Preliminary datasheet
62 mm C-Series module with Trench/Fieldstop IGBT4 and Emitter Controlled 4 diode

Features

- Electrical features
  - V_{CES} = 1200 V
  - $I_{C\ nom}$ = 600 A / I_{CRM} = 1200 A
  - Unbeatable robustness
  - Extended operating temperature $T_{vj\ op}$
  - Low switching losses
  - Low V_{CEsat}
  - V_{CEsat} with positive temperature coefficient
- Mechanical features
  - 4 kV AC 1 min insulation
  - Package with CTI > 400
  - High creepage and clearance distances
  - High power density
  - Isolated base plate
  - Standard housing

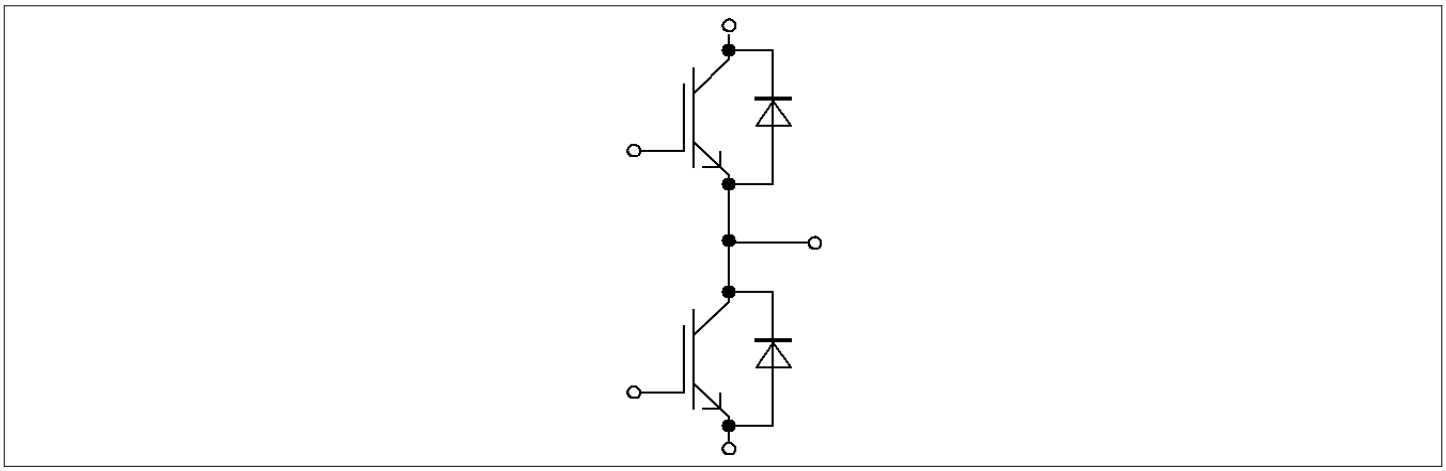
Potential applications

- High power converters
- Motor drives
- UPS systems
- Wind turbines

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
Material of module baseplate			Cu	
Internal Isolation		basic insulation (class 1, IEC 61140)	Al2O3	
Comparative tracking index	*CTI*		> 400	
RTI Elec.	*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
Storage temperature	T_{stg}		-40		125	°C
Mounting torque for modul mounting	*M*	- Mounting according to valid application note M6, Screw	3		6	Nm
Terminal connection torque	*M*	- Mounting according to valid application note M6, Screw	2.5		5	Nm

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
Continous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_C = 100 °C	600	A
Repetitive peak collector current	I_{CRM}	t_P = 1 ms		1200	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 = 600 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.75	2.20	V
			T_{vj} = 125 °C		2.00		
			T_{vj} = 150 °C		2.05		
Gate threshold voltage	V_{GEth}	I_C = 22.8 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		5.25	5.80	6.35	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CE} = 600 V			5		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			1.3		Ω

Table 4 Characteristic values (continued)

