

Final datasheet

EasyPACK™ module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode and PressFIT / NTC

Features

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



Typical appearance

Potential applications

- Air conditioning
- Auxiliary inverters
- Motor drives
- Servo drives
- UPS systems

Product validation

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

Description

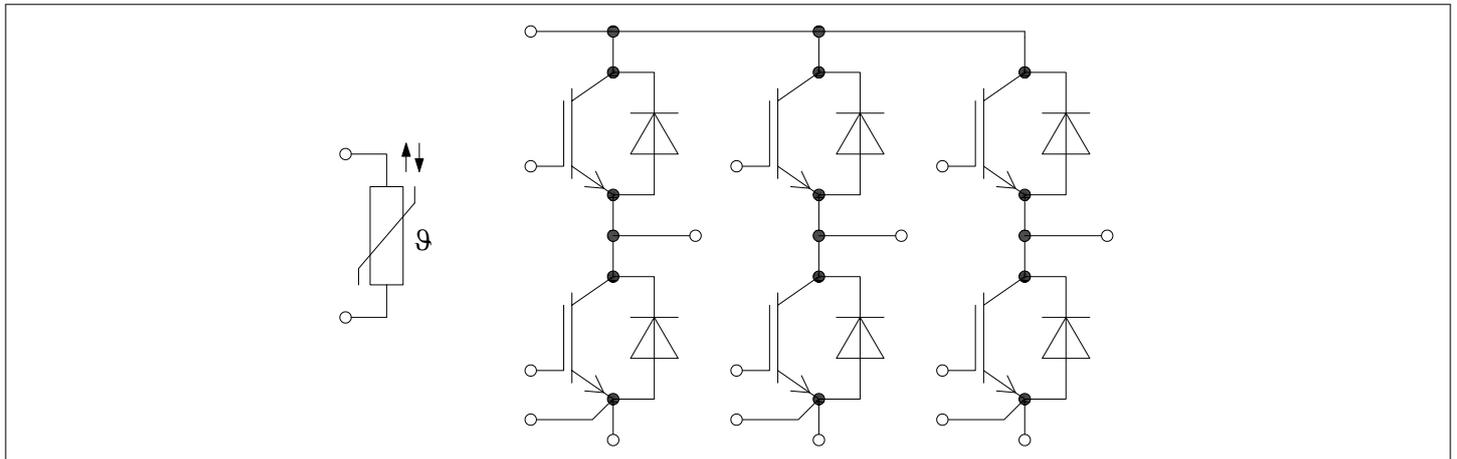


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1 Package

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
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}			40		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25$ °C, per switch		4		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 25 A rms per connector pin.

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
Continuous DC collector current	I_{CDC}	$T_{vj\ max} = 175$ °C $T_H = 105$ °C	50	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\ op}$	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	$T_{vj} = 25$ °C	1.50	1.80	V
			$T_{vj} = 125$ °C	1.64		
			$T_{vj} = 175$ °C	1.72		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Gate threshold voltage	V_{GEth}	$I_C = 1.28 \text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25 \text{ }^\circ\text{C}$	5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15 \text{ V}, V_{CC} = 600 \text{ V}$		0.92		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25 \text{ }^\circ\text{C}$		0		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}, T_{vj} = 25 \text{ }^\circ\text{C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$		11.1		nF
Reverse transfer capacitance	C_{res}	$f = 100 \text{ kHz}, T_{vj} = 25 \text{ }^\circ\text{C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$		0.039		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200 \text{ V}, V_{GE} = 0 \text{ V}$ $T_{vj} = 25 \text{ }^\circ\text{C}$			0.0079	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = 20 \text{ V}, T_{vj} = 25 \text{ }^\circ\text{C}$			100	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 50 \text{ A}, V_{CC} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, R_{Gon} = 5.1 \text{ } \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.018		μs
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.030		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	0.035		
Rise time (inductive load)	t_r	$I_C = 50 \text{ A}, V_{CC} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, R_{Gon} = 5.1 \text{ } \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.021		μs
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.024		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	0.025		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 50 \text{ A}, V_{CC} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, R_{Goff} = 5.1 \text{ } \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.270		μs
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.325		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	0.360		
Fall time (inductive load)	t_f	$I_C = 50 \text{ A}, V_{CC} = 600 \text{ V}, V_{GE} = \pm 15 \text{ V}, R_{Goff} = 5.1 \text{ } \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.120		μs
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.187		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	0.264		
Turn-on energy loss per pulse	E_{on}	$I_C = 50 \text{ A}, V_{CC} = 600 \text{ V}, L_\sigma = 35 \text{ nH}, V_{GE} = \pm 15 \text{ V}, R_{Gon} = 5.1 \text{ } \Omega, di/dt = 1650 \text{ A}/\mu\text{s} (T_{vj} = 175 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	2.41		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	4.3		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	5.45		
Turn-off energy loss per pulse	E_{off}	$I_C = 50 \text{ A}, V_{CC} = 600 \text{ V}, L_\sigma = 35 \text{ nH}, V_{GE} = \pm 15 \text{ V}, R_{Goff} = 5.1 \text{ } \Omega, dv/dt = 2900 \text{ V}/\mu\text{s} (T_{vj} = 175 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	1.9		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	4.72		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	6.12		
SC data	I_{SC}	$V_{GE} \leq 15 \text{ V}, V_{CC} = 800 \text{ V}, V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 8 \text{ } \mu\text{s}, T_{vj} = 150 \text{ }^\circ\text{C}$	185		A
			$t_p \leq 7 \text{ } \mu\text{s}, T_{vj} = 175 \text{ }^\circ\text{C}$	175		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, $\lambda_{grease} = 4.3 \text{ W}/(\text{m}\cdot\text{K})$		0.651		K/W

