

Final datasheet

EasyPACK™ module with TRENCHSTOP™ 5 and RAPID 1 diode and PressFIT / pre-applied thermal interface material / NTC

Features

- Electrical features
 - $V_{CES} = 650\text{ V}$
 - $I_{C\text{nom}} = 75\text{ A} / I_{CRM} = 150\text{ A}$
 - Low switching losses
 - Increased blocking voltage capability up to 650 V
 - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- Mechanical features
 - Al_2O_3 substrate with low thermal resistance
 - Compact design
 - PressFIT contact technology
 - Rugged mounting due to integrated mounting clamps
 - Pre-applied thermal interface material



Typical appearance

Potential applications

- UPS systems
- Three-level applications

Product validation

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

Description

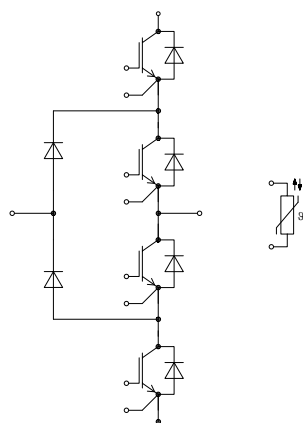


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1 Package

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
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}			23		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_H = 25$ °C, per switch		1.1		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25$ °C, per switch		1.4		mΩ
Storage temperature	T_{stg}		-40		125	°C
Maximum baseplate operation temperature	T_{BPmax}				125	°C
Mounting force per clamp	F		40		80	N
Weight	G			39		g

Note: The current under continuous operation is limited to 25A rms per connector pin.
Storage and shipment of modules with TIM => see AN 2012-07

2 IGBT, T1 / T4

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	V_{CES}	$T_{vj} = 25$ °C	650	V
Implemented collector current	I_{CN}		75	A
Continuous DC collector current	I_{CDC}	$T_{vj\ max} = 175$ °C $T_H = 65$ °C	50	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\ op}$	150	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	$V_{CE\ sat}$	$I_C = 75\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$		1.42	1.90	V
			$T_{vj} = 125\ ^\circ C$		1.53		
			$T_{vj} = 150\ ^\circ C$		1.56		
Gate threshold voltage	V_{GETh}	$I_C = 0.75\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$		3.25	4	4.75	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CC} = 400\ V$			0.315		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$			0		Ω
Input capacitance	C_{ies}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			5.17		nF
Reverse transfer capacitance	C_{res}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.018		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 650\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$			79	μA
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}	$I_C = 75\ A, V_{CC} = 300\ V, V_{GE} = \pm 15\ V, R_{Gon} = 10\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.022		μs
			$T_{vj} = 125\ ^\circ C$		0.023		
			$T_{vj} = 150\ ^\circ C$		0.023		
Rise time (inductive load)	t_r	$I_C = 75\ A, V_{CC} = 300\ V, V_{GE} = \pm 15\ V, R_{Gon} = 10\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.019		μs
			$T_{vj} = 125\ ^\circ C$		0.022		
			$T_{vj} = 150\ ^\circ C$		0.022		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 75\ A, V_{CC} = 300\ V, V_{GE} = \pm 15\ V, R_{Goff} = 1.5\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.093		μs
			$T_{vj} = 125\ ^\circ C$		0.110		
			$T_{vj} = 150\ ^\circ C$		0.110		
Fall time (inductive load)	t_f	$I_C = 75\ A, V_{CC} = 300\ V, V_{GE} = \pm 15\ V, R_{Goff} = 1.5\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.018		μs
			$T_{vj} = 125\ ^\circ C$		0.048		
			$T_{vj} = 150\ ^\circ C$		0.062		
Turn-on energy loss per pulse	E_{on}	$I_C = 75\ A, V_{CC} = 300\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 10\ \Omega, di/dt = 3100\ A/\mu s (T_{vj} = 150\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		0.85		mJ
			$T_{vj} = 125\ ^\circ C$		1.13		
			$T_{vj} = 150\ ^\circ C$		1.2		
Turn-off energy loss per pulse	E_{off}	$I_C = 75\ A, V_{CC} = 300\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 1.5\ \Omega, dv/dt = 6900\ V/\mu s (T_{vj} = 150\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		0.53		mJ
			$T_{vj} = 125\ ^\circ C$		0.95		
			$T_{vj} = 150\ ^\circ C$		1.05		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, Valid with IFX pre-applied Thermal Interface Material, $\lambda_{grease} = 1\ W/(m \cdot K)$				1.17	K/W

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Temperature under switching conditions	$T_{vj\ op}$		-40		150	°C

3 IGBT, T2 / T3

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	V_{CES}	$T_{vj} = 25\ ^\circ\text{C}$	650	V
Implemented collector current	I_{CN}		150	A
Continuous DC collector current	I_{CDC}	$T_{vj\ max} = 175\ ^\circ\text{C}$ $T_H = 65\ ^\circ\text{C}$	85	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\ op}$	300	A
Gate-emitter peak voltage	V_{GES}		±20	V

Table 6 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\ sat}$	$I_C = 150\ \text{A}, V_{GE} = 15\ \text{V}$	$T_{vj} = 25\ ^\circ\text{C}$	1.42	1.90	V
			$T_{vj} = 125\ ^\circ\text{C}$	1.53		
			$T_{vj} = 150\ ^\circ\text{C}$	1.56		
Gate threshold voltage	V_{GEth}	$I_C = 1.5\ \text{mA}, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ\text{C}$	3.25	4	4.75	V
Gate charge	Q_G	$V_{GE} = \pm 15\ \text{V}, V_{CC} = 400\ \text{V}$		0.63		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ\text{C}$		0		Ω
Input capacitance	C_{ies}	$f = 100\ \text{kHz}, T_{vj} = 25\ ^\circ\text{C}, V_{CE} = 25\ \text{V}, V_{GE} = 0\ \text{V}$		10.34		nF
Reverse transfer capacitance	C_{res}	$f = 100\ \text{kHz}, T_{vj} = 25\ ^\circ\text{C}, V_{CE} = 25\ \text{V}, V_{GE} = 0\ \text{V}$		0.036		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 650\ \text{V}, V_{GE} = 0\ \text{V}$ $T_{vj} = 25\ ^\circ\text{C}$			93	μA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\ \text{V}, V_{GE} = 20\ \text{V}, T_{vj} = 25\ ^\circ\text{C}$			100	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 150\ \text{A}, V_{CC} = 300\ \text{V}, V_{GE} = \pm 15\ \text{V}, R_{Gon} = 20\ \Omega$	$T_{vj} = 25\ ^\circ\text{C}$	0.072		μs
			$T_{vj} = 125\ ^\circ\text{C}$	0.065		
			$T_{vj} = 150\ ^\circ\text{C}$	0.064		

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rise time (inductive load)	t_r	$I_C = 150 \text{ A}, V_{CC} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}, R_{Gon} = 20 \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.053		μs
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.059		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	0.060		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 150 \text{ A}, V_{CC} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}, R_{Goff} = 56 \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.660		μs
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.690		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	0.700		
Fall time (inductive load)	t_f	$I_C = 150 \text{ A}, V_{CC} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}, R_{Goff} = 56 \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.032		μs
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.035		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	0.040		
Turn-on energy loss per pulse	E_{on}	$I_C = 150 \text{ A}, V_{CC} = 300 \text{ V}, L_\sigma = 35 \text{ nH}, V_{GE} = \pm 15 \text{ V}, R_{Gon} = 20 \Omega, di/dt = 2300 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	3.85		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	4.7		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	4.76		
Turn-off energy loss per pulse	E_{off}	$I_C = 150 \text{ A}, V_{CC} = 300 \text{ V}, L_\sigma = 35 \text{ nH}, V_{GE} = \pm 15 \text{ V}, R_{Goff} = 56 \Omega, dv/dt = 3700 \text{ V}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$	2.73		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	2.94		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	3.07		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, Valid with IFX pre-applied Thermal Interface Material, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$			0.708	K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	$^\circ\text{C}$

4 Diode, D1 / D4

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = 25 \text{ }^\circ\text{C}$	650	V	
Implemented forward current	I_{FN}		225	A	
Continuous DC forward current	I_F		150	A	
Repetitive peak forward current	I_{FRM}	$t_p = 1 \text{ ms}$	450	A	
I^2t - value	I^2t	$t_p = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ }^\circ\text{C}$	3850	A^2s
			$T_{vj} = 150 \text{ }^\circ\text{C}$	3680	

Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	V_F	$I_F = 150 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$		1.34	1.73	V
			$T_{vj} = 125 \text{ °C}$		1.29		
			$T_{vj} = 150 \text{ °C}$		1.25		
Peak reverse recovery current	I_{RM}	$V_{CC} = 300 \text{ V}, I_F = 150 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2300 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ °C})$	$T_{vj} = 25 \text{ °C}$		51		A
			$T_{vj} = 125 \text{ °C}$		84		
			$T_{vj} = 150 \text{ °C}$		92		
Recovered charge	Q_r	$V_{CC} = 300 \text{ V}, I_F = 150 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2300 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ °C})$	$T_{vj} = 25 \text{ °C}$		3.72		μC
			$T_{vj} = 125 \text{ °C}$		8.65		
			$T_{vj} = 150 \text{ °C}$		10.2		
Reverse recovery energy	E_{rec}	$V_{CC} = 300 \text{ V}, I_F = 150 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2300 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ °C})$	$T_{vj} = 25 \text{ °C}$		0.44		mJ
			$T_{vj} = 125 \text{ °C}$		1.1		
			$T_{vj} = 150 \text{ °C}$		1.4		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$			0.718	K/W	
Temperature under switching conditions	$T_{vj\text{op}}$		-40		150	°C	