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Input capacitance	C_{ies}	f = 1000 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			38		nF
Reverse transfer capacitance	C_{res}	f = 1000 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			1.4		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			5	mA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25 °C				400	nA
Turn-on delay time (inductive load)	t_{don}	I_C = 600 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Gon} = 0.62 Ω	T_{vj} = 25 °C		0.170		µs
			T_{vj} = 125 °C		0.180		
			T_{vj} = 150 °C		0.180		
Rise time (inductive load)	t_r	I_C = 600 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Gon} = 0.62 Ω	T_{vj} = 25 °C		0.046		µs
			T_{vj} = 125 °C		0.048		
			T_{vj} = 150 °C		0.052		
Turn-off delay time (inductive load)	t_{doff}	I_C = 600 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Goff} = 0.62 Ω	T_{vj} = 25 °C		0.400		µs
			T_{vj} = 125 °C		0.500		
			T_{vj} = 150 °C		0.530		
Fall time (inductive load)	t_f	I_C = 600 A, V_{CE} = 600 V, V_{GE} = ±15 V, R_{Goff} = 0.62 Ω	T_{vj} = 25 °C		0.070		µs
			T_{vj} = 125 °C		0.160		
			T_{vj} = 150 °C		0.190		
Turn-on energy loss per pulse	E_{on}	I_C = 600 A, V_{CE} = 600 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Gon} = 0.62 Ω, di/dt = 11000 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		16		mJ
			T_{vj} = 125 °C		29.5		
			T_{vj} = 150 °C		35.5		
Turn-off energy loss per pulse	E_{off}	I_C = 600 A, V_{CE} = 600 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Goff} = 0.62 Ω, dv/dt = 3600 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		50		mJ
			T_{vj} = 125 °C		74		
			T_{vj} = 150 °C		82		
SC data	I_{SC}	$V_{GE} \leq$ 15 V, V_{CC} = 800 V, $V_{CEmax}=V_{CES}-L_{sCE}*di/dt$	$t_P \leq$ 10 µs, T_{vj} = 150 °C		2600		A
Thermal resistance, junction to case	R_{thJC}	per IGBT				0.0460	K/W
Thermal resistance, case to heatsink	R_{thCH}	per IGBT, λ_{grease}= 1 W/(m*K)			0.0226		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

3 Diode, Inverter

Table 5 Maximum rated values

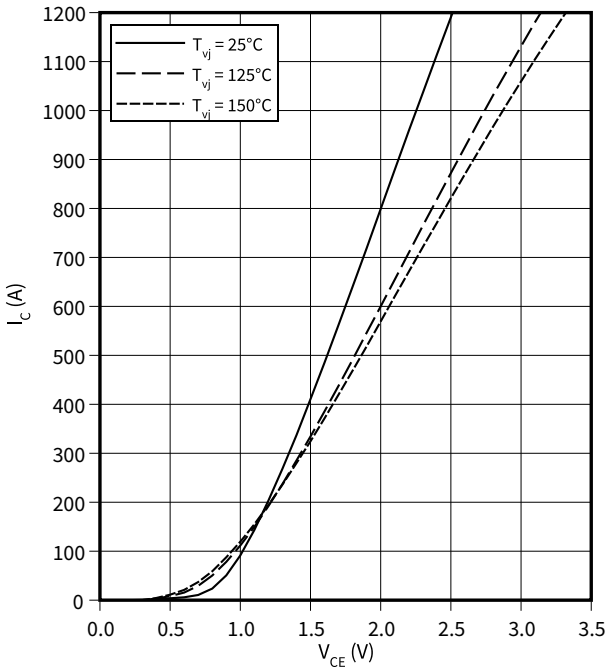
Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		T_{vj} = 25 °C	1200	V
Continous DC forward current	I_F			600	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		1200	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	35000	A^2s
			T_{vj} = 150 °C	33000	

