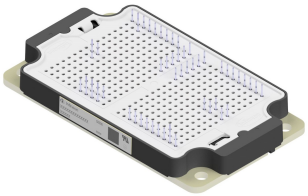
Final datasheet

EasyPACK™ HD3 module with TRENCHSTOP™ H7 and NTC



Features

- Electrical features
  - V_{CES} = 1200 V
  - $I_{C\ nom}$ = 420 A / I_{CRM} = 840 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
  - High current pin
  - Al_2O_3 substrate with low thermal resistance

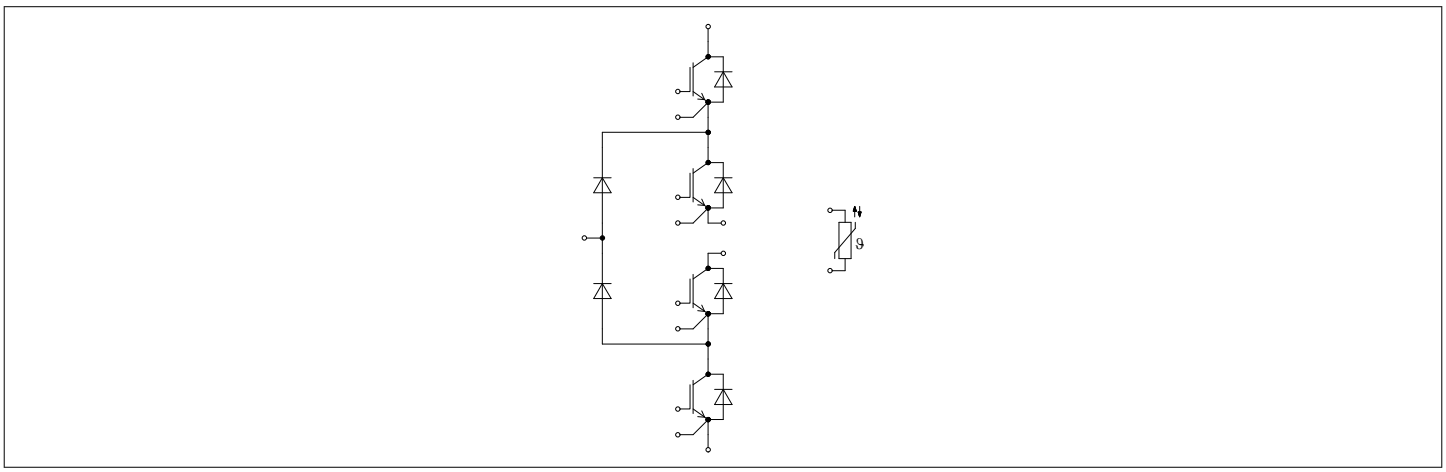
Potential applications

- 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	4.0	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	
Creepage distance	$d_{Creep\ nom}$	terminal to baseplate, nom.	16.0	mm
Clearance	$d_{Clear\ nom}$	terminal to baseplate, nom.	18.8	mm
Comparative tracking index	*CTI*		600	
Relative thermal index (electrical)	*RTI*	frame	130	°C
		lid	140	

Table 2 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray inductance module	L_{sCE}				15		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_C = 25 °C, per switch			1.3		mΩ
Storage temperature	T_{stg}			-40		125	°C
Mounting torque for module mounting	*M*	- Mounting according to valid application note	M5, Screw	3		6	Nm
Weight	*G*				275		g

