Final datasheet

EconoPACK™3 module with TRENCHSTOP™IGBT7 and emitter controlled 7 diode and NTC

Features


Typical appearance

- Electrical features
  - V_{CES} = 1200 V
  - $I_{C\ nom}$ = 50 A / I_{CRM} = 100 A
  - TRENCHSTOP™ IGBT7
  - Integrated temperature sensor
  - Suitable Infineon gate drivers can be found under https://www.infineon.com/gdfinder
- Mechanical features
  - Copper base plate

Potential applications

- Motor drives
- Elevators
- Servo drives

Product validation

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

Description

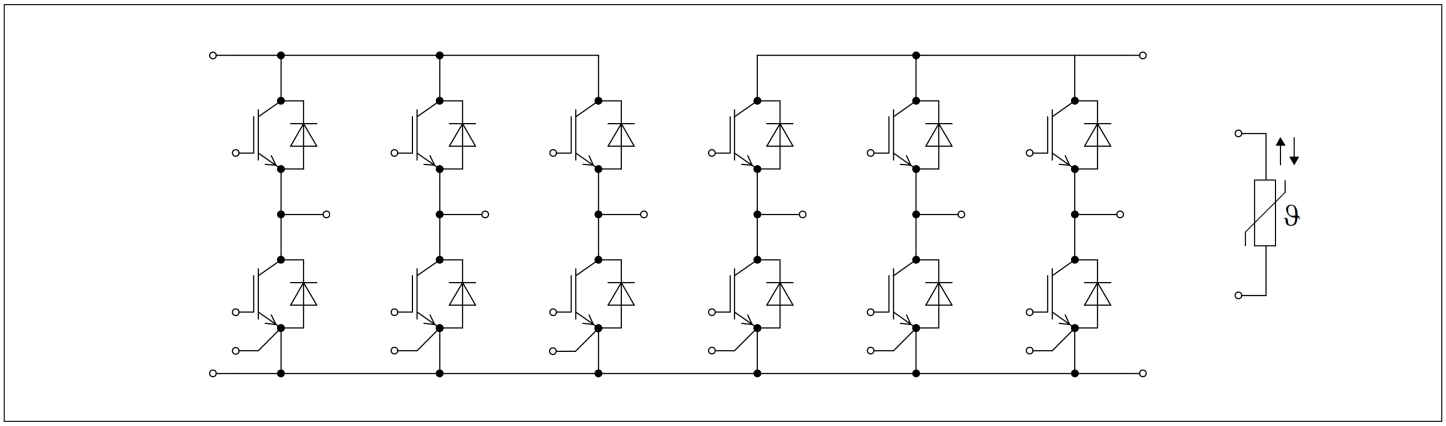


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, f = 50 Hz, *t* = 60 s	2.5	kV
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, f = 50 Hz, *t* = 60 s	2.5	kV
Material of module baseplate			Cu	
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	$d_{Creep\ nom}$	terminal to baseplate, nom.	10.0	mm
Clearance	$d_{Clear\ nom}$	terminal to baseplate, nom.	7.5	mm
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}				20		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_C = 25 °C, per switch			2		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*				300		g

***Note**: The current under continuous operation is limited to 50 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_C = 110 °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		
Gate threshold voltage	V_{GEth}	I_C = 1.28 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		5.15	5.80	6.45	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CC} = 600 V			0.92		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			11.1		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.039		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			13	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 = 50 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 2.7 Ω	T_{vj} = 25 °C		0.021		µs
			T_{vj} = 125 °C		0.025		
			T_{vj} = 175 °C		0.027		
Rise time (inductive load)	t_r	I_C = 50 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 2.7 Ω	T_{vj} = 25 °C		0.014		µs
			T_{vj} = 125 °C		0.016		
			T_{vj} = 175 °C		0.017		
Turn-off delay time (inductive load)	t_{doff}	I_C = 50 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 2.7 Ω	T_{vj} = 25 °C		0.235		µs
			T_{vj} = 125 °C		0.317		
			T_{vj} = 175 °C		0.355		
Fall time (inductive load)	t_f	I_C = 50 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 2.7 Ω	T_{vj} = 25 °C		0.111		µs
			T_{vj} = 125 °C		0.207		
			T_{vj} = 175 °C		0.278		
Turn-on energy loss per pulse	E_{on}	I_C = 50 A, V_{CC} = 600 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Gon} = 2.7 Ω, di/dt = 3560 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		1.53		mJ
			T_{vj} = 125 °C		2.31		
			T_{vj} = 175 °C		2.91		
Turn-off energy loss per pulse	E_{off}	I_C = 50 A, V_{CC} = 600 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Goff} = 2.7 Ω, dv/dt = 3050 V/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		3.01		mJ
			T_{vj} = 125 °C		5.02		
			T_{vj} = 175 °C		6.27		
Thermal resistance, junction to case	R_{thJC}	per IGBT				0.598	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} = 1 W/(m·K)		0.0760		K/W
Temperature under switching conditions	$T_{vj\,op}$		-40		175	°C

