

Final datasheet

62 mm C-Series module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode

Features

- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_{C\text{ nom}} = 1000\text{ A} / I_{CRM} = 2000\text{ A}$
 - TRENCHSTOP™ IGBT7
 - $V_{CE,sat}$ with positive temperature coefficient
 - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- Mechanical features
 - Standard housing
 - 4 kV AC 1 min insulation
 - High creepage and clearance distances
 - High power density
 - Isolated base plate
 - Package with CTI > 400



Potential applications

- Three-level applications
- Commercial agriculture vehicles
- High-power converters
- Motor drives
- Servo drives
- Solar applications
- UPS systems

Product validation

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

Description

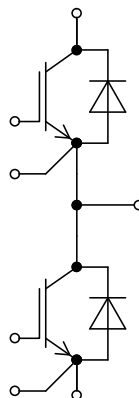


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 60 \text{ s}$	4.0	kV
Material of module baseplate			Cu	
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	$d_{Creep \text{ nom}}$	terminal to baseplate, nom.	29.0	mm
Creepage distance	$d_{Creep \text{ nom}}$	terminal to terminal, nom.	23.0	mm
Clearance	$d_{Clear \text{ nom}}$	terminal to baseplate, nom.	23.0	mm
Clearance	$d_{Clear \text{ nom}}$	terminal to terminal, nom.	11.0	mm
Comparative tracking index	CTI		> 400	
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	$R_{CC'+EE'}$	$T_C = 25 \text{ °C}$, per switch		0.5		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	2.5		5	Nm
Weight	G			340		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}	$T_{vj \text{ max}} = 175 \text{ °C}$ $T_C = 90 \text{ °C}$	905	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj \text{ op}}$	2000	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	$V_{CE\ sat}$	$I_C = 1000\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$		1.50	1.75	V
			$T_{vj} = 125\ ^\circ C$		1.65		
			$T_{vj} = 150\ ^\circ C$		1.70		
			$T_{vj} = 175\ ^\circ C$		1.75		
Gate threshold voltage	V_{GEth}	$I_C = 20\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$		5.15	5.80	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CC} = 600\ V, T_{vj} = 25\ ^\circ C$			16		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$			0.43		Ω
Input capacitance	C_{ies}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			153		nF
Reverse transfer capacitance	C_{res}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.8		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$			0.1	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\ V, V_{GE} = 20\ V, T_{vj} = 25\ ^\circ C$				100	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 1000\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.75\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.601		μs
			$T_{vj} = 125\ ^\circ C$		0.625		
			$T_{vj} = 150\ ^\circ C$		0.632		
			$T_{vj} = 175\ ^\circ C$		0.638		
Rise time (inductive load)	t_r	$I_C = 1000\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.75\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.090		μs
			$T_{vj} = 125\ ^\circ C$		0.101		
			$T_{vj} = 150\ ^\circ C$		0.105		
			$T_{vj} = 175\ ^\circ C$		0.108		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 1000\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 0.75\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.586		μs
			$T_{vj} = 125\ ^\circ C$		0.666		
			$T_{vj} = 150\ ^\circ C$		0.690		
			$T_{vj} = 175\ ^\circ C$		0.713		
Fall time (inductive load)	t_f	$I_C = 1000\ A, V_{CC} = 600\ V, V_{GE} = \pm 15\ V, R_{Goff} = 0.75\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.113		μs
			$T_{vj} = 125\ ^\circ C$		0.266		
			$T_{vj} = 150\ ^\circ C$		0.319		
			$T_{vj} = 175\ ^\circ C$		0.368		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-on energy loss per pulse	E_{on}	$I_C = 1000\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 25\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 0.75\text{ }\Omega$, $di/dt = 8400\text{ A}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$	82.2		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	120		
			$T_{vj} = 150\text{ }^\circ\text{C}$	131		
			$T_{vj} = 175\text{ }^\circ\text{C}$	144		
Turn-off energy loss per pulse	E_{off}	$I_C = 1000\text{ A}$, $V_{CC} = 600\text{ V}$, $L_\sigma = 25\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 0.75\text{ }\Omega$, $dv/dt = 3200\text{ V}/\mu\text{s}$ ($T_{vj} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$	79.3		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	129		
			$T_{vj} = 150\text{ }^\circ\text{C}$	144		
			$T_{vj} = 175\text{ }^\circ\text{C}$	160		
SC data	I_{SC}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 800\text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 8\text{ }\mu\text{s}$, $T_{vj} = 150\text{ }^\circ\text{C}$	3900		A
			$t_p \leq 6\text{ }\mu\text{s}$, $T_{vj} = 175\text{ }^\circ\text{C}$	3700		
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.046	K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 5\text{ W}/(\text{m}\cdot\text{K})$		0.014		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		175	$^\circ\text{C}$

