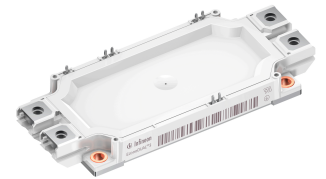


Preliminary datasheet
EconoDUAL™3 module with Trench/Fieldstop IGBT3 and emitter controlled HE diode

Features

- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_{C\text{ nom}} = 450\text{ A} / I_{CRM} = 900\text{ A}$
 - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
 - Integrated temperature sensor
- Mechanical features
 - Standard housing
 - Solder contact technology
 - Isolated base plate
 - High power density



Potential applications

- Industrial drives
- Energy storage systems

Product validation

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

Description

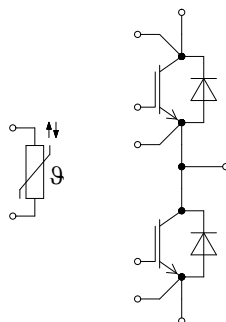


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1 Package

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
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, $f = 50$ Hz, $t = 1$ min	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.	> 15	mm
Creepage distance	$d_{Creep\ min}$	terminal to baseplate, min.	14.7	mm
Creepage distance	$d_{Creep\ nom}$	terminal to terminal, nom.	> 19.3	mm
Creepage distance	$d_{Creep\ min}$	terminal to terminal, min.	19.3	mm
Clearance	$d_{Clear\ nom}$	terminal to baseplate, nom.	> 12.5	mm
Clearance	$d_{Clear\ min}$	terminal to baseplate, min.	12.5	mm
Clearance	$d_{Clear\ nom}$	terminal to terminal, nom.	> 10	mm
Clearance	$d_{Clear\ min}$	terminal to terminal, min.	9.6	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.	
Thermal resistance, case to heat sink	R_{thCH}	$\lambda_{grease} = 1$ W/(m·K)		0.009		K/W
Stray inductance module	L_{SCE}			20		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_C = 25$ °C, per switch		1.1		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting torque for module mounting	M	- Mounting according to valid application note		3	6	Nm
Terminal connection torque	M	- Mounting according to valid application note		3	6	Nm
Weight	G			345		g

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}	$T_{vj\text{ max}} = 150\text{ °C}$ $T_C = 80\text{ °C}$	450	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\text{ op}}$	900	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	$V_{CE\text{ sat}}$	$I_C = 450\text{ A}$, $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$	1.70	2.15	V
			$T_{vj} = 125\text{ °C}$	2.00		
Gate threshold voltage	$V_{GE\text{ th}}$	$I_C = 18\text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25\text{ °C}$	5.00	5.80	6.50	V
Gate charge	Q_G	$V_{GE} = \pm 15\text{ V}$, $T_{vj} = 25\text{ °C}$		4.3		μC
Internal gate resistor	$R_{G\text{ int}}$	$T_{vj} = 25\text{ °C}$		1.7		Ω
Input capacitance	C_{ies}	$f = 1000\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$		32		nF
Reverse transfer capacitance	C_{res}	$f = 1000\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$		1.5		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\text{ V}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		5	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = 20\text{ V}$, $T_{vj} = 25\text{ °C}$			400	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 450\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1.6\text{ Ω}$	$T_{vj} = 25\text{ °C}$	0.250		μs
			$T_{vj} = 125\text{ °C}$	0.300		
Rise time (inductive load)	t_r	$I_C = 450\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1.6\text{ Ω}$	$T_{vj} = 25\text{ °C}$	0.090		μs
			$T_{vj} = 125\text{ °C}$	0.100		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 450\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 1.6\text{ Ω}$	$T_{vj} = 25\text{ °C}$	0.550		μs
			$T_{vj} = 125\text{ °C}$	0.650		
Fall time (inductive load)	t_f	$I_C = 450\text{ A}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 1.6\text{ Ω}$	$T_{vj} = 25\text{ °C}$	0.130		μs
			$T_{vj} = 125\text{ °C}$	0.160		
Turn-on energy loss per pulse	E_{on}	$I_C = 450\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 80\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1.6\text{ Ω}$, $di/dt = 7800\text{ A}/\mu\text{s}$ ($T_{vj} = 125\text{ °C}$)	$T_{vj} = 25\text{ °C}$	22		mJ
			$T_{vj} = 125\text{ °C}$	33		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off energy loss per pulse	E_{off}	$I_C = 450\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 80\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 1.6\ \Omega$, $dv/dt = 3600\text{ V}/\mu\text{s}$ ($T_{vj} = 125\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$		43	mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$		65	
SC data	I_{SC}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 900\text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 10\ \mu\text{s}$, $T_{vj} = 125\text{ }^\circ\text{C}$		1800	A
Thermal resistance, junction to case	R_{thJC}	per IGBT				0.06 K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$			0.03	K/W
Temperature under switching conditions	T_{vjop}			-40		125 $^\circ\text{C}$