Note: *$T_{vj\,op}$ > 150°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 °C	1200	V
Continuous DC forward current	I_F			50	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	260	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 = 50 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.72	2.10	V
			T_{vj} = 125 °C		1.59		
			T_{vj} = 175 °C		1.52		
Peak reverse recovery current	I_{RM}	V_{CC} = 600 V, I_F = 50 A, V_{GE} = -15 V, -di$_F$/dt = 3560 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		87		A
			T_{vj} = 125 °C		108		
			T_{vj} = 175 °C		124		
Recovered charge	Q_r	V_{CC} = 600 V, I_F = 50 A, V_{GE} = -15 V, -di$_F$/dt = 3560 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		3.78		µC
			T_{vj} = 125 °C		7.21		
			T_{vj} = 175 °C		9.68		
Reverse recovery energy	E_{rec}	V_{CC} = 600 V, I_F = 50 A, V_{GE} = -15 V, -di$_F$/dt = 3560 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		1.52		mJ
			T_{vj} = 125 °C		3.05		
			T_{vj} = 175 °C		4.14		

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction to case	R_{thJC}	per diode			0.908	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, λ_{grease} = 1 W/(m·K)		0.109		K/W
Temperature under switching conditions	$T_{vj\,op}$		-40		175	°C

***Note**: $T_{vj\,op}$ > 150°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 °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

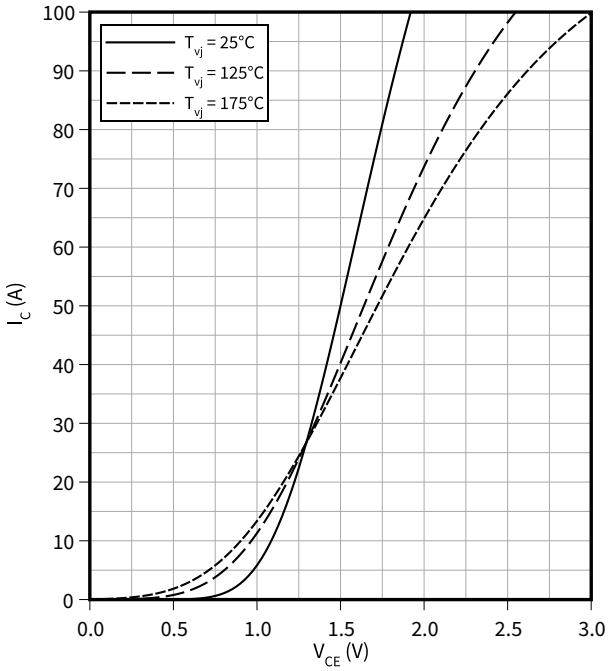
***Note**: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.*

