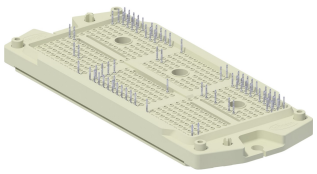
Final datasheet

EasyPACK™ module with active “Advanced Neutral Point Clamp” topology and PressFIT / NTC



Features

- Electrical features
  - V_{CES} = 1200 V
  - $I_{C\ nom}$ = 250 A / I_{CRM} = 500 A
  - Ultra fast IGBT chips
  - Low inductive design
  - Low switching losses
  - Low $V_{CE,sat}$
  - Suitable Infineon gate drivers can be found under https://www.infineon.com/gdfinder
- Mechanical features
  - 3.2 kV AC 1 minute insulation
  - High current pin
  - PressFIT contact technology
  - Rugged mounting due to integrated mounting clamps
  - Al_2O_3 substrate with low thermal resistance

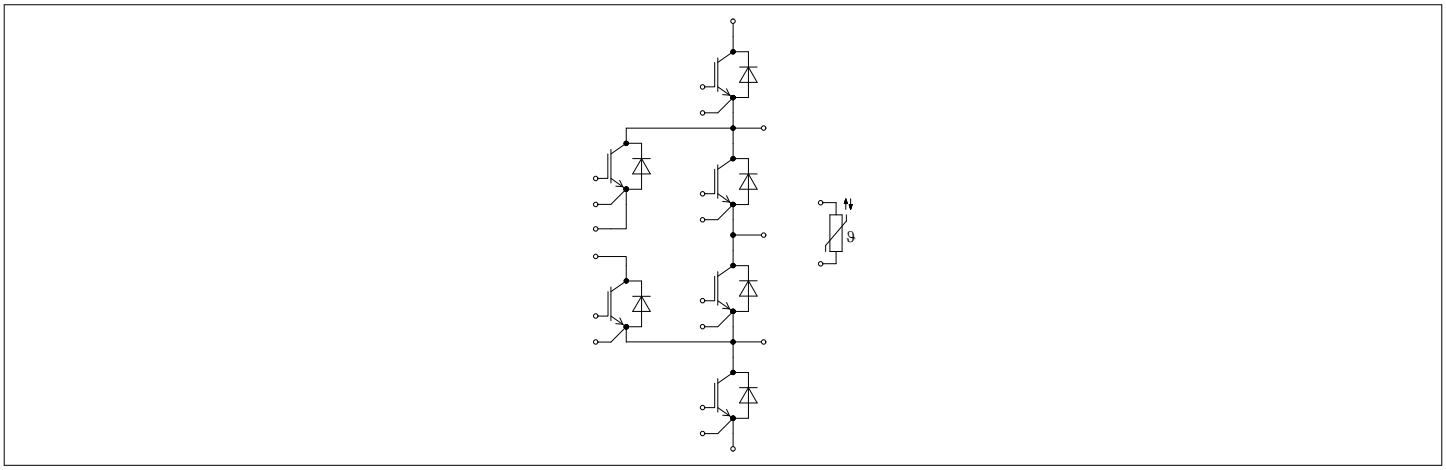
Potential applications

- Three-level applications
- Solar 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	3.2	kV
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, f = 50 Hz, *t* = 1 min	3.2	kV
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
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_H = 25 °C, per switch			2		mΩ
Storage temperature	T_{stg}			-40		125	°C
Terminal connection torque	*M*	- Mounting according to valid application note	Screw	1.3		1.5	Nm
Weight	*G*				112		g

***Note**: The current under continuous operation is limited to 50A rms per connector pin.*

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	1200	V
Implemented collector current	I_{CN}			420	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 65 °C	290	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		500	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 = 250 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.48	1.76	V
			T_{vj} = 125 °C		1.60		
			T_{vj} = 175 °C		1.65		
Gate threshold voltage	V_{GEth}	I_C = 6.72 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		4.85	5.5	6.15	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CC} = 600 V, T_{vj} = 25 °C			6.19		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			1.7		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			47.7		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.3		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			26	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 = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 1.8 Ω	T_{vj} = 25 °C		0.290		µs
			T_{vj} = 125 °C		0.330		
			T_{vj} = 175 °C		0.370		
Rise time (inductive load)	t_r	I_C = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 1.8 Ω	T_{vj} = 25 °C		0.026		µs
			T_{vj} = 125 °C		0.030		
			T_{vj} = 175 °C		0.032		
Turn-off delay time (inductive load)	t_{doff}	I_C = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 1.8 Ω	T_{vj} = 25 °C		0.500		µs
			T_{vj} = 125 °C		0.560		
			T_{vj} = 175 °C		0.600		
Fall time (inductive load)	t_f	I_C = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 1.8 Ω	T_{vj} = 25 °C		0.024		µs
			T_{vj} = 125 °C		0.056		
			T_{vj} = 175 °C		0.080		
Turn-on energy loss per pulse	E_{on}	I_C = 250 A, V_{CC} = 600 V, L_σ = 10 nH, V_{GE} = ±15 V, R_{Gon} = 1.8 Ω, di/dt = 9400 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		11.1		mJ
			T_{vj} = 125 °C		13		
			T_{vj} = 175 °C		15.2		
Turn-off energy loss per pulse	E_{off}	I_C = 250 A, V_{CC} = 600 V, L_σ = 10 nH, V_{GE} = ±15 V, R_{Goff} = 1.8 Ω, dv/dt = 6300 V/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		10.9		mJ
			T_{vj} = 125 °C		15.1		
			T_{vj} = 175 °C		17.6		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, λ_{grease} = 3.3 W/(m·K)			0.173		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		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 IGBT, T2 / T3

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		T_{vj} = 25 °C	950	V
Implemented collector current	I_{CN}			400	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 65 °C	395	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		800	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 = 250 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.17	1.41	V
			T_{vj} = 125 °C		1.18		
			T_{vj} = 150 °C		1.17		
Gate threshold voltage	V_{GEth}	I_C = 6.5 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		4.15	4.9	5.65	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CC} = 600 V, T_{vj} = 25 °C			4.1		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			0.75		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			49.2		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.228		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 950 V, V_{GE} = 0 V	T_{vj} = 25 °C			61	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25 °C				100	nA

(table continues...)

Table 6 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-on delay time (inductive load)	t_{don}	I_C = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 12 Ω	T_{vj} = 25 °C		0.253		µs
			T_{vj} = 125 °C		0.215		
			T_{vj} = 150 °C		0.171		
Rise time (inductive load)	t_r	I_C = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 12 Ω	T_{vj} = 25 °C		0.920		µs
			T_{vj} = 125 °C		0.950		
			T_{vj} = 150 °C		0.952		
Turn-off delay time (inductive load)	t_{doff}	I_C = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 0.22 Ω	T_{vj} = 25 °C		0.432		µs
			T_{vj} = 125 °C		0.485		
			T_{vj} = 150 °C		0.543		
Fall time (inductive load)	t_f	I_C = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 0.22 Ω	T_{vj} = 25 °C		0.243		µs
			T_{vj} = 125 °C		0.310		
			T_{vj} = 150 °C		0.380		
Turn-on energy loss per pulse	E_{on}	I_C = 250 A, V_{CC} = 600 V, L_σ = 10 nH, V_{GE} = ±15 V, R_{Gon} = 12 Ω, di/dt = 2200 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		22.2		mJ
			T_{vj} = 125 °C		28.9		
			T_{vj} = 150 °C		32.3		
Turn-off energy loss per pulse	E_{off}	I_C = 250 A, V_{CC} = 600 V, L_σ = 10 nH, V_{GE} = ±15 V, R_{Goff} = 0.22 Ω, dv/dt = 2300 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		46.1		mJ
			T_{vj} = 125 °C		62.7		
			T_{vj} = 150 °C		63.5		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, λ_{grease} = 3.3 W/(m·K)			0.190		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

4 IGBT, T5 / T6

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		T_{vj} = 25 °C	1200	V
Implemented collector current	I_{CN}			420	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 65 °C	290	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		500	A
Gate-emitter peak voltage	V_{GES}			±20	V

Table 8 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\,sat}$	I_C = 250 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.48	1.76	V
			T_{vj} = 125 °C		1.60		
			T_{vj} = 175 °C		1.65		
Gate threshold voltage	V_{GEth}	I_C = 6.72 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		4.85	5.5	6.15	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CC} = 600 V, T_{vj} = 25 °C			6.19		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			1.7		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			47.7		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.3		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			23	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 = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 2 Ω	T_{vj} = 25 °C		0.273		µs
			T_{vj} = 125 °C		0.340		
			T_{vj} = 175 °C		0.360		
Rise time (inductive load)	t_r	I_C = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 2 Ω	T_{vj} = 25 °C		0.032		µs
			T_{vj} = 125 °C		0.037		
			T_{vj} = 175 °C		0.038		
Turn-off delay time (inductive load)	t_{doff}	I_C = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 2 Ω	T_{vj} = 25 °C		0.514		µs
			T_{vj} = 125 °C		0.569		
			T_{vj} = 175 °C		0.604		
Fall time (inductive load)	t_f	I_C = 250 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 2 Ω	T_{vj} = 25 °C		0.023		µs
			T_{vj} = 125 °C		0.046		
			T_{vj} = 175 °C		0.084		
Turn-on energy loss per pulse	E_{on}	I_C = 250 A, V_{CC} = 600 V, L_σ = 10 nH, V_{GE} = ±15 V, R_{Gon} = 2 Ω, di/dt = 6300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		14.9		mJ
			T_{vj} = 125 °C		19.3		
			T_{vj} = 175 °C		22.4		
Turn-off energy loss per pulse	E_{off}	I_C = 250 A, V_{CC} = 600 V, L_σ = 10 nH, V_{GE} = ±15 V, R_{Goff} = 2 Ω, dv/dt = 6700 V/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		8.84		mJ
			T_{vj} = 125 °C		14		
			T_{vj} = 175 °C		15.3		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, λ_{grease} = 3.3 W/(m·K)			0.173		K/W

(table continues...)

Table 8 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
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.*

5 Diode, D1 / D4

Table 9 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			500	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		1000	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	14000	A^2s
			T_{vj} = 175 °C	11800	

Table 10 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 250 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.97	2.04	V
			T_{vj} = 125 °C		1.66		
			T_{vj} = 175 °C		1.48		
Peak reverse recovery current	I_{RM}	V_{CC}=600 V, I_F = 250 A, V_{GE} = -15 V, -di$_F$/dt = 6300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		144		A
			T_{vj} = 125 °C		195		
			T_{vj} = 175 °C		233		
Recovered charge	Q_r	V_{CC}=600 V, I_F = 250 A, V_{GE} = -15 V, -di$_F$/dt = 6300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		8.22		µC
			T_{vj} = 125 °C		16.8		
			T_{vj} = 175 °C		24.3		
Reverse recovery energy	E_{rec}	V_{CC}=600 V, I_F = 250 A, V_{GE} = -15 V, -di$_F$/dt = 6300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		5.4		mJ
			T_{vj} = 125 °C		6.9		
			T_{vj} = 175 °C		7.84		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 3.3 W/(m·K)			0.250		K/W

(table continues...)