3 Diode, Inverter

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = 25\text{ }^\circ\text{C}$	1200	V
Continuous DC forward current	I_F		450	A
Repetitive peak forward current	I_{FRM}	$t_p = 1\text{ ms}$	900	A
I^2t - value	$\int I^2 t$	$t_p = 10\text{ ms}$, $V_R = 0\text{ V}$	$T_{vj} = 125\text{ }^\circ\text{C}$	35000 A^2s

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	V_F	$I_F = 450\text{ A}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$		1.65	2.15	V
			$T_{vj} = 125\text{ }^\circ\text{C}$		1.65		
Peak reverse recovery current	I_{RM}	$V_{CC} = 600\text{ V}$, $I_F = 450\text{ A}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 7800\text{ A}/\mu\text{s}$ ($T_{vj} = 125\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$		315	A	
			$T_{vj} = 125\text{ }^\circ\text{C}$		405		
Recovered charge	Q_r	$V_{CC} = 600\text{ V}$, $I_F = 450\text{ A}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 7800\text{ A}/\mu\text{s}$ ($T_{vj} = 125\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$		45	μC	
			$T_{vj} = 125\text{ }^\circ\text{C}$		85		
Reverse recovery energy	E_{rec}	$V_{CC} = 600\text{ V}$, $I_F = 450\text{ A}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 7800\text{ A}/\mu\text{s}$ ($T_{vj} = 125\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$		21	mJ	
			$T_{vj} = 125\text{ }^\circ\text{C}$		39		

(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			0.10	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$		0.05		K/W
Temperature under switching conditions	T_{vjop}		-40		125	°C

4 NTC-Thermistor

Table 7 Characteristic values

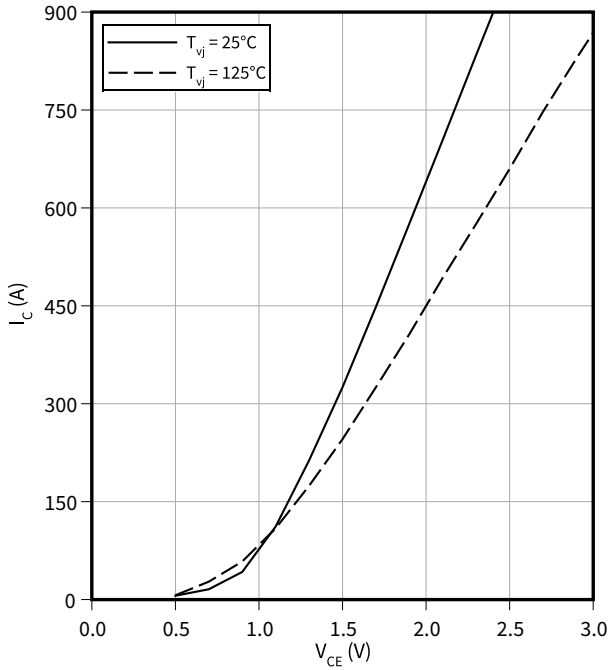
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25 \text{ °C}$		5		kΩ
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100 \text{ °C}, R_{100} = 493 \text{ } \Omega$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25 \text{ °C}$			20	mW
B-value	$B_{25/50}$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