5 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

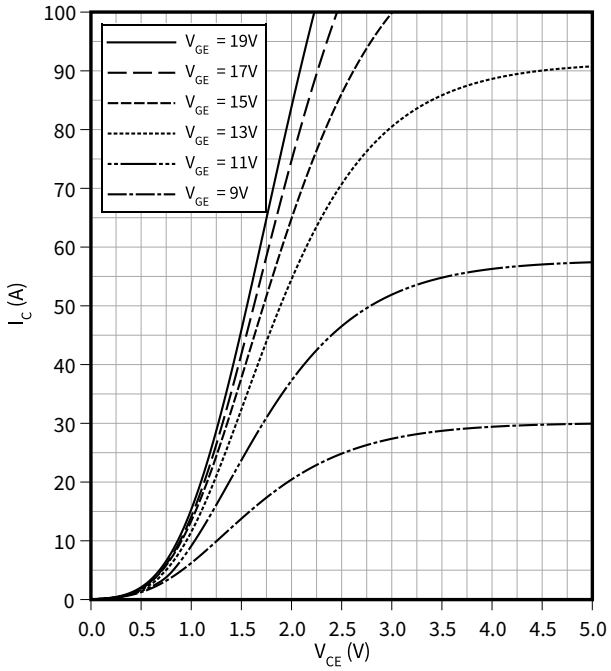
V_{GE} = 15 V



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

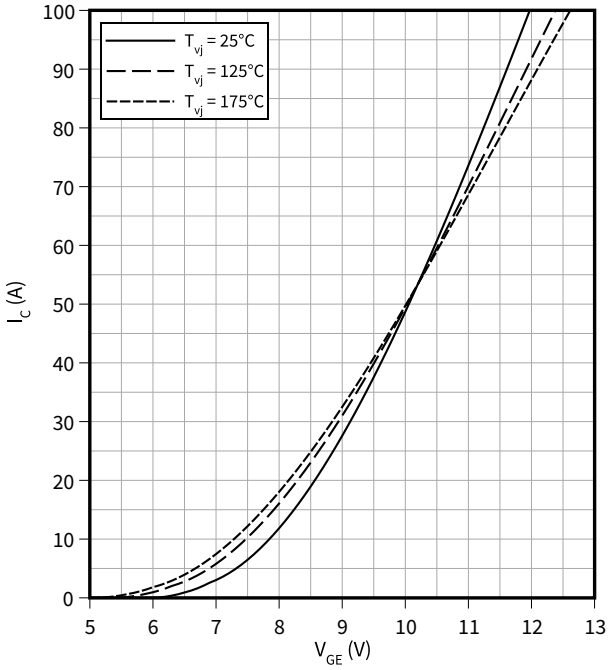
T_{vj} = 175 °C



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

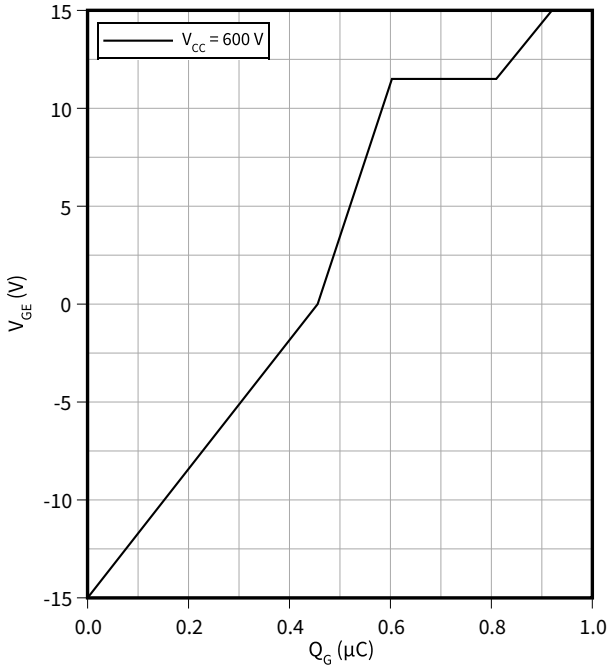
V_{CE} = 20 V



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

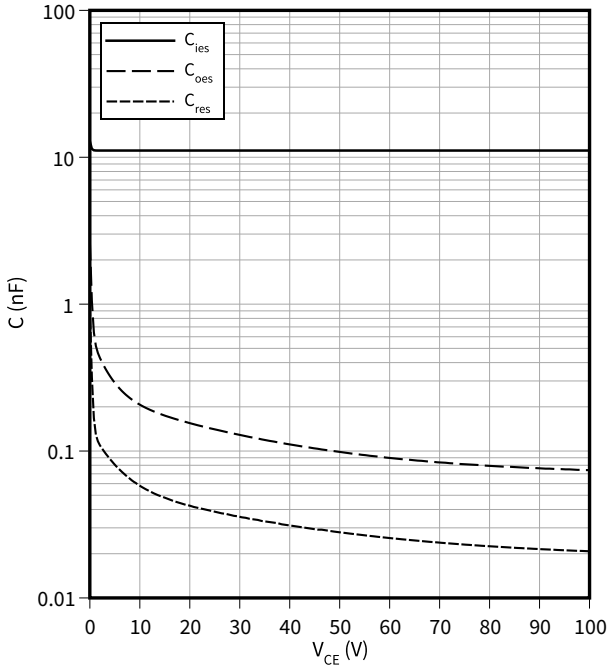
I_C = 50 A, T_{vj} = 25 °C



Capacity characteristic (typical), IGBT, Inverter

$C = f(V_{CE})$

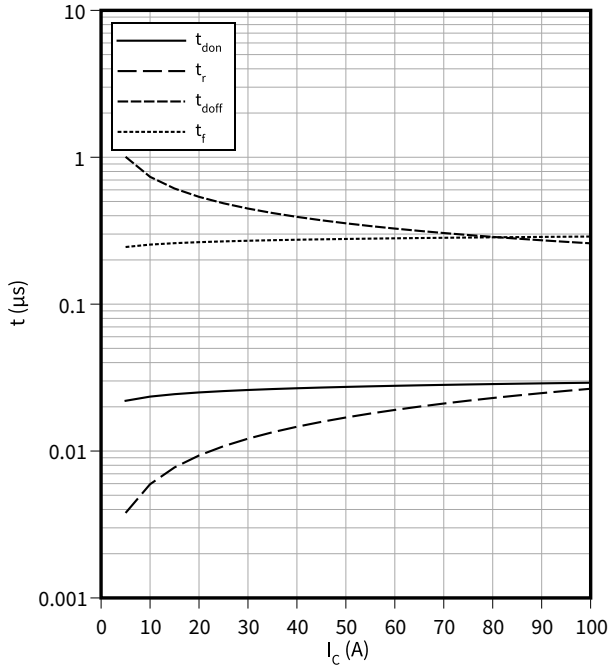
$f = 100\ kHz$, $V_{GE} = 0\ V$, $T_{vj} = 25\ °C$