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			800	A
Repetitive peak forward current	I_{FRM}	$t_p = 1\text{ ms}$		1600	A
I^2t - value	I^2t	$t_p = 10\text{ ms}$, $V_R = 0\text{ V}$	$T_{vj} = 125\text{ }^\circ\text{C}$	53000	A^2s
			$T_{vj} = 175\text{ }^\circ\text{C}$	41000	

Table 6 **Characteristic values**

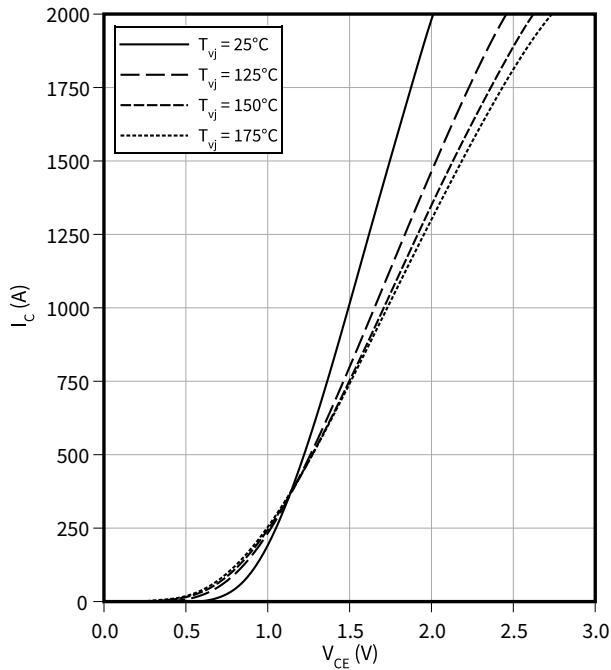
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 800 \text{ A}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$	1.80	2.10	V
			$T_{vj} = 125 \text{ °C}$	1.70		
			$T_{vj} = 150 \text{ °C}$	1.65		
			$T_{vj} = 175 \text{ °C}$	1.60		
Peak reverse recovery current	I_{RM}	$V_{CC} = 600 \text{ V}$, $I_F = 800 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 8400 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	438		A
			$T_{vj} = 125 \text{ °C}$	578		
			$T_{vj} = 150 \text{ °C}$	621		
			$T_{vj} = 175 \text{ °C}$	661		
Recovered charge	Q_r	$V_{CC} = 600 \text{ V}$, $I_F = 800 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 8400 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	45.2		μC
			$T_{vj} = 125 \text{ °C}$	96.3		
			$T_{vj} = 150 \text{ °C}$	114		
			$T_{vj} = 175 \text{ °C}$	133		
Reverse recovery energy	E_{rec}	$V_{CC} = 600 \text{ V}$, $I_F = 800 \text{ A}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 8400 \text{ A}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	15.1		mJ
			$T_{vj} = 125 \text{ °C}$	34.5		
			$T_{vj} = 150 \text{ °C}$	41.7		
			$T_{vj} = 175 \text{ °C}$	48.8		
Thermal resistance, junction to case	R_{thJC}	per diode			0.104	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 5 \text{ W}/(\text{m}\cdot\text{K})$		0.03		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		175	°C

