

Final datasheet

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

Features

- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_{C\text{ nom}} = 25\text{ A} / I_{CRM} = 50\text{ A}$
 - Overload operation up to 175°C
 - Low $V_{CE,sat}$
 - TRENCHSTOP™ IGBT7
 - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- Mechanical features
 - Solder contact technology
 - 2.5 kV AC 1 minute insulation
 - Al_2O_3 substrate with low thermal resistance
 - Compact design
 - 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

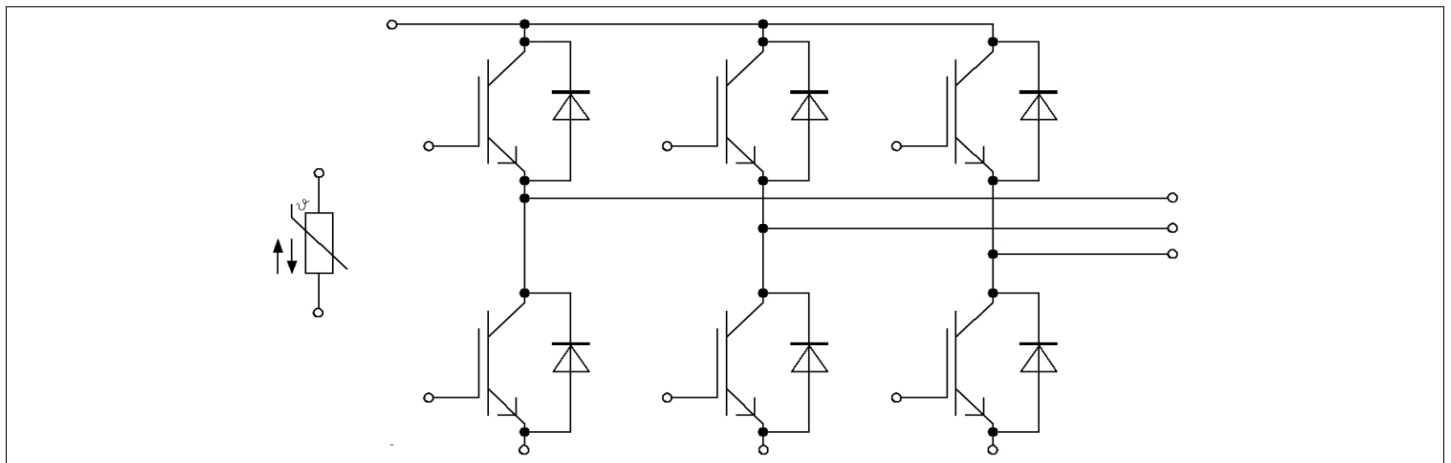


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	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 30 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}	$T_{vj \text{ max}} = 175 \text{ °C}$ $T_H = 115 \text{ °C}$	25	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj \text{ op}}$	50	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	$V_{CE \text{ sat}}$	$I_C = 25 \text{ A}$, $V_{GE} = 15 \text{ V}$	$T_{vj} = 25 \text{ °C}$	1.60	1.85	V
			$T_{vj} = 125 \text{ °C}$	1.74		
			$T_{vj} = 175 \text{ °C}$	1.82		
Gate threshold voltage	V_{GEth}	$I_C = 0.525 \text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25 \text{ °C}$	5.15	5.8	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 600 \text{ V}$, $T_{vj} = 25 \text{ °C}$		0.395		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}	$f = 100\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$		4.77		nF
Reverse transfer capacitance	C_{res}	$f = 100\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$		0.017		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\text{ V}$, $V_{GE} = 0\text{ V}$ $T_{vj} = 25\text{ °C}$			0.0056	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}	$I_C = 25\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 6.2\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.035		μs
			$T_{vj} = 125\text{ °C}$	0.036		
			$T_{vj} = 175\text{ °C}$	0.043		
Rise time (inductive load)	t_r	$I_C = 25\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 6.2\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.021		μs
			$T_{vj} = 125\text{ °C}$	0.026		
			$T_{vj} = 175\text{ °C}$	0.031		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 25\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 6.2\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.190		μs
			$T_{vj} = 125\text{ °C}$	0.260		
			$T_{vj} = 175\text{ °C}$	0.380		
Fall time (inductive load)	t_f	$I_C = 25\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 6.2\text{ }\Omega$	$T_{vj} = 25\text{ °C}$	0.190		μs
			$T_{vj} = 125\text{ °C}$	0.270		
			$T_{vj} = 175\text{ °C}$	0.290		
Turn-on energy loss per pulse	E_{on}	$I_C = 25\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 6.2\text{ }\Omega$, $di/dt = 650\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	1.78		mJ
			$T_{vj} = 125\text{ °C}$	2.57		
			$T_{vj} = 175\text{ °C}$	3.18		
Turn-off energy loss per pulse	E_{off}	$I_C = 25\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 6.2\text{ }\Omega$, $dv/dt = 3000\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ °C}$)	$T_{vj} = 25\text{ °C}$	1.68		mJ
			$T_{vj} = 125\text{ °C}$	2.67		
			$T_{vj} = 175\text{ °C}$	3.2		
SC data	I_{SC}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 800\text{ V}$, $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_p \leq 8\text{ }\mu\text{s}$, $T_{vj} = 150\text{ °C}$	80		A
			$t_p \leq 7\text{ }\mu\text{s}$, $T_{vj} = 175\text{ °C}$	75		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, $\lambda_{grease} = 4.3\text{ W}/(\text{m}\cdot\text{K})$		1.10		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			35	A
Repetitive peak forward current	I_{FRM}	$t_P = 1\text{ ms}$		50	A
I^2t - value	I^2t	$t_P = 10\text{ ms}, V_R = 0\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	150	A^2s
			$T_{vj} = 175^{\circ}\text{C}$	140	