Table 6 Characteristic values

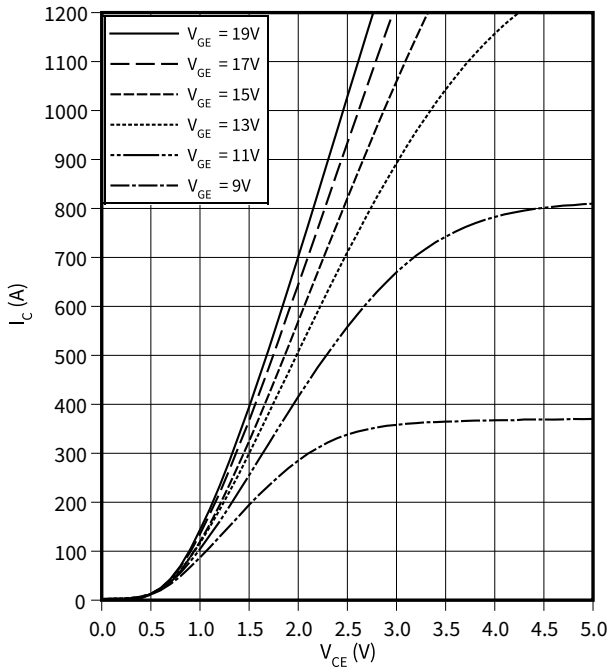
Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 600 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.85	2.45	V
			T_{vj} = 125 °C		1.80		
			T_{vj} = 150 °C		1.75		
Peak reverse recovery current	I_{RM}	V_R = 600 V, I_F = 600 A, V_{GE} = -15 V, -di$_F$/dt = 11000 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		535		A
			T_{vj} = 125 °C		655		
			T_{vj} = 150 °C		680		
Recovered charge	Q_r	V_R = 600 V, I_F = 600 A, V_{GE} = -15 V, -di$_F$/dt = 11000 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		50.5		µC
			T_{vj} = 125 °C		94		
			T_{vj} = 150 °C		110		
Reverse recovery energy	E_{rec}	V_R = 600 V, I_F = 600 A, V_{GE} = -15 V, -di$_F$/dt = 11000 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		27		mJ
			T_{vj} = 125 °C		48.5		
			T_{vj} = 150 °C		54.5		
Thermal resistance, junction to case	R_{thJC}	per diode				0.0929	K/W
Thermal resistance, case to heatsink	R_{thCH}	per diode, λ_{grease}= 1 W/(m*K)			0.0303		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

4 Characteristics diagrams

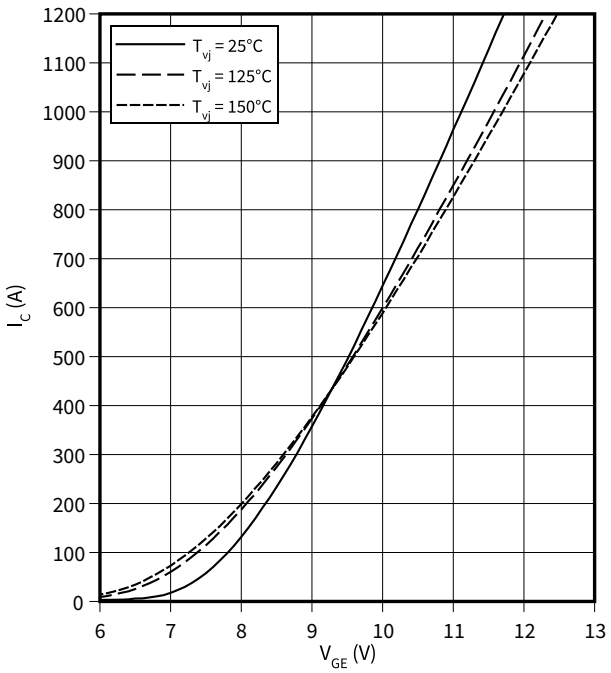
output characteristic (typical), IGBT, Inverter
$I_C = f(V_{CE})$
V_{GE} = 15 V



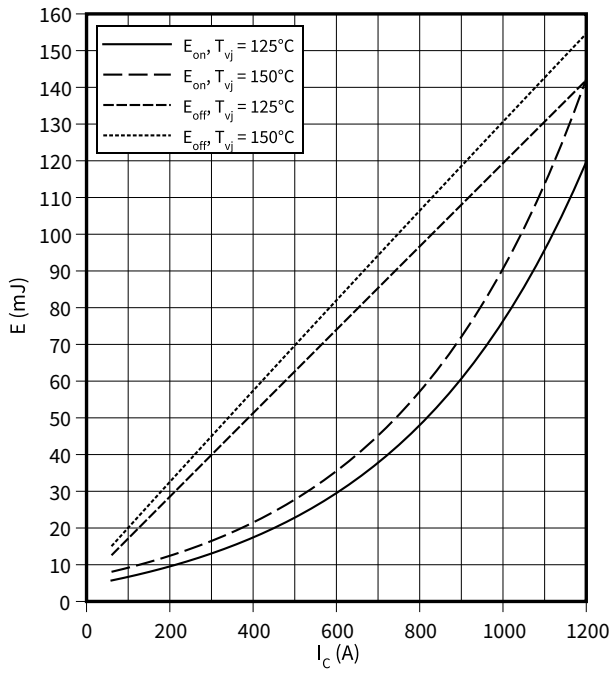
output characteristic (typical), IGBT, Inverter
$I_C = f(V_{CE})$
T_{vj} = 150 °C



transfer characteristic (typical), IGBT, Inverter
$I_C = f(V_{GE})$
V_{CE} = 20 V