4 Characteristics diagrams

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

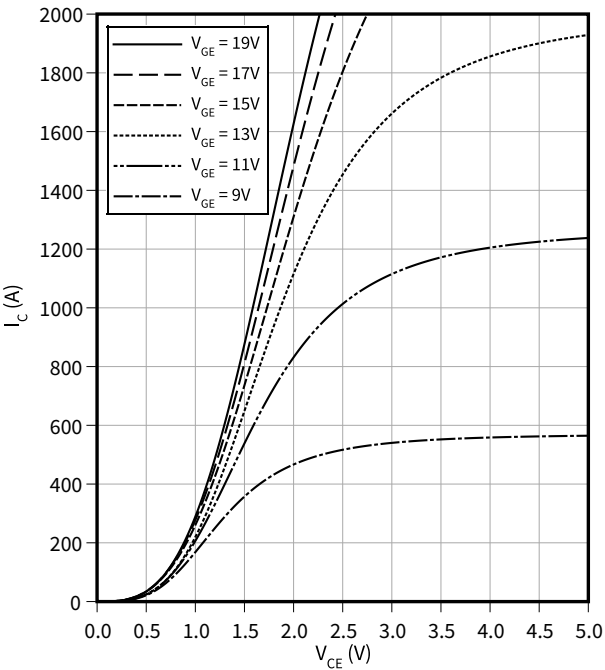
$V_{GE} = 15\text{ V}$



Output characteristic field (typical), IGBT, Inverter

$I_C = f(V_{CE})$

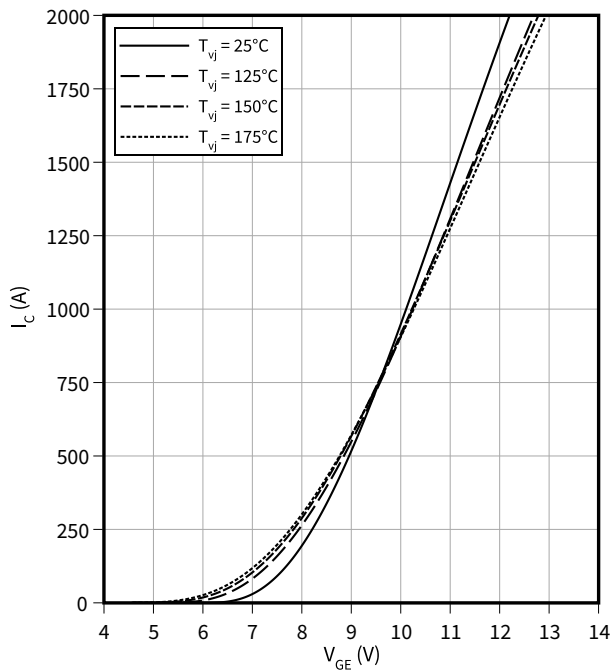
$T_{vj} = 175^\circ\text{C}$



Transfer characteristic (typical), IGBT, Inverter

$I_C = f(V_{GE})$

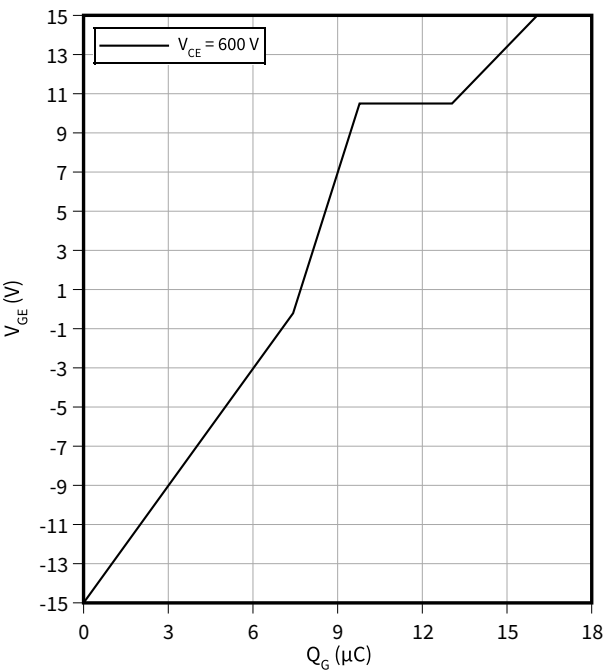
$V_{CE} = 20\text{ V}$



Gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$

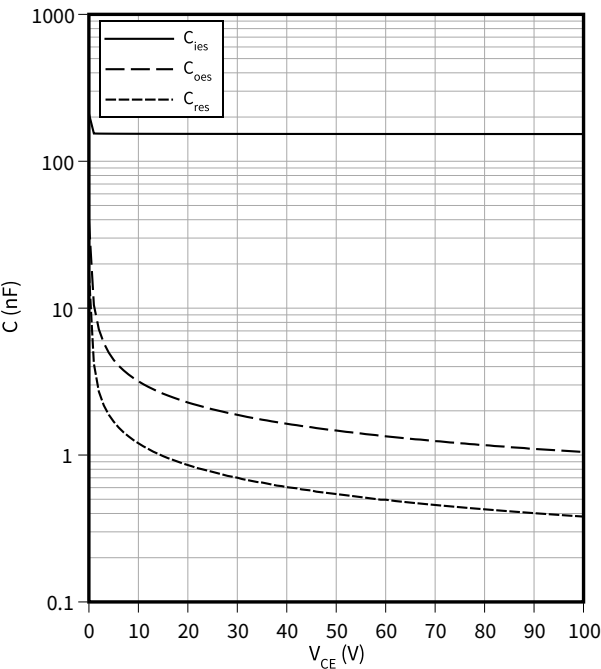
