

Final datasheet

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

Features

- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_{C\text{ nom}} = 50\text{ A} / I_{CRM} = 100\text{ A}$
 - TRENCHSTOP™ IGBT7
 - Low $V_{CE,sat}$
 - Overload operation up to 175°C
 - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- Mechanical features
 - PressFIT contact technology
 - High power density
 - 2.5 kV AC 1 minute insulation
 - Al_2O_3 substrate with low thermal resistance
 - Compact design



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

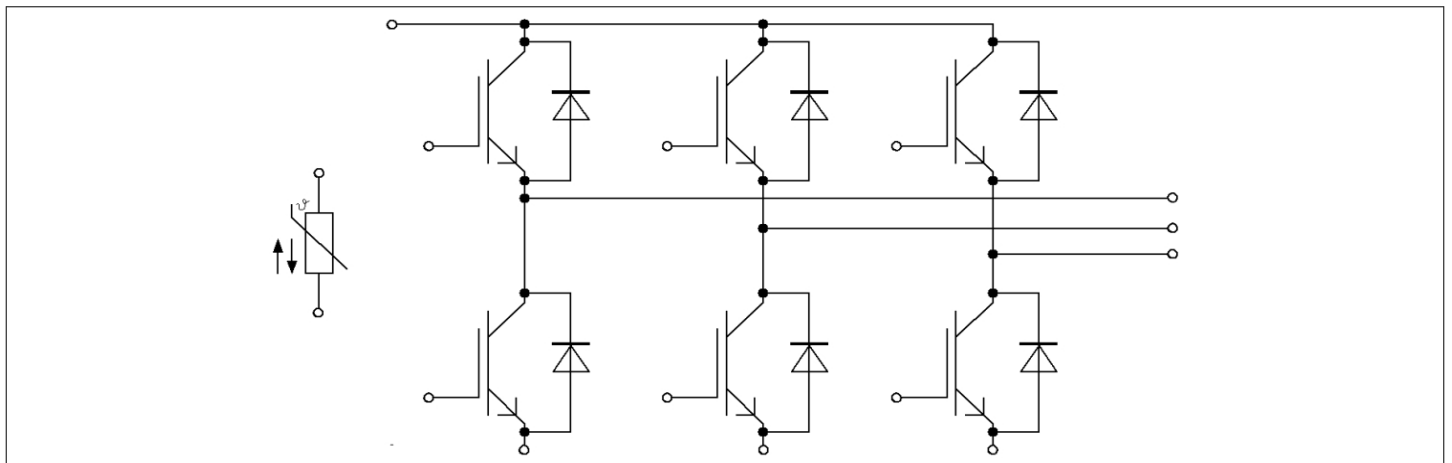


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	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}			30		nH
Storage temperature	T_{stg}		-40		125	°C
Mounting force per clamp	F		40		80	N
Weight	G			24		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}		$T_{vj} = 25 \text{ °C}$	1200	V
Continuous DC collector current	I_{CDC}	$T_{vj \text{ max}} = 175 \text{ °C}$	$T_H = 95 \text{ °C}$	50	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj \text{ op}}$		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	$V_{CE \text{ sat}}$	$I_C = 50 \text{ A}$, $V_{GE} = 15 \text{ V}$	$T_{vj} = 25 \text{ °C}$		1.50	1.80	V
			$T_{vj} = 125 \text{ °C}$		1.64		
			$T_{vj} = 175 \text{ °C}$		1.72		
Gate threshold voltage	V_{GEth}	$I_C = 1.28 \text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25 \text{ °C}$		5.15	5.8	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 600 \text{ V}$, $T_{vj} = 25 \text{ °C}$			0.92		μC

(table continues...)

Table 4 (continued) **Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Internal gate resistor	R_{Gint}	$T_{vj} = 25\text{ °C}$		0.0		Ω
Input capacitance	C_{ies}	$f = 100\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$		11.1		nF
Reverse transfer capacitance	C_{res}	$f = 100\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$		0.039		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\text{ V}$, $V_{GE} = 0\text{ V}$ $T_{vj} = 25\text{ °C}$			0.0079	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = 20\text{ V}$, $T_{vj} = 25\text{ °C}$			100	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.045		μs
			$T_{vj} = 125\text{ °C}$	0.047		
			$T_{vj} = 175\text{ °C}$	0.048		
Rise time (inductive load)	t_r	$I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.041		μs
			$T_{vj} = 125\text{ °C}$	0.044		
			$T_{vj} = 175\text{ °C}$	0.048		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 4.3\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.270		μs
			$T_{vj} = 125\text{ °C}$	0.330		
			$T_{vj} = 175\text{ °C}$	0.350		
Fall time (inductive load)	t_f	$I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 4.3\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.110		μs
			$T_{vj} = 125\text{ °C}$	0.200		
			$T_{vj} = 175\text{ °C}$	0.260		
Turn-on energy loss per pulse	E_{on}	$I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\text{ }\Omega$, $di/dt = 850\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	4.44		mJ
			$T_{vj} = 125\text{ °C}$	6.05		
			$T_{vj} = 175\text{ °C}$	7.11		
Turn-off energy loss per pulse	E_{off}	$I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 4.3\text{ }\Omega$, $dv/dt = 3000\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	3.35		mJ
			$T_{vj} = 125\text{ °C}$	5.2		
			$T_{vj} = 175\text{ °C}$	6.45		
SC data	I_{SC}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 800\text{ V}$, $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_p \leq 8\text{ }\mu\text{s}$, $T_{vj} = 150\text{ °C}$	190		A
			$t_p \leq 7\text{ }\mu\text{s}$, $T_{vj} = 175\text{ °C}$	180		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, $\lambda_{grease} = 4.3\text{ W}/(\text{m}\cdot\text{K})$		0.742		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		175	$^{\circ}\text{C}$

