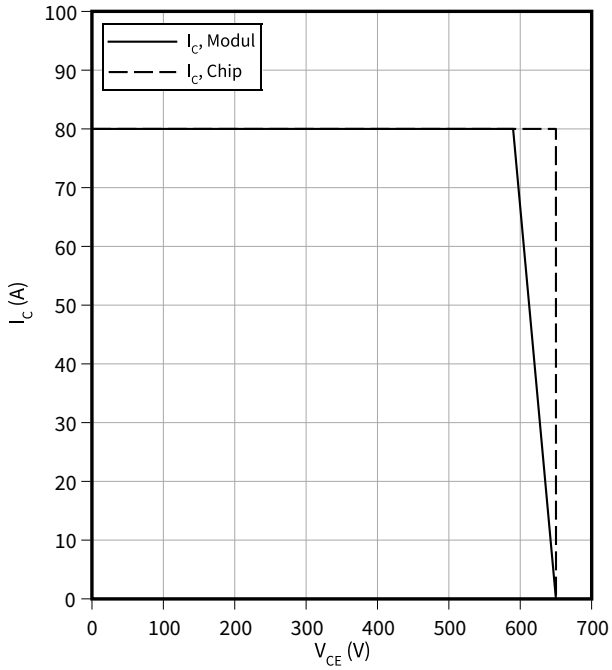
V_{GE} = ±15 V, I_C = 40 A, V_{CC} = 300 V