***Note**: The current under continuous operation is limited to 50 A 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_C = 85 °C	295	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\ op}$		840	A
Gate-emitter peak voltage	V_{GES}			±23	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	1.96	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	5.50	6.15	V
Gate charge	Q_G	V_{GE} = -5/15 V, V_{CC} = 600 V, T_{vj} = 25 °C			4.03		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			0.31		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			20	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} = -5/15 V, R_{Gon} = 0.22 Ω	T_{vj} = 25 °C		0.148		µs
			T_{vj} = 125 °C		0.159		
			T_{vj} = 175 °C		0.166		
Rise time (inductive load)	t_r	I_C = 250 A, V_{CC} = 600 V, V_{GE} = -5/15 V, R_{Gon} = 0.22 Ω	T_{vj} = 25 °C		0.022		µs
			T_{vj} = 125 °C		0.025		
			T_{vj} = 175 °C		0.027		
Turn-off delay time (inductive load)	t_{doff}	I_C = 250 A, V_{CC} = 600 V, V_{GE} = -5/15 V, R_{Goff} = 4.7 Ω	T_{vj} = 25 °C		1.255		µs
			T_{vj} = 125 °C		1.371		
			T_{vj} = 175 °C		1.447		
Fall time (inductive load)	t_f	I_C = 250 A, V_{CC} = 600 V, V_{GE} = -5/15 V, R_{Goff} = 4.7 Ω	T_{vj} = 25 °C		0.025		µs
			T_{vj} = 125 °C		0.062		
			T_{vj} = 175 °C		0.090		
Turn-on energy loss per pulse	E_{on}	I_C = 250 A, V_{CC} = 600 V, L_σ = 15 nH, V_{GE} = -5/15 V, R_{Gon} = 0.22 Ω, di/dt = 8300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		11.2		mJ
			T_{vj} = 125 °C		15.9		
			T_{vj} = 175 °C		19		
Turn-off energy loss per pulse	E_{off}	I_C = 250 A, V_{CC} = 600 V, L_σ = 15 nH, V_{GE} = -5/15 V, R_{Goff} = 4.7 Ω, dv/dt = 5000 V/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		9.38		mJ
			T_{vj} = 125 °C		13.9		
			T_{vj} = 175 °C		16.8		
Thermal resistance, junction to case	R_{thJC}	per IGBT				0.137	K/W

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, λ_{grease} = 5 W/(m·K)		0.0193		K/W
Temperature under switching conditions	$T_{vj\,op}$		-40		175	°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 °C	1200	V
Implemented collector current	I_{CN}			600	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_C = 85 °C	440	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		1200	A
Gate-emitter peak voltage	V_{GES}			±23	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		1.18	1.46	V
			T_{vj} = 125 °C		1.22		
			T_{vj} = 175 °C		1.25		
Gate threshold voltage	V_{GEth}	I_C = 9.3 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		5.25	5.80	6.35	V
Gate charge	Q_G	V_{GE} = -5/15 V, V_{CC} = 600 V, T_{vj} = 25 °C			3.46		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			0.38		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			65.2		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.255		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			25	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} = -5/15 V, R_{Gon} = 0.39 Ω	T_{vj} = 25 °C		0.102		µs
			T_{vj} = 125 °C		0.105		
			T_{vj} = 175 °C		0.105		
Rise time (inductive load)	t_r	I_C = 250 A, V_{CC} = 600 V, V_{GE} = -5/15 V, R_{Gon} = 0.39 Ω	T_{vj} = 25 °C		0.027		µs
			T_{vj} = 125 °C		0.031		
			T_{vj} = 175 °C		0.033		
Turn-off delay time (inductive load)	t_{doff}	I_C = 250 A, V_{CC} = 600 V, V_{GE} = -5/15 V, R_{Goff} = 6.2 Ω	T_{vj} = 25 °C		0.942		µs
			T_{vj} = 125 °C		1.065		
			T_{vj} = 175 °C		1.124		
Fall time (inductive load)	t_f	I_C = 250 A, V_{CC} = 600 V, V_{GE} = -5/15 V, R_{Goff} = 6.2 Ω	T_{vj} = 25 °C		0.107		µs
			T_{vj} = 125 °C		0.138		
			T_{vj} = 175 °C		0.239		
Turn-on energy loss per pulse	E_{on}	I_C = 250 A, V_{CC} = 600 V, L_σ = 15 nH, V_{GE} = -5/15 V, R_{Gon} = 0.39 Ω, di/dt = 7800 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		6.27		mJ
			T_{vj} = 125 °C		8.92		
			T_{vj} = 175 °C		11.2		
Turn-off energy loss per pulse	E_{off}	I_C = 250 A, V_{CC} = 600 V, L_σ = 15 nH, V_{GE} = -5/15 V, R_{Goff} = 6.2 Ω, dv/dt = 1750 V/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		26.7		mJ
			T_{vj} = 125 °C		34.9		
			T_{vj} = 175 °C		40.1		
Thermal resistance, junction to case	R_{thJC}	per IGBT				0.107	K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, λ_{grease} = 5 W/(m·K)			0.0185		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°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 °C	1200	V
Continuous DC forward current	I_F			300	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		600	A

(table continues...)