Note: $T_{vj\text{ op}} > 150^{\circ}\text{C}$ 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}	$V_{CC} = 600\text{ V}, I_F = 50\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 850\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$	29.4		A
			$T_{vj} = 125^{\circ}\text{C}$	38.6		
			$T_{vj} = 175^{\circ}\text{C}$	41.8		
Recovered charge	Q_r	$V_{CC} = 600\text{ V}, I_F = 50\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 850\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$	3.38		μC
			$T_{vj} = 125^{\circ}\text{C}$	6.53		
			$T_{vj} = 175^{\circ}\text{C}$	8.84		
Reverse recovery energy	E_{rec}	$V_{CC} = 600\text{ V}, I_F = 50\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 850\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$	1.36		mJ
			$T_{vj} = 125^{\circ}\text{C}$	2.59		
			$T_{vj} = 175^{\circ}\text{C}$	3.47		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, $\lambda_{grease} = 4.3\text{ W}/(\text{m}\cdot\text{K})$		1.23		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$			-40	175	$^{\circ}\text{C}$

Note: $T_{vj\text{ op}} > 150^{\circ}\text{C}$ 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}	$T_{NTC} = 25\text{ °C}$		5		kΩ
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100\text{ °C}, R_{100} = 493\text{ Ω}$	-5		5	%
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

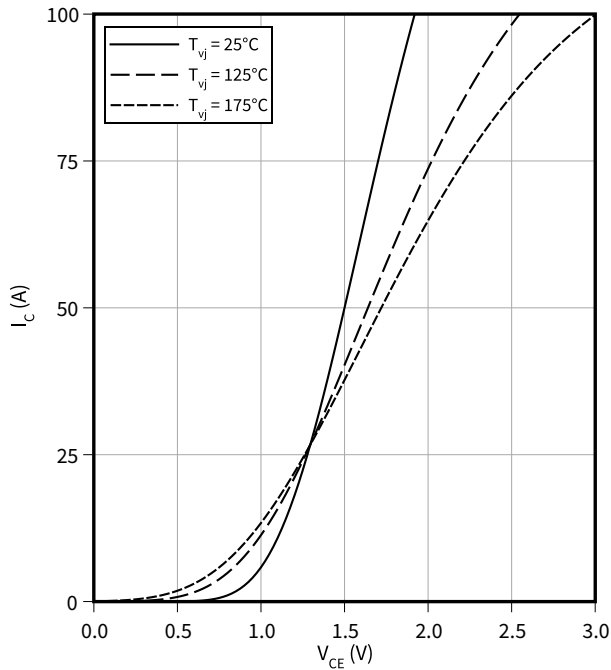
Note: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

5 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

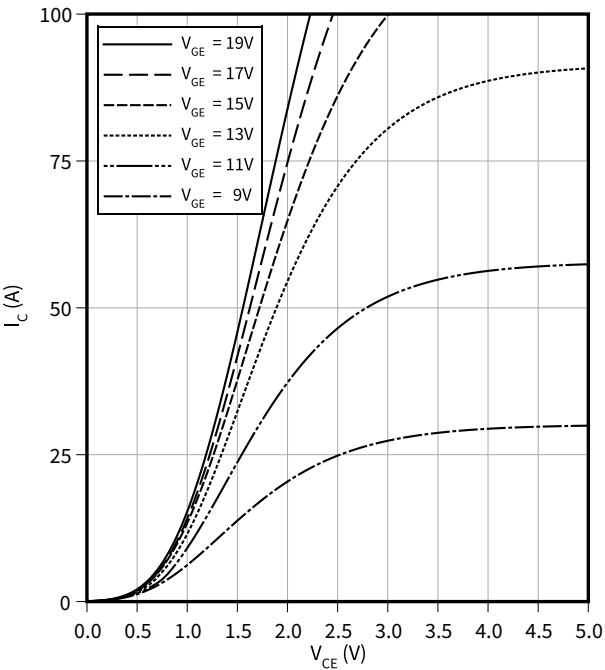
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