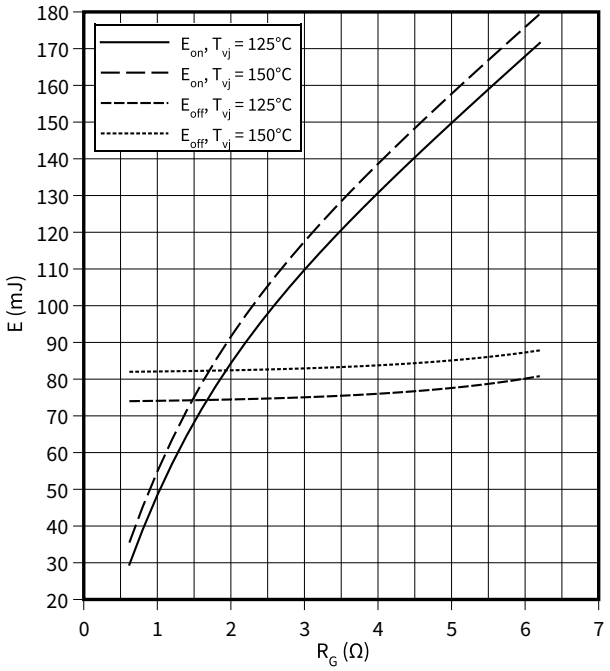
switching losses (typical), IGBT, Inverter
$E = f(I_C)$
R_{Goff} = 0.62 Ω, R_{Gon} = 0.62 Ω, V_{CE} = 600 V, V_{GE} = ± 15 V