Table 7 (continued) Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	2120	A^2s
			T_{vj} = 175 °C	1930	

Table 8 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		2.34	2.85	V
			T_{vj} = 125 °C		2.03		
			T_{vj} = 175 °C		1.83		
Peak reverse recovery current	I_{RM}	V_{CC} = 600 V, I_F = 250 A, V_{GE} = -5 V, -di$_F$/dt = 7800 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		171		A
			T_{vj} = 125 °C		240		
			T_{vj} = 175 °C		284		
Recovered charge	Q_r	V_{CC} = 600 V, I_F = 250 A, V_{GE} = -5 V, -di$_F$/dt = 7800 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		6.37		µC
			T_{vj} = 125 °C		14.8		
			T_{vj} = 175 °C		21.7		
Reverse recovery time	t_{rr}	V_{CC} = 600 V, I_F = 250 A, V_{GE} = -5 V, -di$_F$/dt = 7800 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		0.101		µs
			T_{vj} = 125 °C		0.14		
			T_{vj} = 175 °C		0.162		
Reverse recovery energy	E_{rec}	V_{CC} = 600 V, I_F = 250 A, V_{GE} = -5 V, -di$_F$/dt = 7800 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		2.25		mJ
			T_{vj} = 125 °C		5.43		
			T_{vj} = 175 °C		8.24		
Thermal resistance, junction to case	R_{thJC}	per diode				0.286	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, λ_{grease} = 5 W/(m·K)			0.0427		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°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 °C	1200	V
Continuous DC forward current	I_F			300	A

(table continues...)

Table 9 (continued) Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		600	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	2120	A^2s
			T_{vj} = 175 °C	1930	

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		2.34	2.85	V
			T_{vj} = 125 °C		2.03		
			T_{vj} = 175 °C		1.83		
Thermal resistance, junction to case	R_{thJC}	per diode				0.301	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, λ_{grease} = 5 W/(m·K)			0.0424		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°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 °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	2120	A^2s
			T_{vj} = 175 °C	1930	

Table 12 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 250 A	T_{vj} = 25 °C		2.12	2.59	V
			T_{vj} = 125 °C		1.81		
			T_{vj} = 175 °C		1.62		

(table continues...)

Table 12 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Reverse current	I_R					20	µA
Peak reverse recovery current	I_{RM}	V_{CC} = 600 V, I_F = 250 A, -di$_F$/dt = 8300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		123		A
			T_{vj} = 125 °C		196		
			T_{vj} = 175 °C		244		
Recovered charge	Q_r	V_{CC} = 600 V, I_F = 250 A, -di$_F$/dt = 8300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		6.24		µC
			T_{vj} = 125 °C		16.4		
			T_{vj} = 175 °C		24.7		
Reverse recovery time	t_{rr}	V_{CC} = 600 V, I_F = 250 A, -di$_F$/dt = 8300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		0.123		µs
			T_{vj} = 125 °C		0.175		
			T_{vj} = 175 °C		0.21		
Reverse recovery energy	E_{rec}	V_{CC} = 600 V, I_F = 250 A, -di$_F$/dt = 8300 A/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		1.86		mJ
			T_{vj} = 125 °C		5.43		
			T_{vj} = 175 °C		8.65		
Thermal resistance, junction to case	R_{thJC}	per diode				0.287	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, λ_{grease} = 5 W/(m·K)			0.0257		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°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 °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	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2\text{-}1/(298{,}15\ K))]$		3375		K
B-value	$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2\text{-}1/(298{,}15\ K))]$		3411		K
B-value	$B_{25/100}$	$R_2 = R_{25} \exp[B_{25/100}(1/T_2\text{-}1/(298{,}15\ K))]$		3433		K