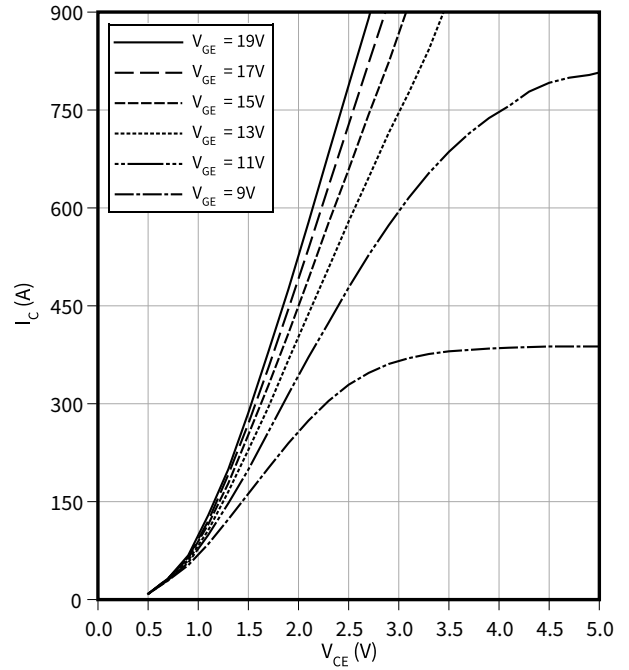
Output characteristic (typical), IGBT, Inverter

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



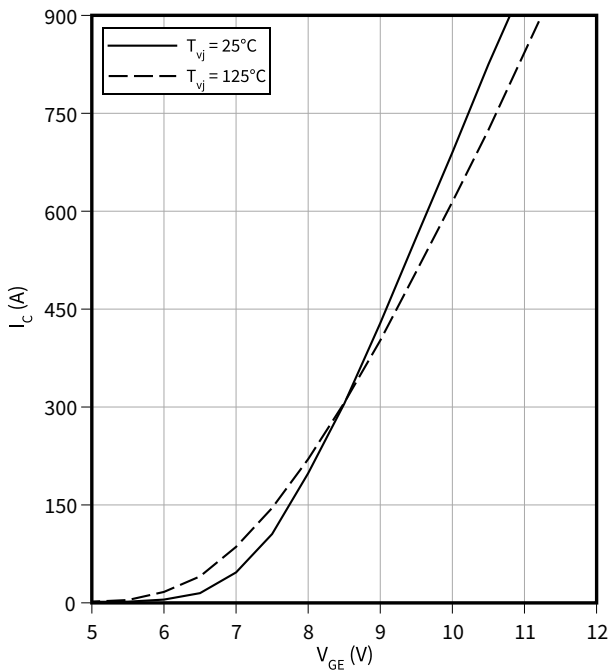
Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$
 $T_{vj} = 125\text{ °C}$



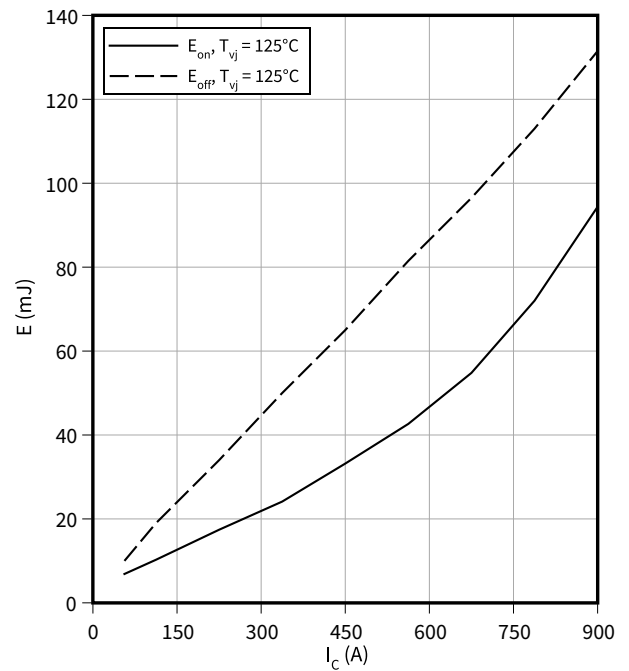
Transfer characteristic (typical), IGBT, Inverter