Table 10 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
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.*

6 Diode, D2 / D3

Table 11 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			400	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		800	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	13500	A^2s
			T_{vj} = 175 °C	11500	

Table 12 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 250 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.48	1.73	V
			T_{vj} = 125 °C		1.35		
			T_{vj} = 175 °C		1.28		
Peak reverse recovery current	I_{RM}	V_{CC} = 600 V, I_F = 250 A, V_{GE} = -15 V, -di$_F$/dt = 2200 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		154		A
			T_{vj} = 125 °C		216		
			T_{vj} = 175 °C		243		
Recovered charge	Q_r	V_{CC} = 600 V, I_F = 250 A, V_{GE} = -15 V, -di$_F$/dt = 2200 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		17.4		µC
			T_{vj} = 125 °C		38.8		
			T_{vj} = 175 °C		52.6		
Reverse recovery energy	E_{rec}	V_{CC} = 600 V, I_F = 250 A, V_{GE} = -15 V, -di$_F$/dt = 2200 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		6.39		mJ
			T_{vj} = 125 °C		15.3		
			T_{vj} = 175 °C		20.8		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 3.3 W/(m·K)			0.246		K/W

(table continues...)

Table 12 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
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.*

7 Diode, D5 / D6

Table 13 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			400	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		800	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	8400	A^2s
			T_{vj} = 175 °C	7700	

Table 14 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 250 A, V_{GE} = 0 V	T_{vj} = 25 °C		2.12	2.29	V
			T_{vj} = 125 °C		1.81		
			T_{vj} = 175 °C		1.63		
Peak reverse recovery current	I_{RM}	V_{CC} = 600 V, I_F = 250 A, V_{GE} = -15 V, -di$_F$/dt = 6300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		145		A
			T_{vj} = 125 °C		195		
			T_{vj} = 175 °C		231		
Recovered charge	Q_r	V_{CC} = 600 V, I_F = 250 A, V_{GE} = -15 V, -di$_F$/dt = 6300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		8.2		µC
			T_{vj} = 125 °C		16.8		
			T_{vj} = 175 °C		24.3		
Reverse recovery energy	E_{rec}	V_{CC} = 600 V, I_F = 250 A, V_{GE} = -15 V, -di$_F$/dt = 6300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		4.3		mJ
			T_{vj} = 125 °C		5.76		
			T_{vj} = 175 °C		6.76		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 3.3 W/(m·K)			0.280		K/W

(table continues...)

Table 14 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
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.*

8 NTC-Thermistor

Table 15 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

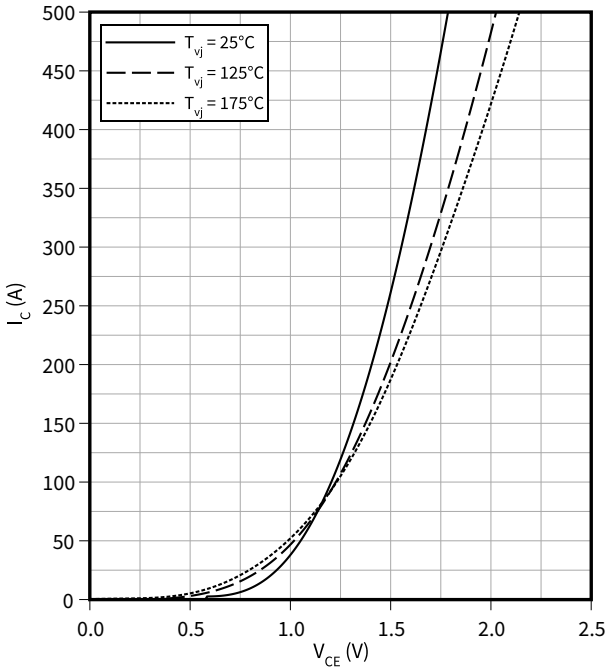
***Note**: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4*

9 Characteristics diagrams

Output characteristic (typical), IGBT, T1 / T4

$I_C = f(V_{CE})$

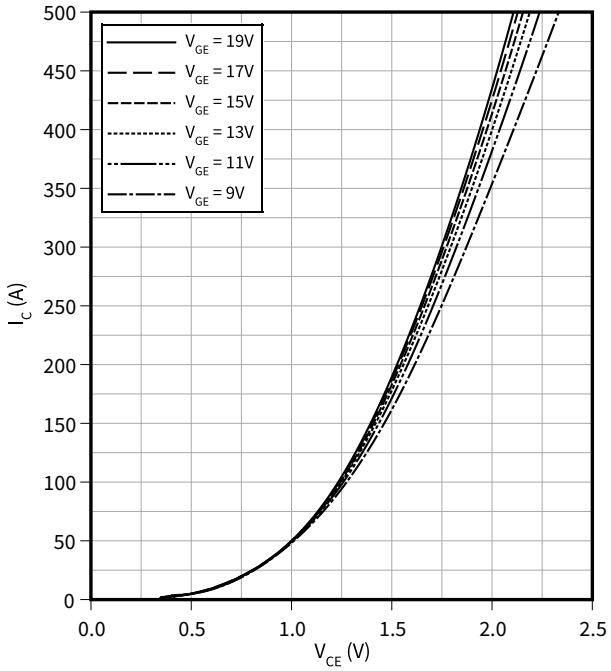
V_{GE} = 15 V



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

$I_C = f(V_{CE})$

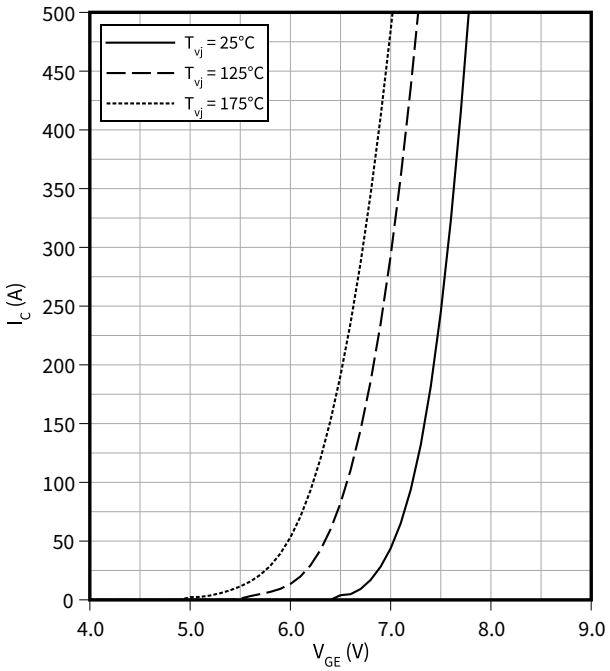
T_{vj} = 175 °C



Transfer characteristic (typical), IGBT, T1 / T4

$I_C = f(V_{GE})$

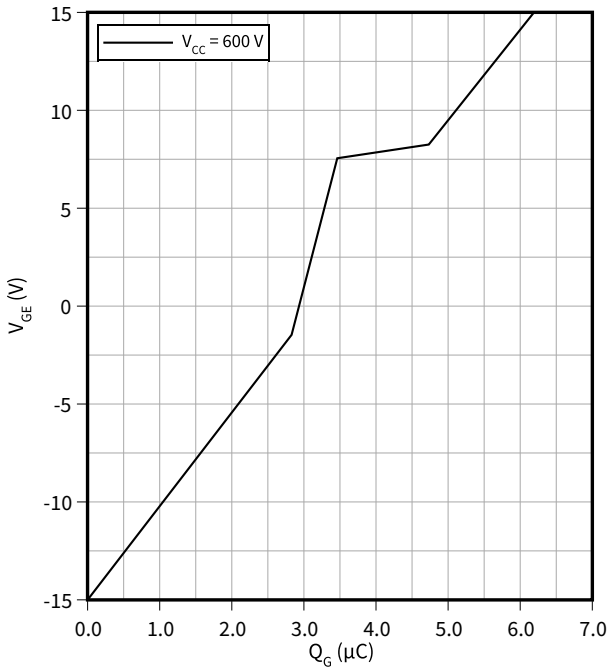
V_{CE} = 20 V



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

$V_{GE} = f(Q_G)$

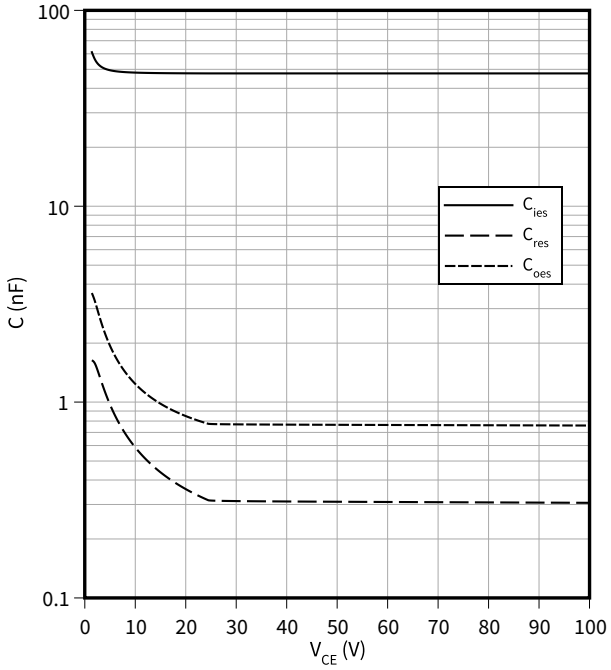
I_C = 250 A, T_{vj} = 25 °C



Capacity characteristic (typical), IGBT, T1 / T4

$C = f(V_{CE})$

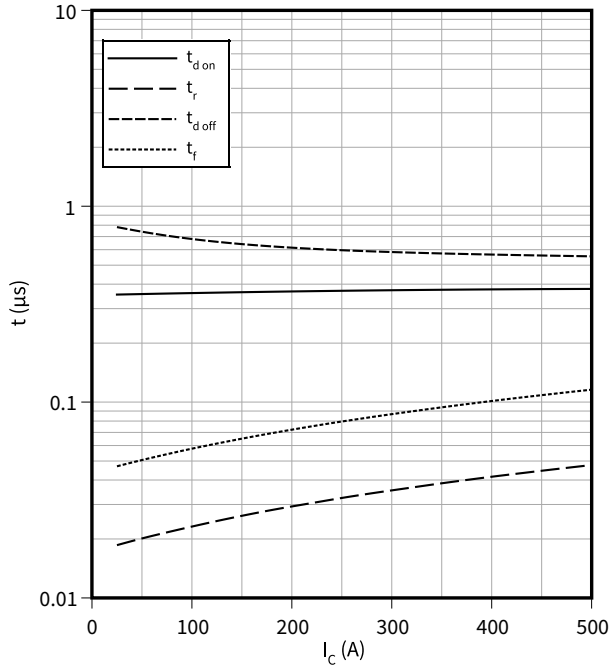
$f = 100\ kHz$, $V_{GE} = 0\ V$, $T_{vj} = 25\ °C$