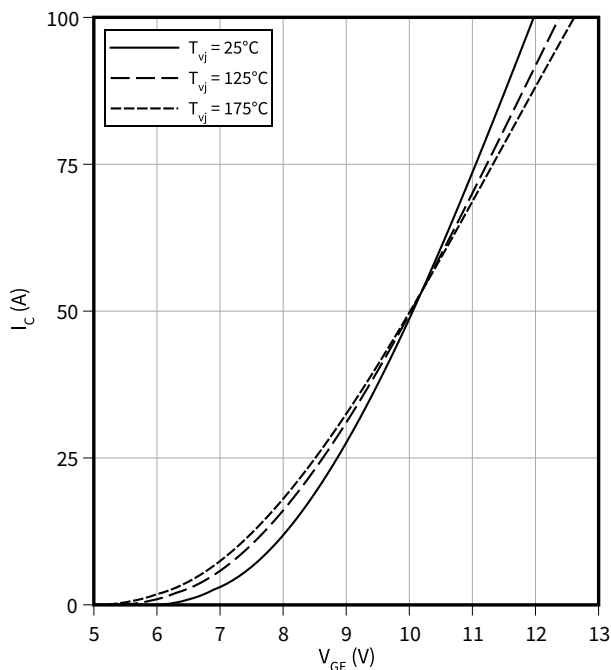
$T_{vj} = 175^\circ\text{C}$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

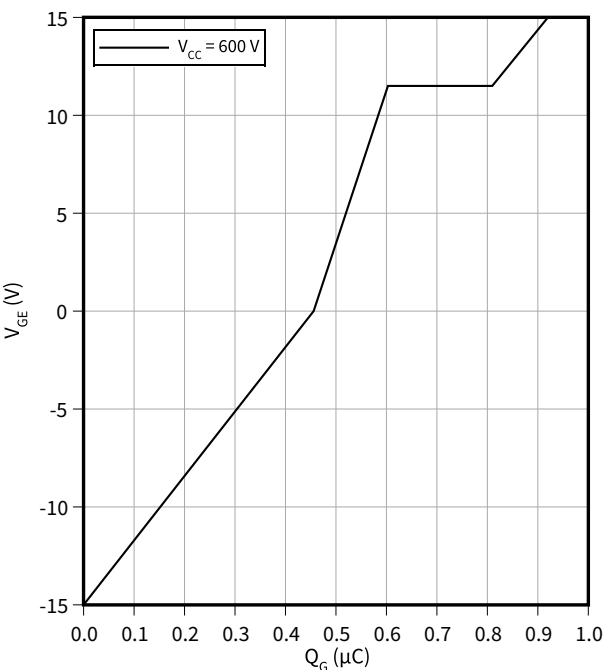
$V_{CE} = 20\text{ V}$



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

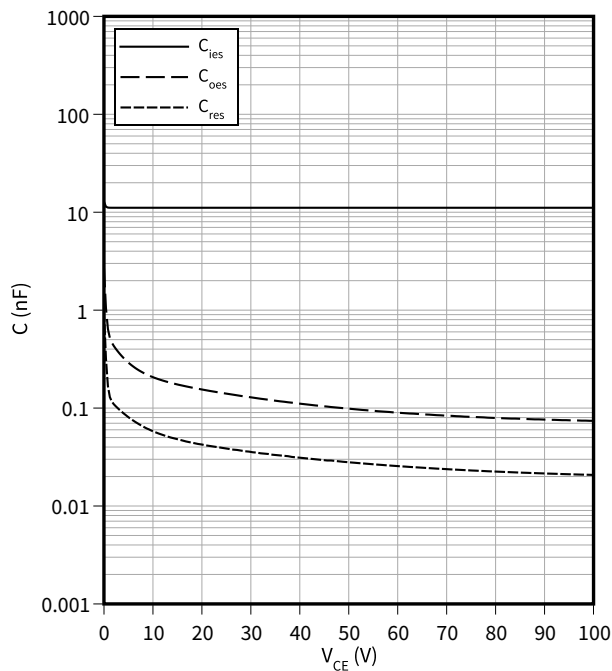
$I_C = 50\text{ A}, T_{vj} = 25^\circ\text{C}$



5 Characteristics diagrams

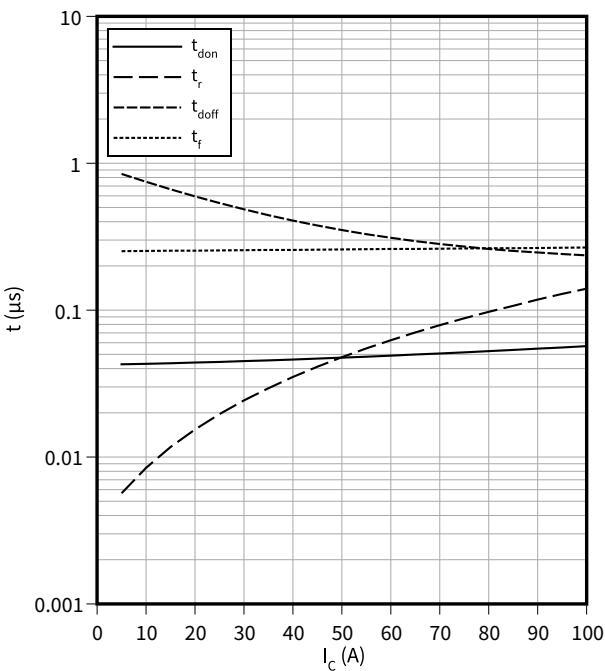
Capacity characteristic (typical), IGBT, Inverter