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 35\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	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}	$V_{CC} = 600\text{ V}, I_F = 35\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 750\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$	22.5		A
			$T_{vj} = 125^{\circ}\text{C}$	29.8		
			$T_{vj} = 175^{\circ}\text{C}$	33.8		
Recovered charge	Q_r	$V_{CC} = 600\text{ V}, I_F = 35\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 750\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$	2.84		μC
			$T_{vj} = 125^{\circ}\text{C}$	5.22		
			$T_{vj} = 175^{\circ}\text{C}$	6.84		
Reverse recovery energy	E_{rec}	$V_{CC} = 600\text{ V}, I_F = 35\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 750\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$	1.08		mJ
			$T_{vj} = 125^{\circ}\text{C}$	1.99		
			$T_{vj} = 175^{\circ}\text{C}$	2.6		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, $\lambda_{grease} = 4.3\text{ W}/(\text{m}\cdot\text{K})$		1.43		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

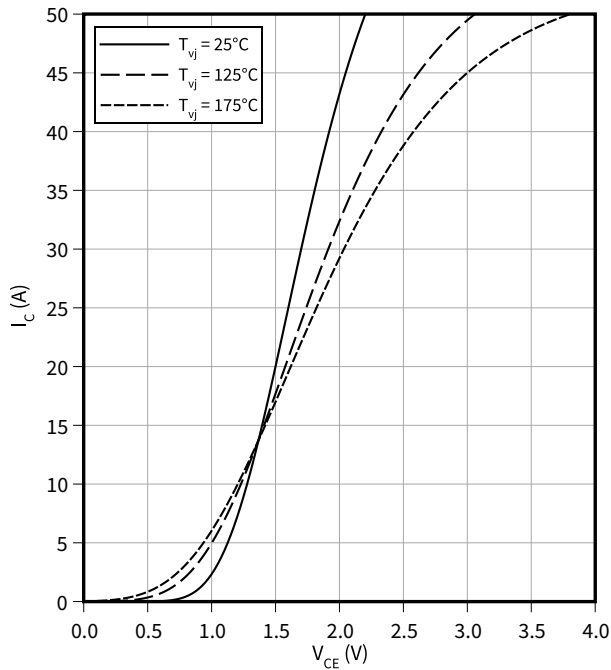
Note: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

5 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

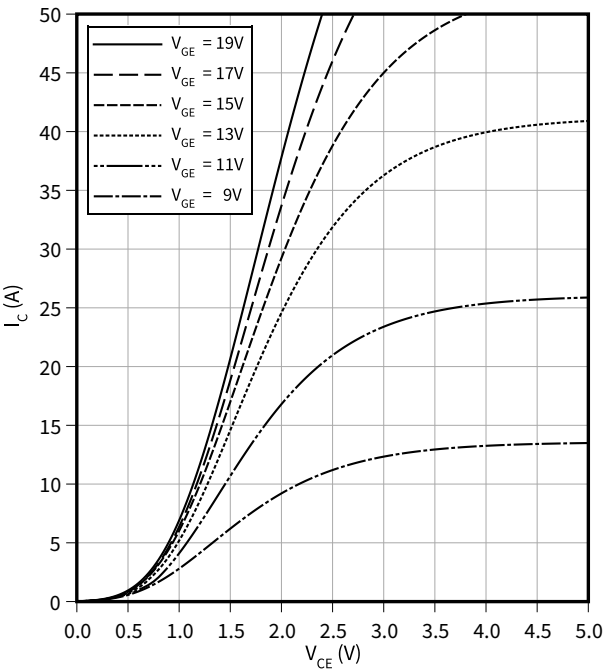
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