$I_C = 1000\text{ A}, T_{vj} = 25^\circ\text{C}$



4 Characteristics diagrams

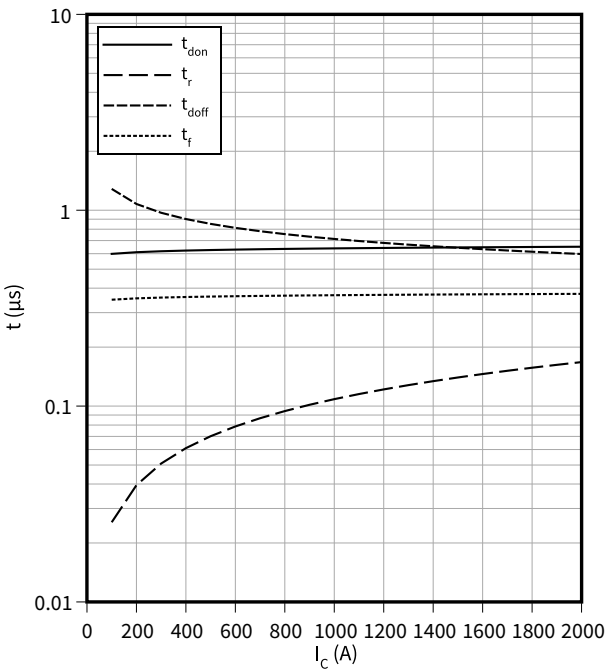
Capacity characteristic (typical), IGBT, Inverter

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



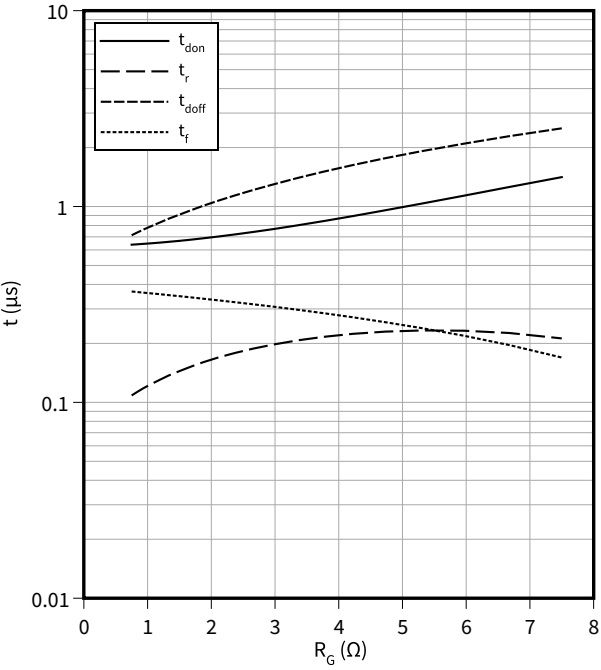
Switching times (typical), IGBT, Inverter

$t = f(I_C)$
 $R_{Goff} = 0.75 \text{ } \Omega$, $R_{Gon} = 0.75 \text{ } \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 600 \text{ V}$, $T_{vj} = 175 \text{ }^{\circ}\text{C}$