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



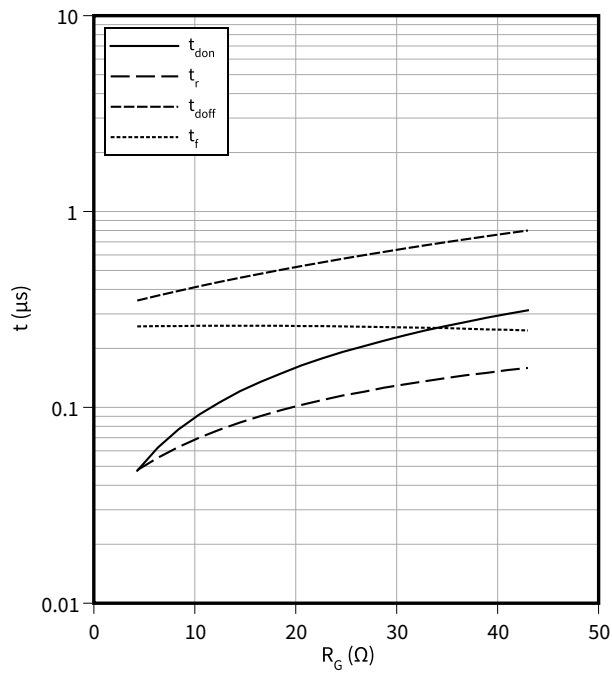
Switching times (typical), IGBT, Inverter

$t = f(I_C)$
 $R_{Goff} = 4.3\text{ }\Omega$, $R_{Gon} = 4.3\text{ }\Omega$, $V_{GE} = \pm 15\text{ V}$, $V_{CC} = 600\text{ V}$, $T_{vj} = 175\text{ }^{\circ}\text{C}$



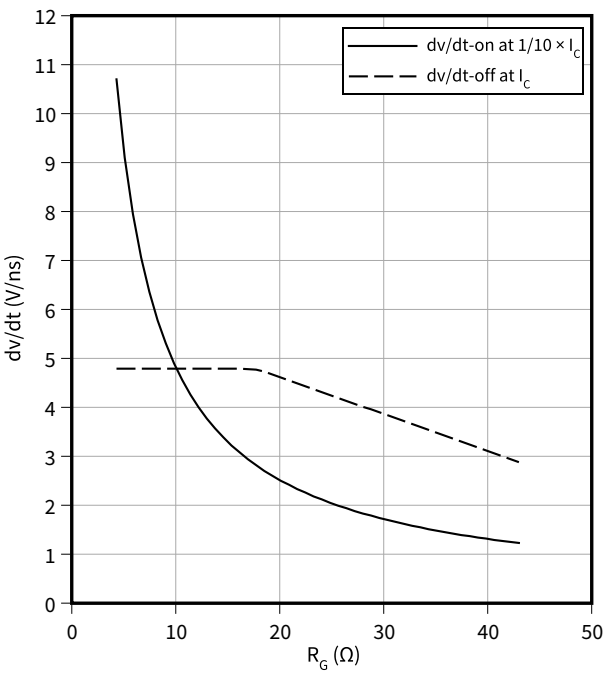
Switching times (typical), IGBT, Inverter

$t = f(R_G)$
 $I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $T_{vj} = 175\text{ }^{\circ}\text{C}$



Voltage slope (typical), IGBT, Inverter

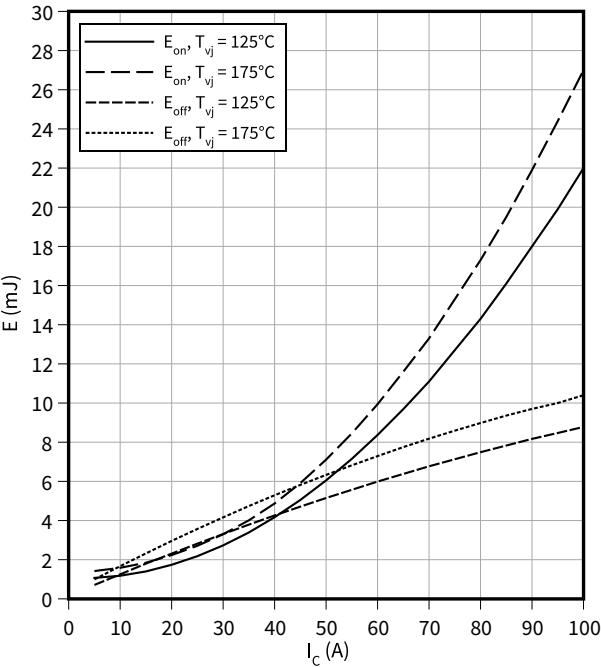
$dv/dt = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$, $T_{vj} = 25\text{ }^{\circ}\text{C}$