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



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$
 $R_{Goff} = 1.6\ \Omega, R_{Gon} = 1.6\ \Omega, V_{GE} = \pm 15\text{ V}, V_{CC} = 600\text{ V}$

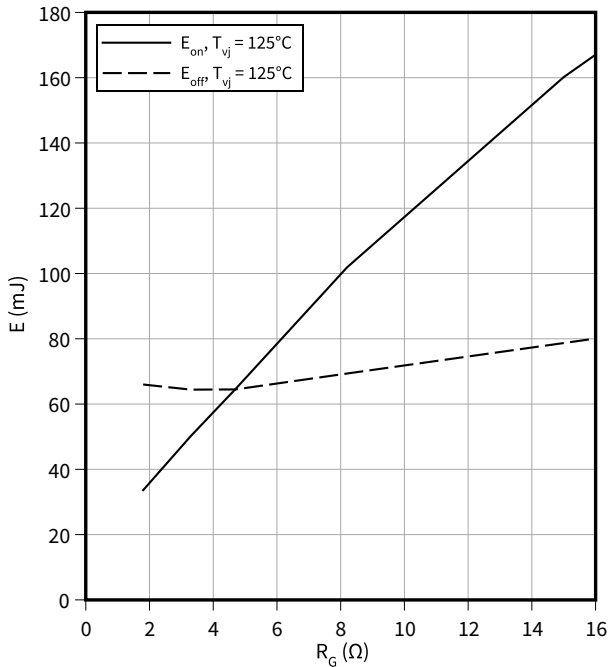


5 Characteristics diagrams

Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

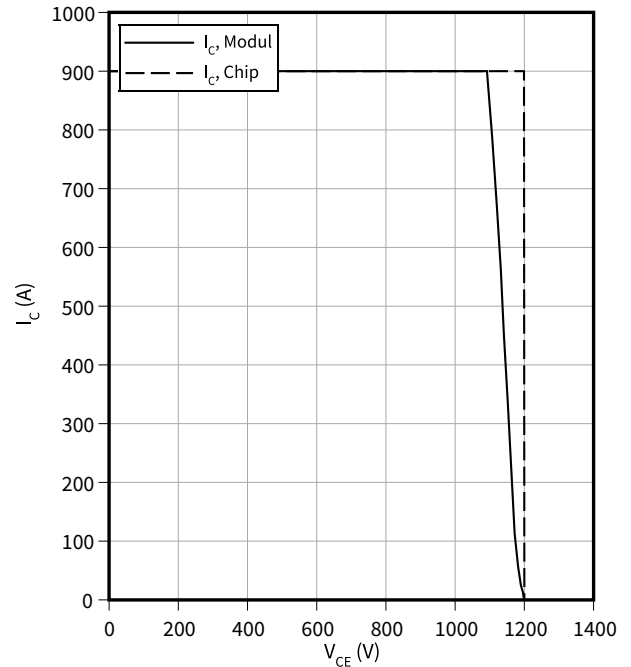
$V_{GE} = \pm 15 \text{ V}, I_C = 450 \text{ A}, V_{CC} = 600 \text{ V}$