Switching times (typical), IGBT, T1 / T4

$t = f(I_C)$

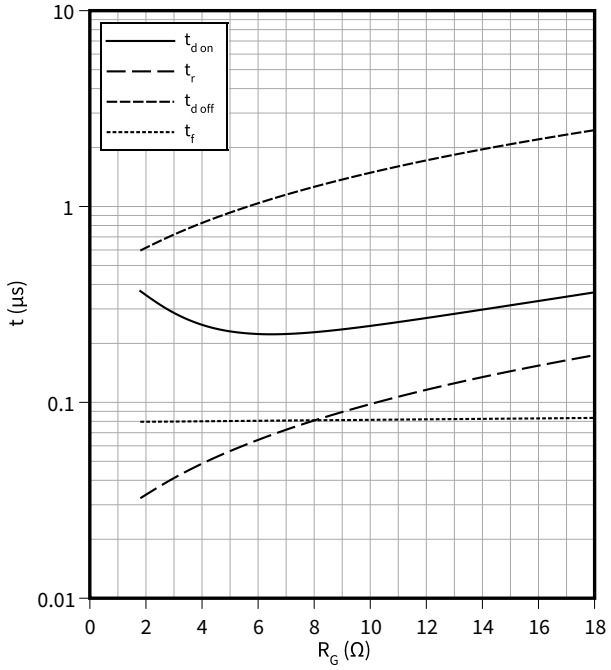
$R_{Goff} = 1.8\ \Omega$, $R_{Gon} = 1.8\ \Omega$, $V_{GE} = \pm 15\ V$, $V_{CC} = 600\ V$, $T_{vj} = 175\ °C$



Switching times (typical), IGBT, T1 / T4

$t = f(R_G)$

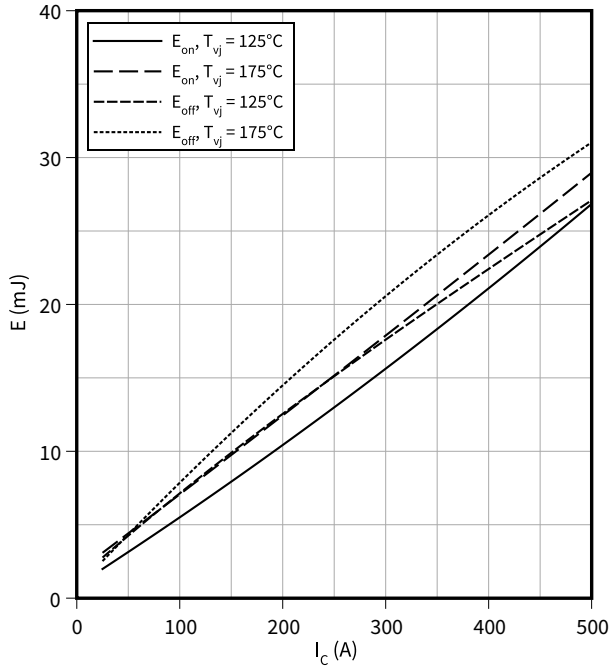
$V_{GE} = \pm 15\ V$, $I_C = 250\ A$, $V_{CC} = 600\ V$, $T_{vj} = 175\ °C$



Switching losses (typical), IGBT, T1 / T4

$E = f(I_C)$

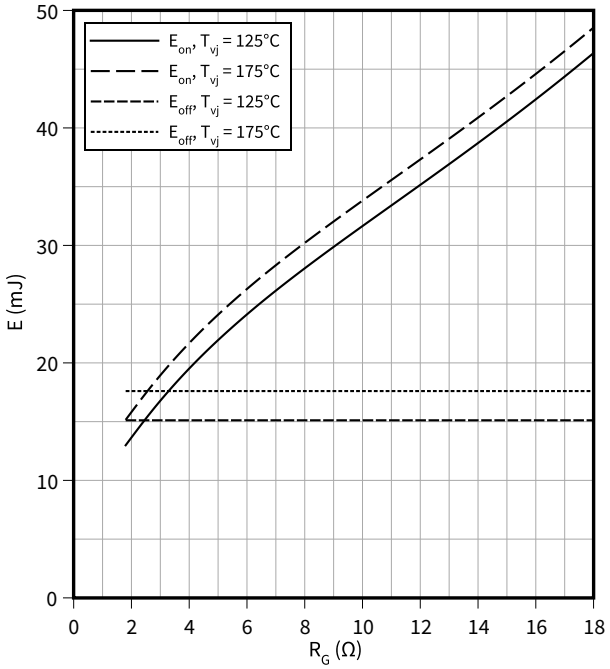
$R_{Goff} = 1.8\ \Omega$, $R_{Gon} = 1.8\ \Omega$, $V_{CC} = 600\ V$, VGE = ± 15 V



Switching losses (typical), IGBT, T1 / T4

$E = f(R_G)$

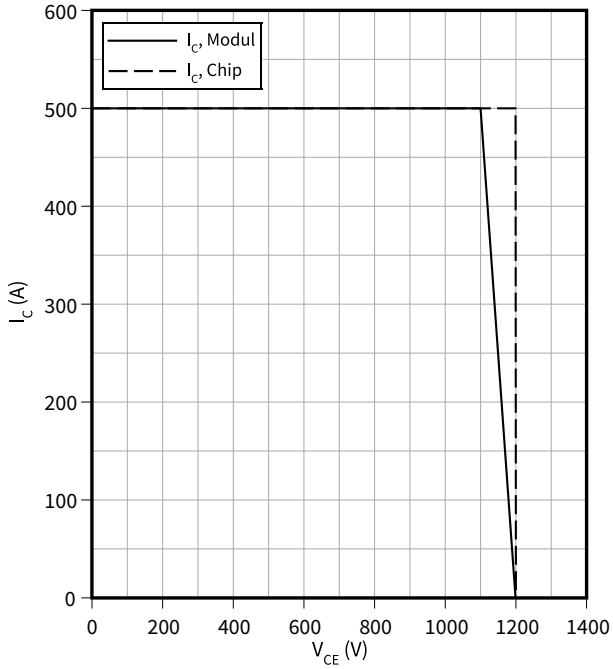
$I_C = 250\ A$, $V_{CC} = 600\ V$, $VGE = \pm 15\ V$



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

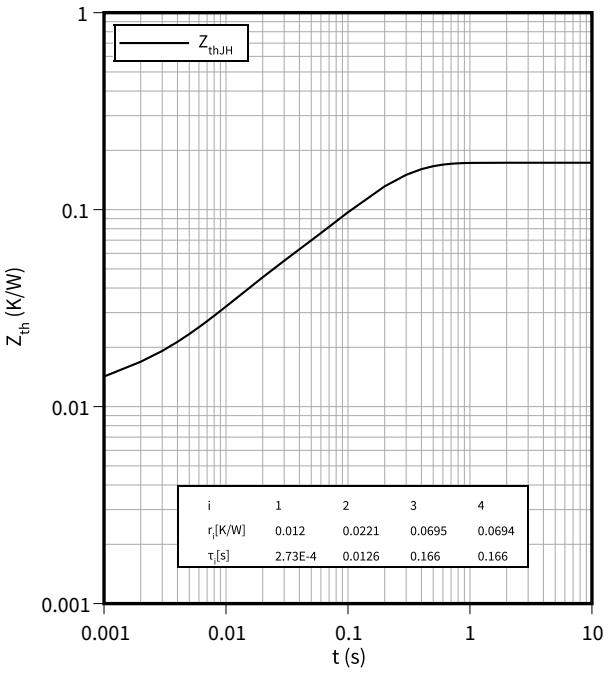
$I_C = f(V_{CE})$

$R_{Goff} = 1.8\ \Omega$, $V_{GE} = \pm 15\ V$, $T_{vj} = 175\ °C$



Transient thermal impedance, IGBT, T1 / T4

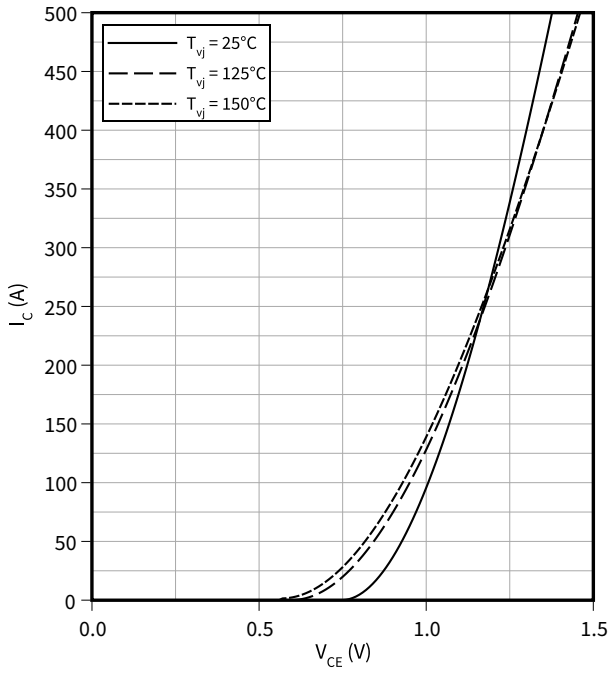
$Z_{th} = f(t)$



Output characteristic (typical), IGBT, T2 / T3

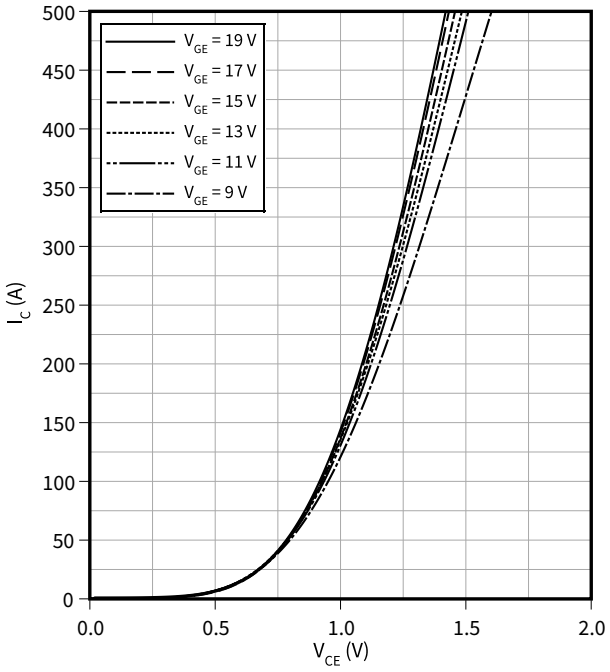
$I_C = f(V_{CE})$

$V_{GE} = 15\ V$



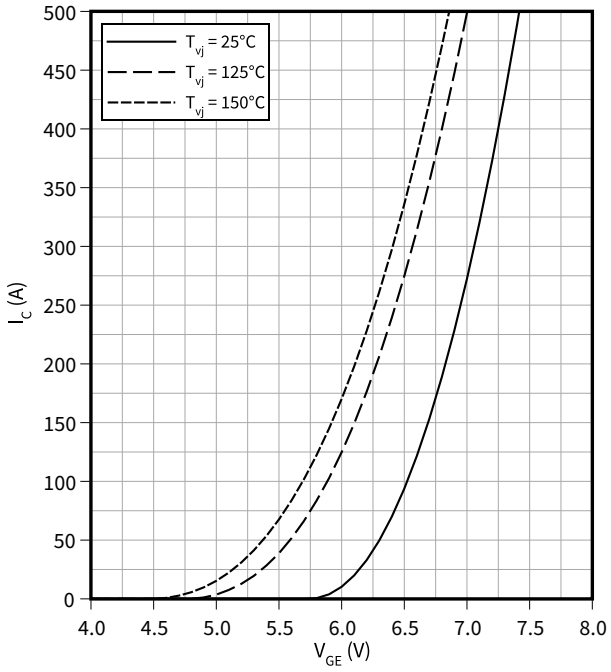
Output characteristic field (typical), IGBT, T2 / T3