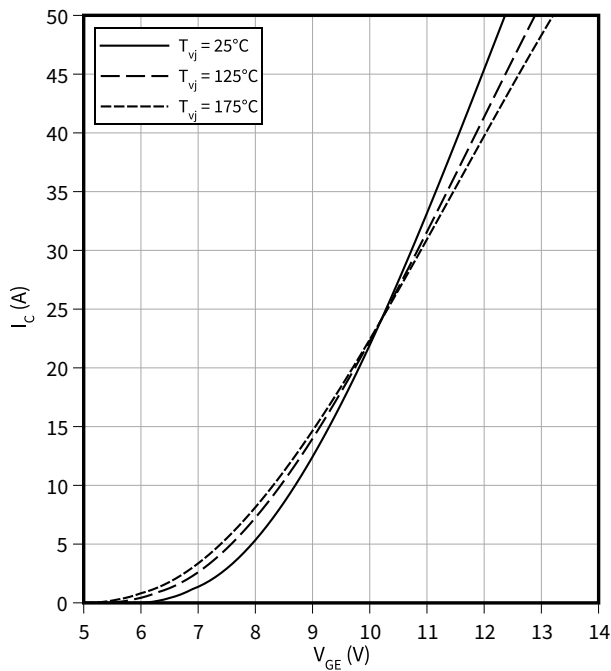
$T_{vj} = 175^\circ\text{C}$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

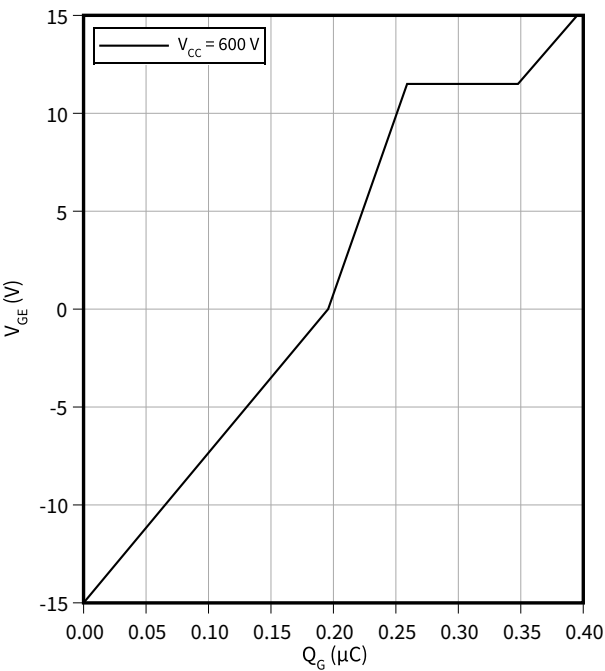
$V_{CE} = 20\text{ V}$



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

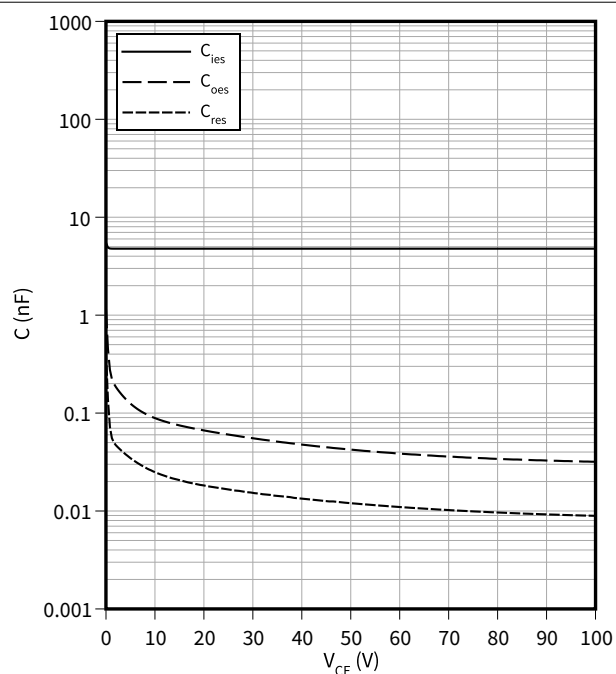
$I_C = 25\text{ A}, T_{vj} = 25^\circ\text{C}$



Capacity characteristic (typical), IGBT, Inverter

$$C = f(V_{CE})$$

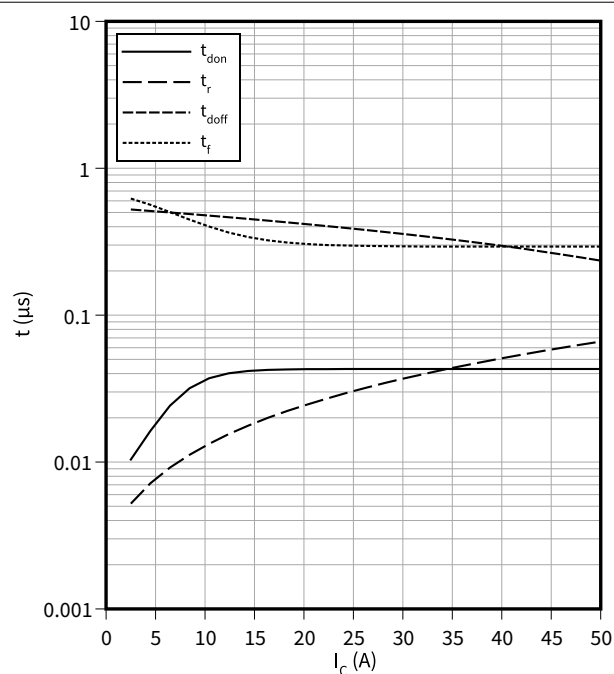
$f = 100 \text{ kHz}$, $T_{vj} = 25 \text{ }^{\circ}\text{C}$, $V_{GE} = 0 \text{ V}$