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Temperature under switching conditions	$T_{vj\ op}$		-40		175	°C

Note: $T_{vj\ op} > 150^\circ\text{C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

3 Diode, Inverter

Table 5 Maximum rated values

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

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	V_F	$I_F = 50\ \text{A}, V_{GE} = 0\ \text{V}$	$T_{vj} = 25^\circ\text{C}$		1.72	2.10	V
			$T_{vj} = 125^\circ\text{C}$		1.59		
			$T_{vj} = 175^\circ\text{C}$		1.52		
Peak reverse recovery current	I_{RM}	$V_{CC} = 600\ \text{V}, I_F = 50\ \text{A}, V_{GE} = -15\ \text{V}, -di_F/dt = 1650\ \text{A}/\mu\text{s} (T_{vj} = 175^\circ\text{C})$	$T_{vj} = 25^\circ\text{C}$		42.5		A
			$T_{vj} = 125^\circ\text{C}$		53		
			$T_{vj} = 175^\circ\text{C}$		60.5		
Recovered charge	Q_r	$V_{CC} = 600\ \text{V}, I_F = 50\ \text{A}, V_{GE} = -15\ \text{V}, -di_F/dt = 1650\ \text{A}/\mu\text{s} (T_{vj} = 175^\circ\text{C})$	$T_{vj} = 25^\circ\text{C}$		3.74		μC
			$T_{vj} = 125^\circ\text{C}$		8.19		
			$T_{vj} = 175^\circ\text{C}$		10.4		
Reverse recovery energy	E_{rec}	$V_{CC} = 600\ \text{V}, I_F = 50\ \text{A}, V_{GE} = -15\ \text{V}, -di_F/dt = 1650\ \text{A}/\mu\text{s} (T_{vj} = 175^\circ\text{C})$	$T_{vj} = 25^\circ\text{C}$		1.72		mJ
			$T_{vj} = 125^\circ\text{C}$		3.06		
			$T_{vj} = 175^\circ\text{C}$		3.73		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, $\lambda_{grease} = 4.3\ \text{W}/(\text{m}\cdot\text{K})$		1.02		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		175	°C

Note: $T_{vj\ op} > 150^{\circ}\text{C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

4 NTC-Thermistor

Table 7 **Characteristic values**

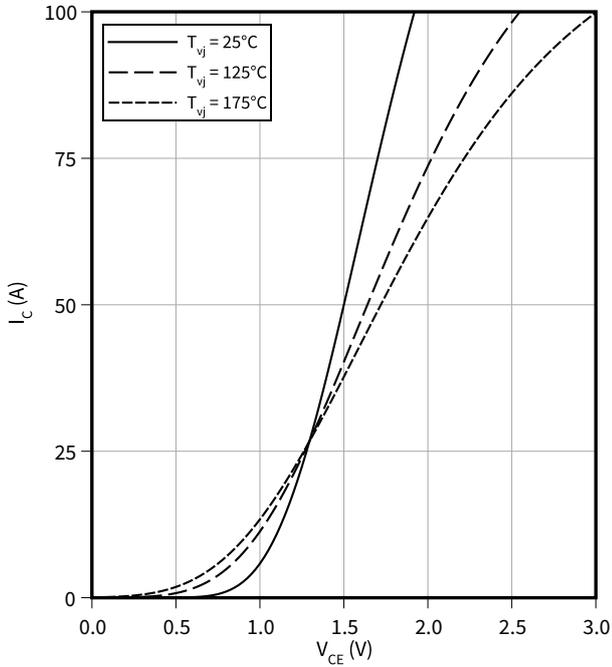
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25^{\circ}\text{C}$		5		kΩ
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493\ \Omega$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25^{\circ}\text{C}$			20	mW
B-value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

5 Characteristics diagrams

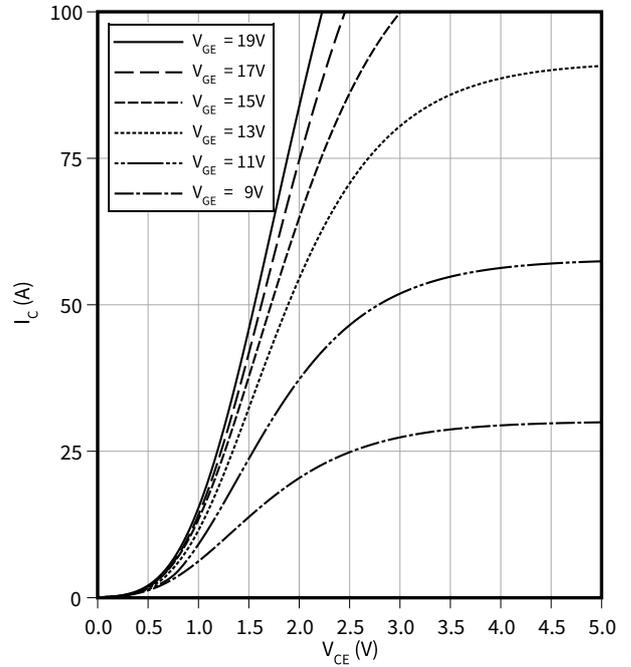
Output characteristic (typical), IGBT, Inverter