switching losses (typical), IGBT, Inverter

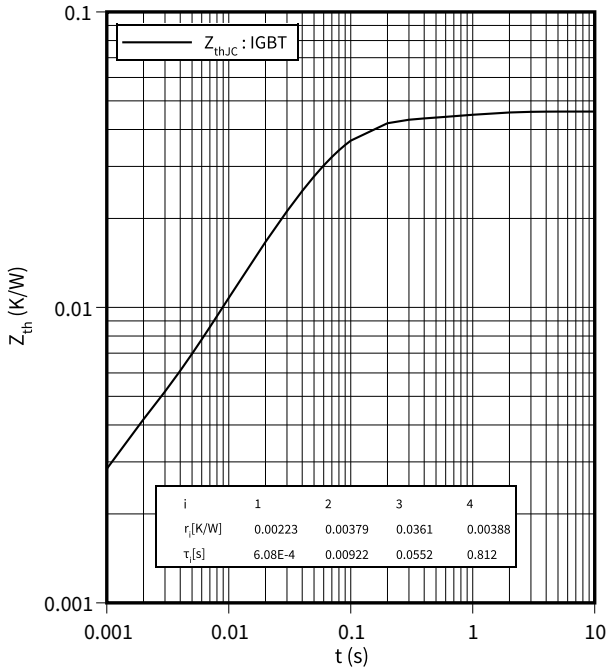
$E = f(R_G)$

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



transient thermal impedance , IGBT, Inverter

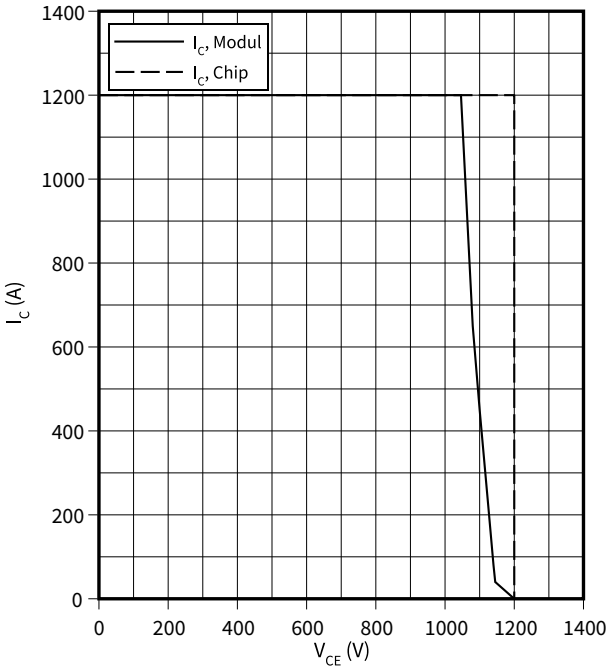
$Z_{th} = f(t)$



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

$I_C = f(V_{CE})$

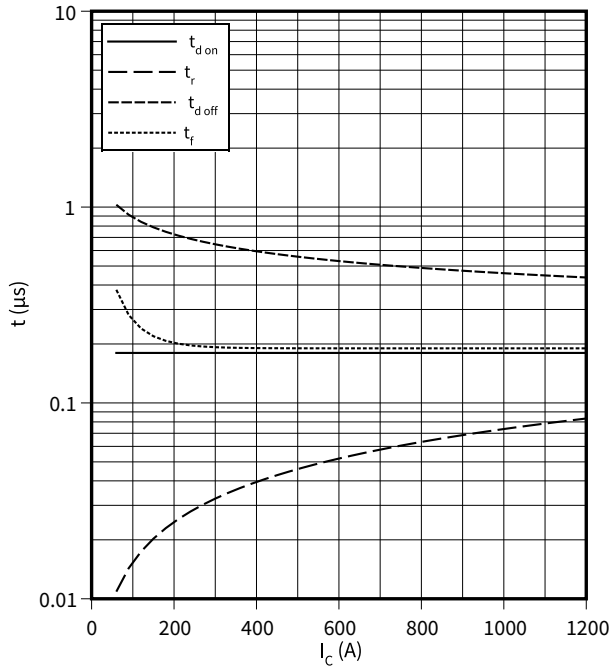
$R_{Goff} = 0.62\ \Omega$, $V_{GE} = \pm 15.0\ V$, $T_{vj} = 150\ °C$



switching times (typical), IGBT, Inverter

$t = f(I_C)$

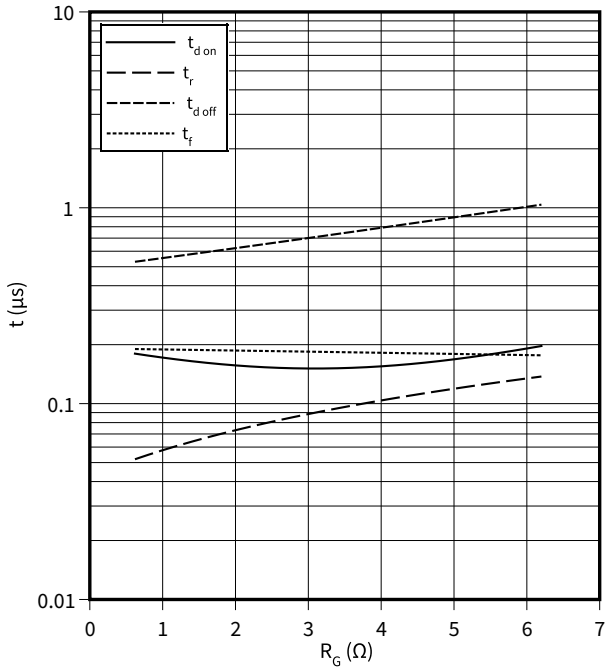
$R_{Goff} = 0.62\ \Omega$, $R_{Gon} = 0.62\ \Omega$, $V_{CE} = 600\ V$, $V_{GE} = \pm 15\ V$, $T_{vj} = 150\ °C$