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

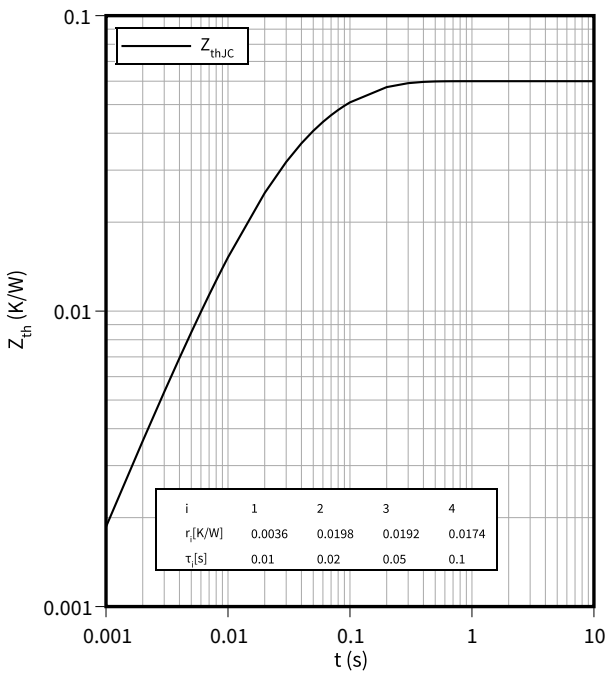
$I_C = f(V_{CE})$

$R_{Goff} = 1.6 \Omega, V_{GE} = \pm 15 \text{ V}, T_{vj} = 125 \text{ °C}$



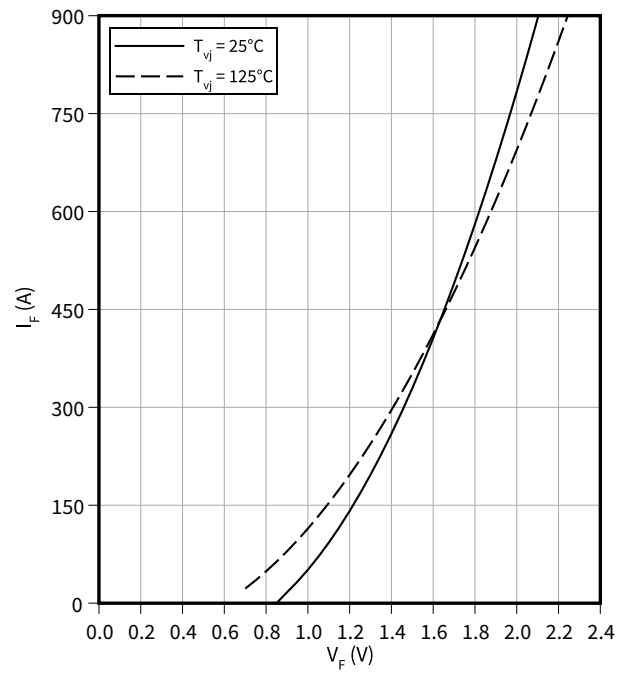
Transient thermal impedance, IGBT, Inverter

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, Inverter

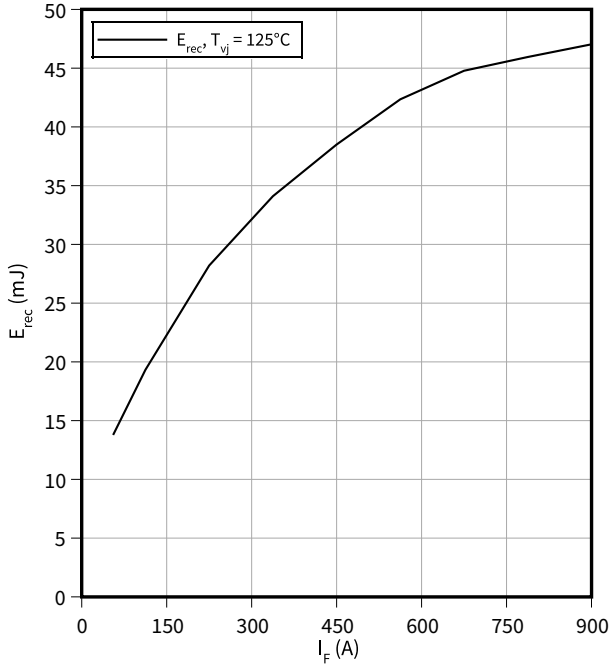
$I_F = f(V_F)$



5 Characteristics diagrams

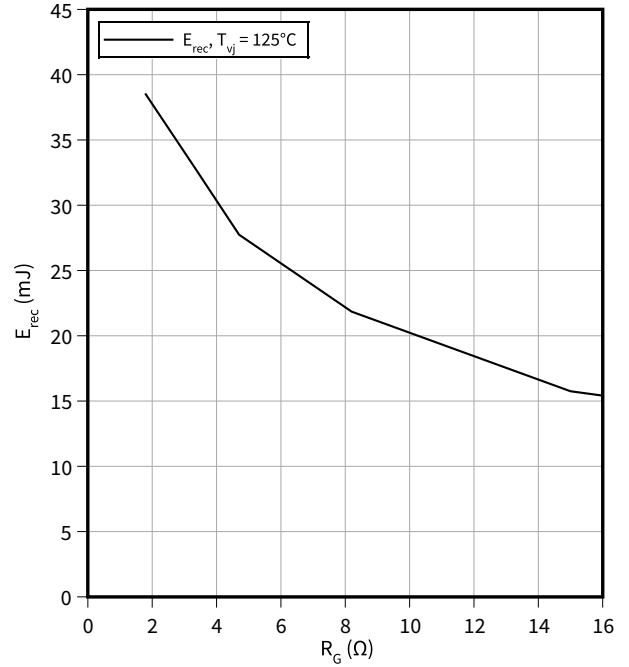
Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$
 $R_{Gon} = 1.6 \Omega, V_{CE} = 600 V$