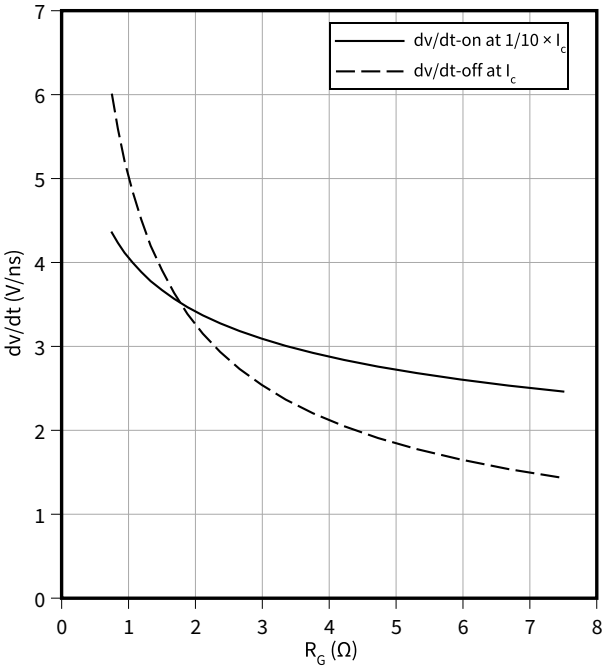
Switching times (typical), IGBT, Inverter

$t = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 1000 \text{ A}$, $V_{CC} = 600 \text{ V}$, $T_{vj} = 175 \text{ }^{\circ}\text{C}$



Voltage slope (typical), IGBT, Inverter

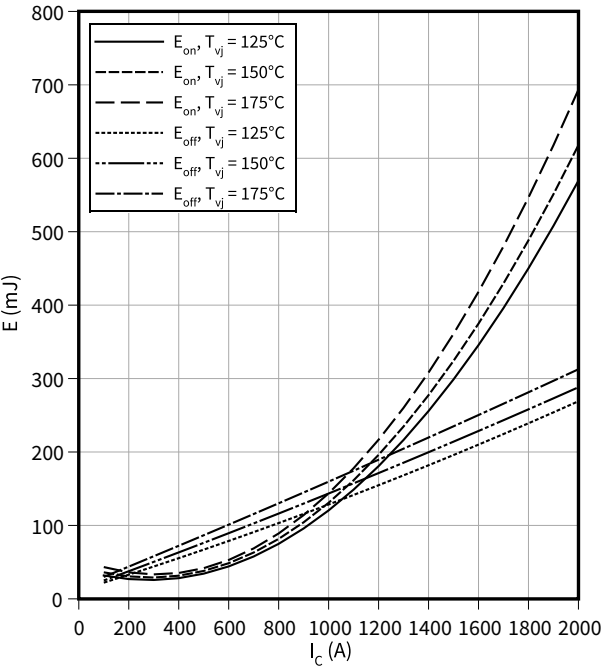
$dv/dt = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 1000 \text{ A}$, $V_{CC} = 600 \text{ V}$, $T_{vj} = 25 \text{ }^{\circ}\text{C}$



4 Characteristics diagrams

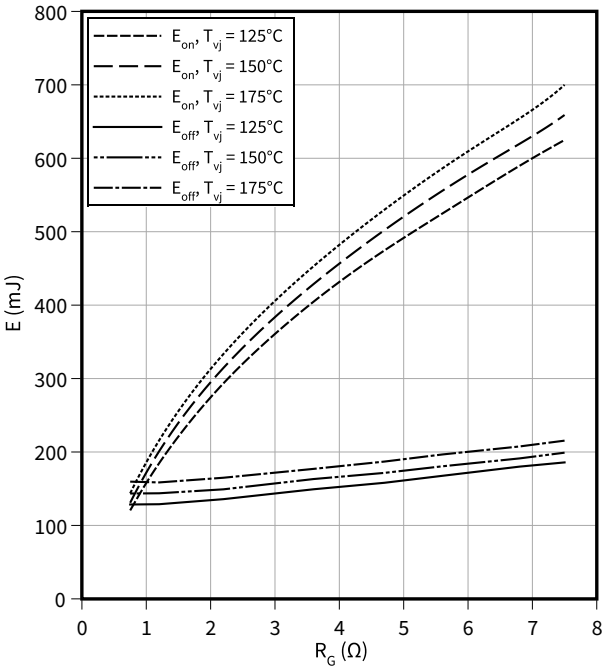
Switching losses (typical), IGBT, Inverter