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



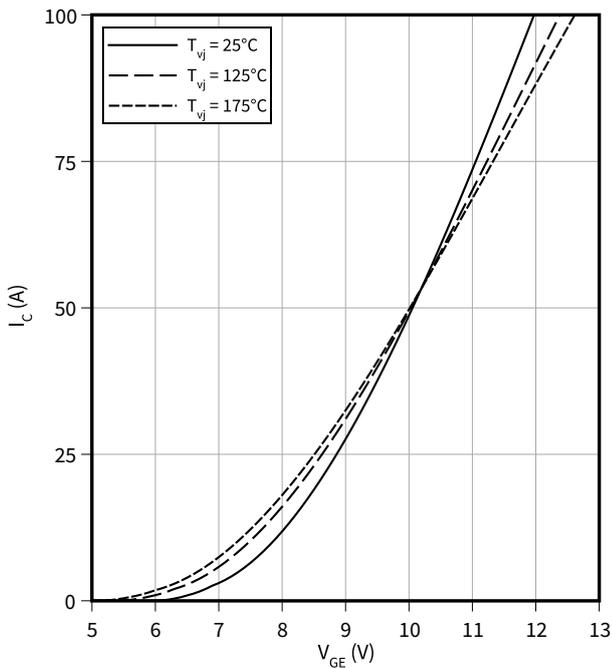
Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$
 $T_{vj} = 175\text{ °C}$



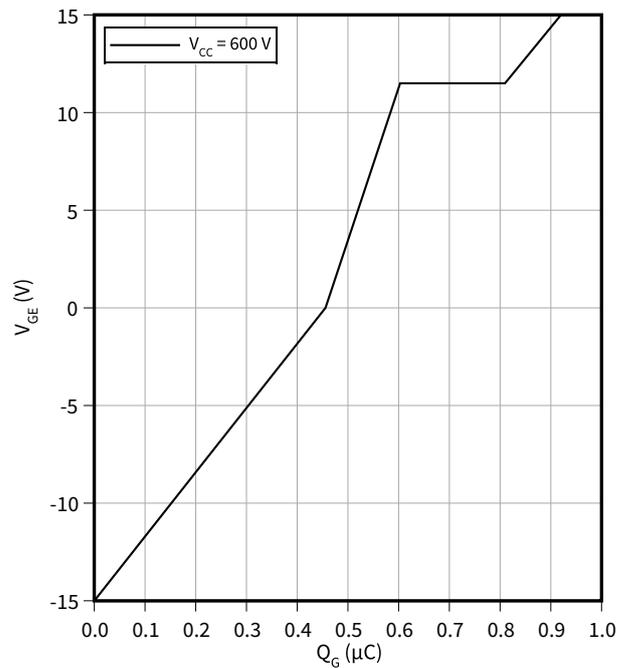
Transfer characteristic (typical), IGBT, Inverter

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



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$
 $I_C = 50\text{ A}, T_{vj} = 25\text{ °C}$