Switching times (typical), IGBT, Inverter

$$t = f(I_C)$$

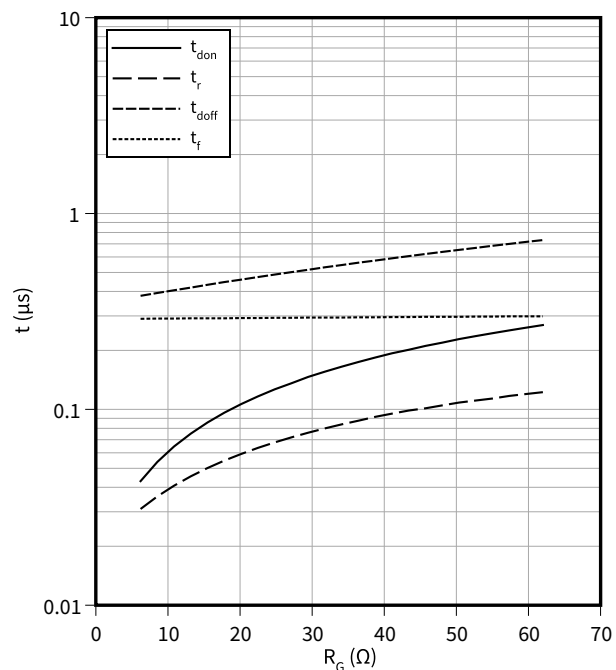
$R_{Goff} = 6.2 \text{ } \Omega$, $R_{Gon} = 6.2 \text{ } \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 600 \text{ V}$, $T_{vj} = 175 \text{ }^{\circ}\text{C}$



Switching times (typical), IGBT, Inverter

$$t = f(R_G)$$

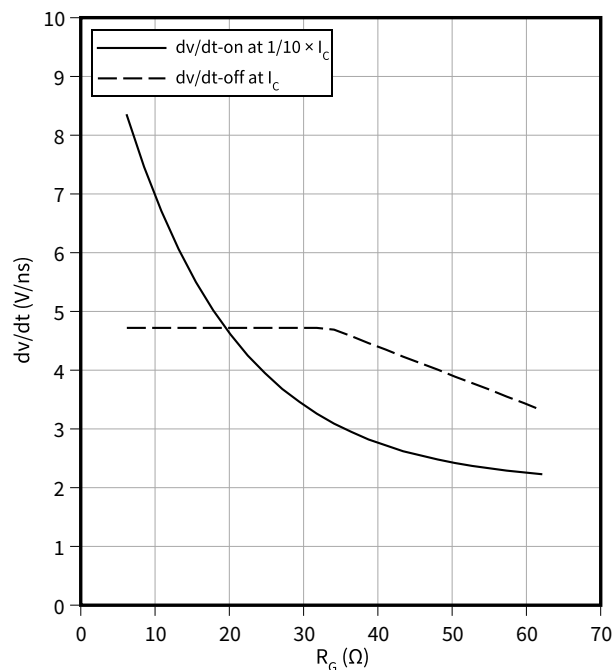
$V_{GE} = \pm 15 \text{ V}$, $I_C = 25 \text{ A}$, $V_{CC} = 600 \text{ V}$, $T_{vj} = 175 \text{ }^{\circ}\text{C}$



Voltage slope (typical), IGBT, Inverter

$$dv/dt = f(R_G)$$

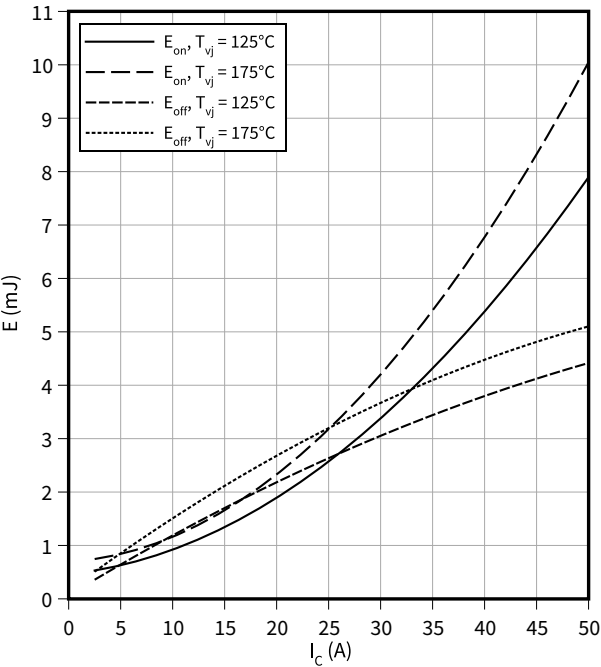
$I_C = 25 \text{ A}$, $V_{CC} = 600 \text{ V}$, $T_{vj} = 25 \text{ }^{\circ}\text{C}$, $V_{GE} = \pm 15 \text{ V}$