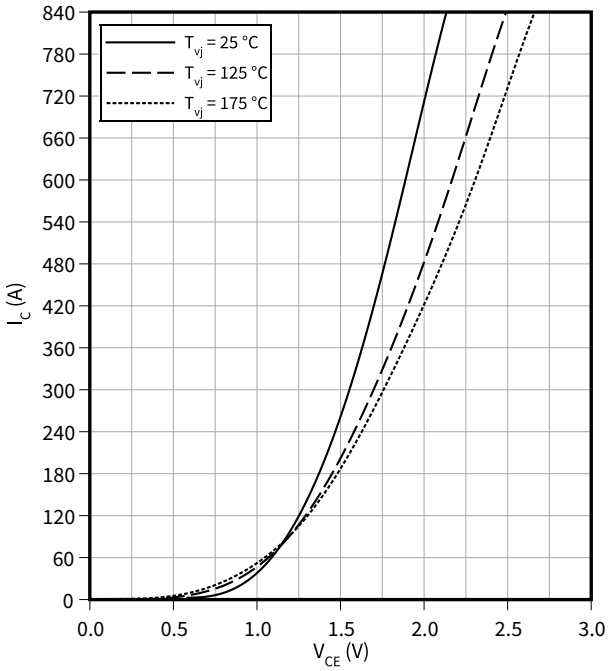
***Note**: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4*