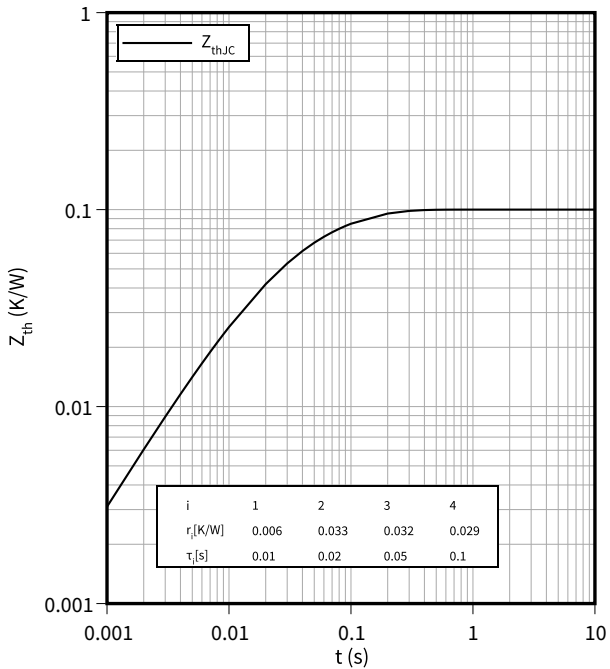
Switching losses (typical), Diode, Inverter

$E_{rec} = f(R_G)$
 $V_{CE} = 600 V, I_F = 450 A$



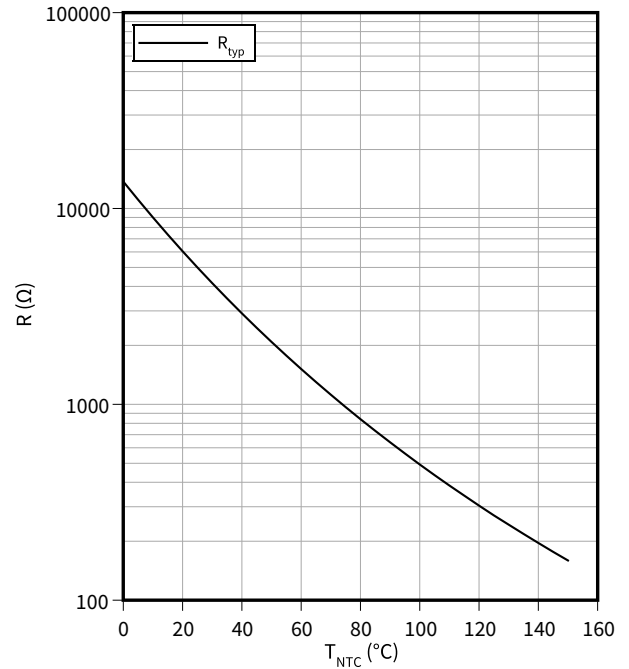
Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