5 Characteristics diagrams

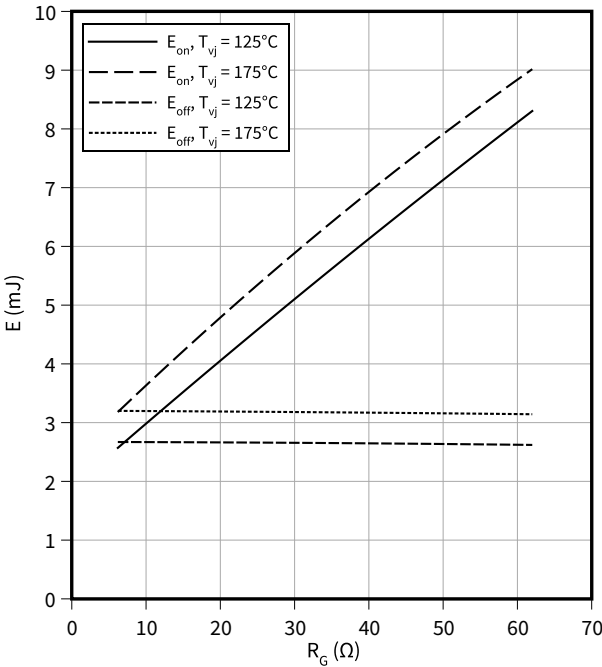
Switching losses (typical), IGBT, Inverter

$E = f(I_C)$
 $R_{Goff} = 6.2 \, \Omega$, $R_{Gon} = 6.2 \, \Omega$, $V_{GE} = \pm 15 \, V$, $V_{CC} = 600 \, V$



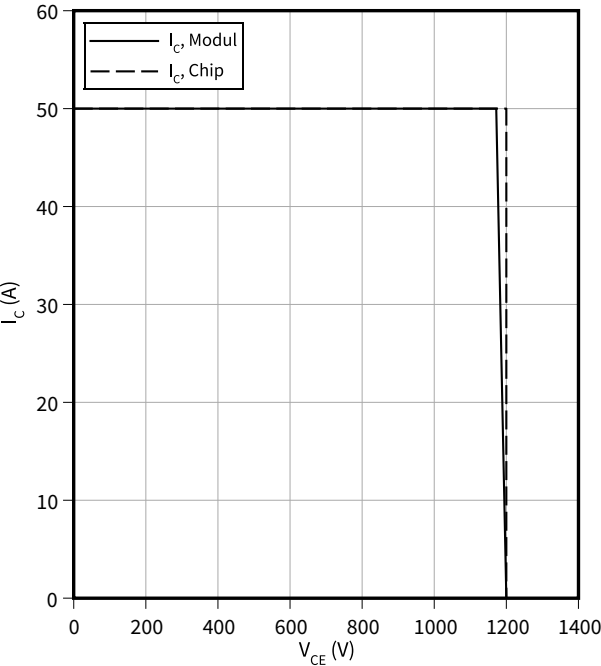
Switching losses (typical), IGBT, Inverter

$E = f(R_G)$
 $V_{GE} = \pm 15 \, V$, $I_C = 25 \, A$, $V_{CC} = 600 \, V$



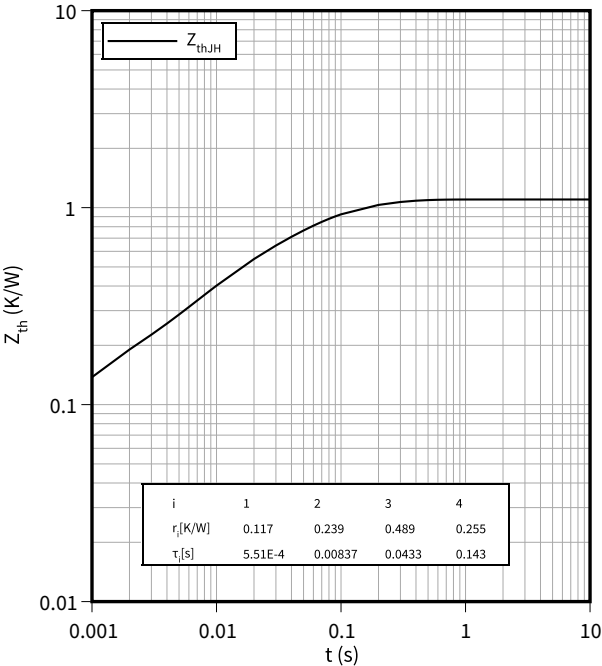
Reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$
 $R_{Goff} = 6.2 \, \Omega$, $V_{GE} = \pm 15 \, V$, $T_{vj} = 175 \, ^\circ C$



Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$

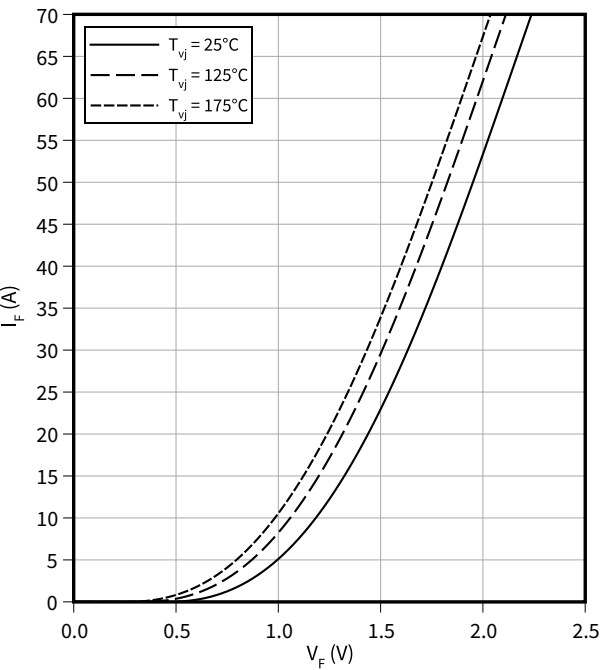


i	1	2	3	4
$r_f [K/W]$	0.117	0.239	0.489	0.255
$\tau_f [s]$	5.51E-4	0.00837	0.0433	0.143

5 Characteristics diagrams

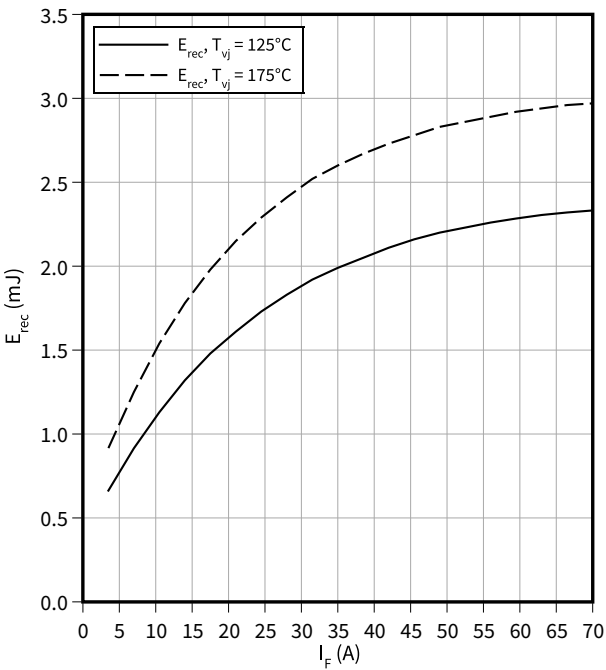
Forward characteristic (typical), Diode, Inverter

$I_F = f(V_F)$



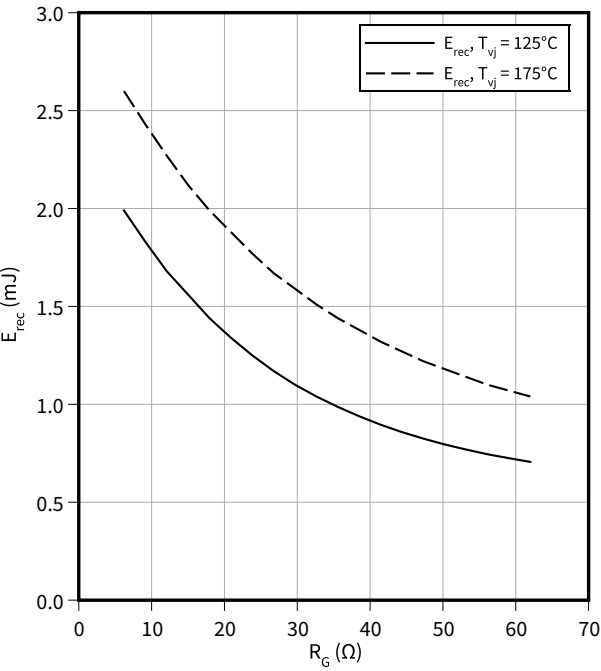
Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$
 $R_{Gon} = 6.2\ \Omega, V_{CC} = 600\ \text{V}$



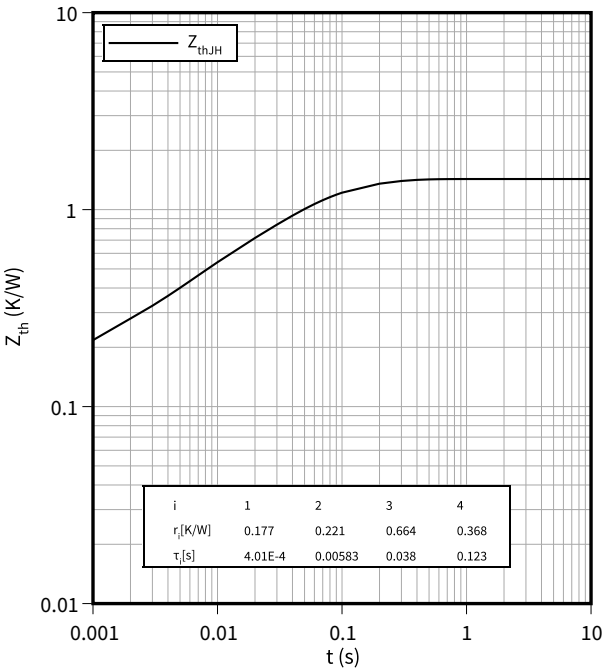
Switching losses (typical), Diode, Inverter