5 Diode, D2 / D3

Table 9 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = 25 \text{ °C}$	650	V	
Implemented forward current	I_{FN}		225	A	
Continuous DC forward current	I_F		150	A	
Repetitive peak forward current	I_{FRM}	$t_p = 1 \text{ ms}$	450	A	
I^2t - value	I^2t	$t_p = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ °C}$	3850	A^2s
			$T_{vj} = 150 \text{ °C}$	3680	

Table 10 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	V_F	$I_F = 150 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$		1.34	1.73	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$		1.29		
			$T_{vj} = 150 \text{ }^\circ\text{C}$		1.25		
Peak reverse recovery current	I_{RM}	$V_{CC} = 300 \text{ V}, I_F = 150 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2300 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$		51		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$		84		
			$T_{vj} = 150 \text{ }^\circ\text{C}$		92		
Recovered charge	Q_r	$V_{CC} = 300 \text{ V}, I_F = 150 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2300 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$		3.72		μC
			$T_{vj} = 125 \text{ }^\circ\text{C}$		8.65		
			$T_{vj} = 150 \text{ }^\circ\text{C}$		10.2		
Reverse recovery energy	E_{rec}	$V_{CC} = 300 \text{ V}, I_F = 150 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 2300 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$		0.44		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$		1.1		
			$T_{vj} = 150 \text{ }^\circ\text{C}$		1.4		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$			0.718	K/W	
Temperature under switching conditions	$T_{vj\text{op}}$		-40		150	$^\circ\text{C}$	

6 Diode, D5 / D6

Table 11 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = 25 \text{ }^\circ\text{C}$	650	V	
Implemented forward current	I_{FN}		150	A	
Continuous DC forward current	I_F		75	A	
Repetitive peak forward current	I_{FRM}	$t_p = 1 \text{ ms}$	300	A	
I^2t - value	I^2t	$t_p = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ }^\circ\text{C}$	1810	A^2s
			$T_{vj} = 150 \text{ }^\circ\text{C}$	1720	

Table 12 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	V_F	$I_F = 75 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$		1.25	1.57	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$		1.17		
			$T_{vj} = 150 \text{ }^\circ\text{C}$		1.13		
Peak reverse recovery current	I_{RM}	$V_{CC} = 300 \text{ V}, I_F = 75 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 3100 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$		70		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$		110		
			$T_{vj} = 150 \text{ }^\circ\text{C}$		121		
Recovered charge	Q_r	$V_{CC} = 300 \text{ V}, I_F = 75 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 3100 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$		2.69		μC
			$T_{vj} = 125 \text{ }^\circ\text{C}$		5.67		
			$T_{vj} = 150 \text{ }^\circ\text{C}$		6.59		
Reverse recovery energy	E_{rec}	$V_{CC} = 300 \text{ V}, I_F = 75 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 3100 \text{ A}/\mu\text{s} (T_{vj} = 150 \text{ }^\circ\text{C})$	$T_{vj} = 25 \text{ }^\circ\text{C}$		0.37		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$		1.03		
			$T_{vj} = 150 \text{ }^\circ\text{C}$		1.27		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material, $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$			1.00		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$			-40		150	$^\circ\text{C}$

7 NTC-Thermistor

Table 13 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25 \text{ }^\circ\text{C}$		5		k Ω
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100 \text{ }^\circ\text{C}, R_{100} = 493 \text{ } \Omega$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25 \text{ }^\circ\text{C}$			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

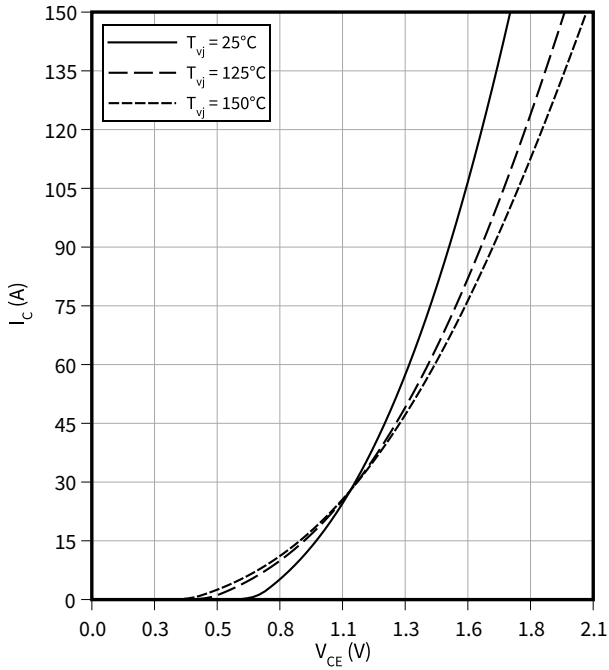
Note: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