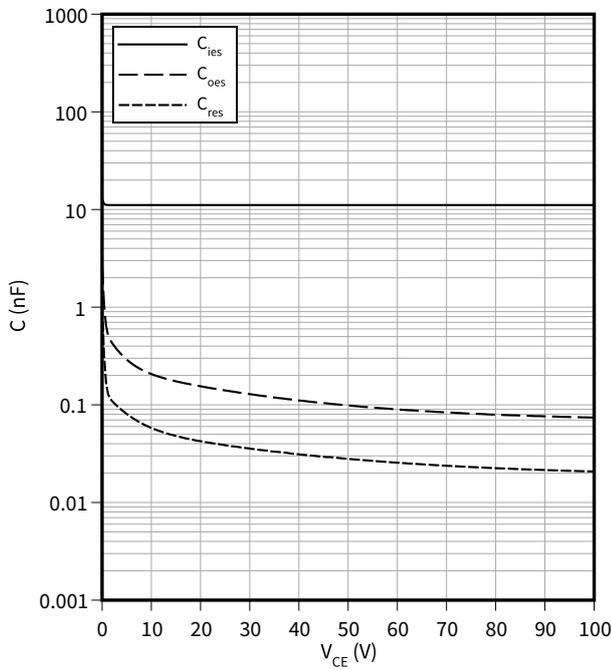


5 Characteristics diagrams

Capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

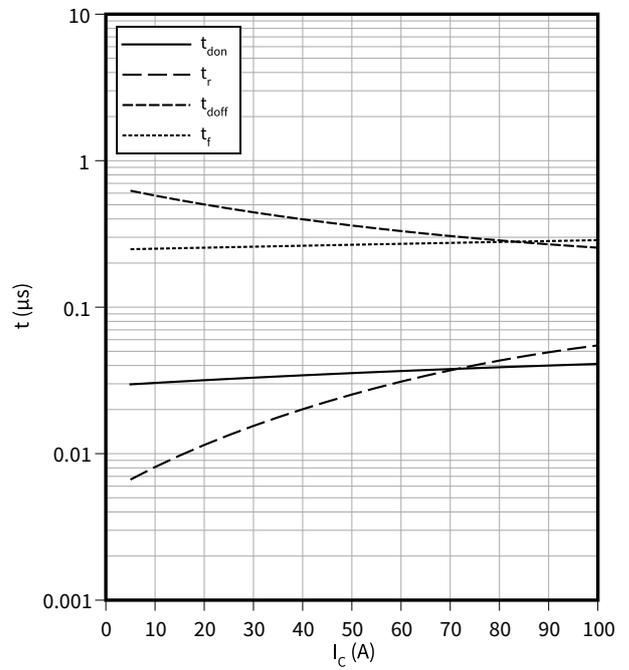
$T_{vj} = 25\text{ °C}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$



Switching times (typical), IGBT, Inverter

$t = f(I_C)$

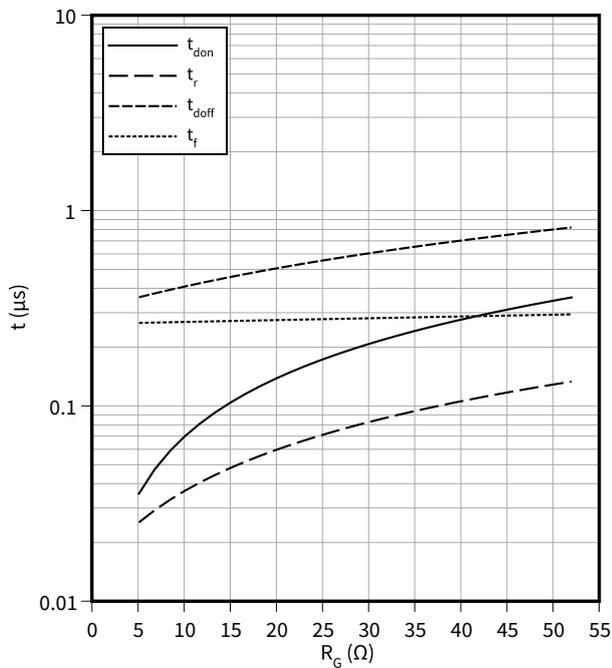
$R_{Goff} = 5.1\ \Omega, R_{Gon} = 5.1\ \Omega, V_{GE} = \pm 15\text{ V}, V_{CC} = 600\text{ V}, T_{vj} = 175\text{ °C}$



Switching times (typical), IGBT, Inverter

$t = f(R_G)$

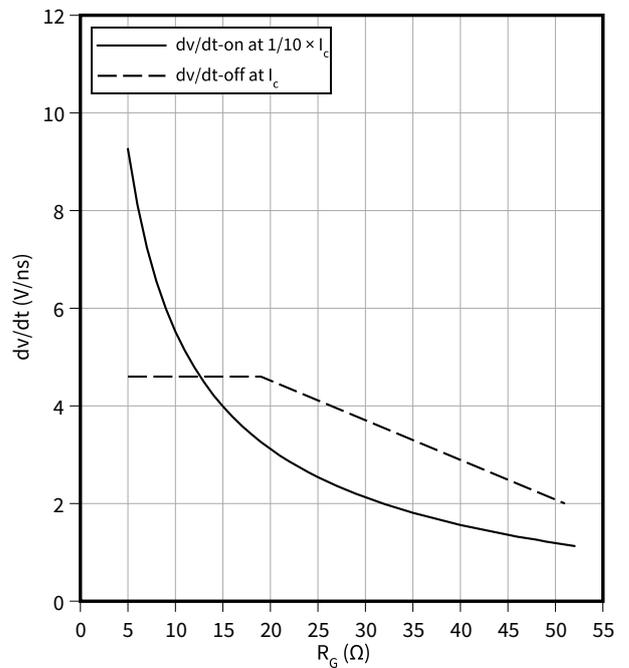
$V_{GE} = \pm 15\text{ V}, I_C = 50\text{ A}, V_{CC} = 600\text{ V}, T_{vj} = 175\text{ °C}$