$E = f(I_C)$
 $R_{Goff} = 0.75 \Omega$, $R_{Gon} = 0.75 \Omega$, $V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 600 \text{ V}$



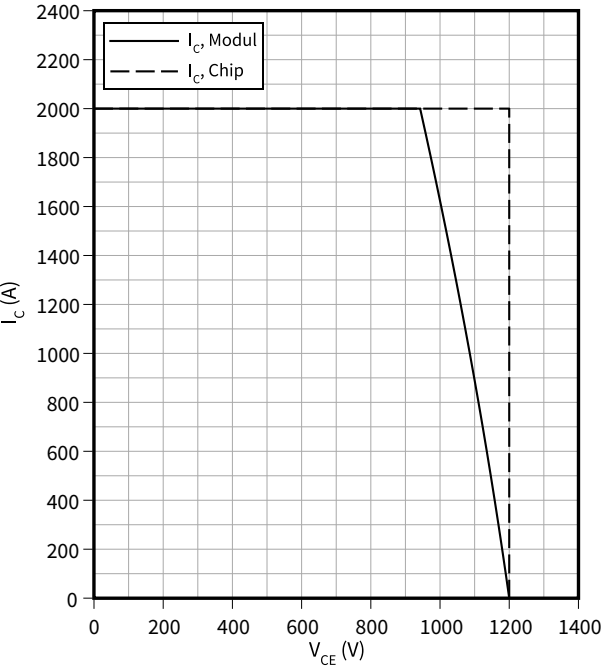
Switching losses (typical), IGBT, Inverter

$E = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 1000 \text{ A}$, $V_{CC} = 600 \text{ V}$



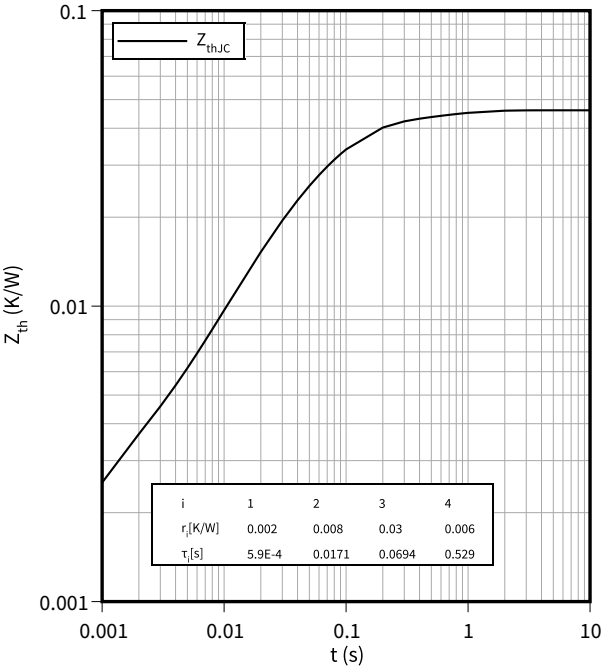
Reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$
 $R_{Goff} = 0.75 \Omega$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 175 \text{ °C}$