8 Characteristics diagrams

Output characteristic (typical), IGBT, T1 / T4

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

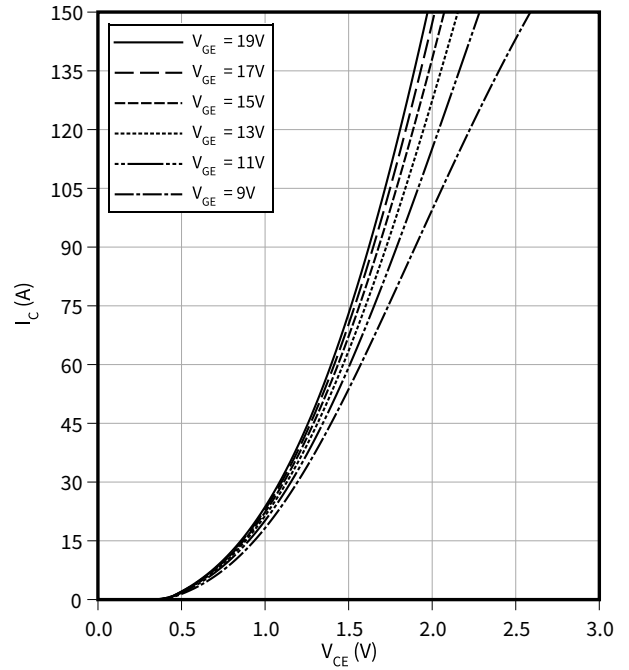
$$V_{GE} = 15 \text{ V}$$



Output characteristic field (typical), IGBT, T1 / T4

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

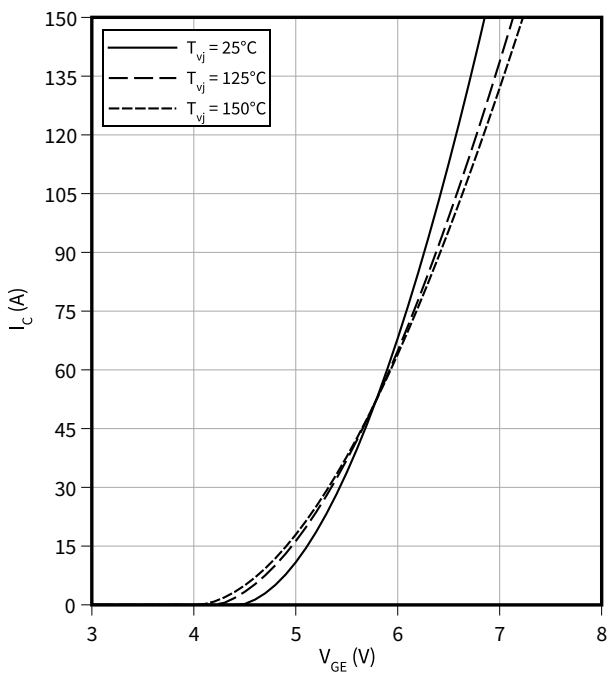
$$T_{vj} = 150 \text{ °C}$$



Transfer characteristic (typical), IGBT, T1 / T4

$$I_C = f(V_{GE})$$

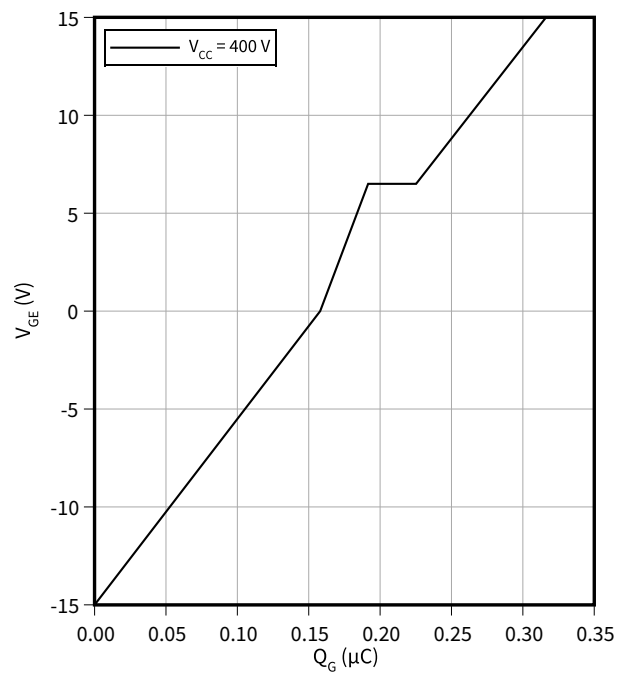
$$V_{CE} = 20 \text{ V}$$



Gate charge characteristic (typical), IGBT, T1 / T4

$$V_{GE} = f(Q_G)$$

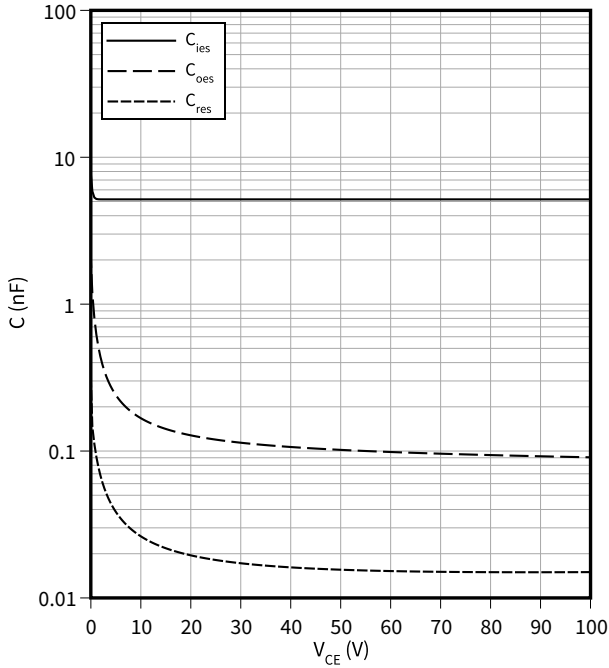
$$I_C = 75 \text{ A}, T_{vj} = 25 \text{ °C}$$



Capacity characteristic (typical), IGBT, T1 / T4

$C = f(V_{CE})$

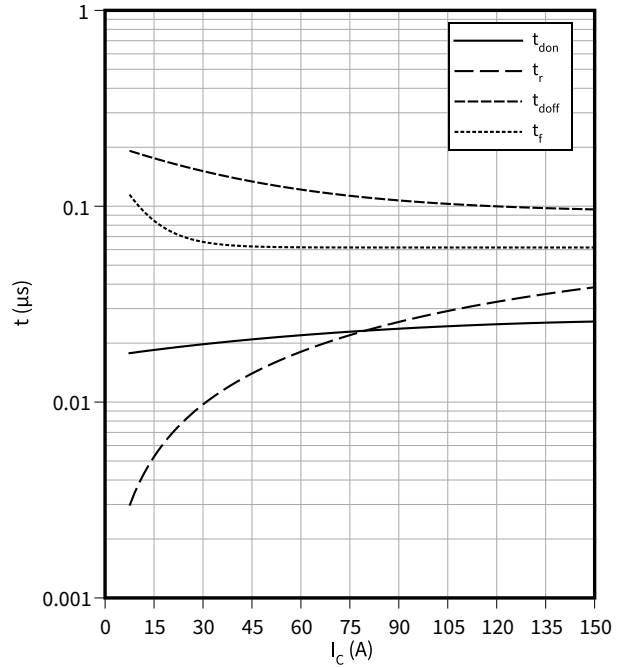
$f = 100 \text{ kHz}, V_{GE} = 0 \text{ V}, T_{vj} = 25 \text{ °C}$



Switching times (typical), IGBT, T1 / T4

$t = f(I_C)$

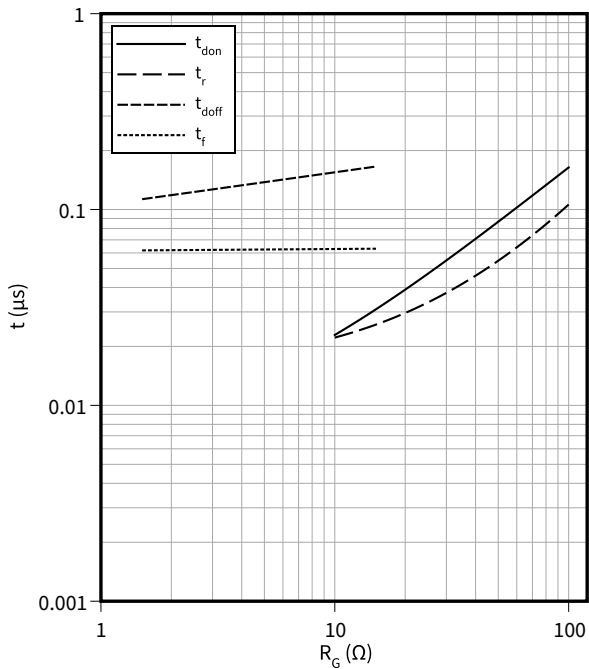
$R_{Goff} = 1.5 \text{ } \Omega, R_{Gon} = 10 \text{ } \Omega, V_{CC} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 150 \text{ °C}$



Switching times (typical), IGBT, T1 / T4

$t = f(R_G)$

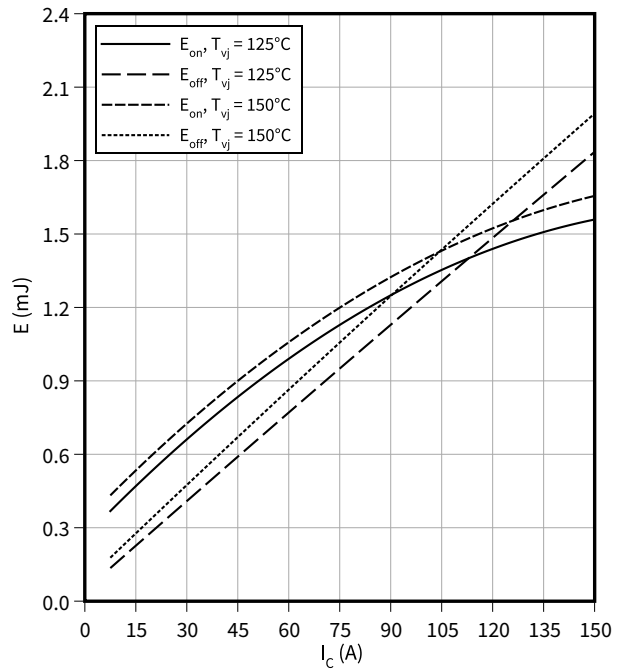
$I_C = 75 \text{ A}, V_{CC} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 150 \text{ °C}$



Switching losses (typical), IGBT, T1 / T4

$E = f(I_C)$

$R_{Goff} = 1.5 \text{ } \Omega, R_{Gon} = 10 \text{ } \Omega, V_{CC} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}$

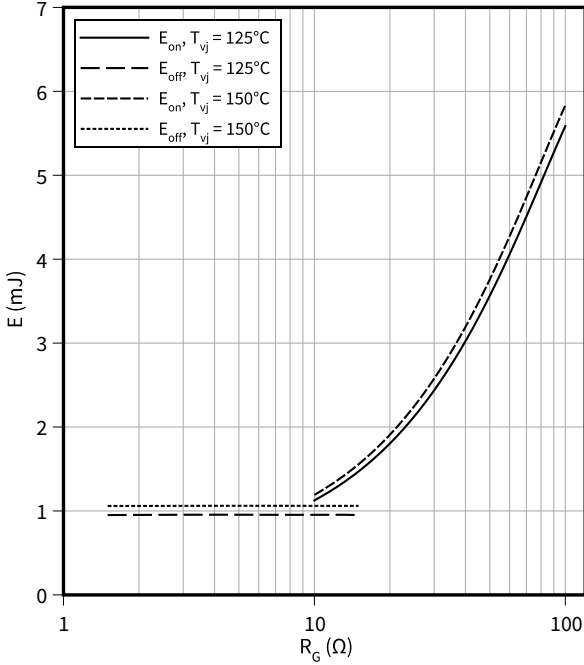


8 Characteristics diagrams

Switching losses (typical), IGBT, T1 / T4

$E = f(R_G)$

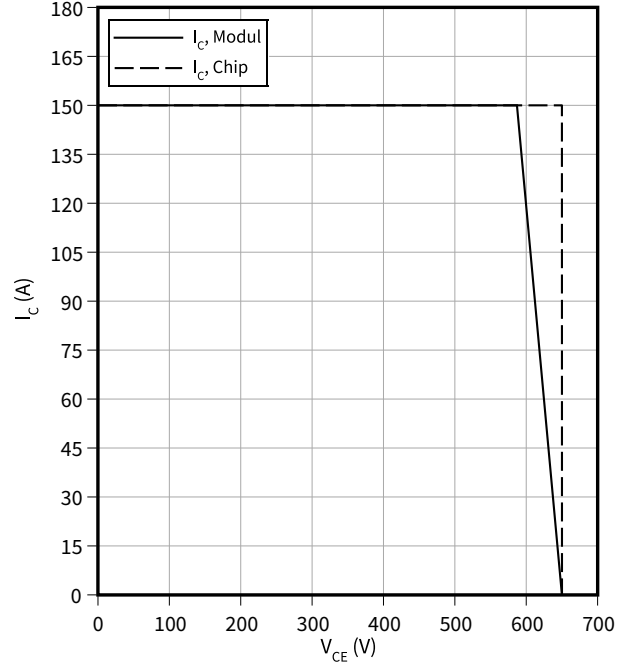
$I_C = 75 \text{ A}, V_{CC} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}$