$E_{rec} = f(R_G)$
 $I_F = 35\ \text{A}, V_{CC} = 600\ \text{V}$



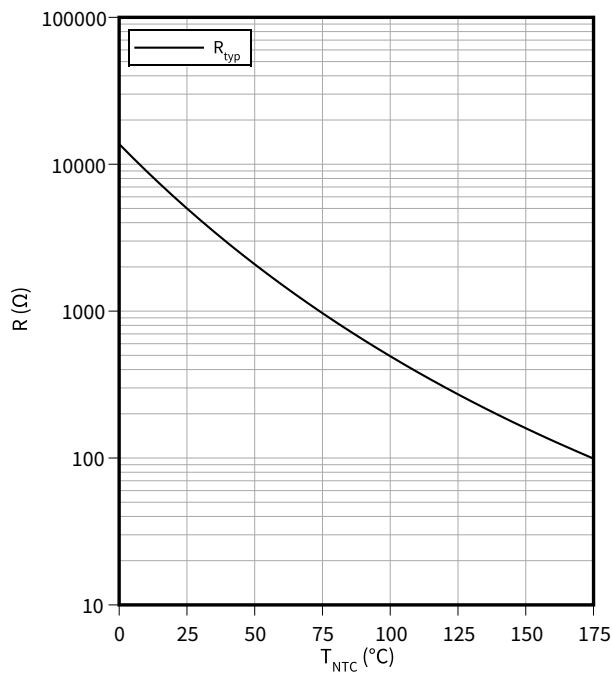
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