Transient thermal impedance, IGBT, Inverter

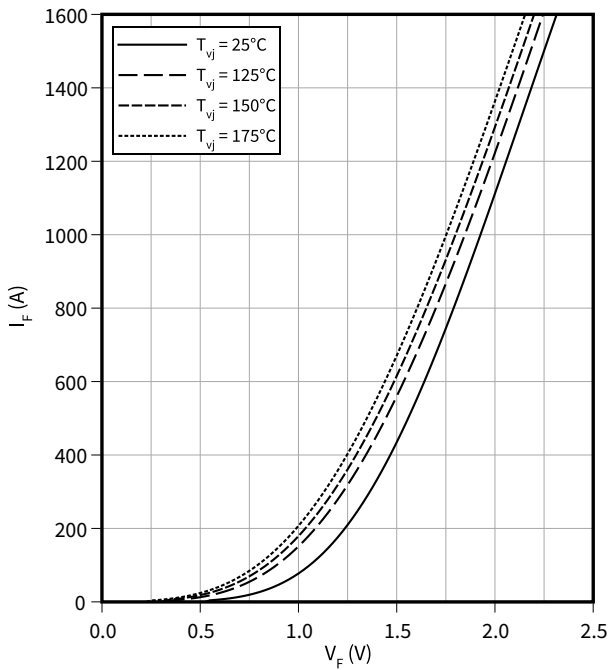
$Z_{th} = f(t)$



4 Characteristics diagrams

Forward characteristic (typical), Diode, Inverter

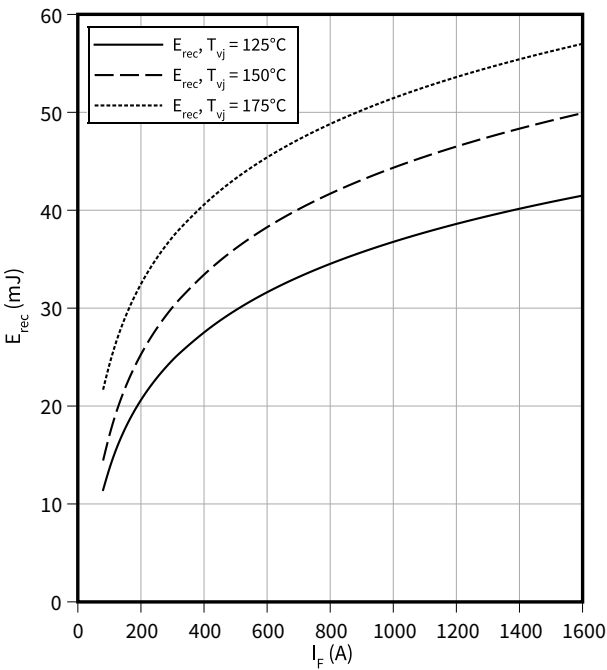
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

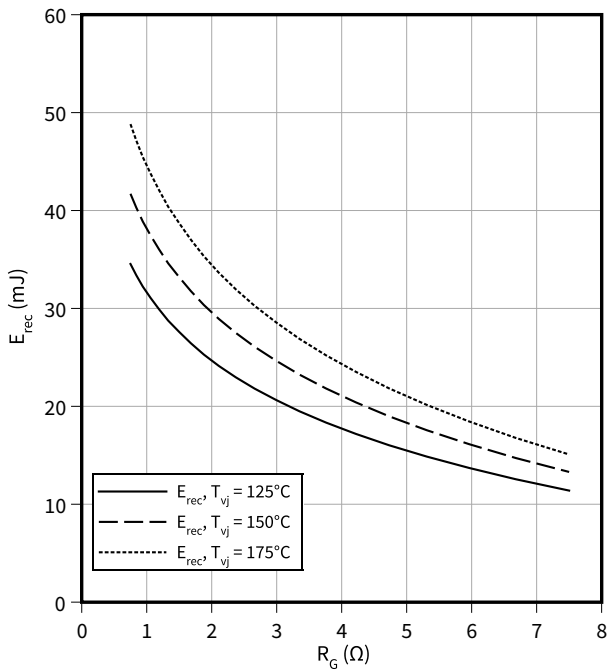
$R_{Gon} = 0.75\ \Omega, V_{CE} = 600\ \text{V}$