switching times (typical), IGBT, Inverter

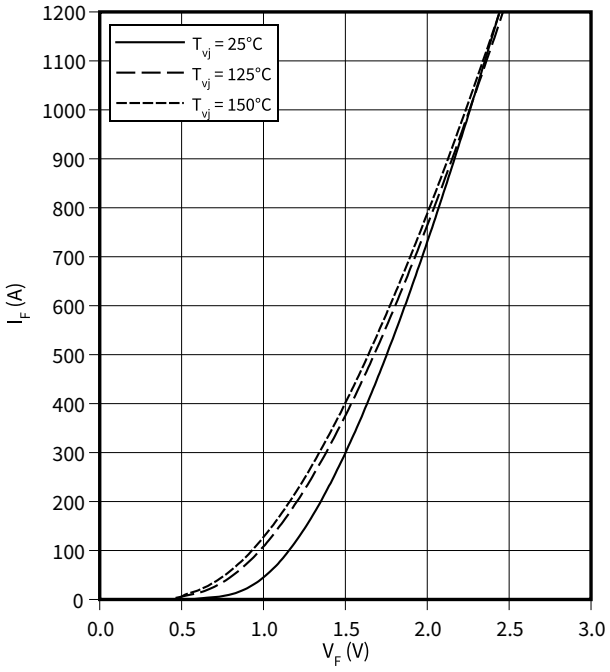
$t = f(R_G)$

$I_C = 600\ A$, $V_{CE} = 600\ V$, $V_{GE} = \pm 15\ V$, $T_{vj} = 150\ °C$



forward characteristic (typical), Diode, Inverter

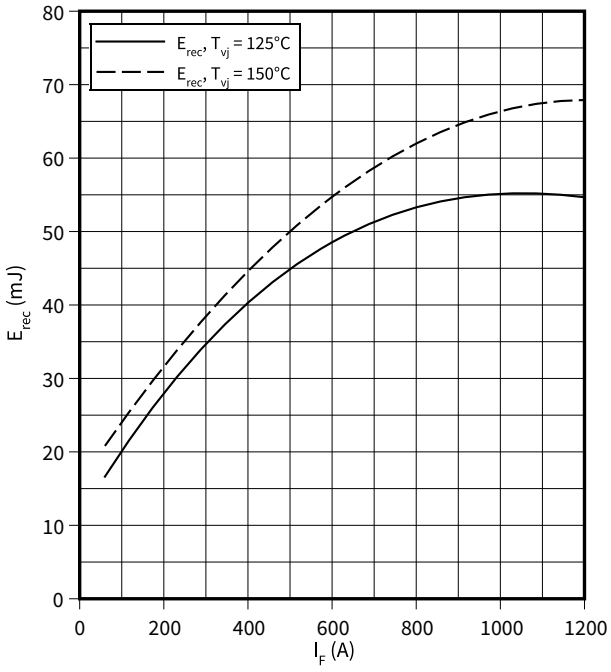
$I_F = f(V_F)$



switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

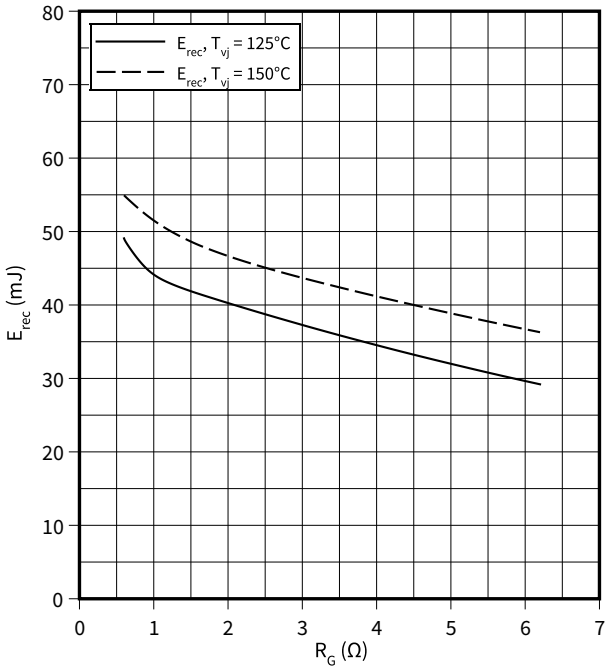
$V_{CE} = 600\ V$, $R_{Gon} = R_{Gon}(IGBT)$