Reverse bias safe operating area (RBSOA), IGBT, T1 / T4

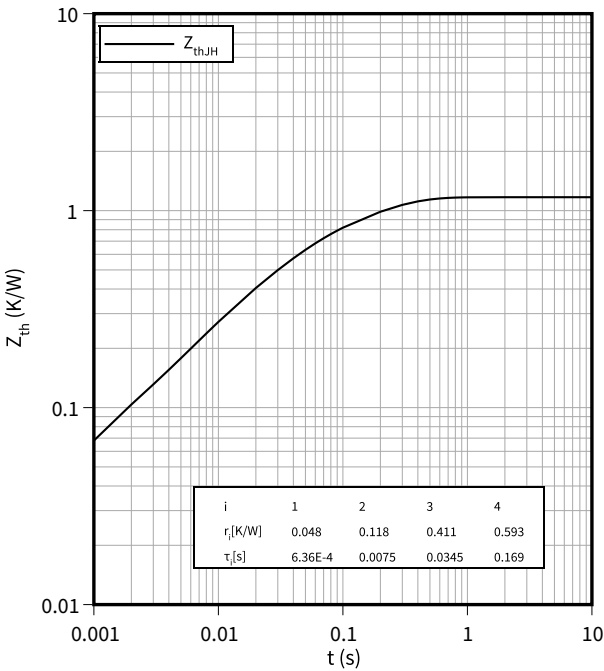
$I_C = f(V_{CE})$

$R_{Goff} = 1.5 \text{ } \Omega, V_{GE} = \pm 15 \text{ V}, T_{vj} = 150 \text{ } ^\circ\text{C}$



Transient thermal impedance, IGBT, T1 / T4

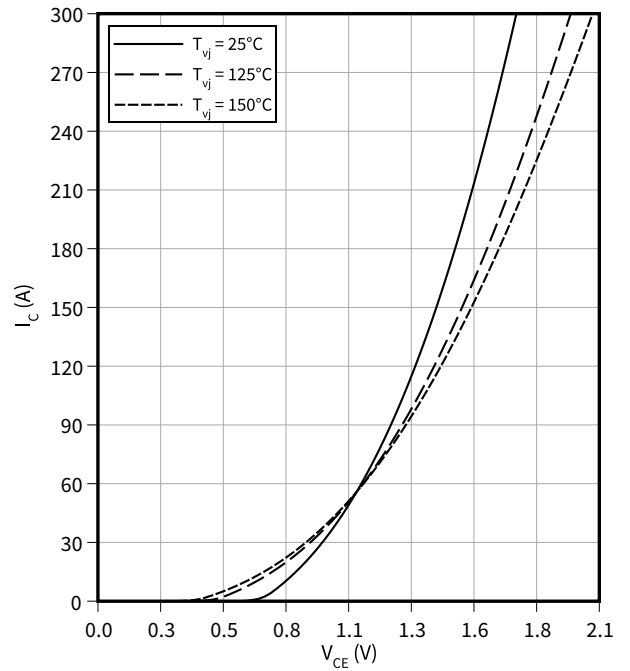
$Z_{th} = f(t)$



Output characteristic (typical), IGBT, T2 / T3

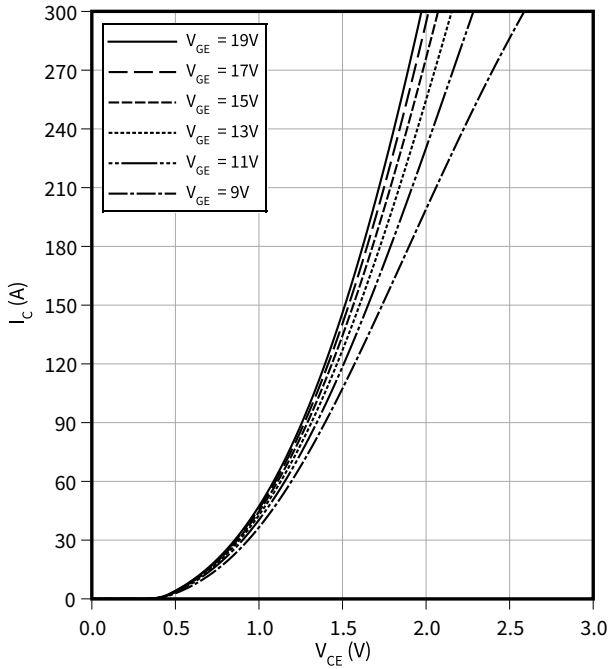
$I_C = f(V_{CE})$

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



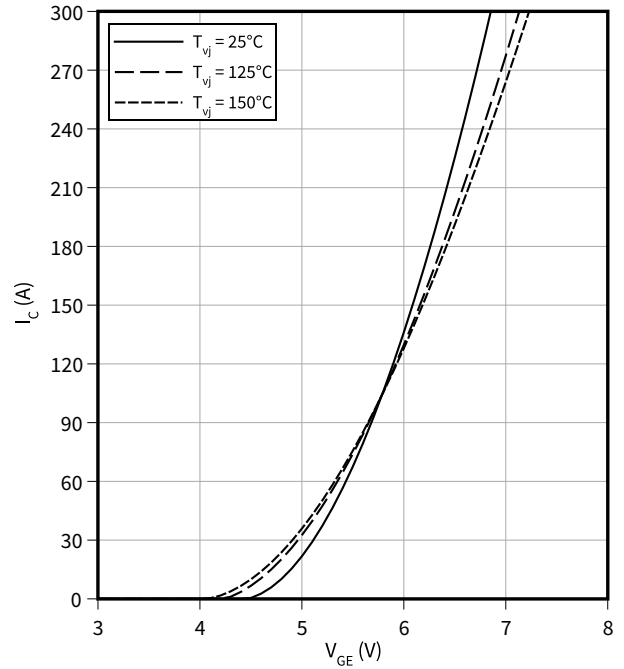
Output characteristic field (typical), IGBT, T2 / T3

$I_C = f(V_{CE})$
 $T_{vj} = 150\text{ °C}$



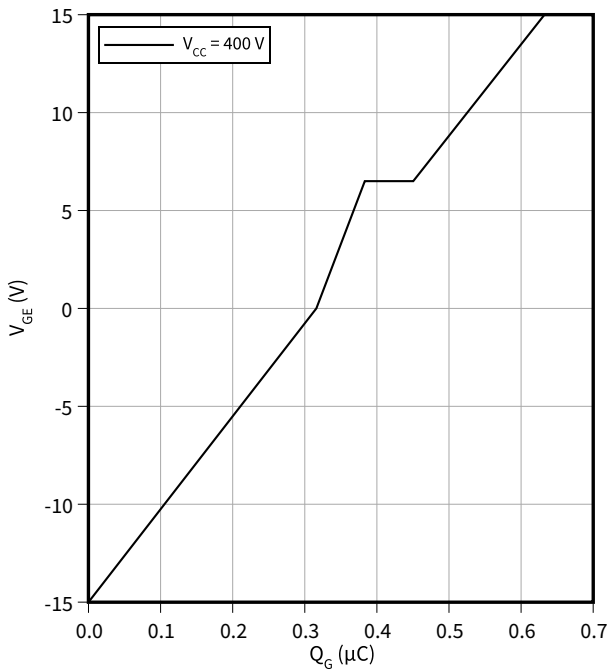
Transfer characteristic (typical), IGBT, T2 / T3

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



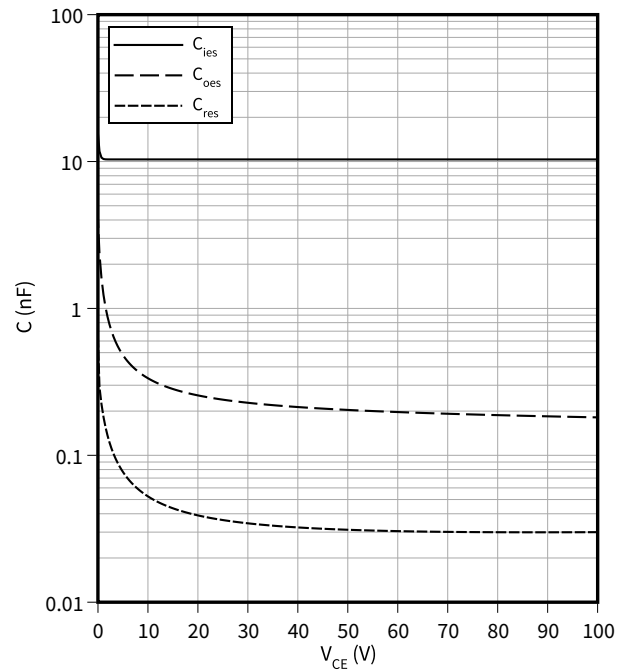
Gate charge characteristic (typical), IGBT, T2 / T3