Switching losses (typical), Diode, Inverter

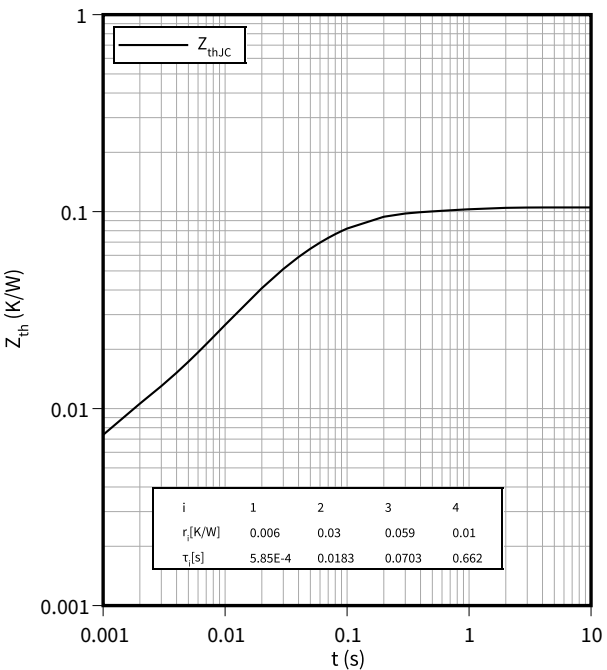
$E_{rec} = f(R_G)$

$V_{CE} = 600\ \text{V}, I_F = 800\ \text{A}$



Transient thermal impedance, Diode, Inverter

$Z_{th} = f(t)$



5 **Circuit diagram**

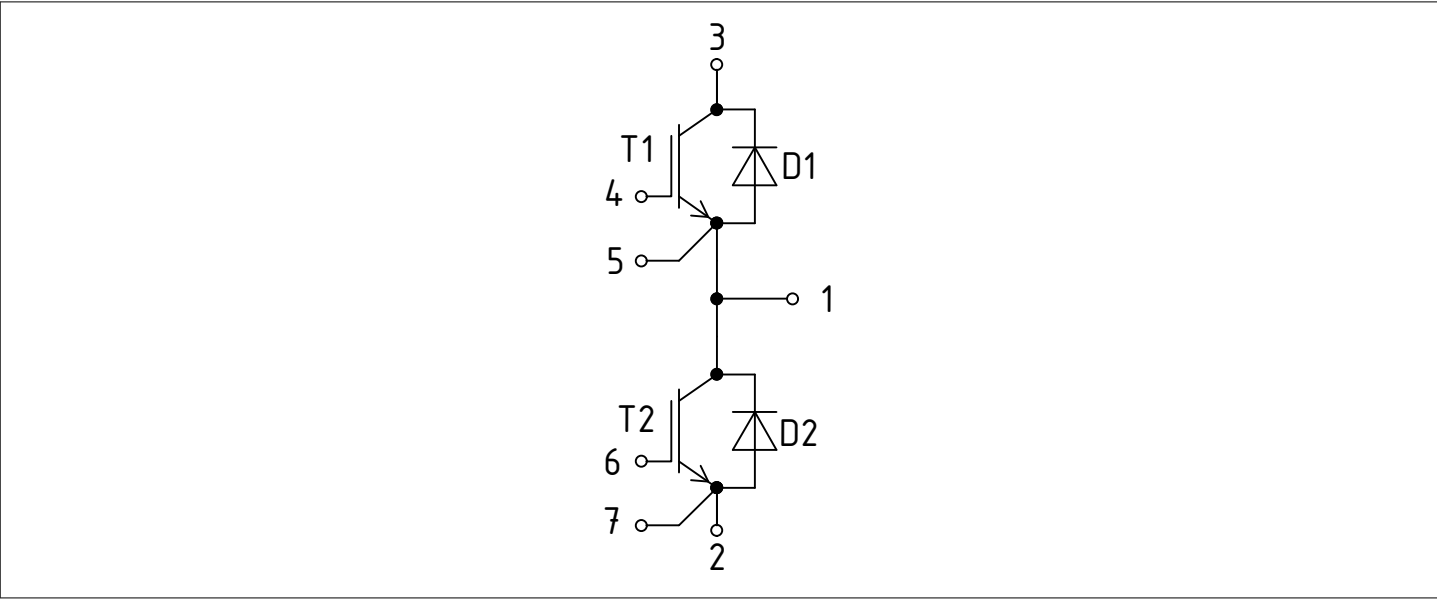


Figure 1



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	<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

Revision history

Document revision	Date of release	Description of changes
0.10	2024-06-12	Initial version
0.20	2024-07-16	Target datasheet
0.30	2024-09-13	Preliminary datasheet
1.00	2025-09-01	Final datasheet

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Email: erratum@infineon.com

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