$I_C = f(V_{CE})$
$T_{vj} = 150\ °C$



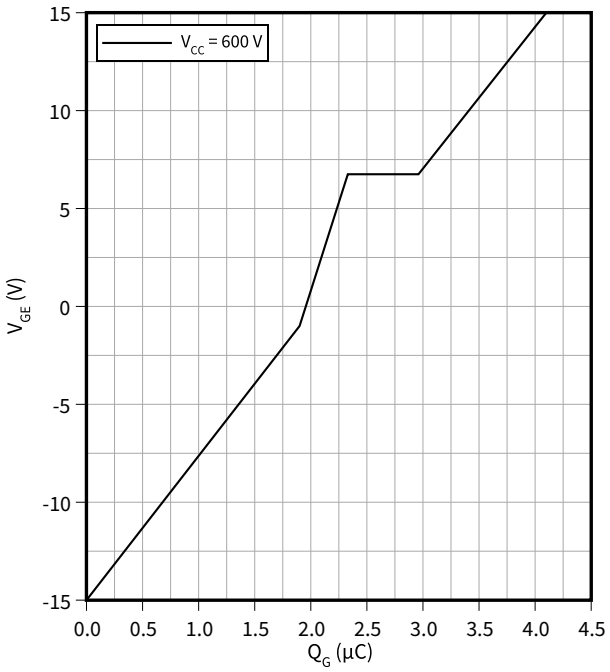
Transfer characteristic (typical), IGBT, T2 / T3

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



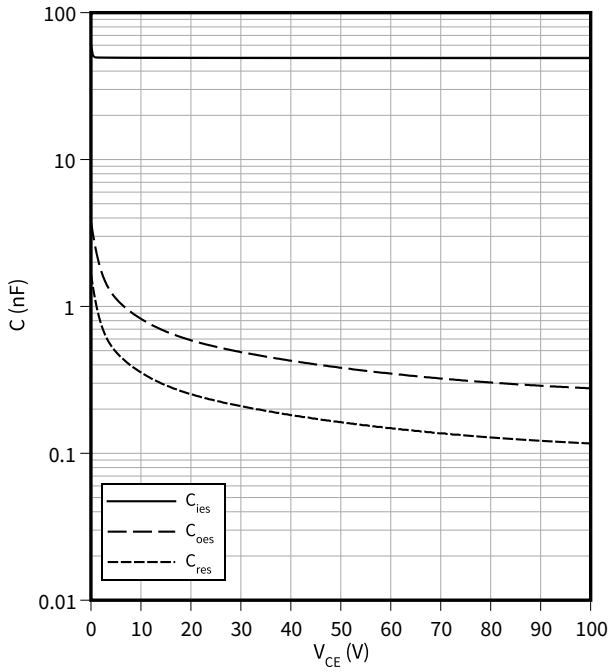
Gate charge characteristic (typical), IGBT, T2 / T3

$V_{GE} = f(Q_G)$
$I_C = 250\ A,\ T_{vj} = 25\ °C$



Capacity characteristic (typical), IGBT, T2 / T3

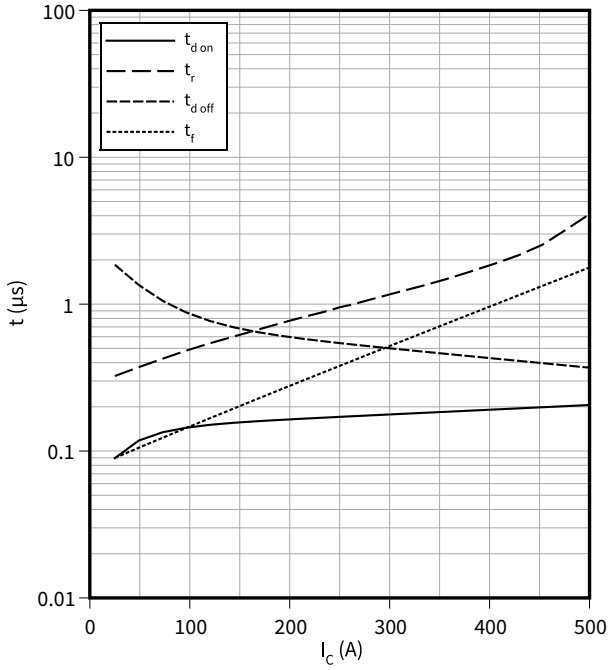
$C = f(V_{CE})$
$f = 100\ kHz,\ V_{GE} = 0\ V,\ T_{vj} = 25\ °C$



Switching times (typical), IGBT, T2 / T3

t = f(I_C)

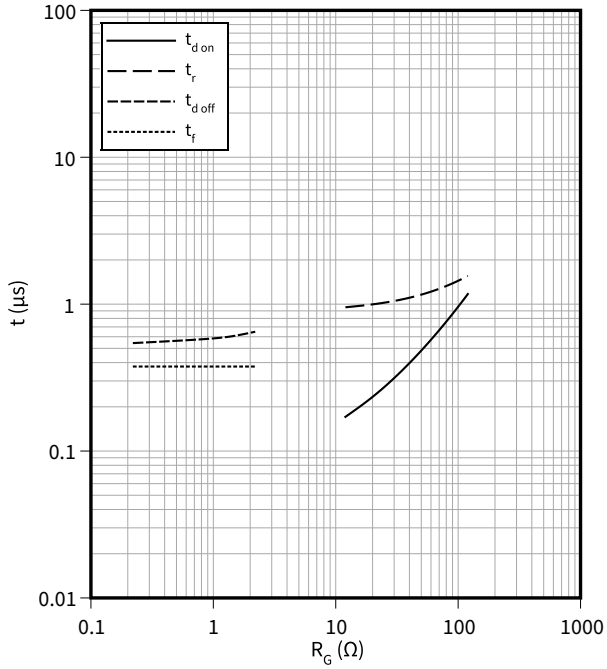
R_{Goff} = 0.22 Ω, R_{Gon} = 12 Ω, V_{GE} = ±15 V, V_{CC} = 600 V, T_{vj} = 150 °C



Switching times (typical), IGBT, T2 / T3

t = f(R_G)

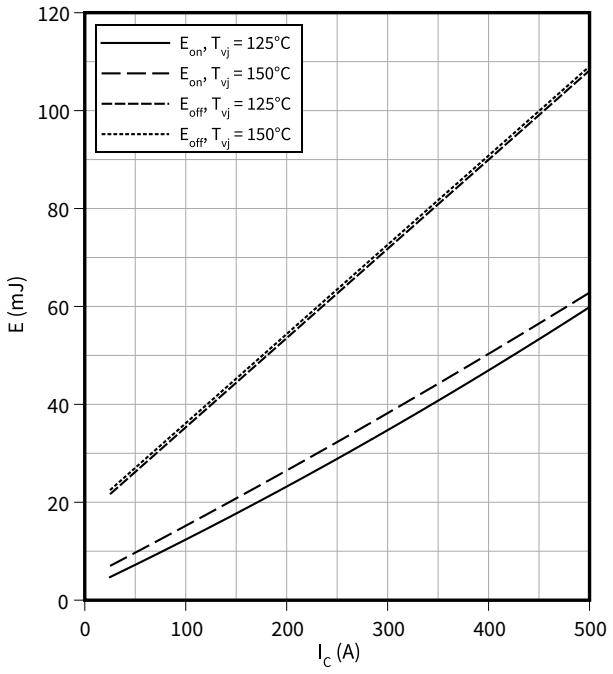
V_{GE} = ±15 V, I_C = 250 A, V_{CC} = 600 V, T_{vj} = 150 °C



Switching losses (typical), IGBT, T2 / T3

E = f(I_C)

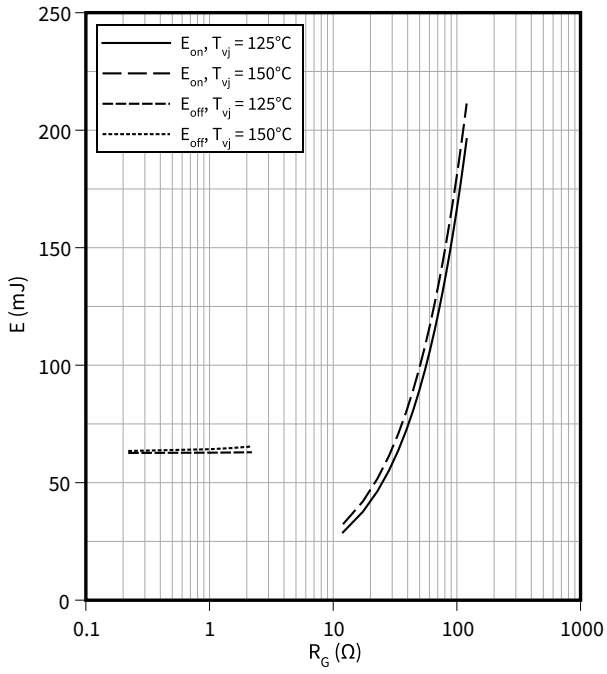
R_{Goff} = 0.22 Ω, R_{Gon} = 12 Ω, V_{GE} = ±15 V, V_{CC} = 600 V



Switching losses (typical), IGBT, T2 / T3

E = f(R_G)

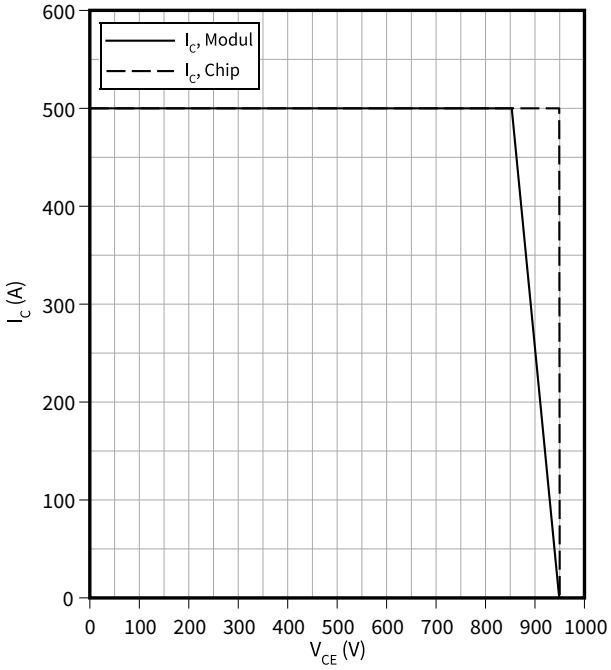
V_{GE} = ±15 V, I_C = 250 A, V_{CC} = 600 V