Switching times (typical), IGBT, Inverter

$t = f(I_C)$

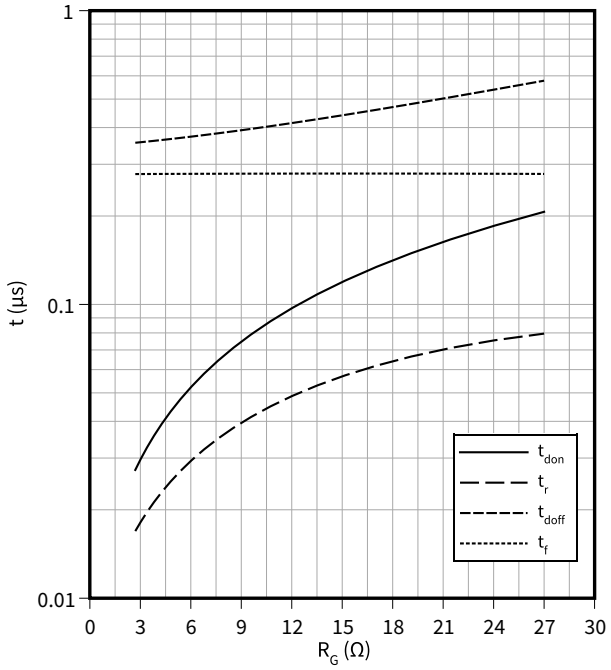
$R_{Goff} = 2.7\ \Omega$, $R_{Gon} = 2.7\ \Omega$, $V_{CC} = 600\ V$, $V_{GE} = \pm 15\ V$, $T_{vj} = 175\ °C$



Switching times (typical), IGBT, Inverter

$t = f(R_G)$

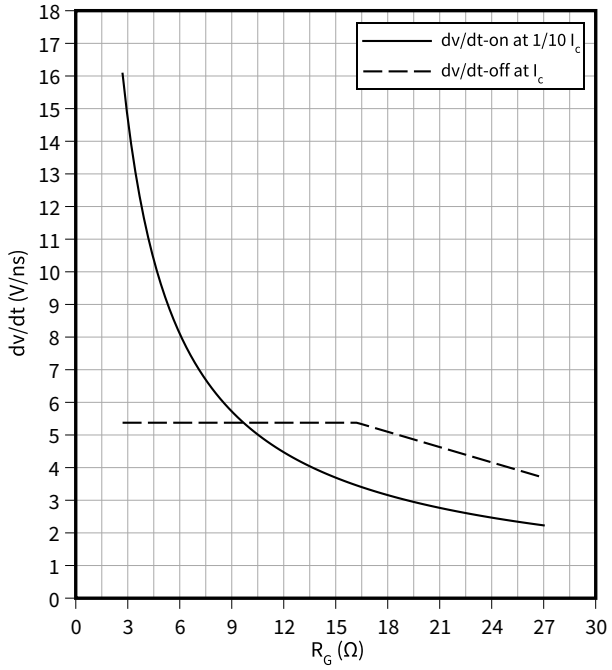
$I_C = 50\ A$, $V_{CC} = 600\ V$, $V_{GE} = \pm 15\ V$, $T_{vj} = 175\ °C$