5 Characteristics diagrams

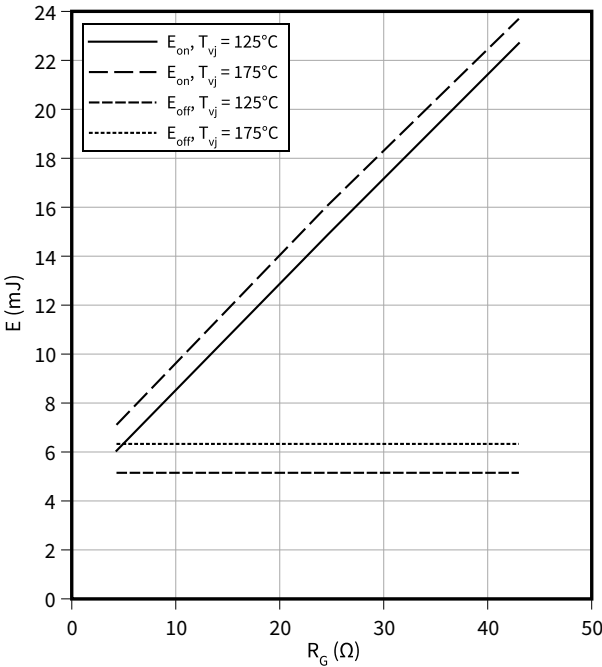
Switching losses (typical), IGBT, Inverter

$E = f(I_C)$
 $R_{Goff} = 4.3 \Omega$, $R_{Gon} = 4.3 \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 600 \text{ V}$



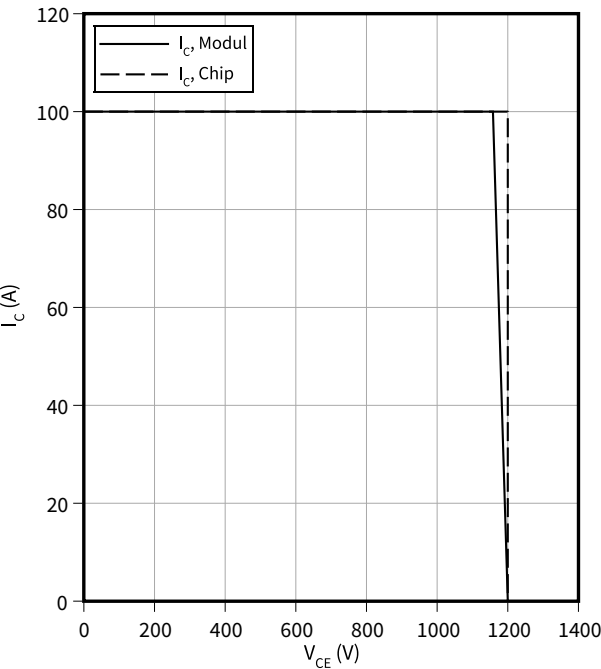
Switching losses (typical), IGBT, Inverter

$E = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 50 \text{ A}$, $V_{CC} = 600 \text{ V}$



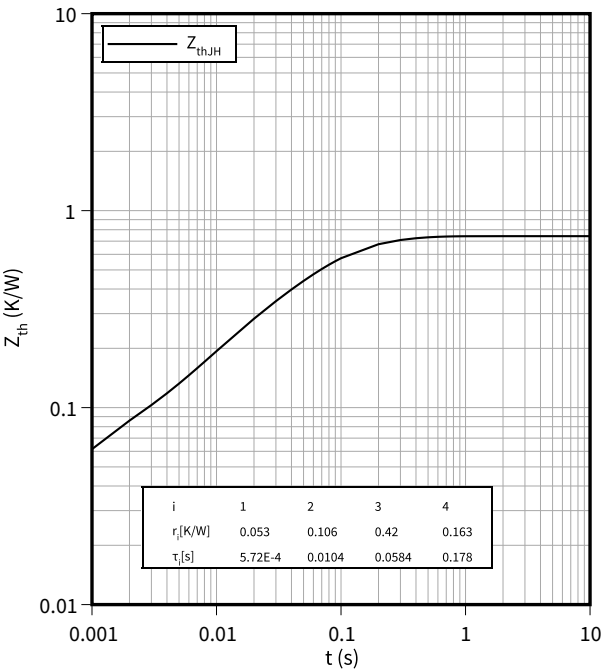
Reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$
 $R_{Goff} = 4.3 \Omega$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 175 \text{ °C}$