8 Characteristics diagrams

Output characteristic (typical), IGBT, T1 / T4

$I_C = f(V_{CE})$

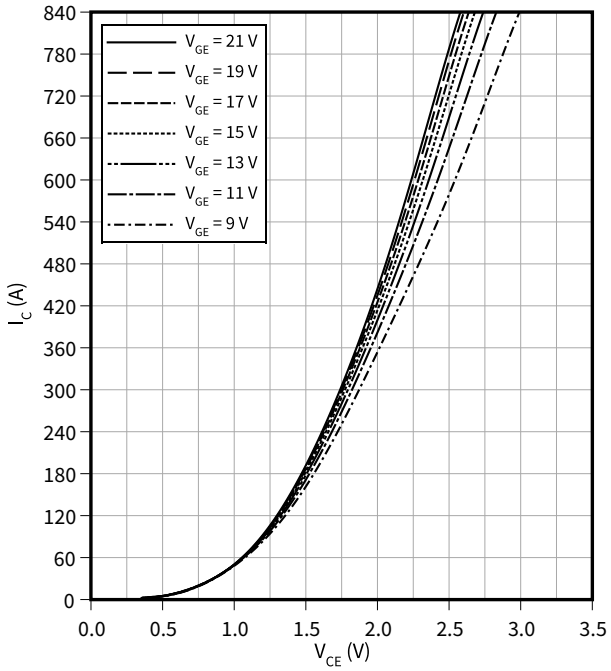
V_{GE} = 15 V



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

$I_C = f(V_{CE})$

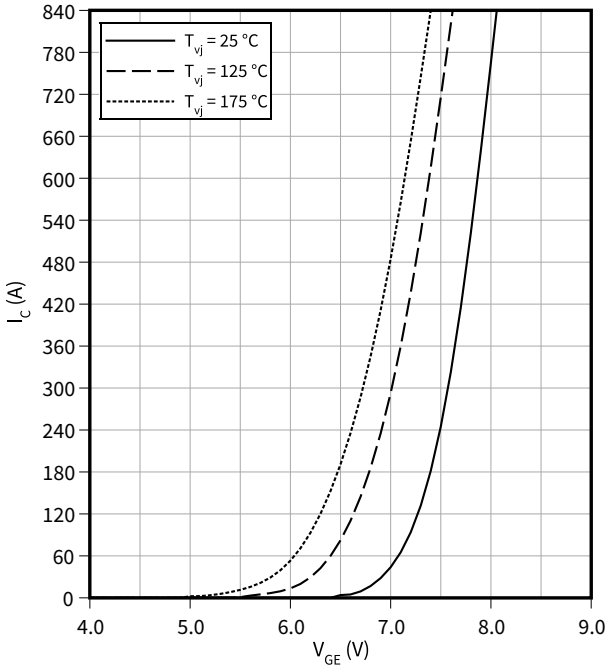
T_{vj} = 175 °C



Transfer characteristic (typical), IGBT, T1 / T4

$I_C = f(V_{GE})$

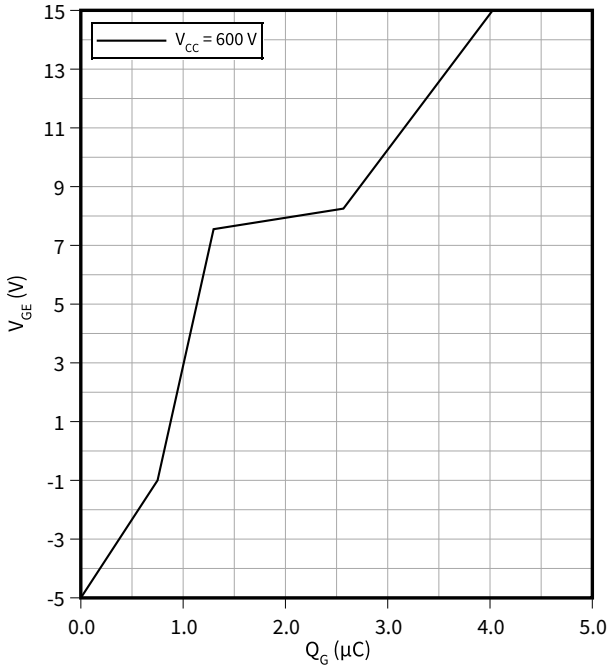
V_{CE} = 20 V



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

$V_{GE} = f(Q_G)$

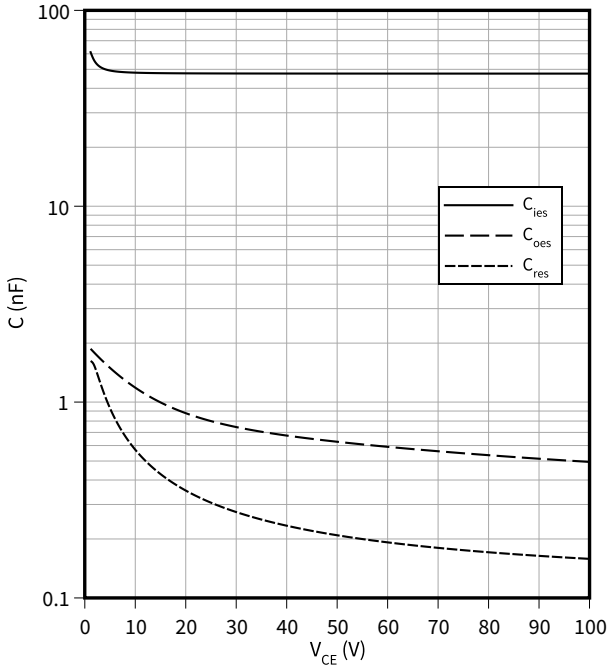
I_C = 420 A, T_{vj} = 25 °C



Capacity characteristic (typical), IGBT, T1 / T4

$C = f(V_{CE})$

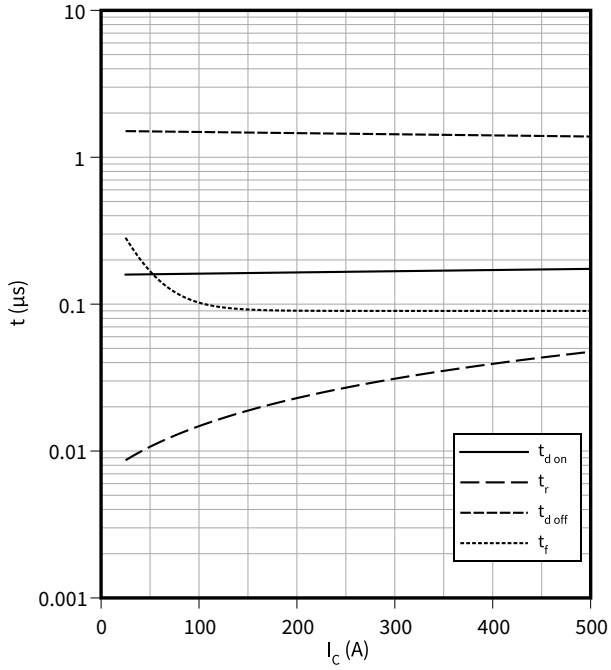
$f = 100\ kHz$, $V_{GE} = 0\ V$, $T_{vj} = 25\ °C$