Voltage slope (typical), IGBT, Inverter

$dv/dt = f(R_G)$

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

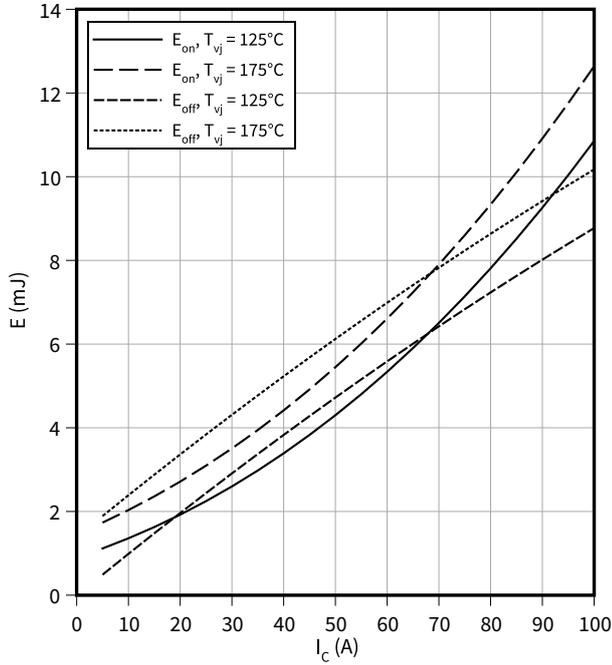


5 Characteristics diagrams

Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

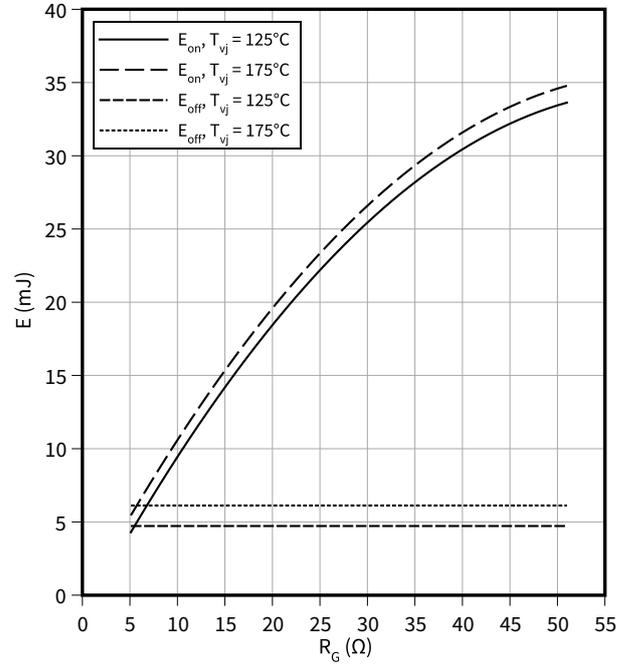
$R_{Goff} = 5.1 \Omega, R_{Gon} = 5.1 \Omega, V_{GE} = \pm 15 V, V_{CC} = 600 V$



Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

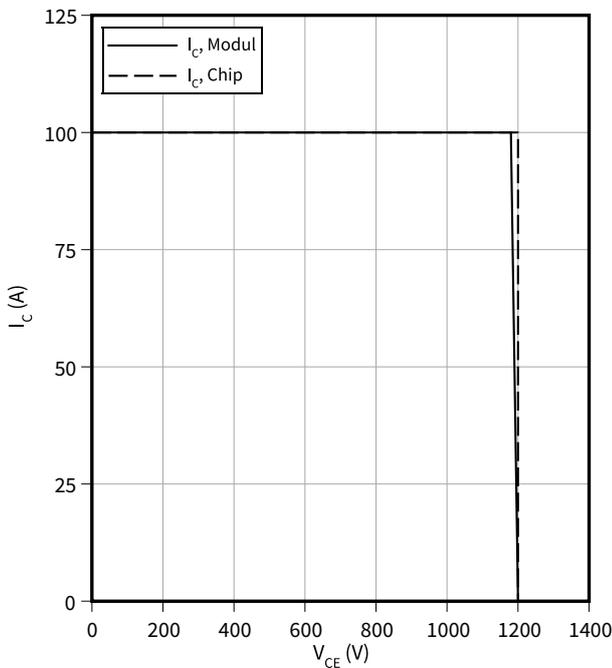
$I_C = 50 A, V_{CC} = 600 V, V_{GE} = \pm 15 V$