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

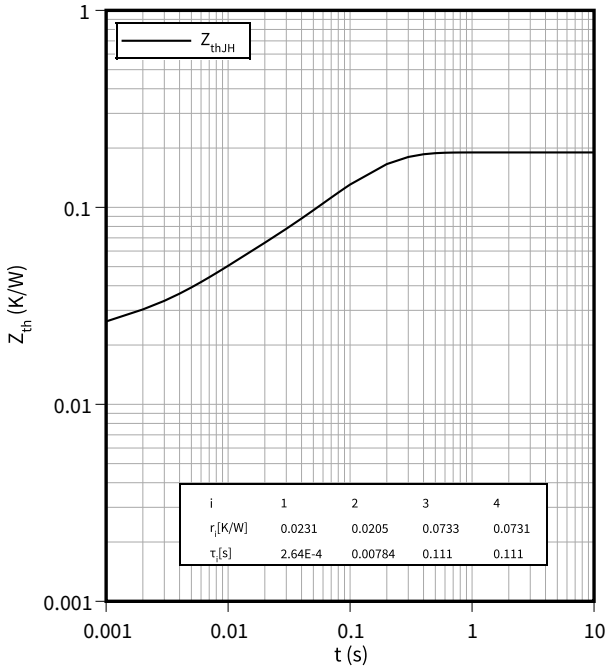
$I_C = f(V_{CE})$

$R_{Goff} = 0.22\ \Omega$, $V_{GE} = \pm 15$ V, $T_{vj} = 150$ °C



Transient thermal impedance, IGBT, T2 / T3

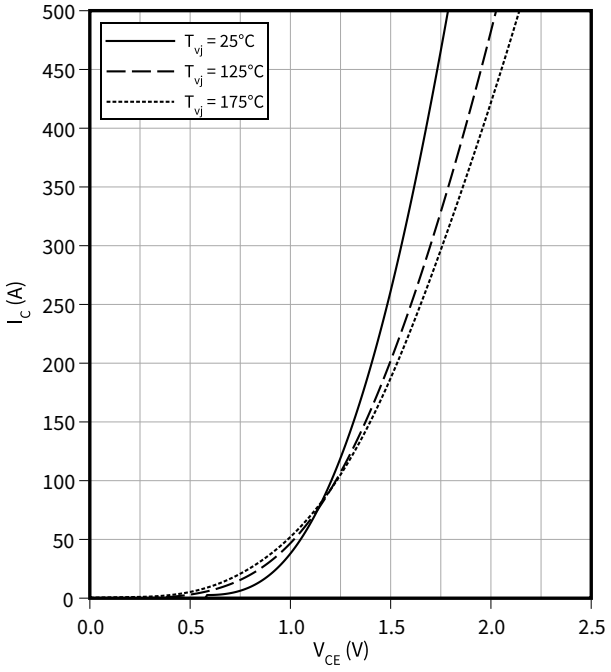
$Z_{th} = f(t)$



Output characteristic (typical), IGBT, T5 / T6

$I_C = f(V_{CE})$

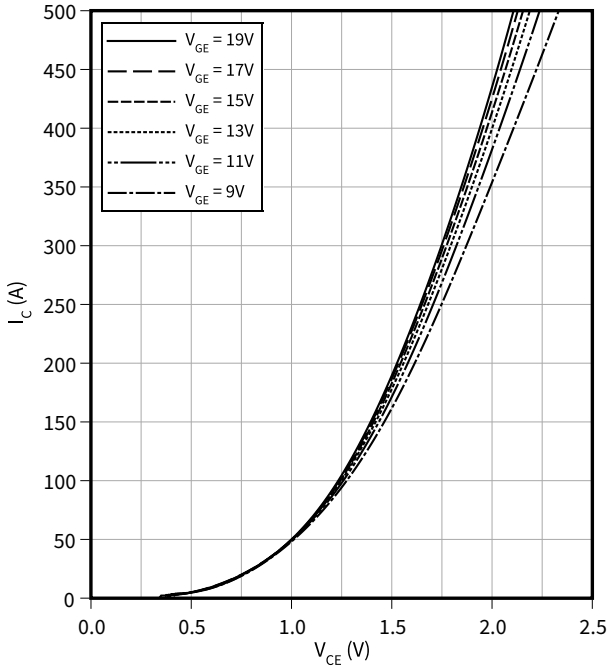
$V_{GE} = 15$ V



Output characteristic field (typical), IGBT, T5 / T6

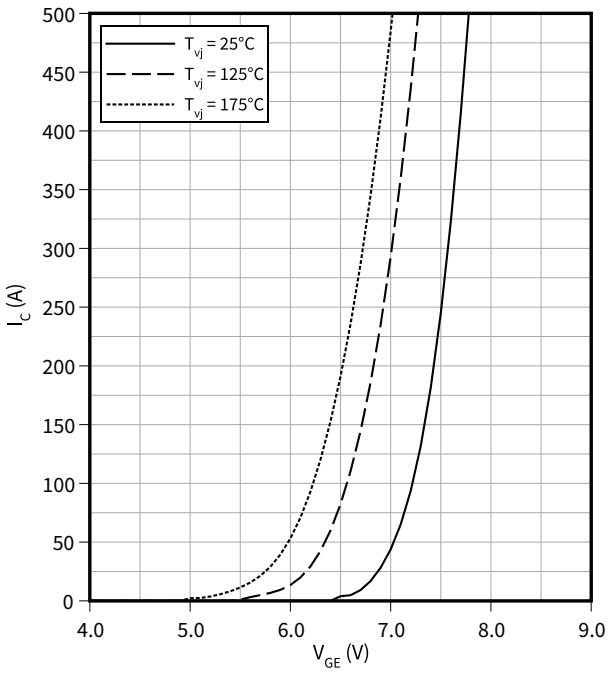
$I_C = f(V_{CE})$

$T_{vj} = 175$ °C



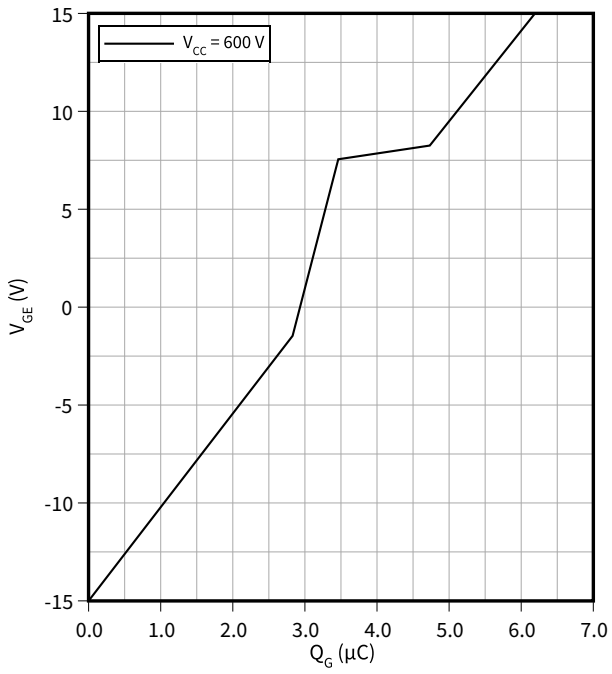
Transfer characteristic (typical), IGBT, T5 / T6

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



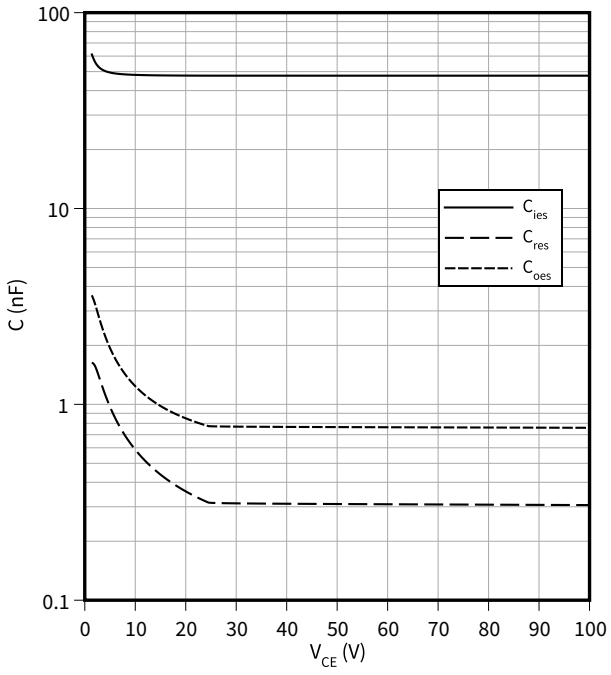
Gate charge characteristic (typical), IGBT, T5 / T6

$V_{GE} = f(Q_G)$
$I_C = 250$ A, $T_{vj} = 25$ °C



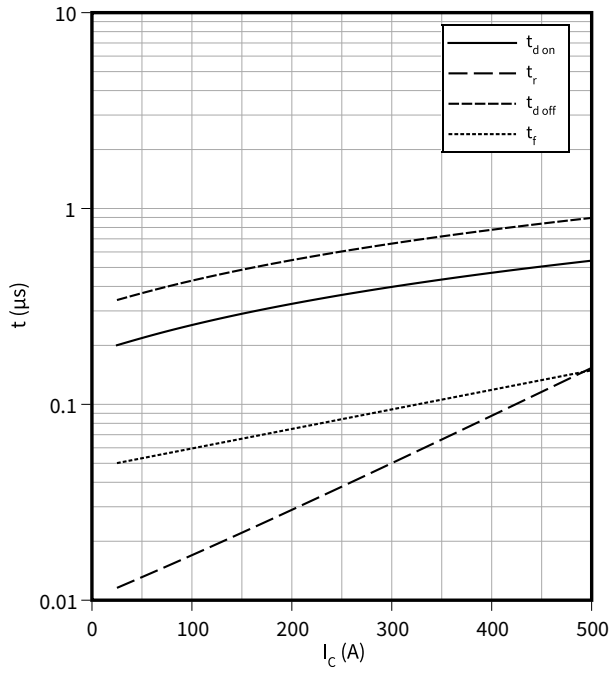
Capacity characteristic (typical), IGBT, T5 / T6

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



Switching times (typical), IGBT, T5 / T6

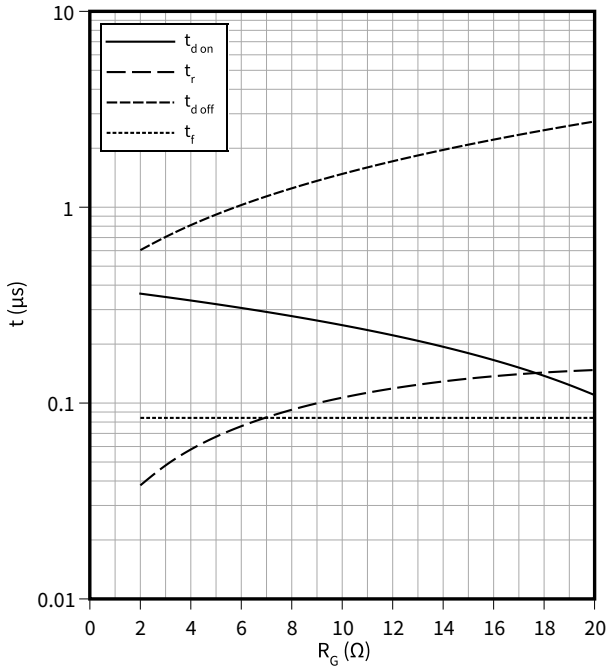
$t = f(I_C)$
$R_{Goff} = 2\ \Omega$, $R_{Gon} = 2\ \Omega$, $V_{GE} = \pm 15$ V, $V_{CC} = 600$ V, $T_{vj} = 175$ °C