Switching times (typical), IGBT, T1 / T4

$t = f(I_C)$

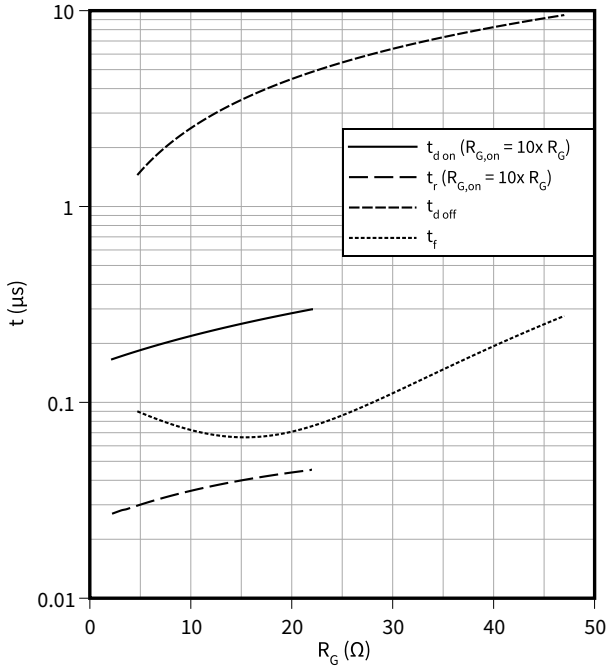
$V_{CC} = 600\ V$, $T_{vj} = 175\ °C$, $R_{Goff} = 4.7\ \Omega$, $R_{Gon} = 0.22\ \Omega$, $V_{GE} = -5/15\ V$



Switching times (typical), IGBT, T1 / T4

$t = f(R_G)$

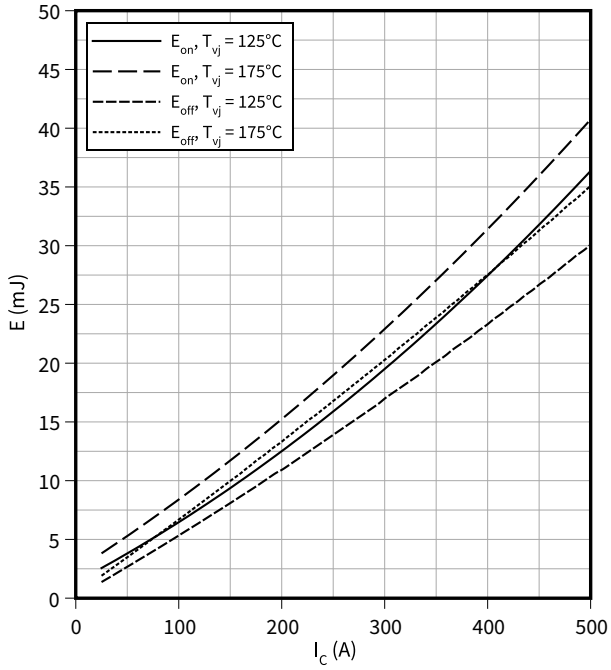
$V_{GE} = -5/15\ V$, $I_C = 250\ A$, $V_{CC} = 600\ V$, $T_{vj} = 175\ °C$



Switching losses (typical), IGBT, T1 / T4

$E = f(I_C)$

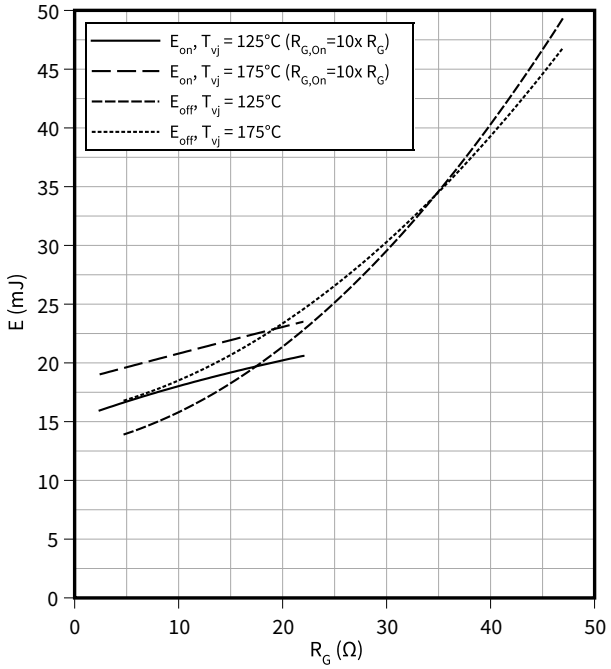
$R_{Goff} = 6.8\ \Omega$, $R_{Gon} = 0.22\ \Omega$, $V_{GE} = -5/15\ V$, $V_{CC} = 600\ V$