Reverse bias safe operating area (RBSOA), IGBT, T1

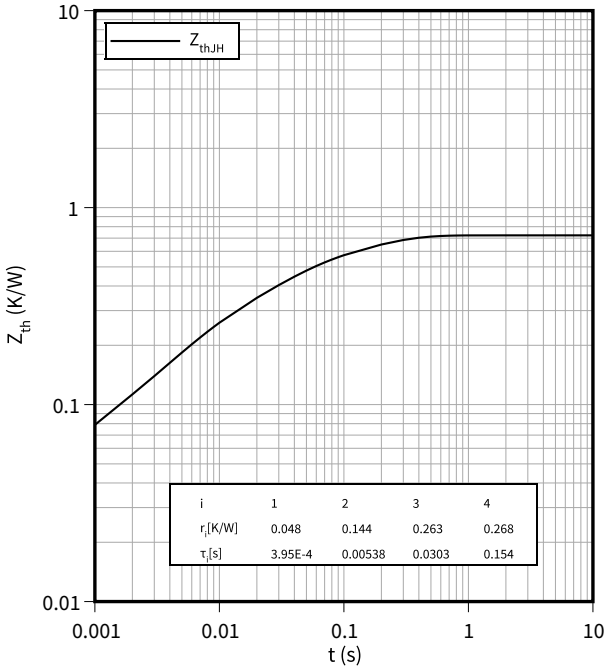
$I_C = f(V_{CE})$

R_{Goff} = 24 Ω, V_{GE} = ±15 V, T_{vj} = 150 °C



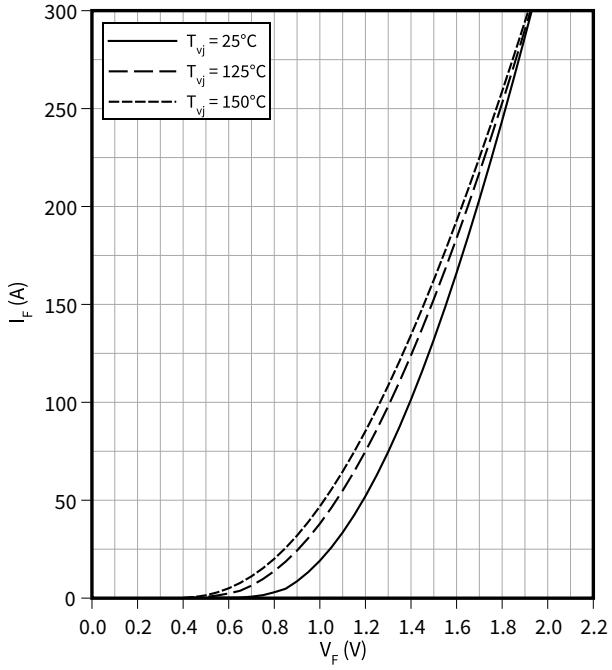
Transient thermal impedance, IGBT, T1

$Z_{th} = f(t)$



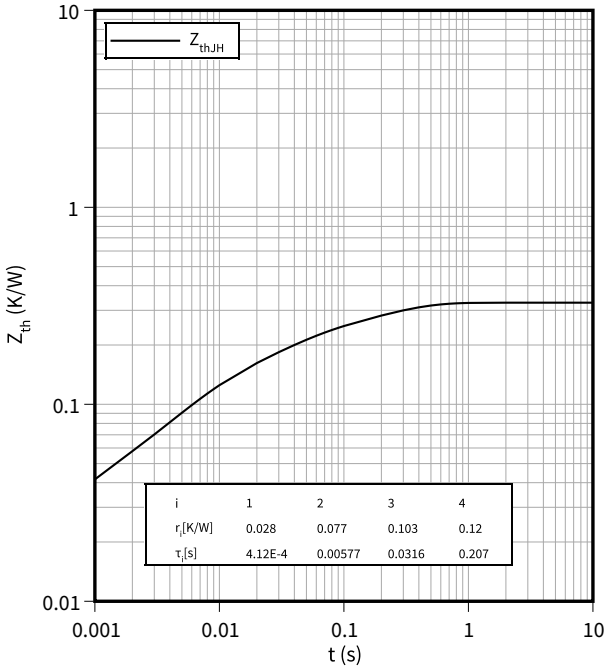
Forward characteristic (typical), Diode, D1