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

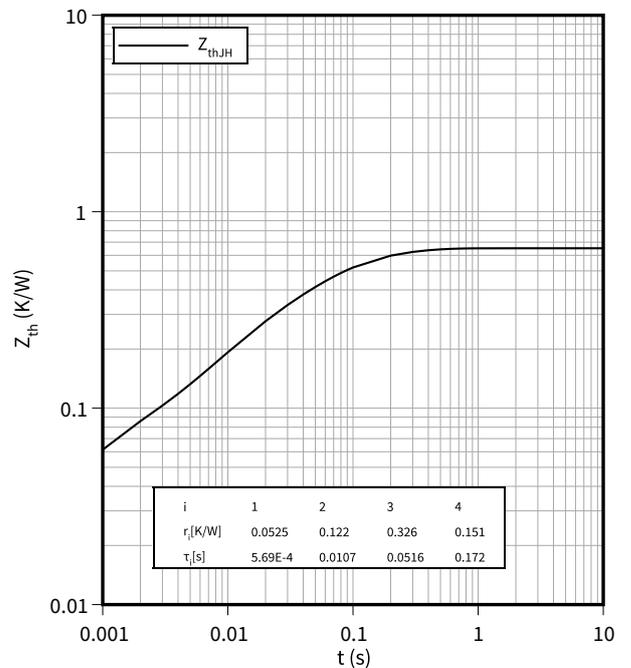
$I_C = f(V_{CE})$

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



Transient thermal impedance, IGBT, Inverter

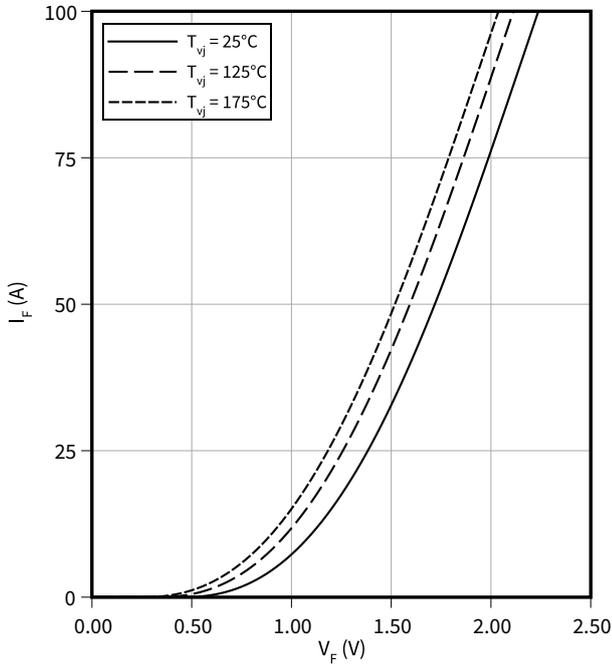
$Z_{th} = f(t)$



5 Characteristics diagrams

Forward characteristic (typical), Diode, Inverter

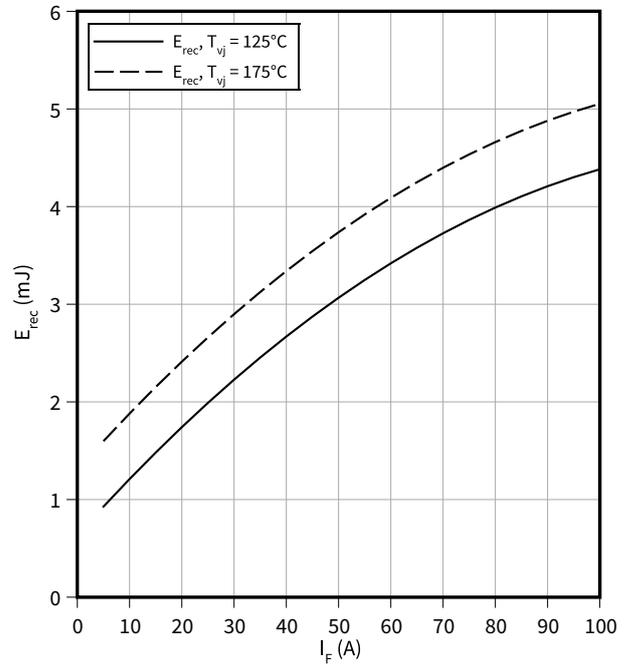
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

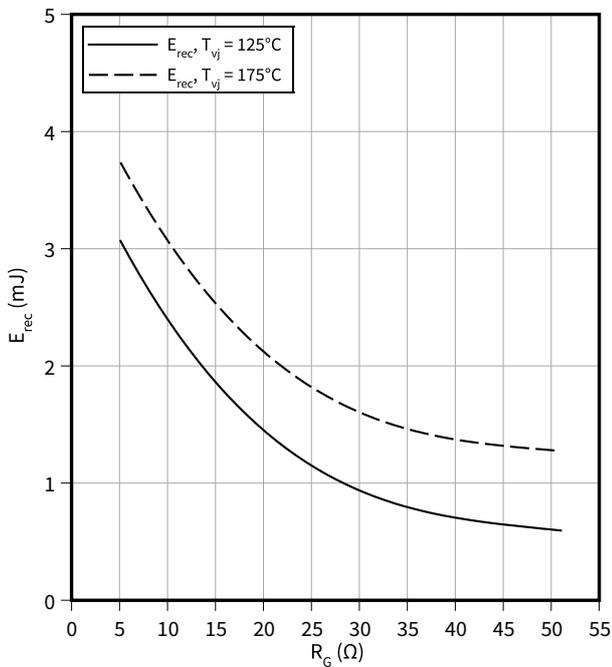
$R_{Gon} = 5.1 \Omega, V_{CC} = 600 \text{ V}$