Switching losses (typical), IGBT, T1 / T4

$E = f(R_G)$

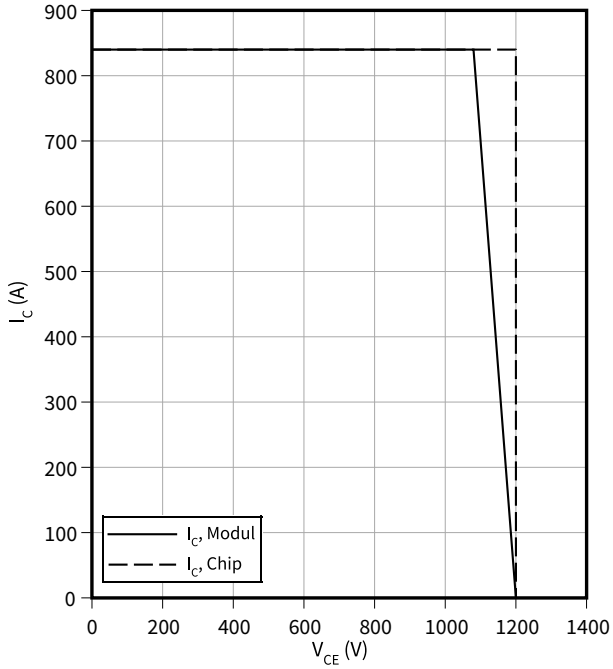
V_{GE} = -5/15 V, I_C = 250 A, V_{CC} = 600 V