$V_{GE} = f(Q_G)$
 $I_C = 150\text{ A}, T_{vj} = 25\text{ °C}$



Capacity characteristic (typical), IGBT, T2 / T3

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

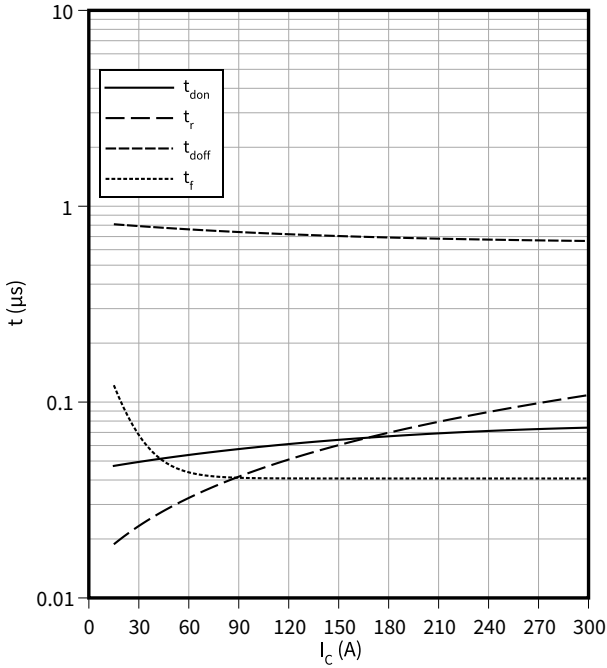


8 Characteristics diagrams

Switching times (typical), IGBT, T2 / T3

$t = f(I_C)$

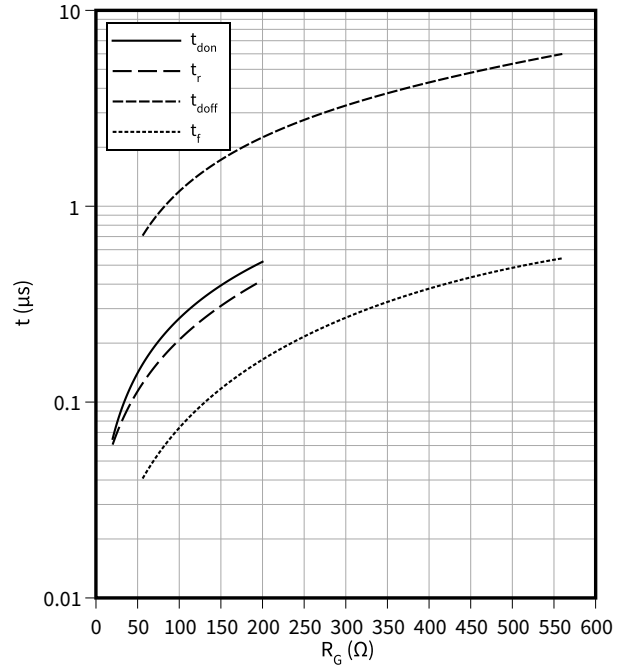
$R_{Goff} = 56 \Omega$, $R_{Gon} = 20 \Omega$, $V_{CC} = 300 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 150 \text{ }^\circ\text{C}$



Switching times (typical), IGBT, T2 / T3

$t = f(R_G)$

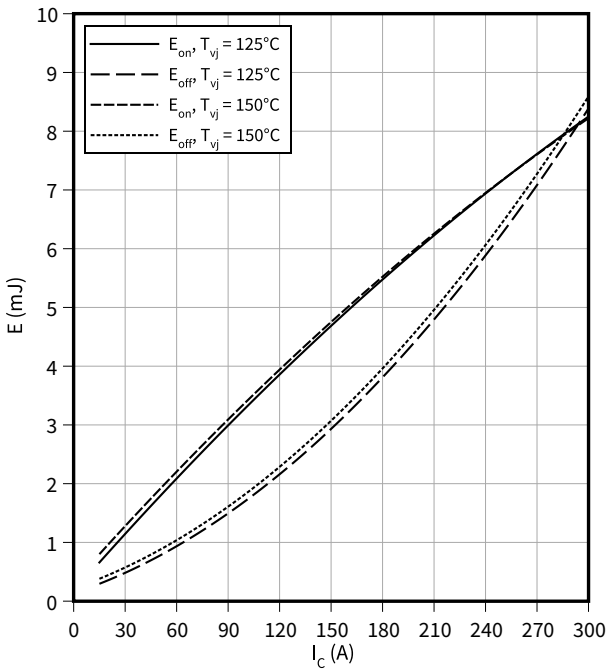
$I_C = 150 \text{ A}$, $V_{CC} = 300 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 150 \text{ }^\circ\text{C}$



Switching losses (typical), IGBT, T2 / T3

$E = f(I_C)$

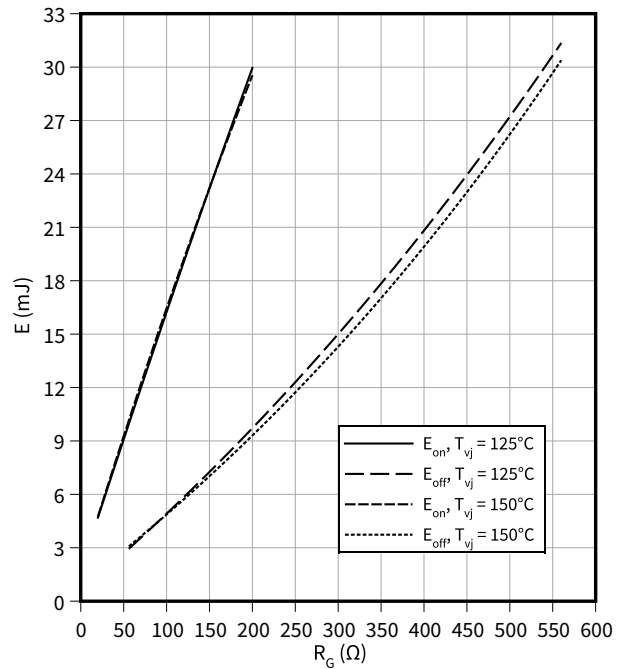
$R_{Goff} = 56 \Omega$, $R_{Gon} = 20 \Omega$, $V_{CC} = 300 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$



Switching losses (typical), IGBT, T2 / T3

$E = f(R_G)$

$I_C = 150 \text{ A}$, $V_{CC} = 300 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$

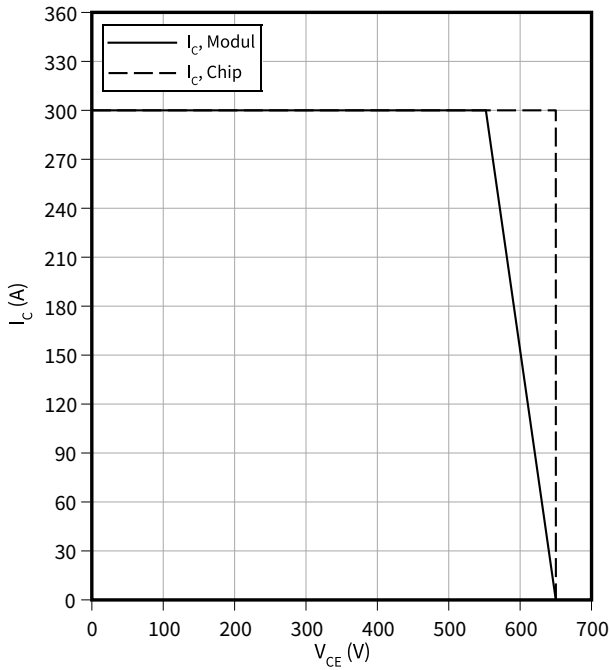


8 Characteristics diagrams

Reverse bias safe operating area (RBSOA), IGBT, T2 / T3

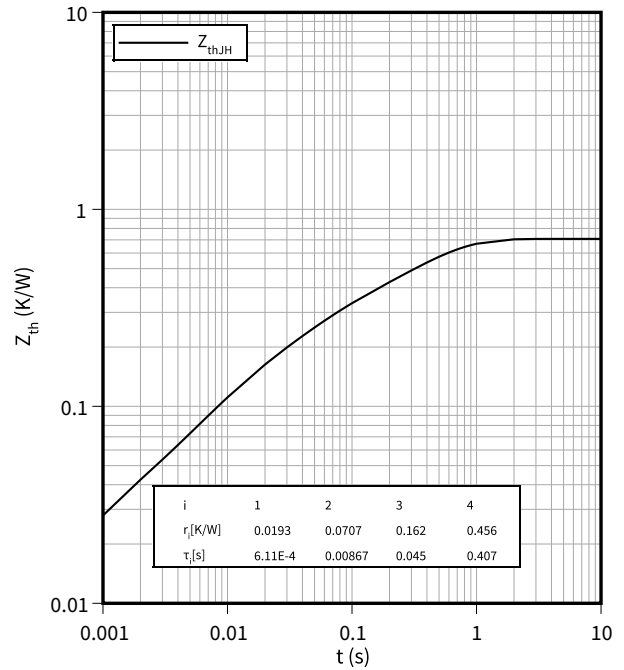
$I_C = f(V_{CE})$

$R_{Goff} = 56 \Omega$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 150 \text{ }^\circ\text{C}$



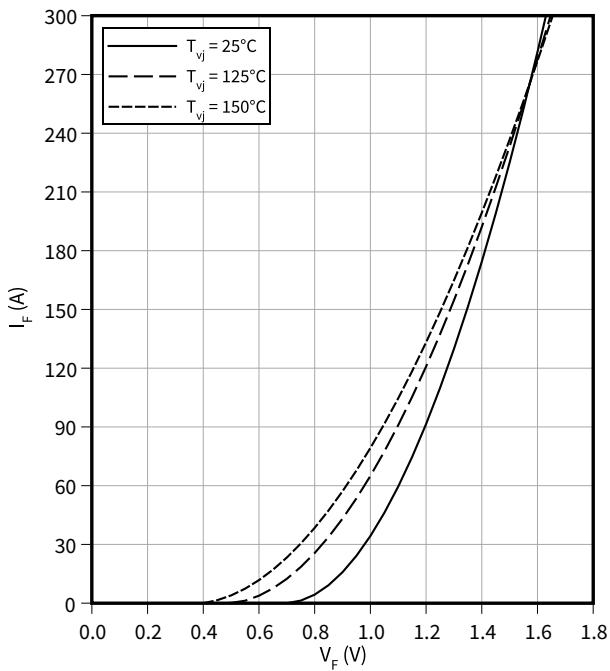
Transient thermal impedance, IGBT, T2 / T3