Switching losses (typical), Diode, Inverter

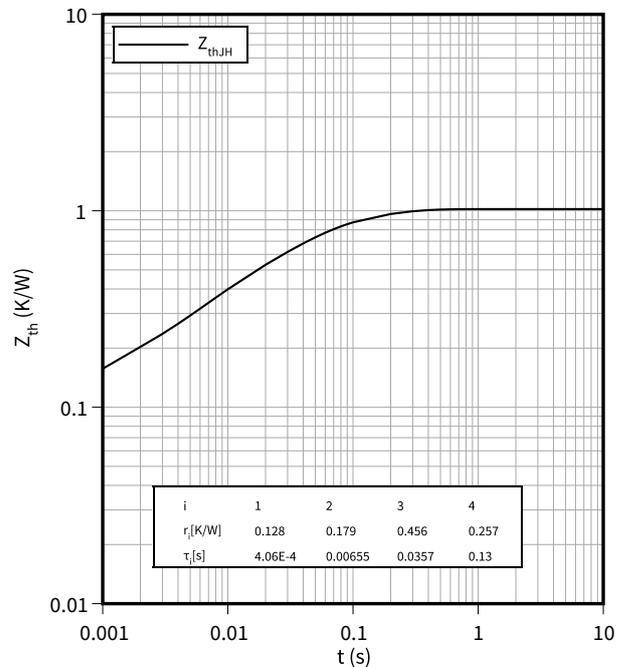
$E_{rec} = f(R_G)$

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



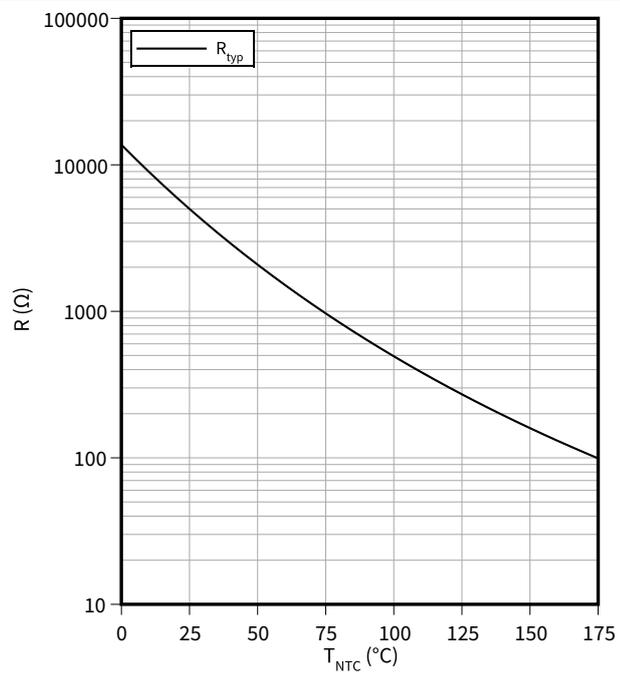
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