Voltage slope (typical), IGBT, Inverter

$dv/dt = f(R_G)$

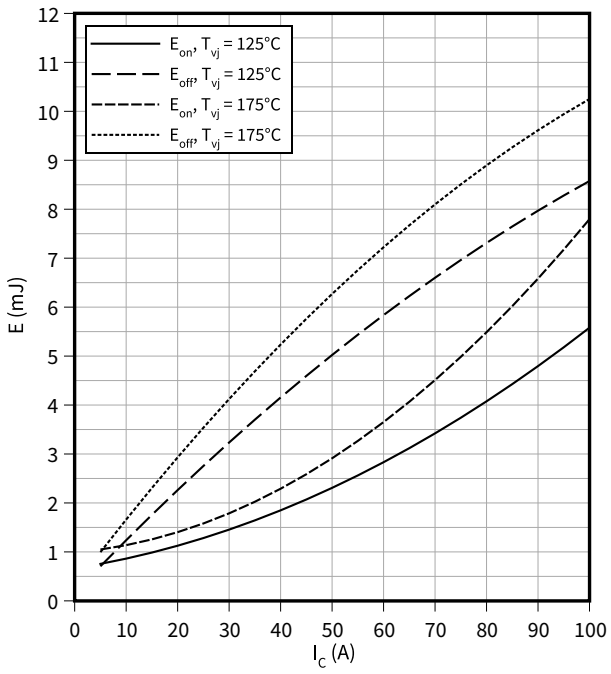
$I_C = 50\ A$, $V_{CE} = 600\ V$, $V_{GE} = \pm 15\ V$, $T_{vj} = 25\ °C$



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

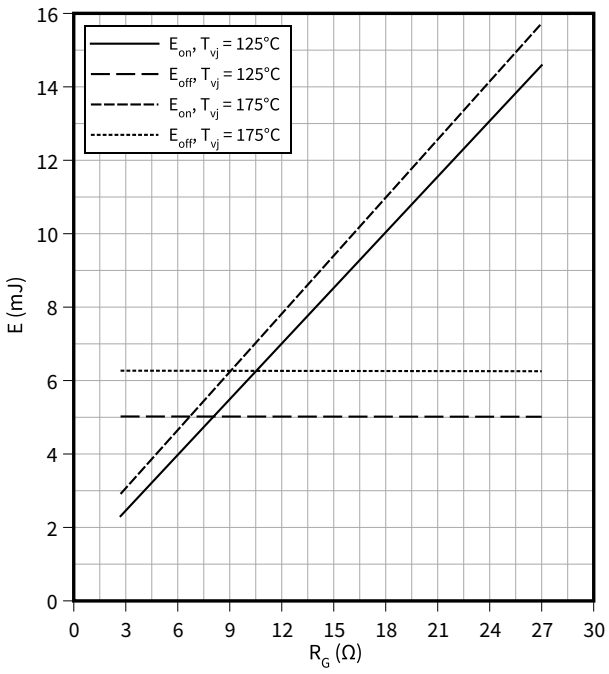
$R_{Goff} = 2.7\ \Omega$, $R_{Gon} = 2.7\ \Omega$, $V_{CC} = 600\ V$, $V_{GE} = \pm 15\ V$



Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

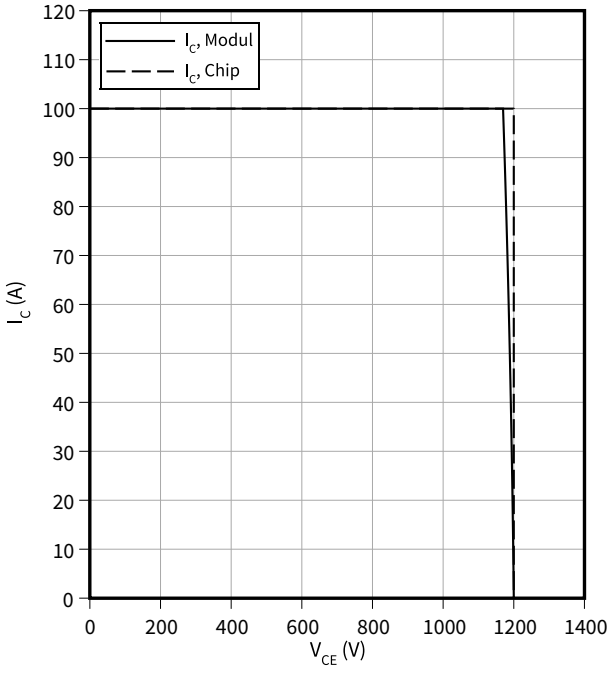
$I_C = 50\ A$, $V_{CC} = 600\ V$, $V_{GE} = \pm 15\ V$