Switching times (typical), IGBT, T5 / T6

$t = f(R_G)$

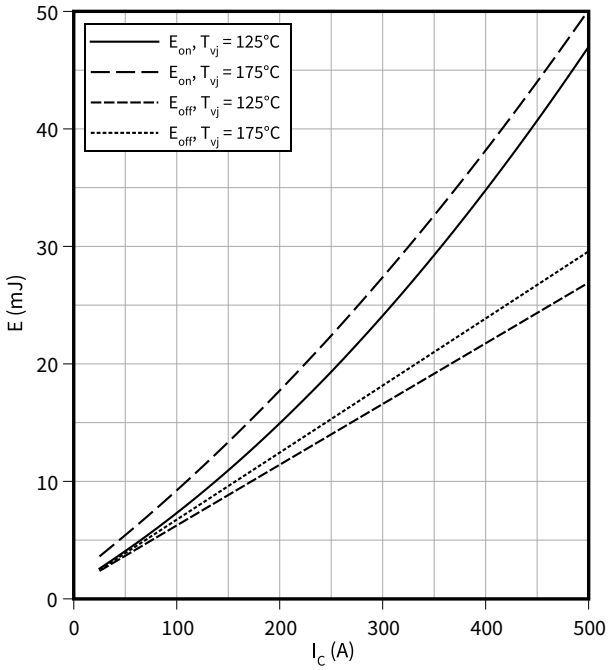
V_{GE} = ±15 V, I_C = 250 A, V_{CC} = 600 V, T_{vj} = 175 °C



Switching losses (typical), IGBT, T5 / T6

$E = f(I_C)$

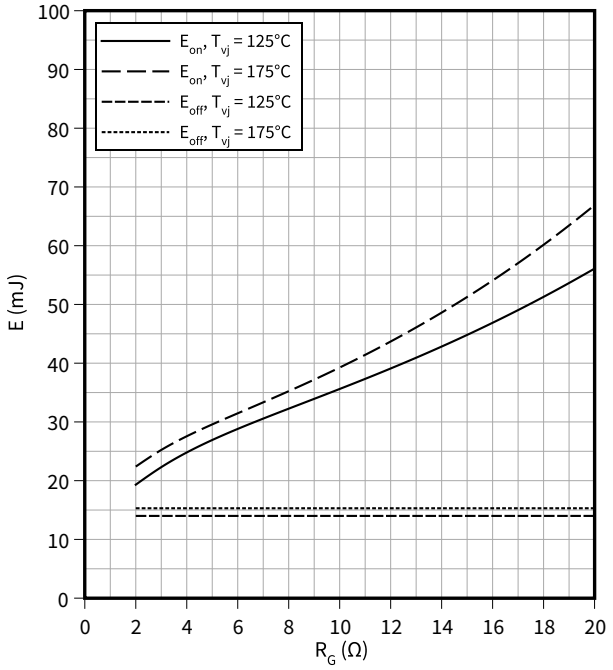
R_{Goff} = 2 Ω, R_{Gon} = 2 Ω, V_{CC} = 600 V, VGE = ± 15 V



Switching losses (typical), IGBT, T5 / T6

$E = f(R_G)$

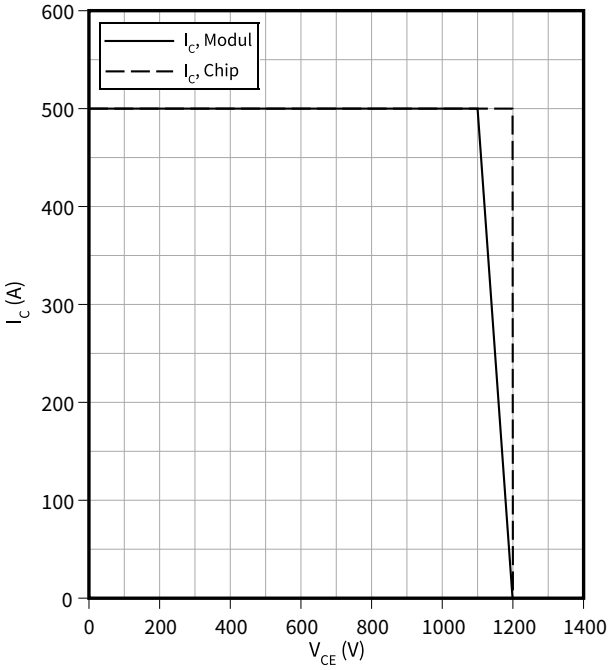
I_C = 250 A, V_{CC} = 600 V, VGE = ± 15 V



Reverse bias safe operating area (RBSOA), IGBT, T5 / T6

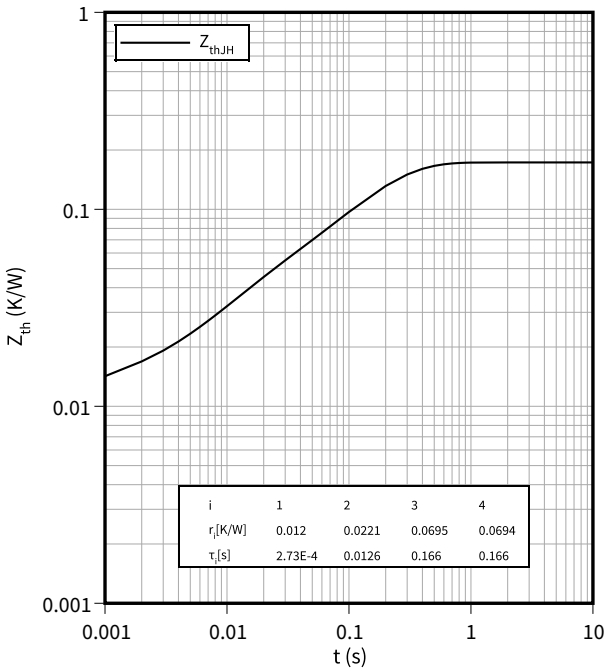
$I_C = f(V_{CE})$

R_{Goff} = 2 Ω, V_{GE} = ±15 V, T_{vj} = 175 °C



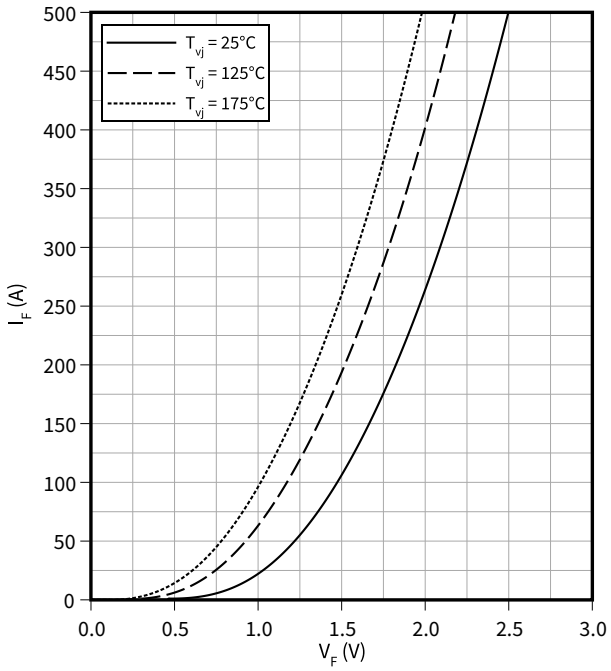
Transient thermal impedance, IGBT, T5 / T6