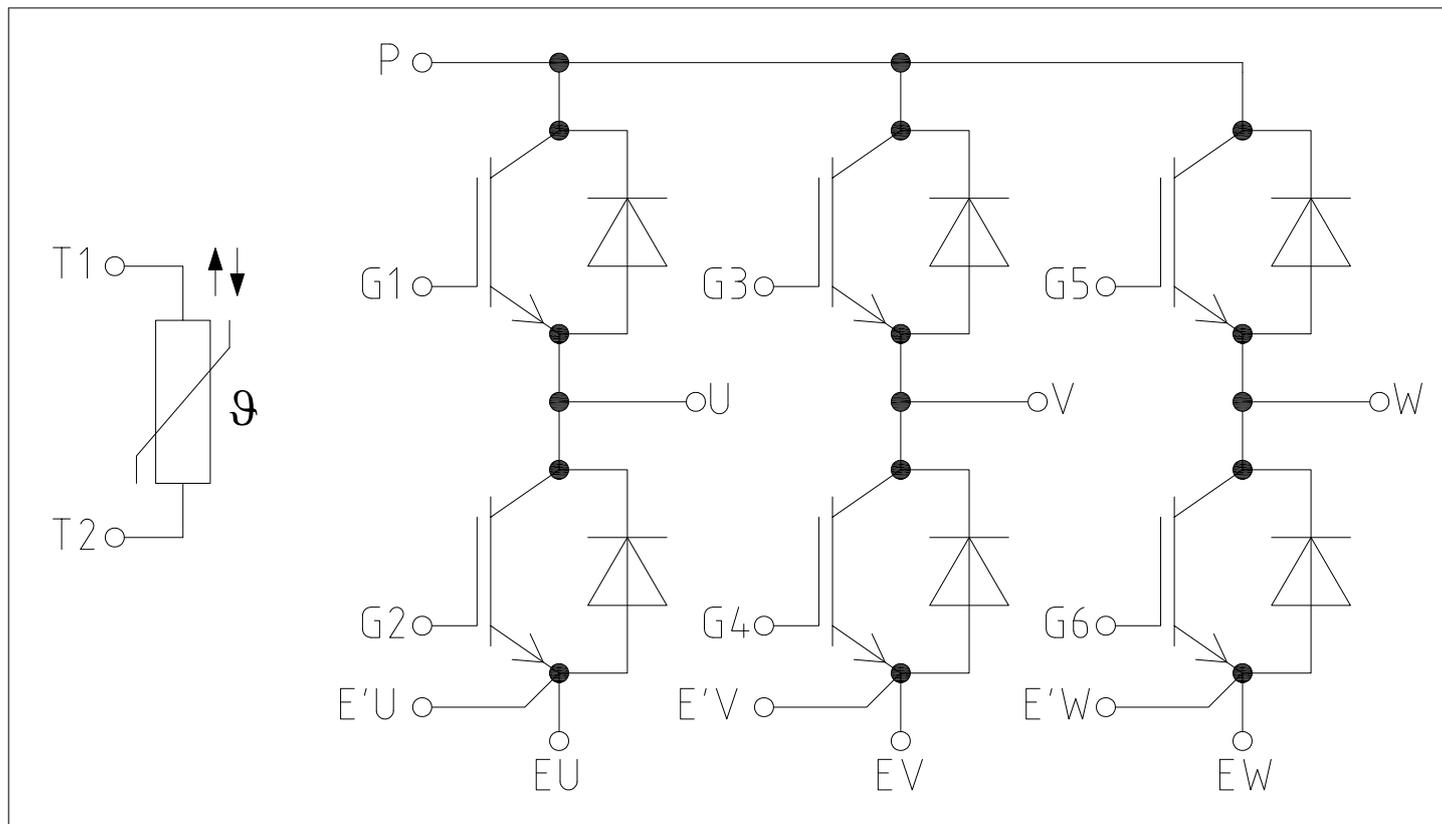


Figure 1

7 Package outlines

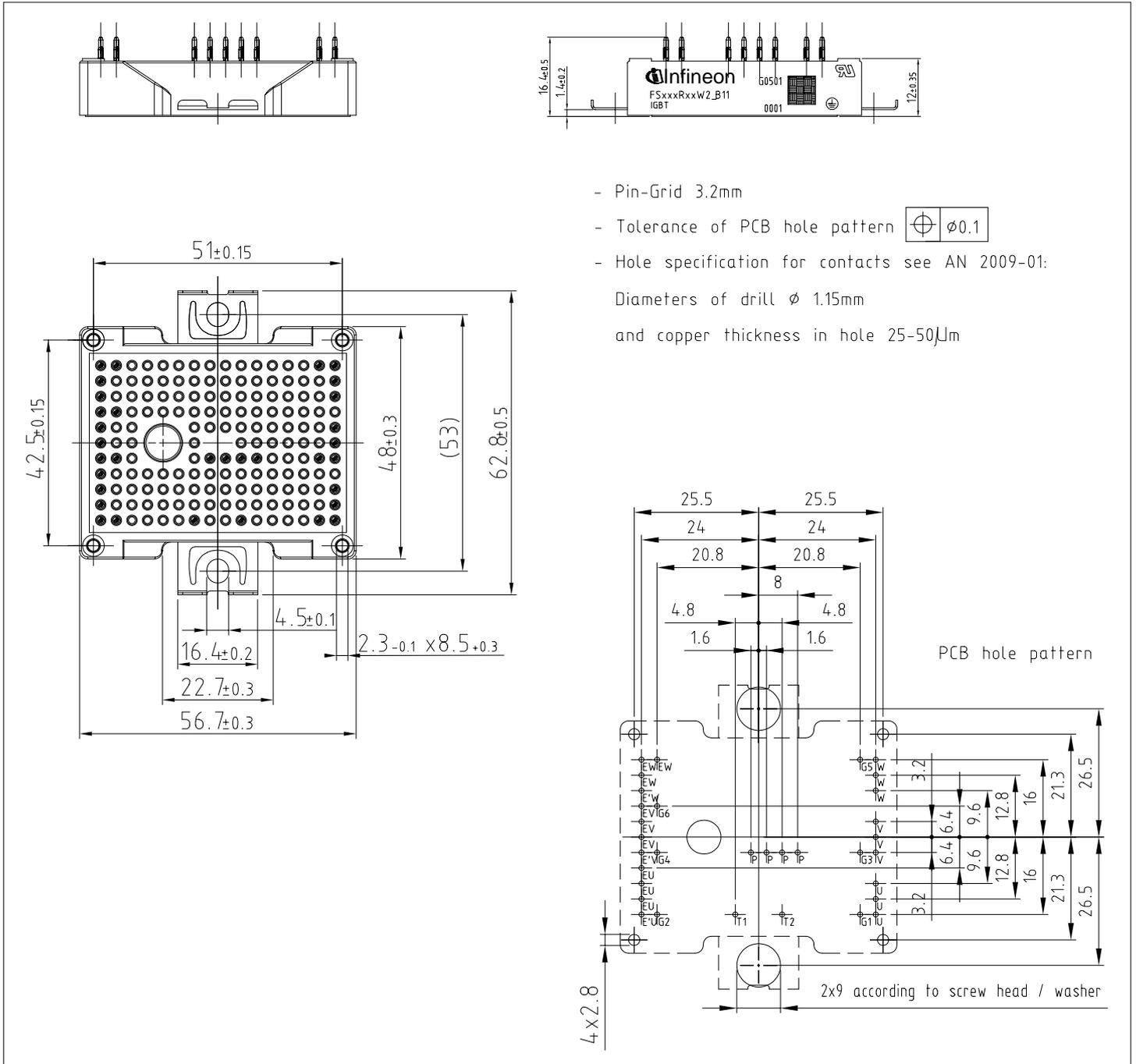


Figure 2

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	<i>Content</i> Module serial number Module material number Production order number Date code (production year) Date code (production week)	<i>Digit</i> 1 - 5 6 - 11 12 - 19 20 - 21 22 - 23	<i>Example</i> 71549 142846 55054991 15 30
Example	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  71549142846550549911530 </div> <div style="text-align: center;">  71549142846550549911530 </div> </div>		

Figure 3

Revision history

Document revision	Date of release	Description of changes
V1.0	2019-03-28	Target datasheet
V2.0	2019-12-13	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
1.00	2025-07-18	Final datasheet

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