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D1 / D4

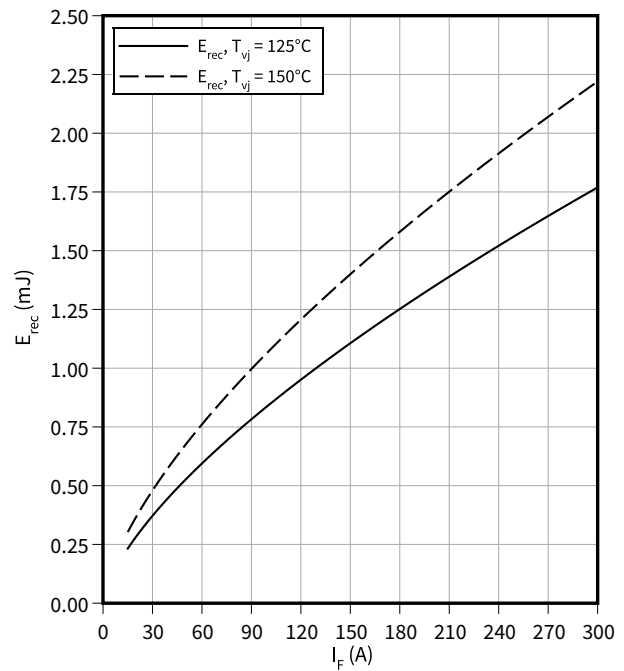
$I_F = f(V_F)$



Switching losses (typical), Diode, D1 / D4

$E_{rec} = f(I_F)$

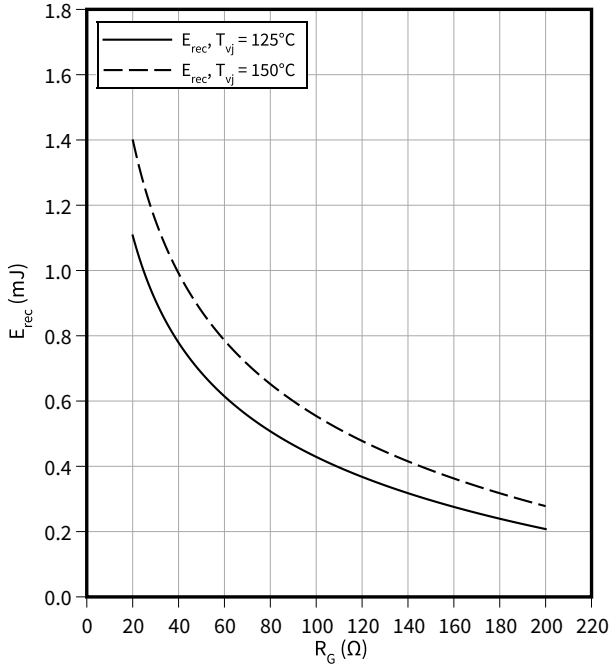
$R_{Gon} = 20 \Omega$, $V_{CE} = 300 \text{ V}$



8 Characteristics diagrams

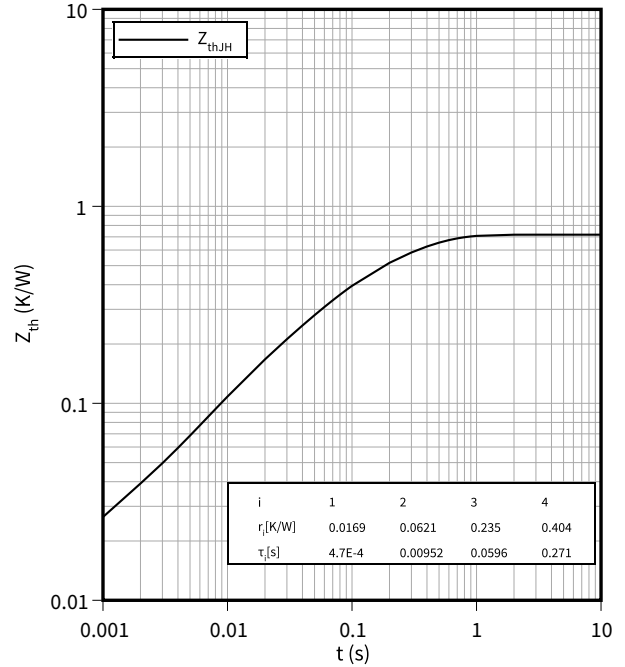
Switching losses (typical), Diode, D1 / D4

$E_{rec} = f(R_G)$
 $V_{CE} = 300\text{ V}, I_F = 150\text{ A}$



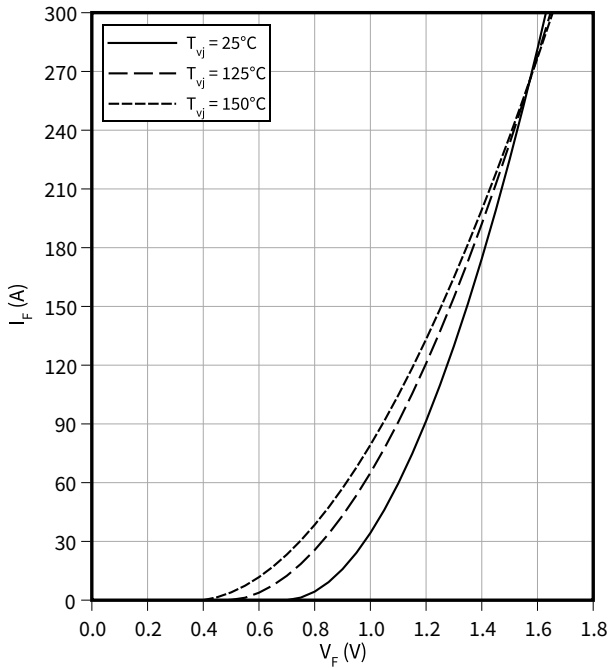
Transient thermal impedance, Diode, D1 / D4

$Z_{th} = f(t)$



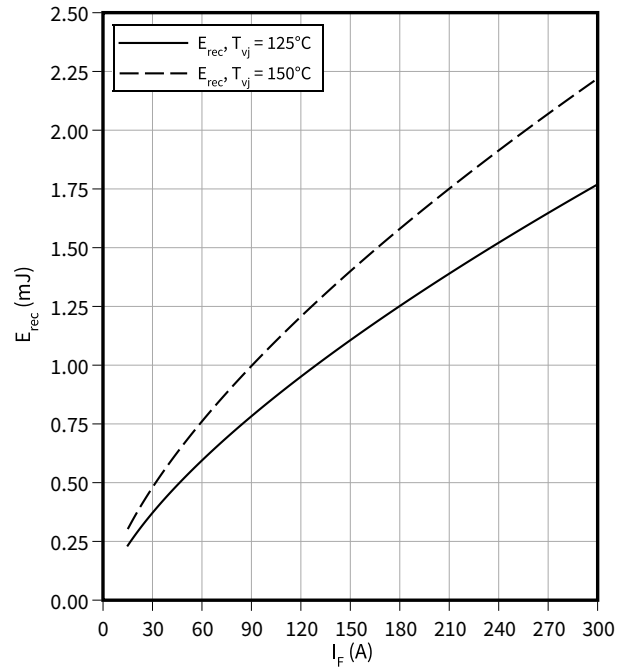
Forward characteristic (typical), Diode, D2 / D3