$I_F = f(V_F)$



Transient thermal impedance, Diode, D1

$Z_{th} = f(t)$



6 Circuit diagram

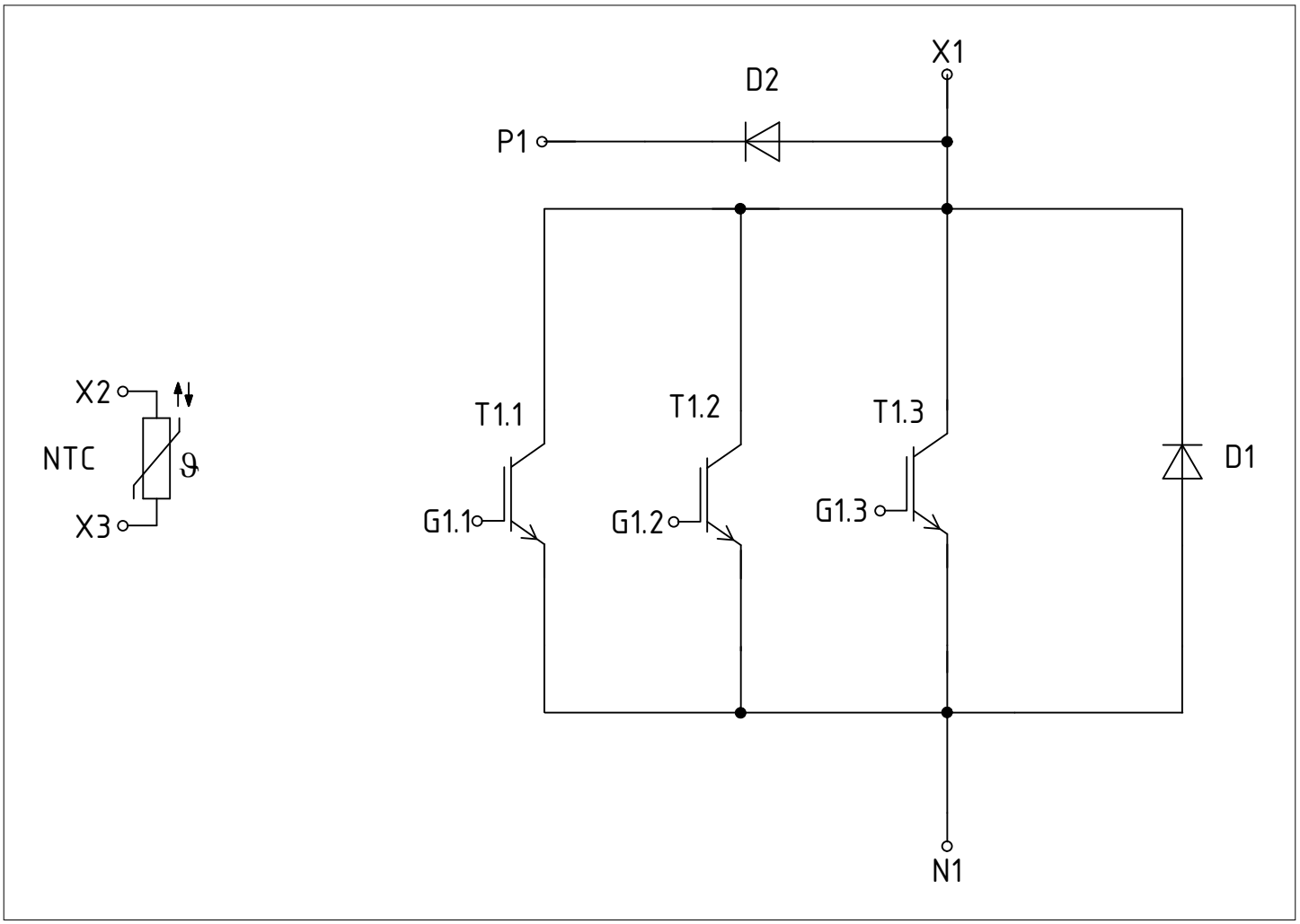


Figure 1

7 Package outlines

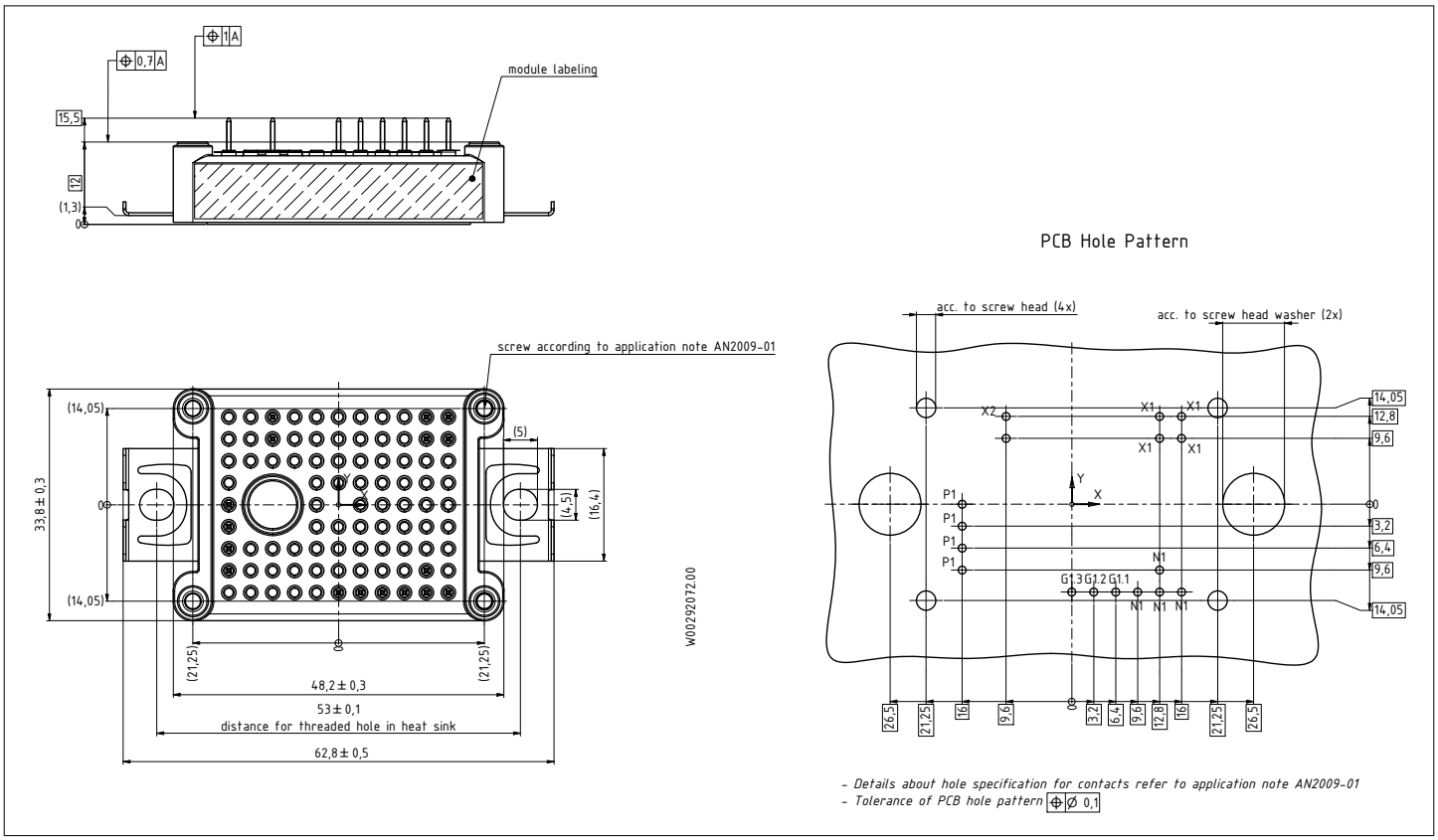


Figure 2

8 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	71549142846550549911530		71549142846550549911530

Figure 3

Revision history

Document version	Date of release	Description of changes
1.00	2025-10-10	Final datasheet

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