switching losses (typical), Diode, Inverter

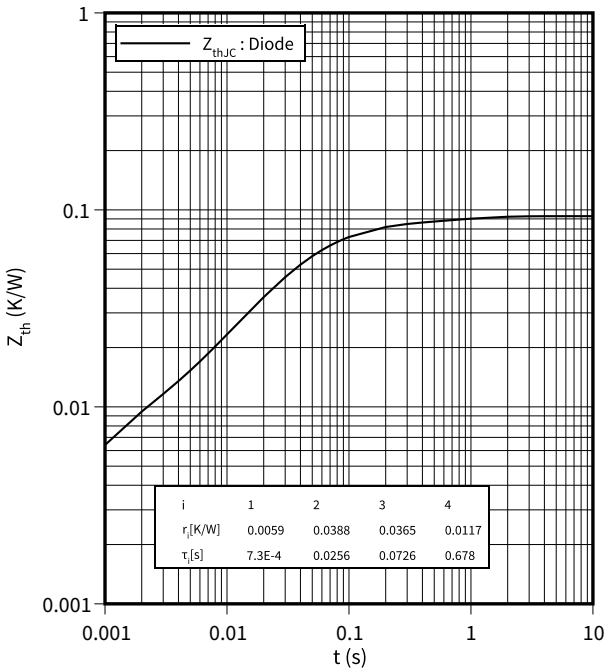
$E_{rec} = f(R_G)$

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



transient thermal impedance , Diode, Inverter

$Z_{th} = f(t)$



5 Circuit diagram

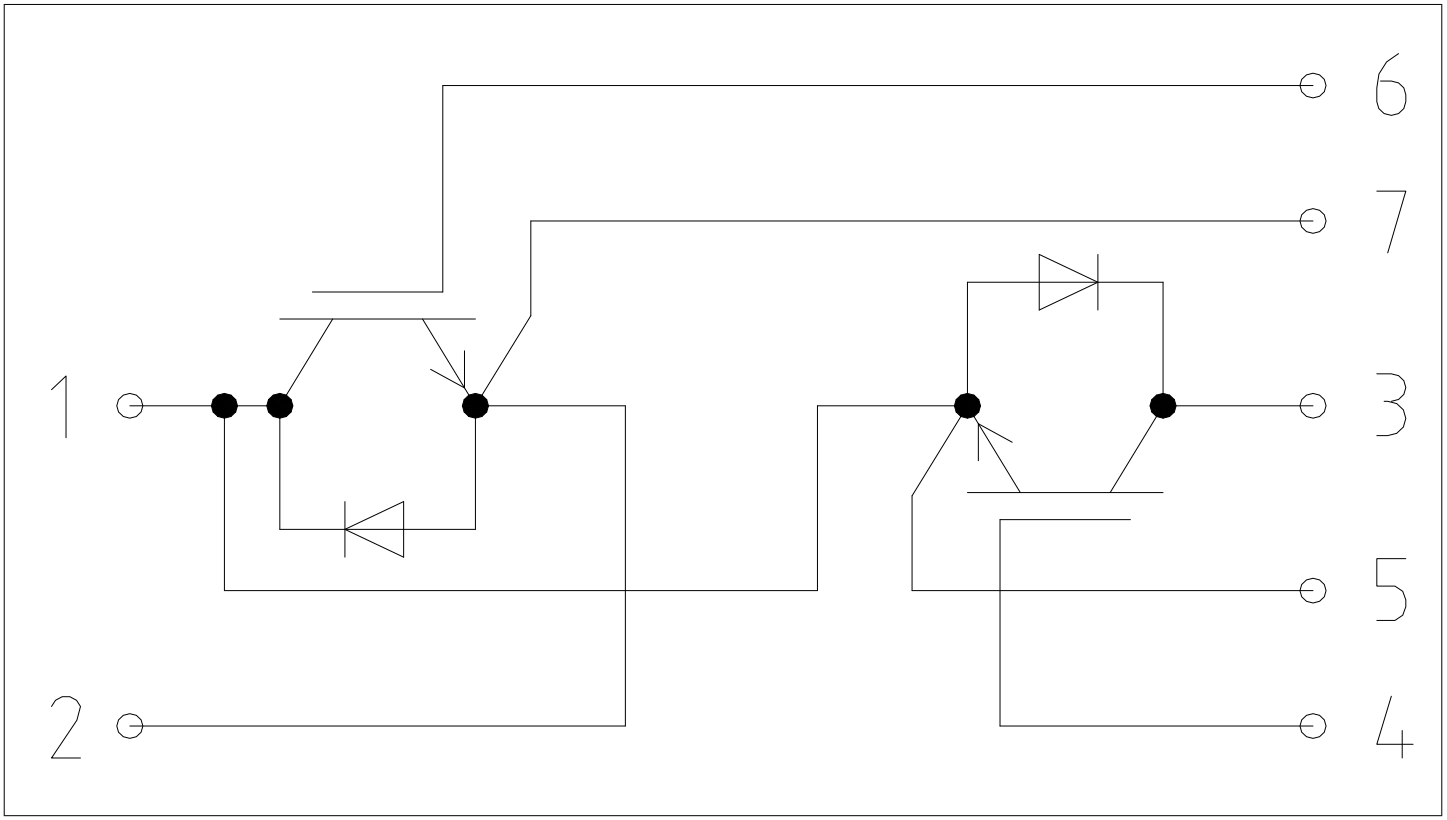


Figure 2