$I_F = f(V_F)$



Switching losses (typical), Diode, D2 / D3

$E_{rec} = f(I_F)$
 $R_{Gon} = 20\ \Omega, V_{CE} = 300\text{ V}$

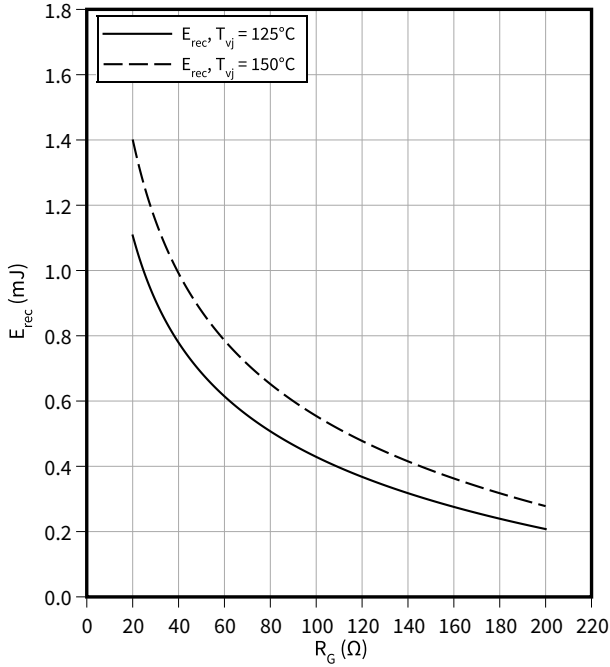


8 Characteristics diagrams

Switching losses (typical), Diode, D2 / D3

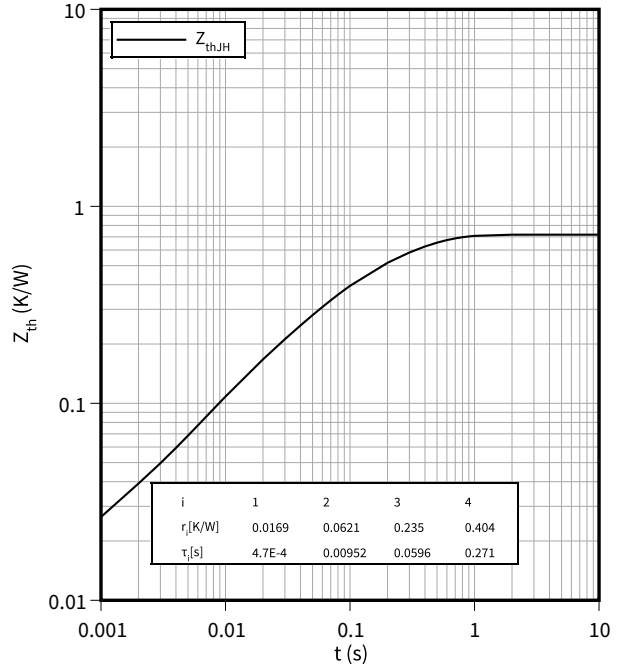
$E_{rec} = f(R_G)$

$V_{CE} = 300\text{ V}, I_F = 150\text{ A}$



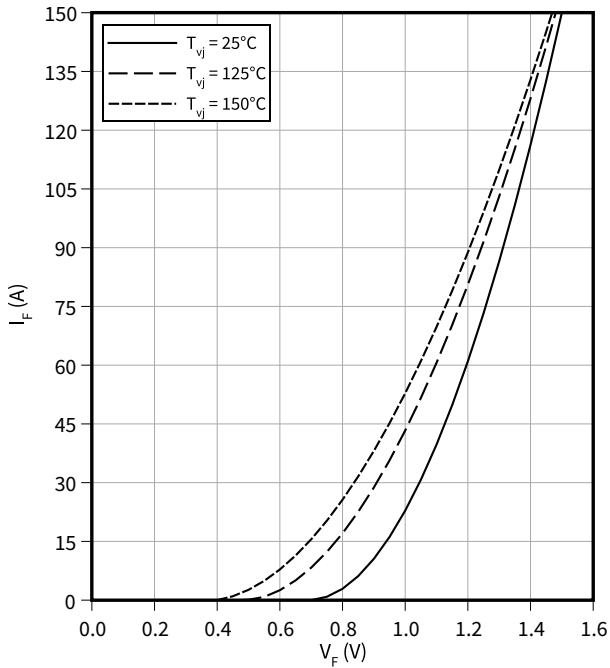
Transient thermal impedance, Diode, D2 / D3

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D5 / D6

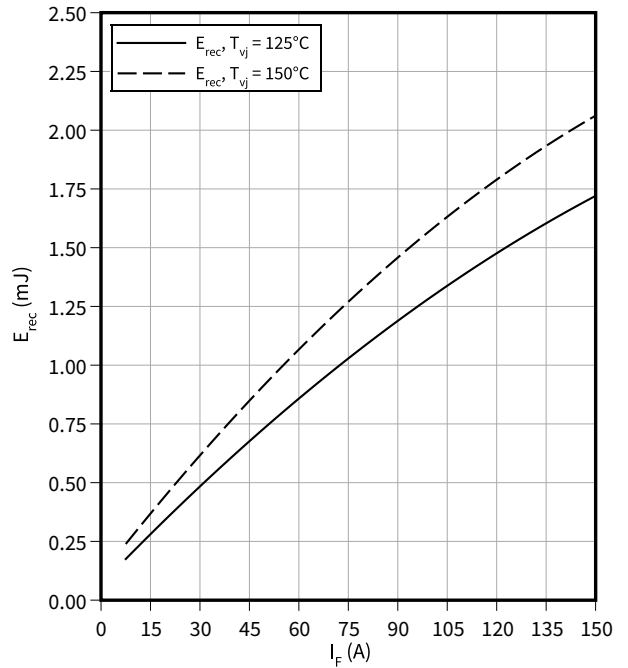
$I_F = f(V_F)$



Switching losses (typical), Diode, D5 / D6

$E_{rec} = f(I_F)$

$R_{Gon} = 10\ \Omega, V_{CE} = 300\text{ V}$

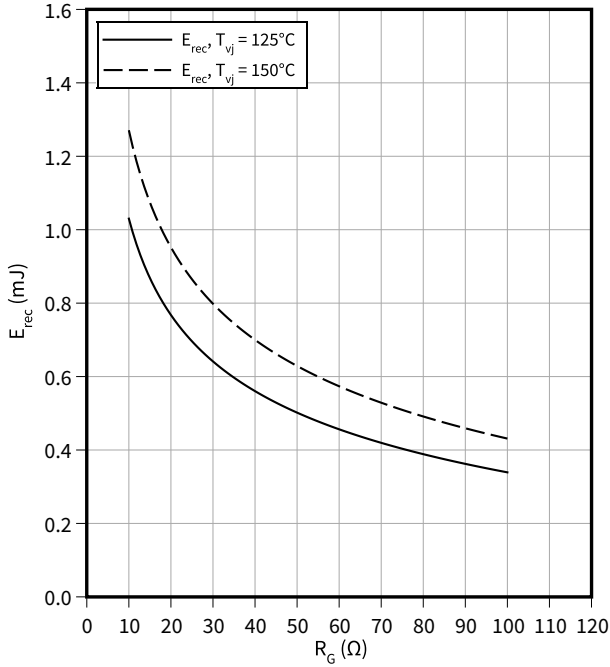


8 Characteristics diagrams

Switching losses (typical), Diode, D5 / D6

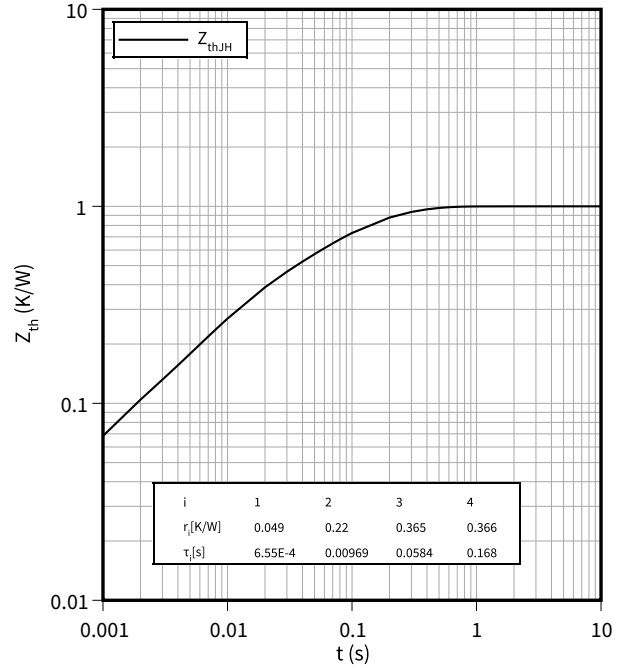
$E_{rec} = f(R_G)$

$V_{CE} = 300\text{ V}, I_F = 75\text{ A}$



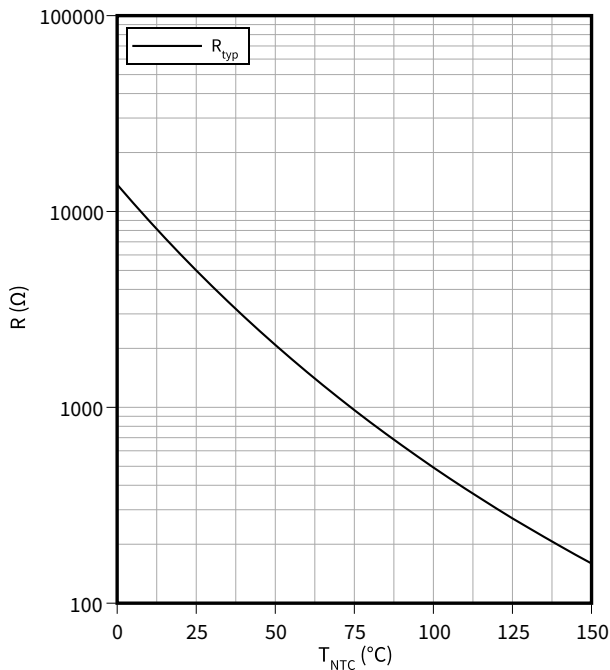
Transient thermal impedance, Diode, D5 / D6