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

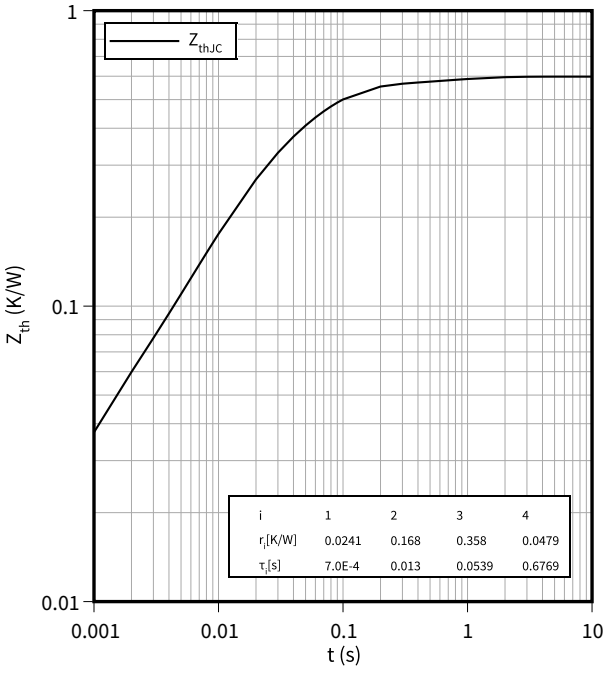
$I_C = f(V_{CE})$

$R_{Goff} = 2.7\ \Omega$, $V_{GE} = \pm 15\ V$, $T_{vj} = 175\ °C$



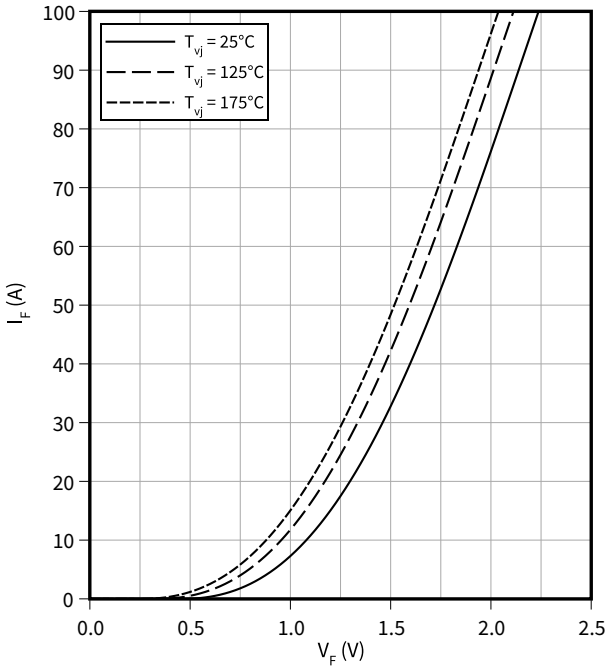
Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Inverter

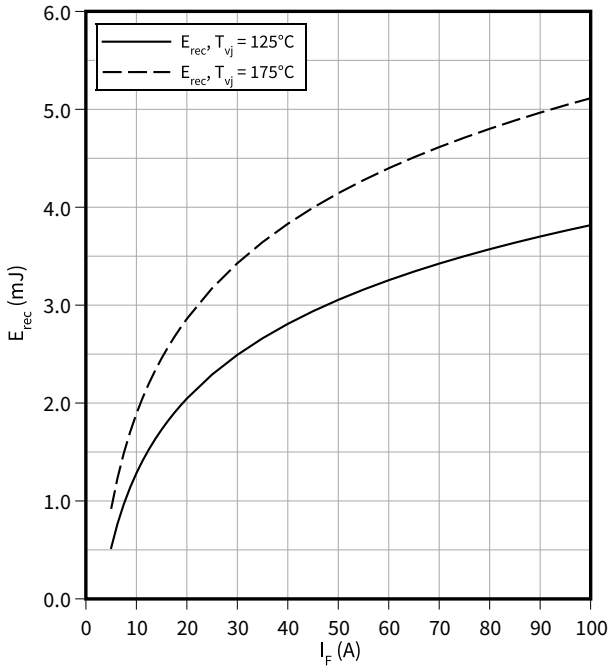
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

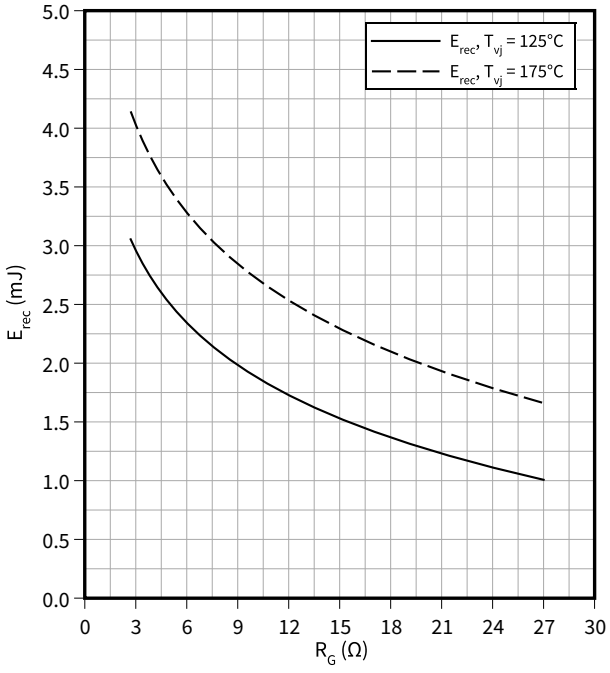
$R_{Gon} = 2.7\ \Omega$, $V_{CE} = 600\ V$