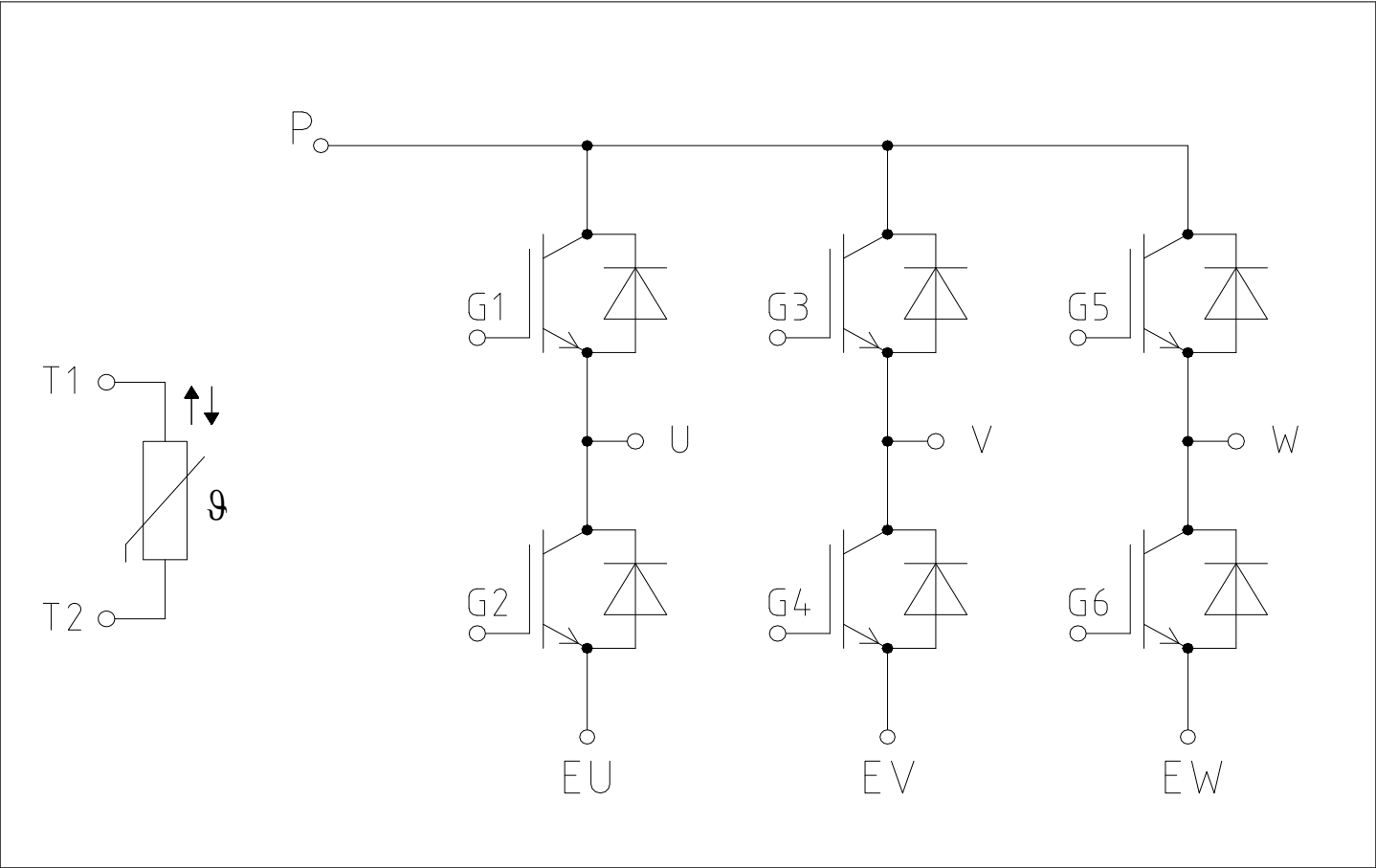


Figure 1

7 Package outlines

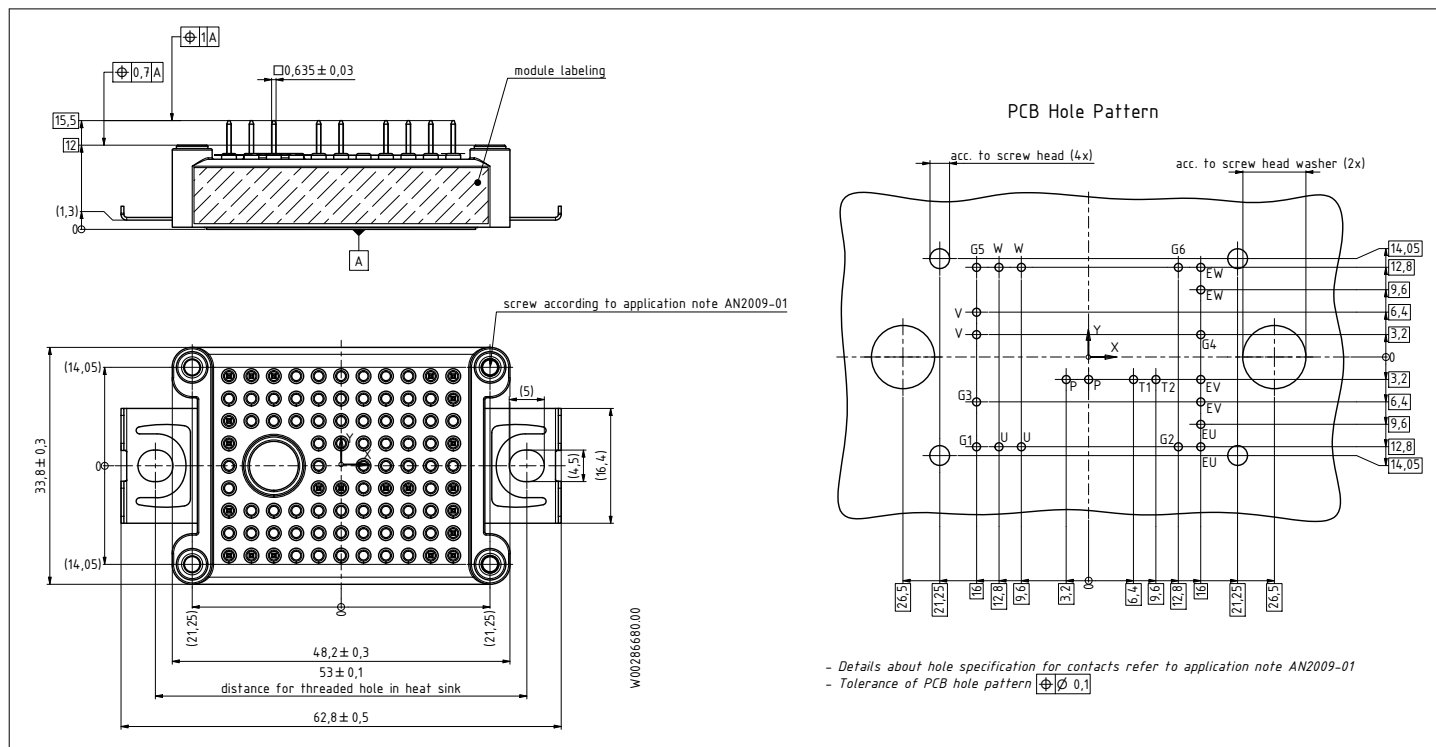


Figure 2

8 **Module label code**

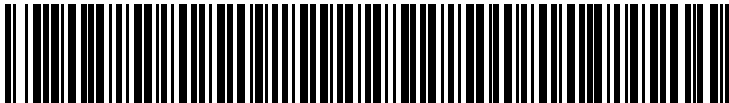
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	<i>Content</i> Module serial number Module material number Production order number Date code (production year) Date code (production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

Figure 3

Revision history

Document revision	Date of release	Description of changes
V2.0	2020-01-29	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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