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



9 Circuit diagram

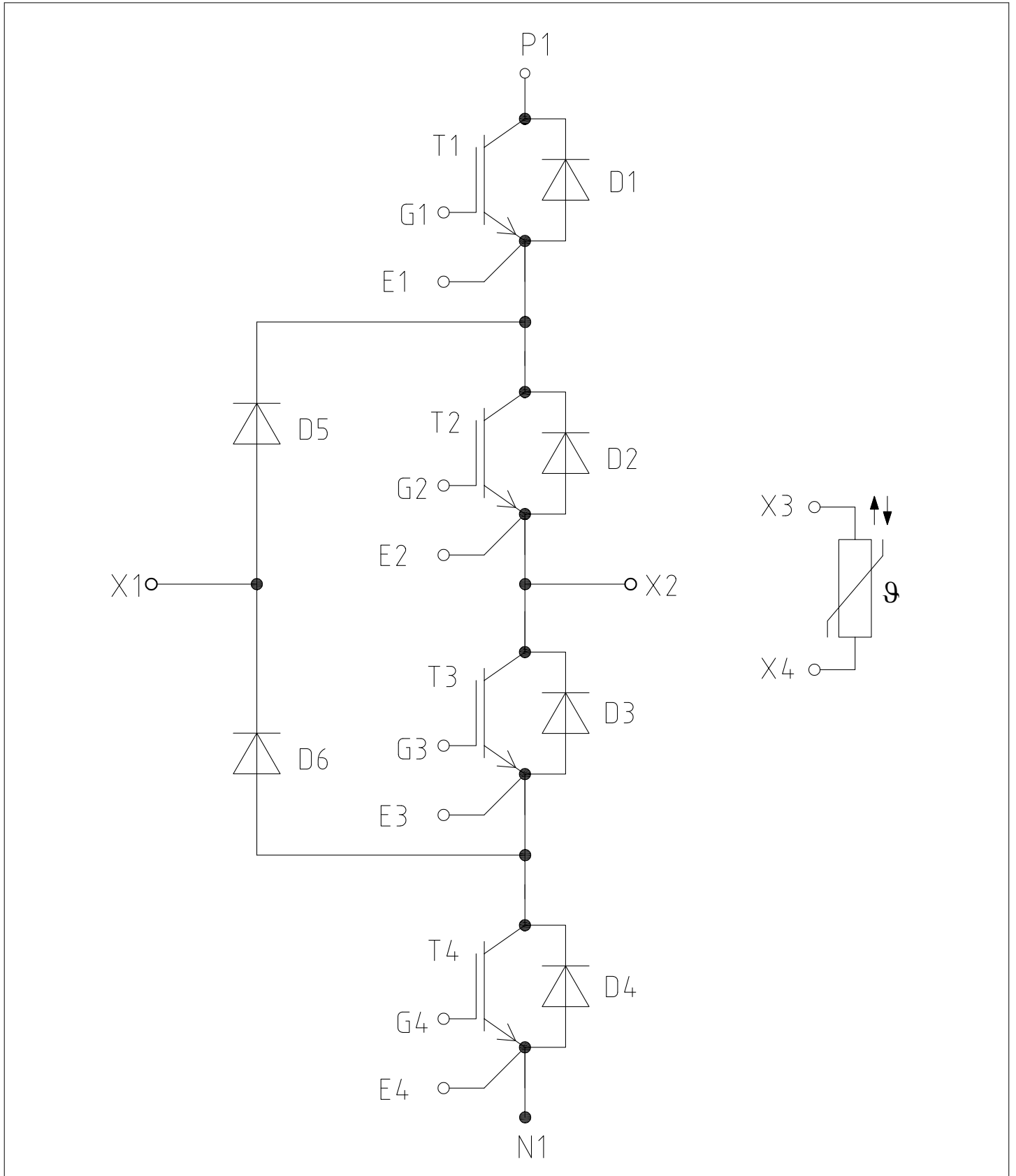


Figure 1

10 Package outlines

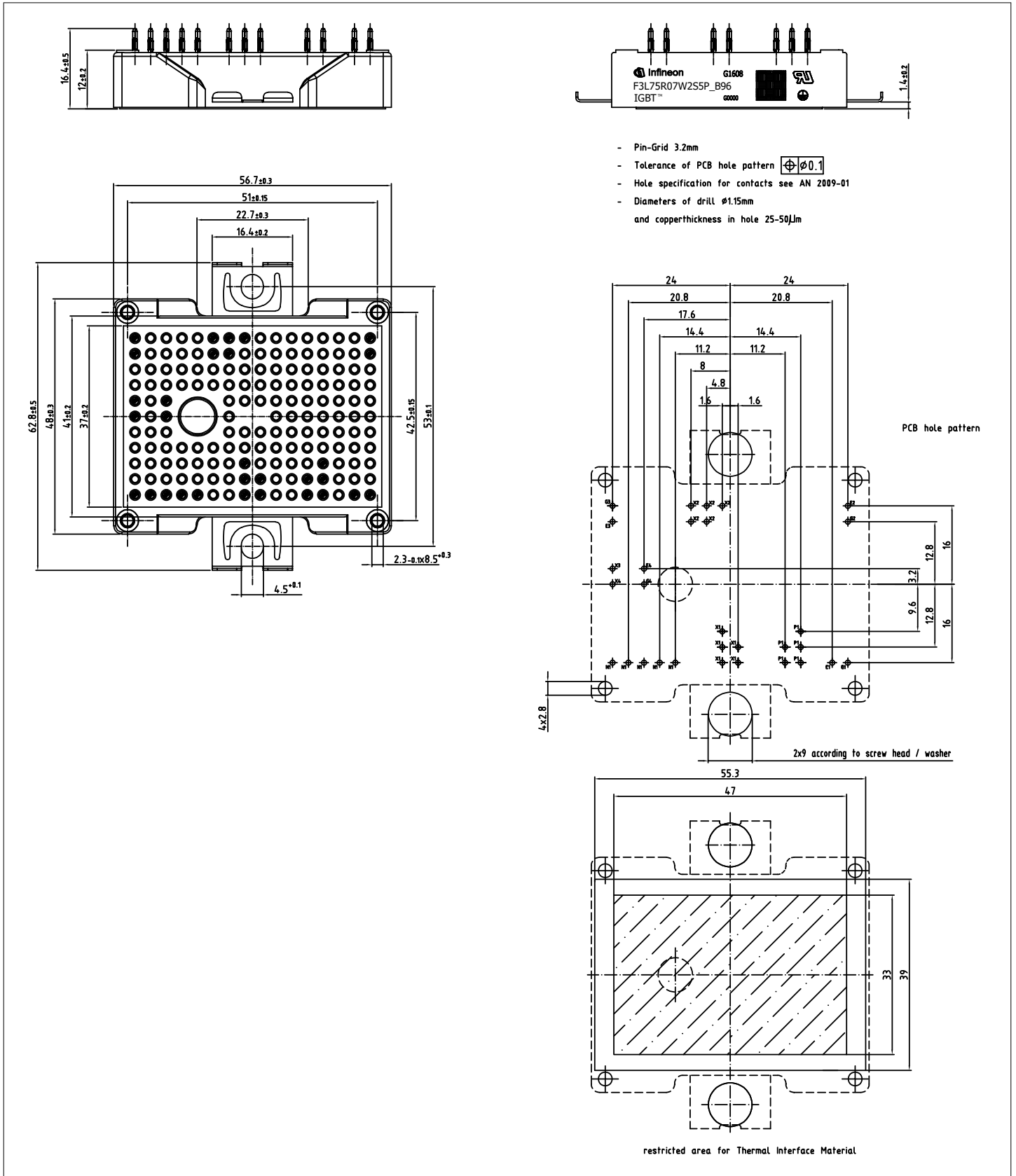


Figure 2

11 Module label code


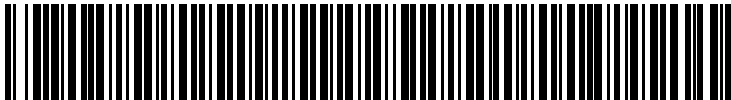
Module label code			
Code format	Data Matrix	Barcode Code128	
Encoding	ASCII text	Code Set A	
Symbol size	16x16	23 digits	
Standard	IEC24720 and IEC16022	IEC8859-1	
Code content	<i>Content</i>	<i>Digit</i>	<i>Example</i>
	Module serial number	1 - 5	71549
	Module material number	6 - 11	142846
	Production 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

Document version	Date of release	Description of changes
0.10	2023-10-30	Initial version
1.00	2024-01-18	Final datasheet

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Edition 2024-01-18

Published by

Infineon Technologies AG

81726 Munich, Germany

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IFX-ABH835-002

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[FF150R12KE3G](#) [FF200R06KE3](#) [FF200R06YE3](#) [FF300R06KE3_B2](#) [FF600R12IP4V](#) [FF800R17KP4_B2](#) [FF900R12IE4V](#)
[FP06R12W1T4_B3](#) [FP100R07N3E4](#) [FP100R07N3E4_B11](#) [FP10R06W1E3_B11](#) [FP10R12W1T4_B11](#) [FP10R12YT3](#) [FP15R12W2T4](#)
[FP15R12YT3](#) [FP20R06W1E3](#) [FP30R06W1E3](#) [FP40R12KT3G](#) [FP75R06KE3](#) [FS10R12YE3](#) [FS150R07PE4](#) [FS150R12PT4](#)
[FS150R17N3E4_B11](#) [FS20R06W1E3_B11](#) [FS30R06W1E3_B11](#) [FS75R12KE3G](#) [FS75R12W2T4_B11](#) [FZ1600R17HP4_B2](#)
[FZ300R12KE3G](#) [FZ400R17KE3](#) [FZ400R17KE4](#) [FZ600R65KE3](#) [DF1000R17IE4D_B2](#) [APTGT75DA60T1G](#) [DZ800S17K3](#) [F12-](#)
[25R12KT4G](#) [F3L200R12W2H3_B11](#) [F3L300R12ME4_B22](#) [F3L75R07W2E3_B11](#) [F4-150R12KS4](#) [F475R07W1H3B11ABOMA1](#)
[FD1400R12IP4D](#) [FD400R12KE3_B5](#)