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D1 / D4

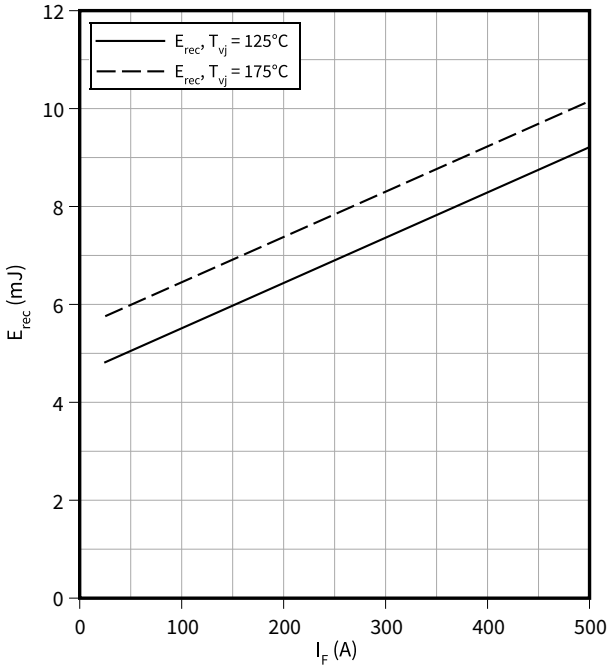
$I_F = f(V_F)$



Switching losses (typical), Diode, D1 / D4

$E_{rec} = f(I_F)$

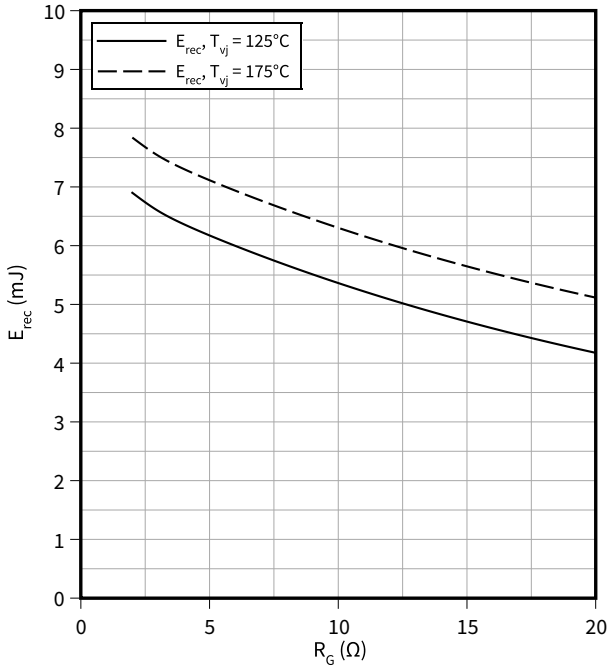
$R_{Gon} = 2\ \Omega$, $V_{CC} = 600$ V



Switching losses (typical), Diode, D1 / D4

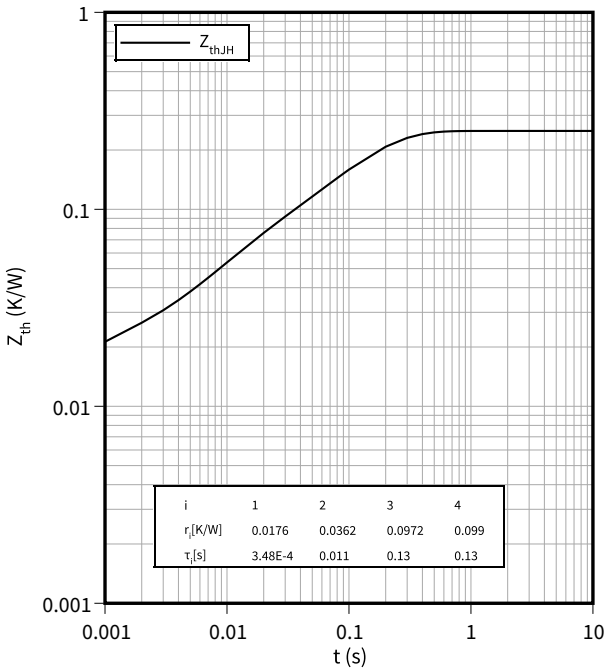
$E_{rec} = f(R_G)$

$I_F = 250$ A, $V_{CC} = 600$ V



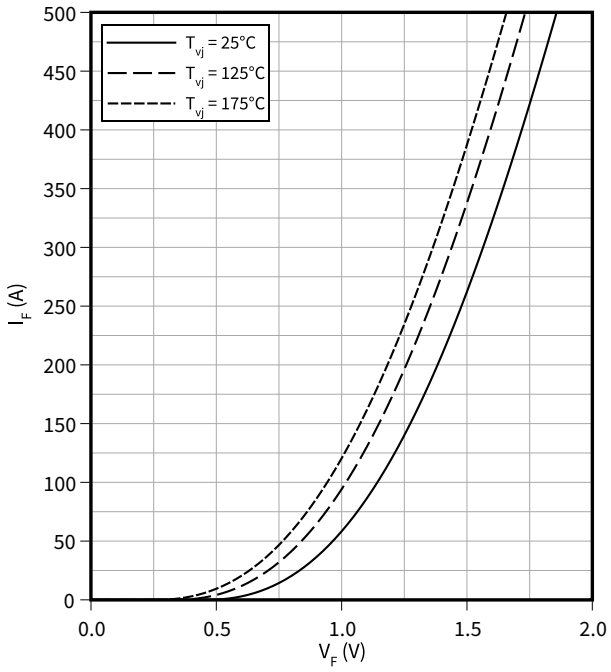
Transient thermal impedance, Diode, D1 / D4

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D2 / D3

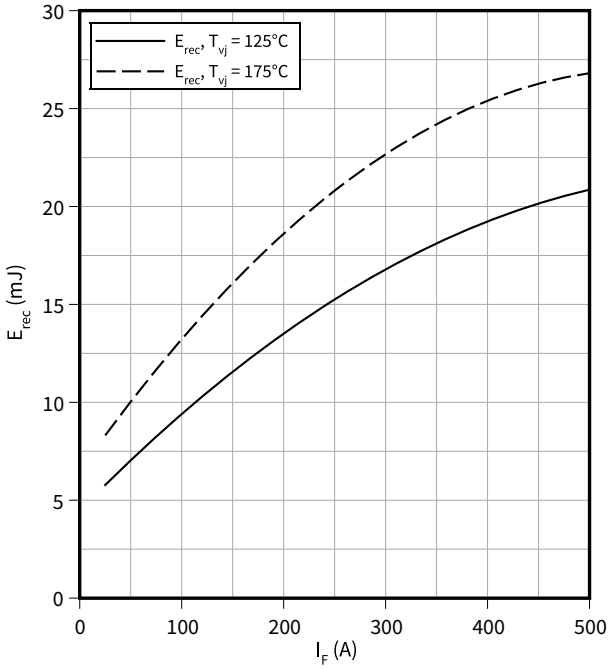
$I_F = f(V_F)$



Switching losses (typical), Diode, D2 / D3

$E_{rec} = f(I_F)$

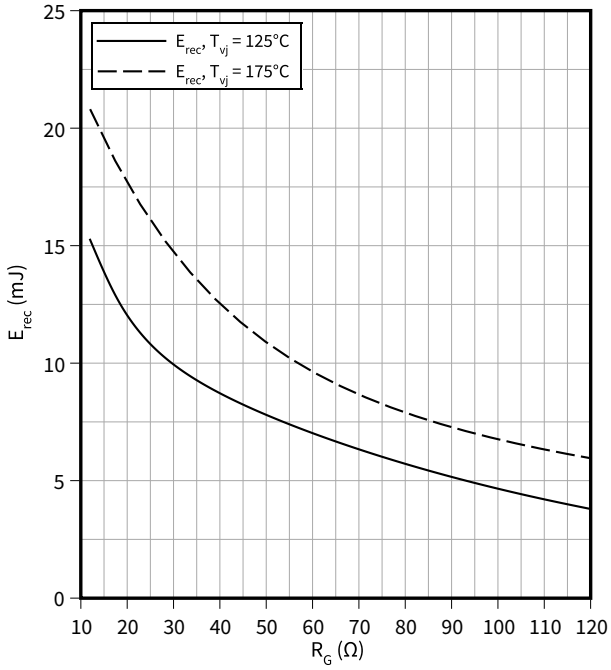
$R_G = 12\ \Omega$, $V_{CC} = 600\ V$



Switching losses (typical), Diode, D2 / D3

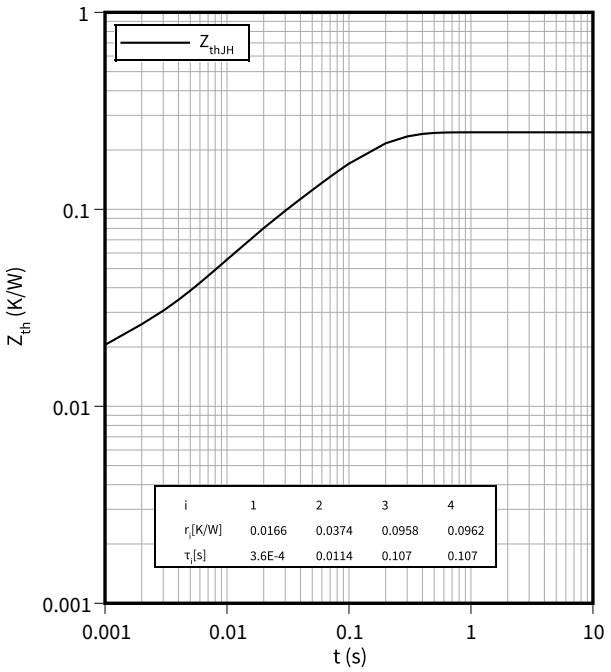
$E_{rec} = f(R_G)$

$I_F = 250\ A$, $V_{CC} = 600\ V$



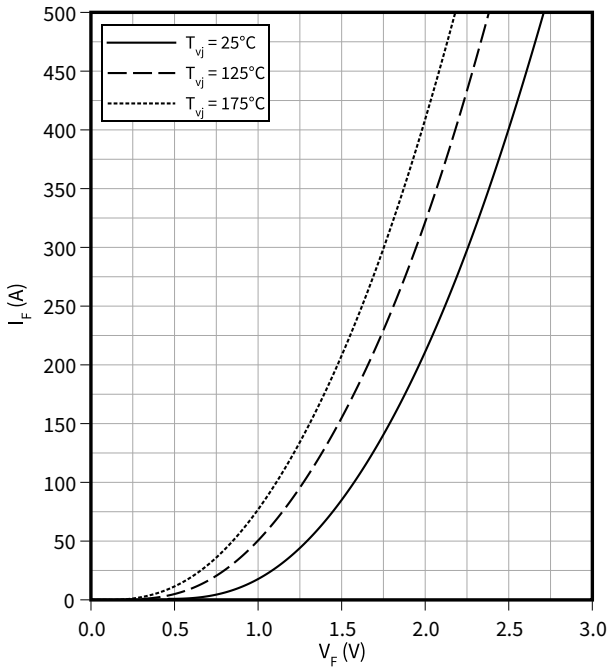
Transient thermal impedance, Diode, D2 / D3

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D5 / D6

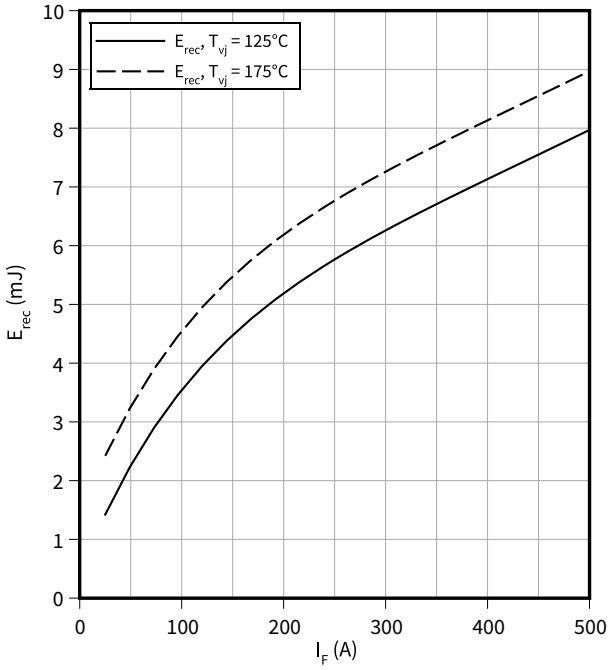
$I_F = f(V_F)$



Switching losses (typical), Diode, D5 / D6

$E_{rec} = f(I_F)$

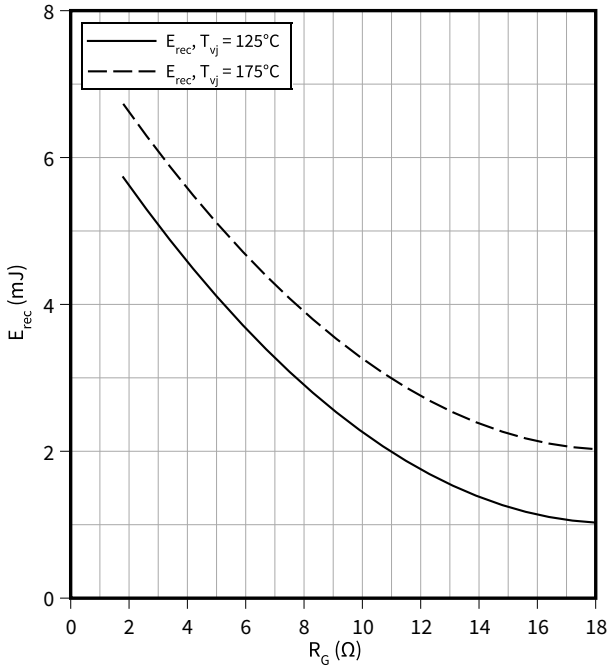
$R_{Gon} = 1.8\ \Omega$, $V_{CC} = 600$ V