6 Circuit diagram

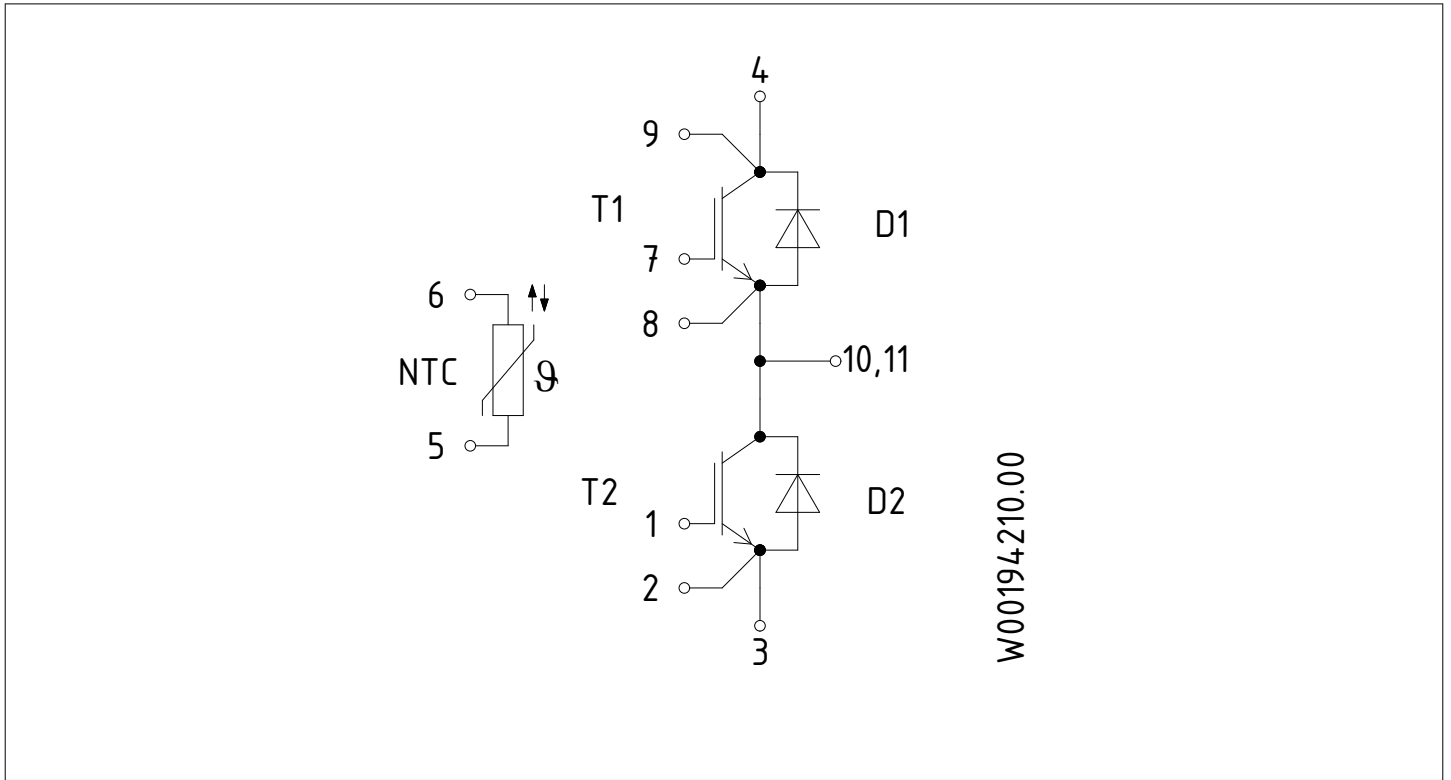


Figure 1

8 Module label code


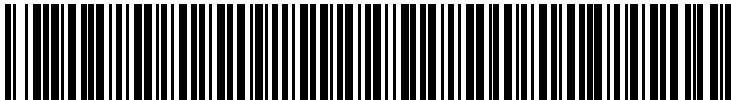
Module label code			
Code format	Data Matrix	Barcode Code128	
Encoding	ASCII text	Code Set A	
Symbol size	16x16	23 digits	
Standard	IEC24720 and IEC16022	IEC8859-1	
Code content	<i>Content</i> Module serial number Module material number Production order number Date code (production year) Date code (production 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	2004-04-05	Target datasheet
V1.1	2004-06-17	Target datasheet
V1.2	2004-08-17	Target datasheet
V1.3	2004-12-03	Target datasheet
V2.0	2005-11-10	Preliminary datasheet
V2.1	2007-06-04	Preliminary datasheet
V2.2	2011-03-04	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
0.20	2025-09-09	Preliminary datasheet

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