Transient thermal impedance, IGBT, Inverter

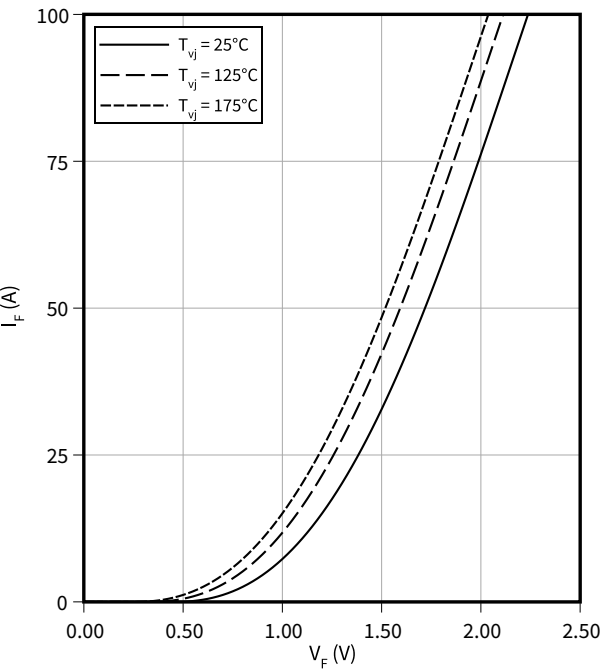
$Z_{th} = f(t)$



5 Characteristics diagrams

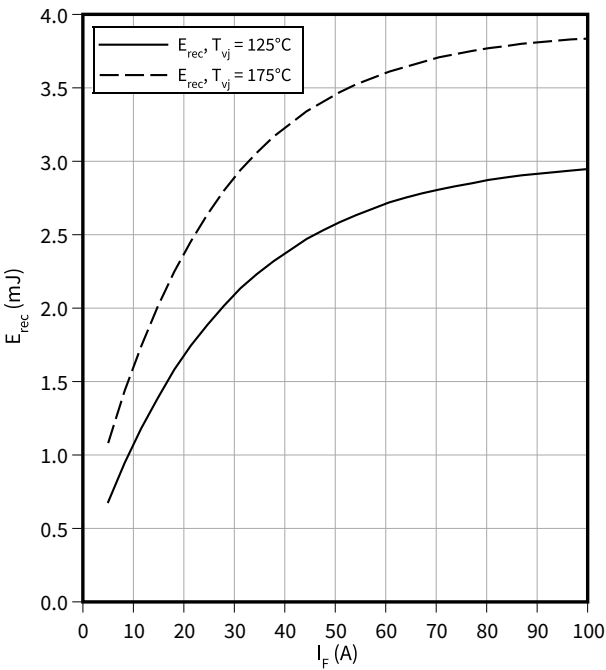
Forward characteristic (typical), Diode, Inverter

$I_F = f(V_F)$



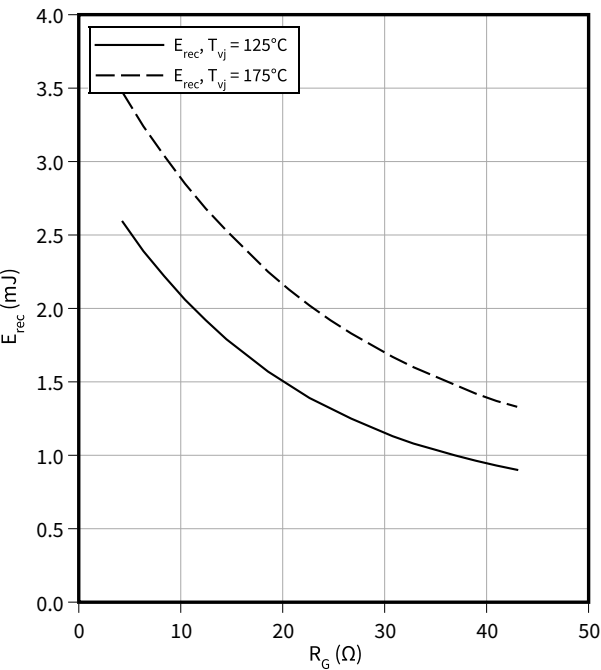
Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$
 $R_{Gon} = 4.3\ \Omega, V_{CC} = 600\ \text{V}$



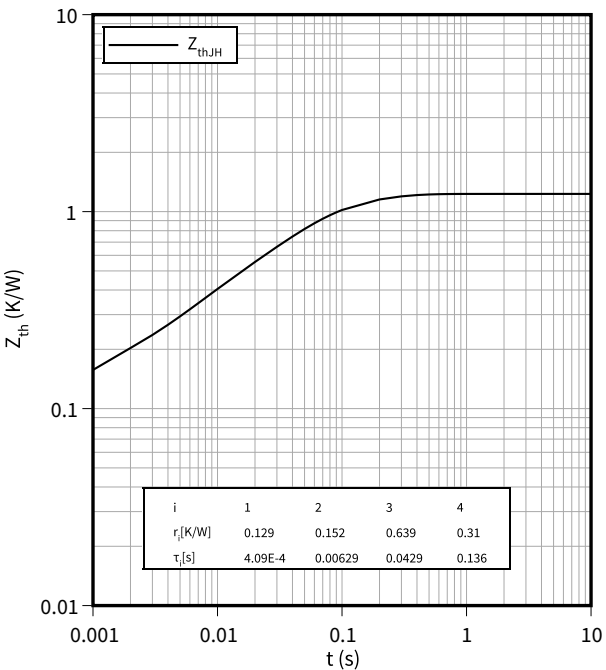
Switching losses (typical), Diode, Inverter