Switching losses (typical), Diode, D5 / D6

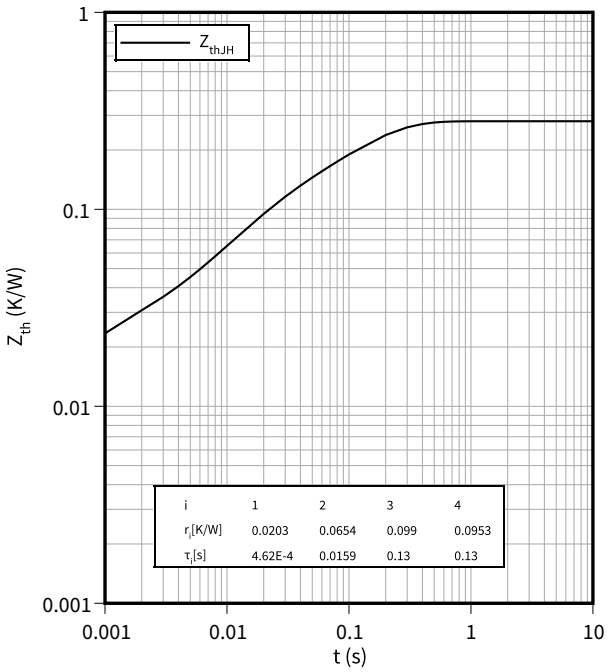
$E_{rec} = f(R_G)$

$I_F = 250$ A, $V_{CC} = 600$ V



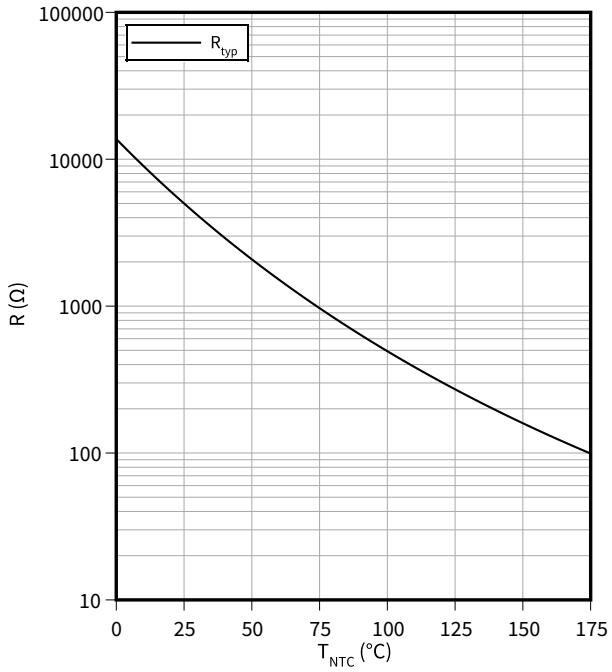
Transient thermal impedance, Diode, D5 / D6

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



10 Circuit diagram

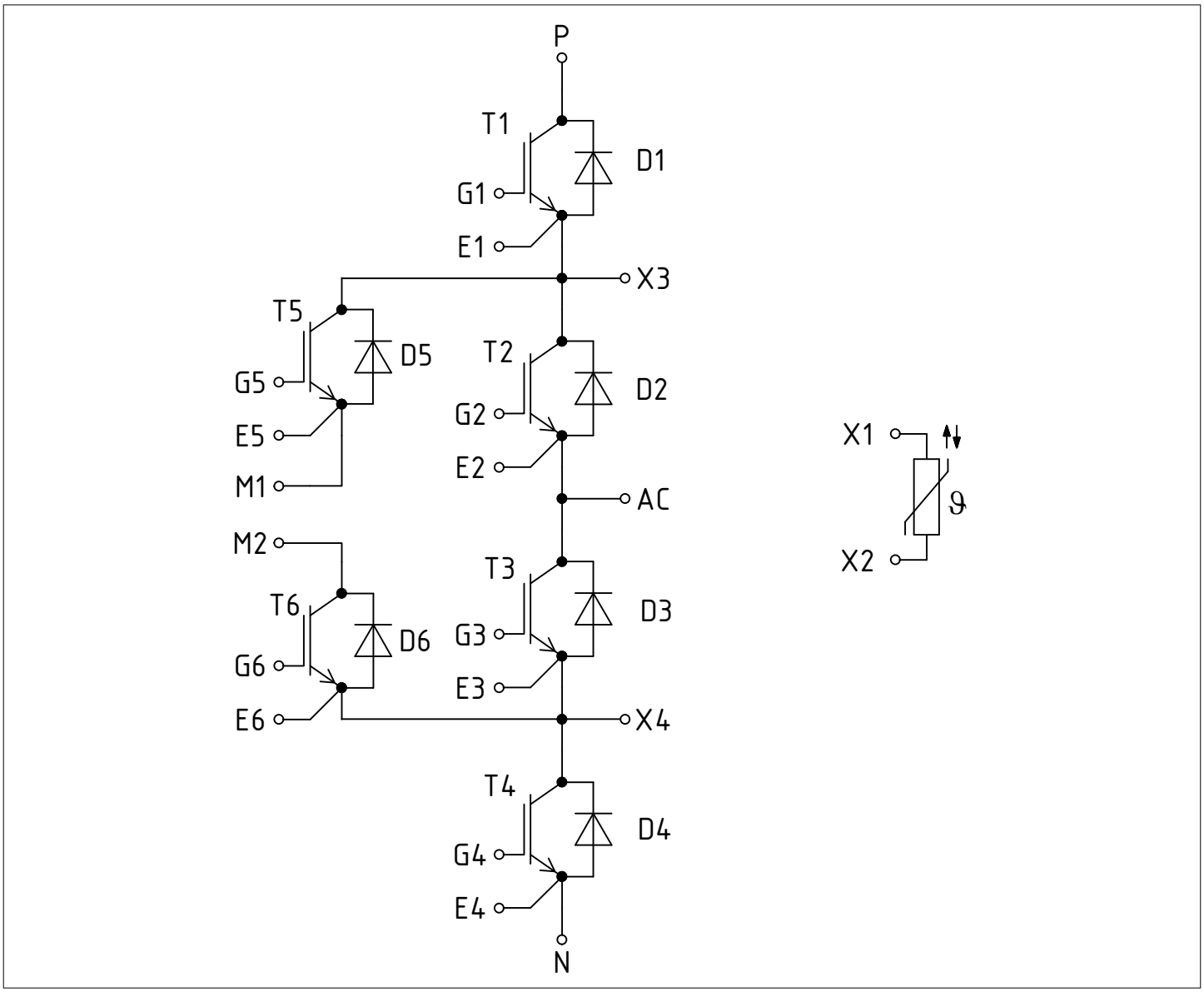


Figure 1

11 Package outlines

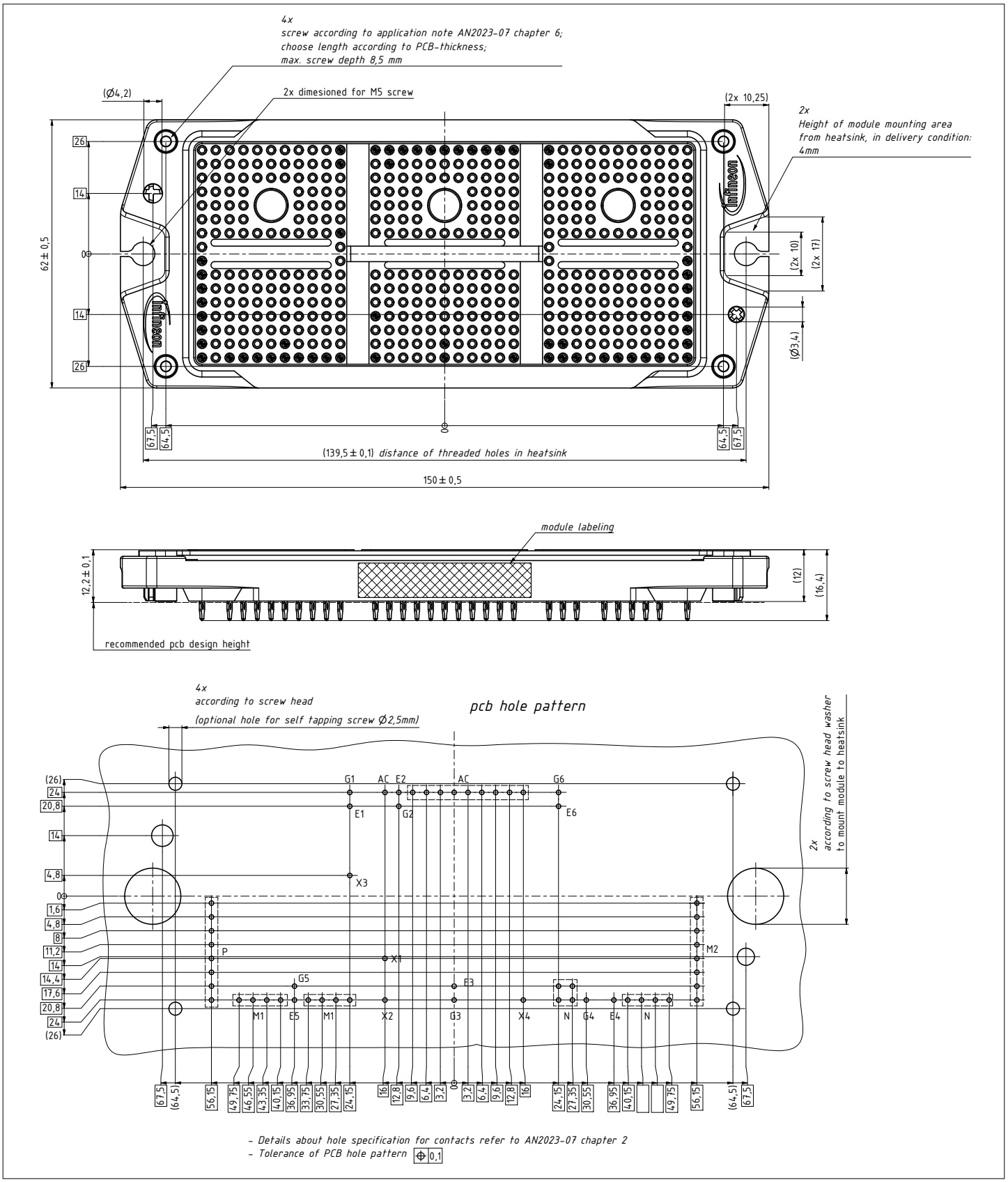


Figure 2

12 Module label code

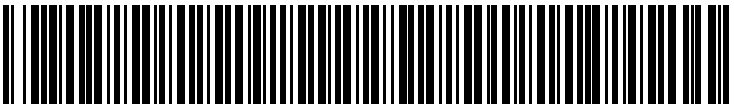
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production week)	*Digit* 1 – 5 6 - 11 12 - 19 20 – 21 22 – 23	*Example* 71549 142846 55054991 15 30
Example	 7154914284655054991530	 7154914284655054991530	

Figure 3

Revision history

Document revision	Date of release	Description of changes
0.10	2024-07-05	Initial version
1.00	2025-02-28	Final datasheet

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