6 Package outlines

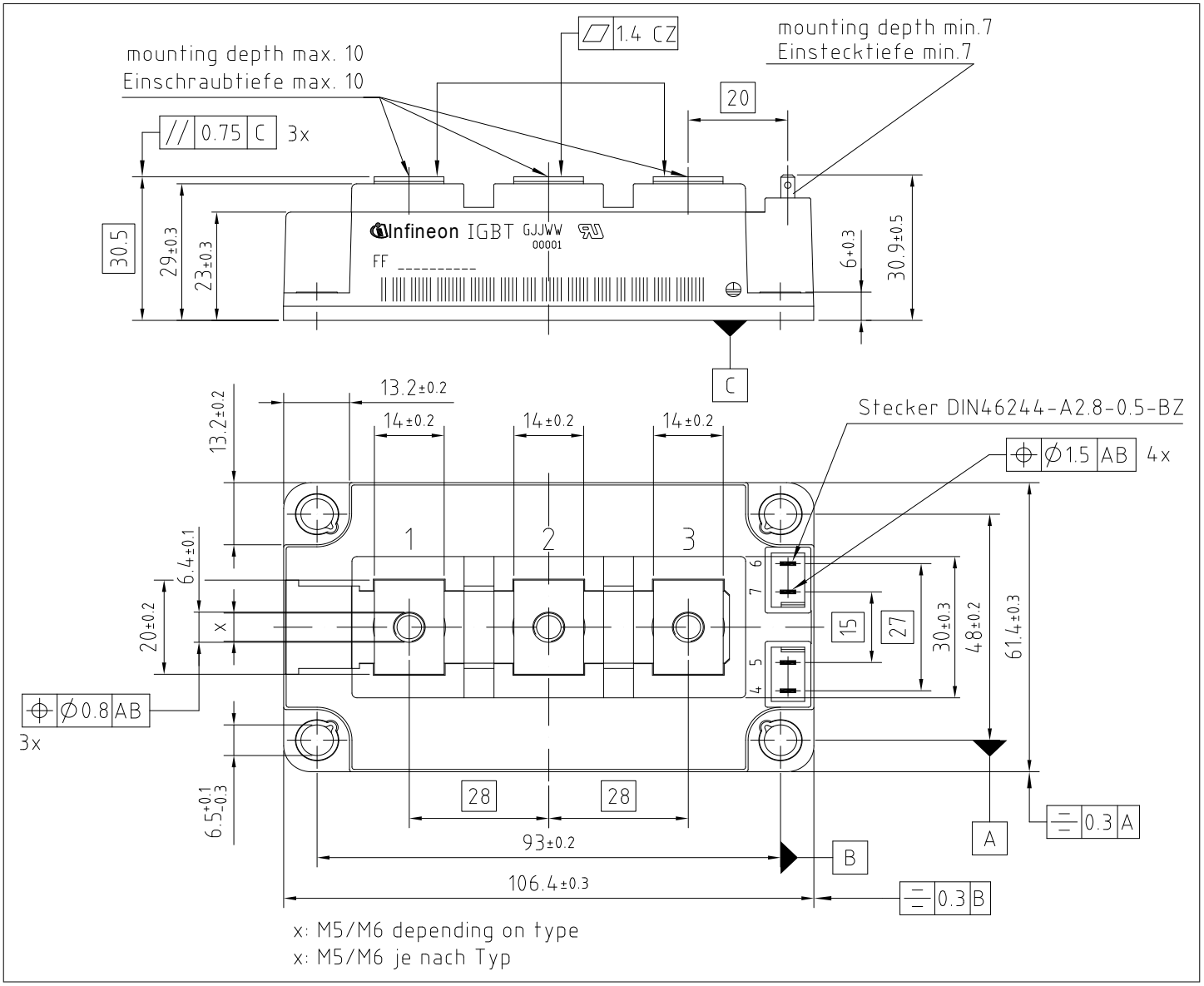


Figure 3

7 Module label code

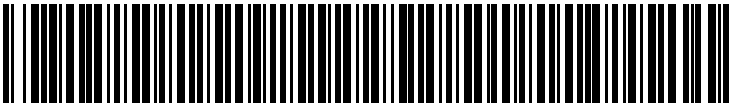
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production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

Figure 4

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