$E_{rec} = f(R_G)$
 $I_F = 50\ \text{A}, V_{CC} = 600\ \text{V}$



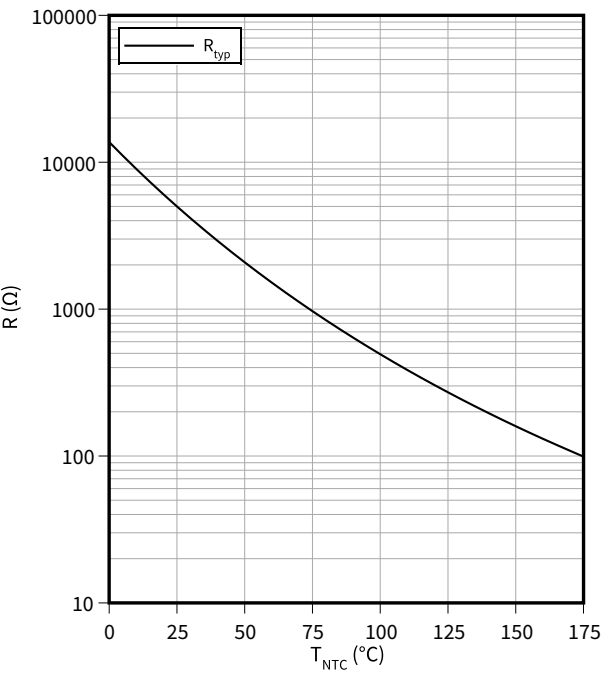
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