Switching losses (typical), Diode, Inverter

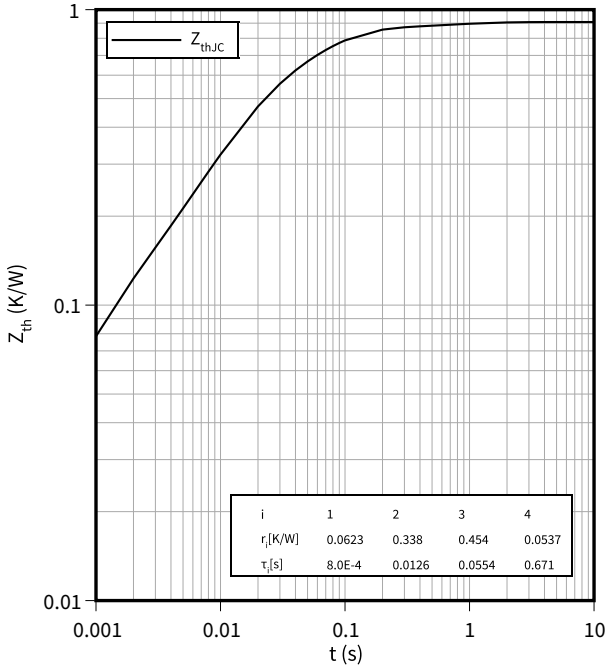
$E_{rec} = f(R_G)$

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



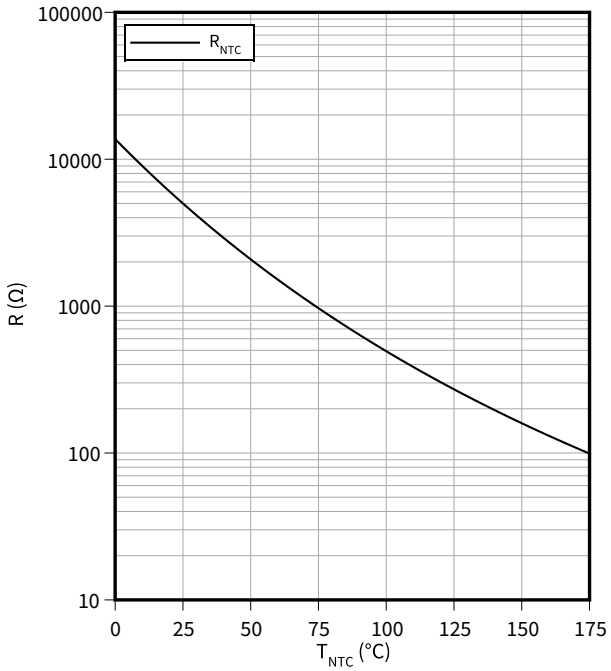
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

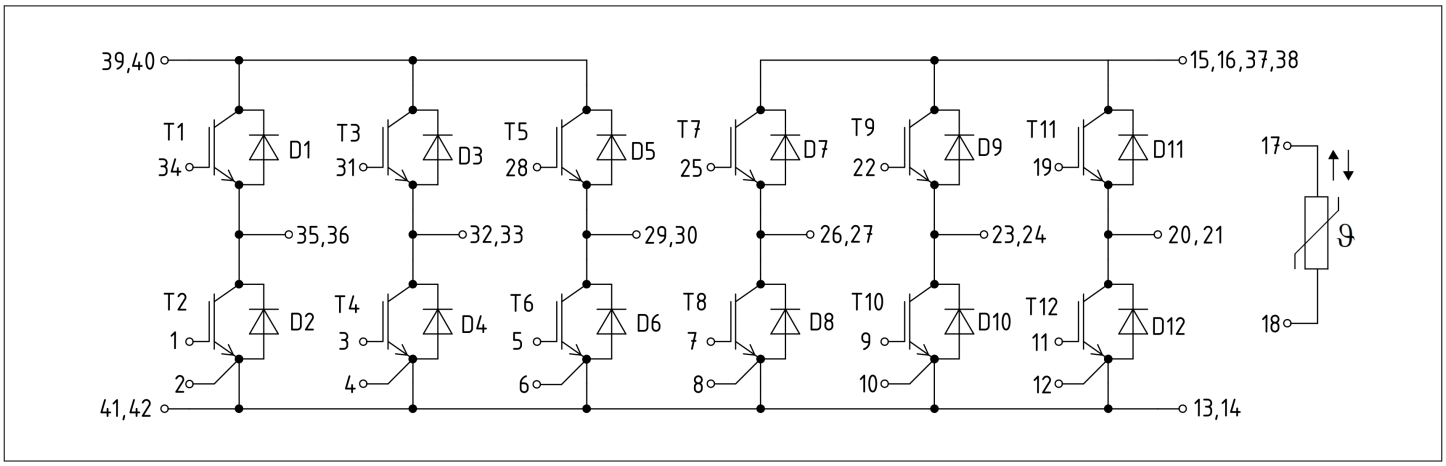


Figure 1

7 Package outlines

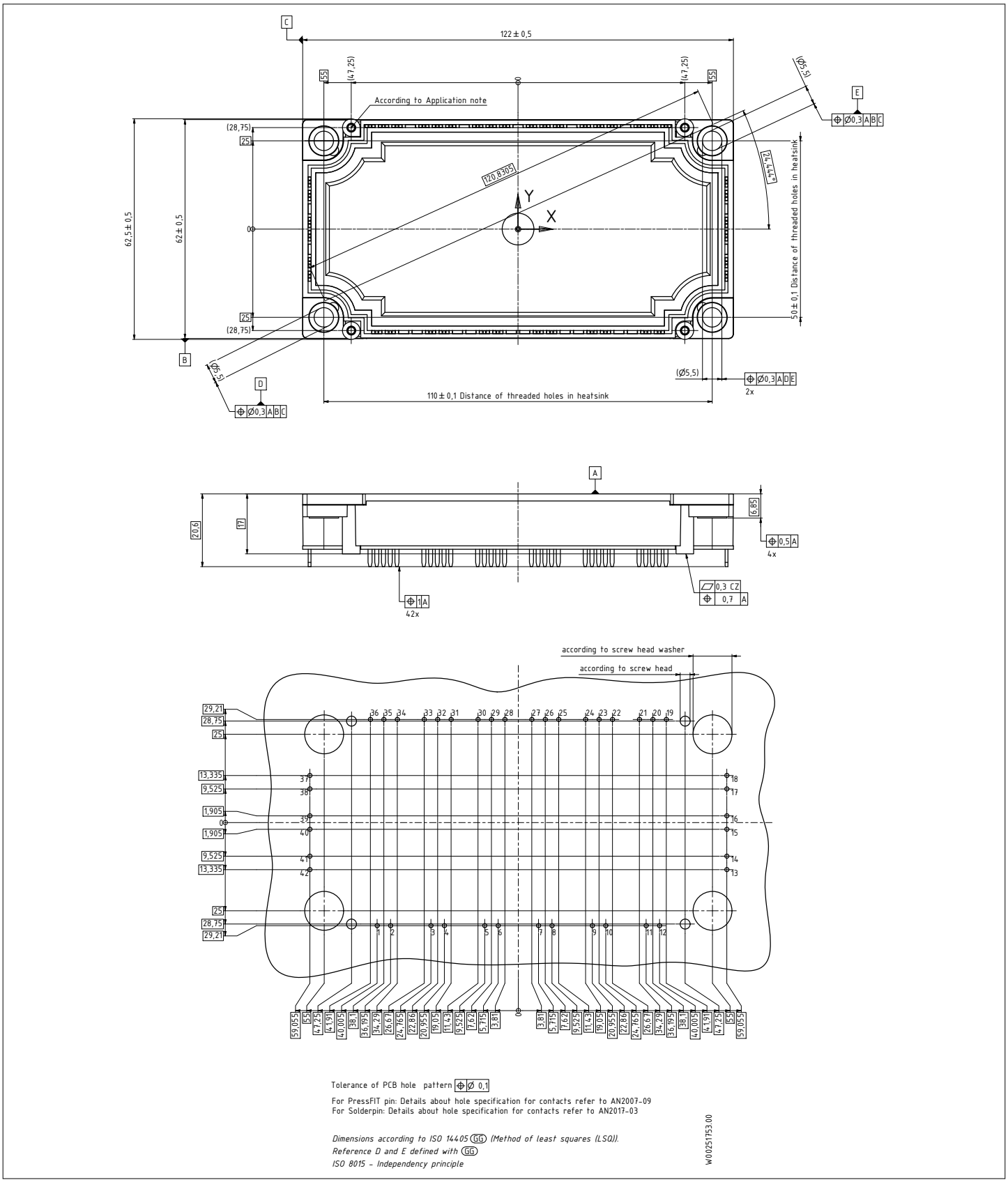


Figure 2

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	*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 revision	Date of release	Description of changes
0.10	2023-09-21	Initial version
1.00	2024-04-02	Final datasheet

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