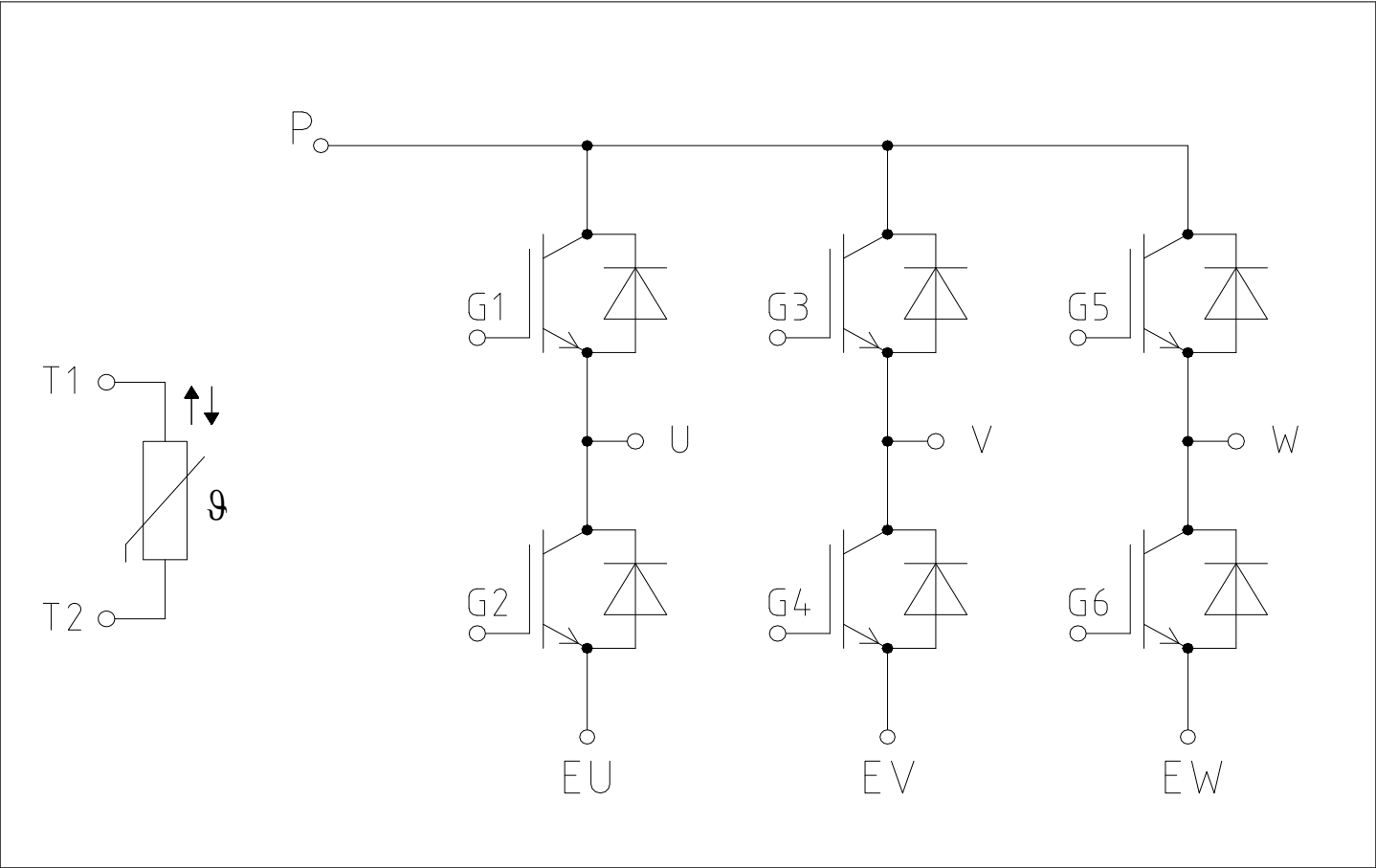


Figure 1

7 Package outlines

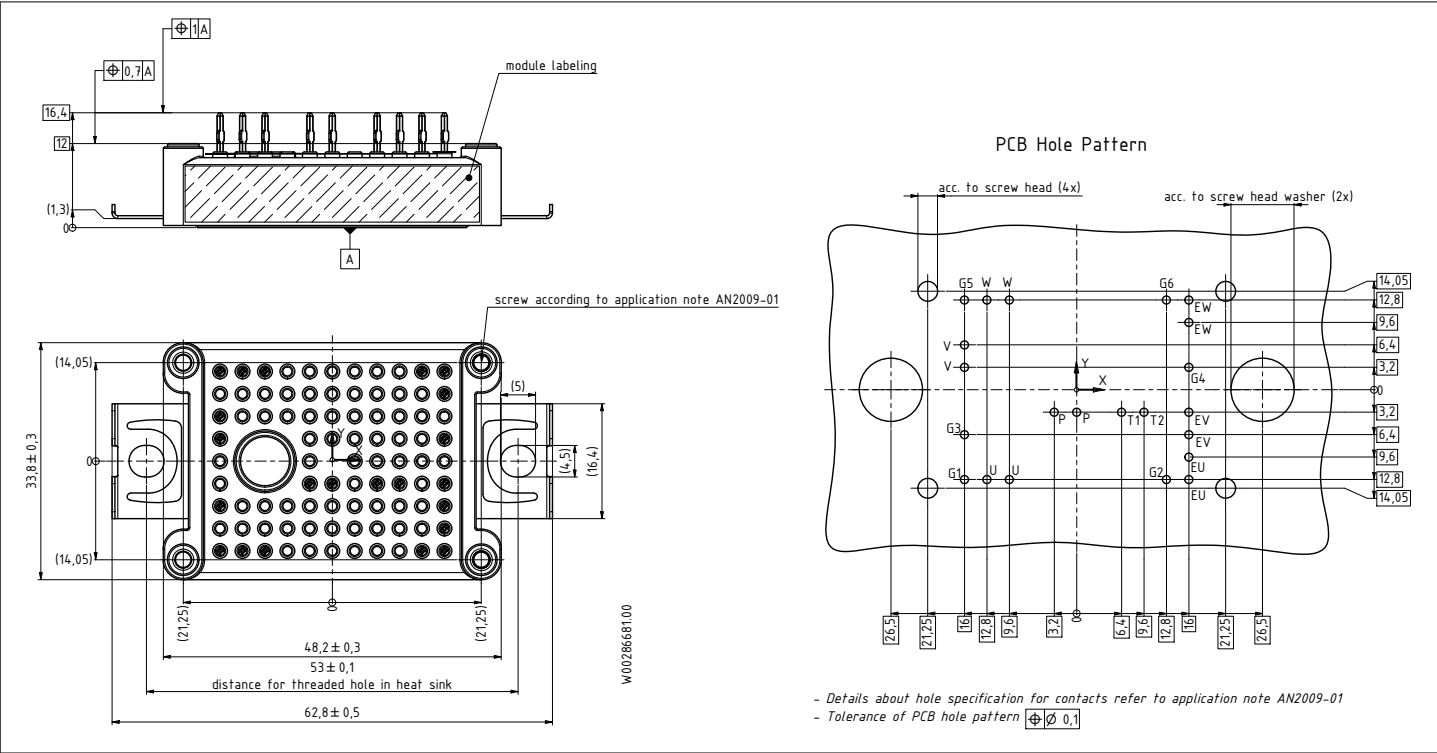


Figure 2

8 Module label code

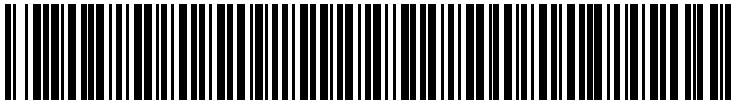
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	<i>Content</i>	<i>Digit</i>	<i>Example</i>
	Module serial number	1 – 5	71549
	Module material number	6 - 11	142846
	Production 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

Document revision	Date of release	Description of changes
V1.0	2018-10-25	Target datasheet
V2.0	2019-10-31	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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