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

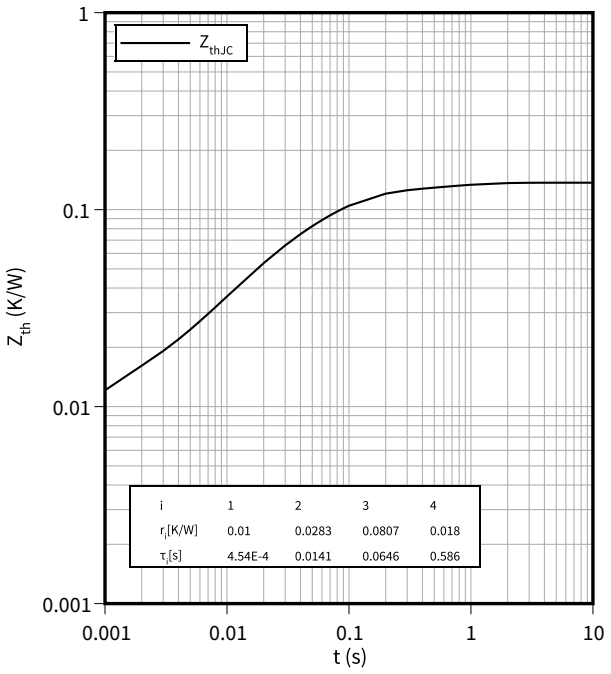
$I_C = f(V_{CE})$

T_{vj} = 175 °C, R_{Goff} = 4.7 Ω, V_{GE} = -5/15 V



Transient thermal impedance, IGBT, T1 / T4

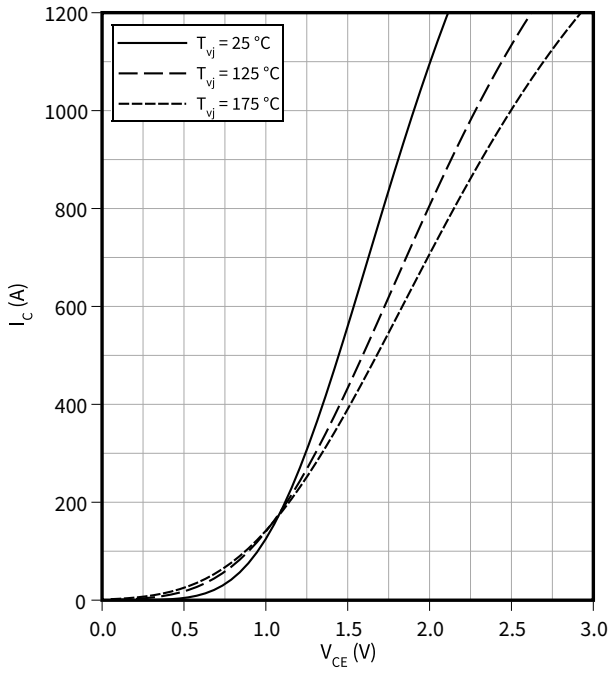
$Z_{th} = f(t)$



Output characteristic (typical), IGBT, T2 / T3

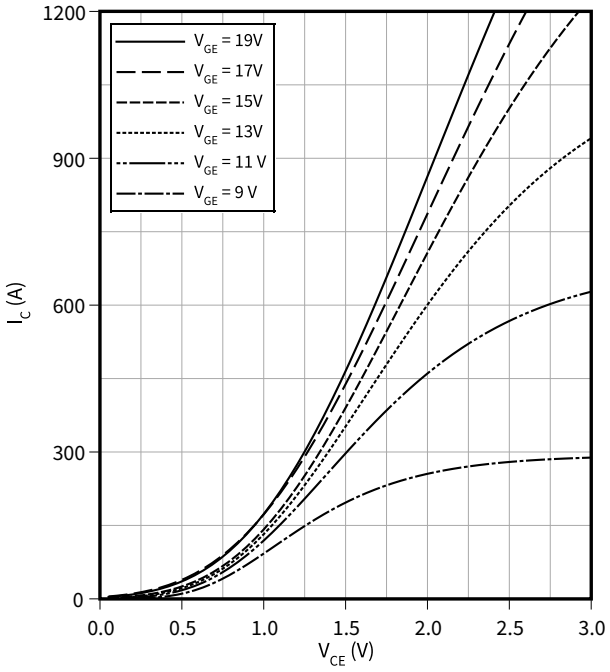
$I_C = f(V_{CE})$

V_{GE} = 15 V



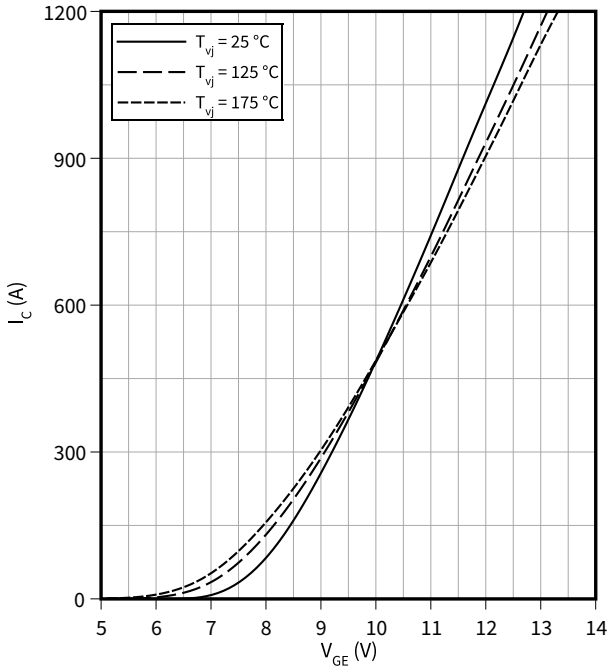
Output characteristic field (typical), IGBT, T2 / T3

$I_C = f(V_{CE})$
$T_{vj} = 175\ °C$



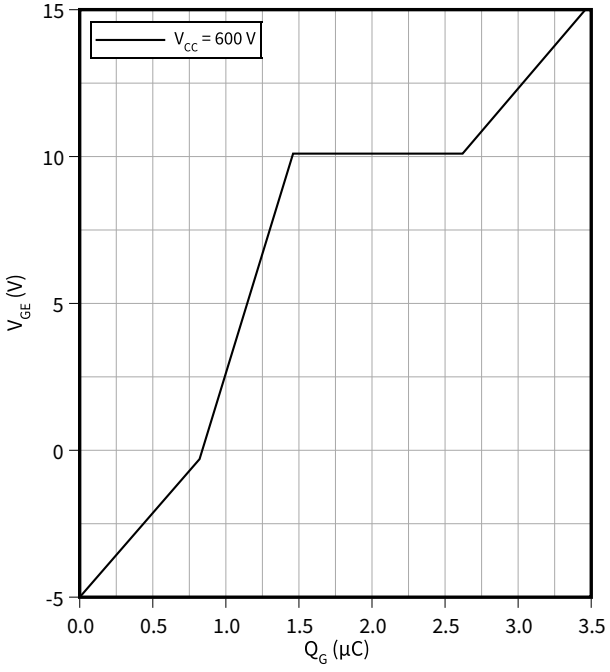
Transfer characteristic (typical), IGBT, T2 / T3

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



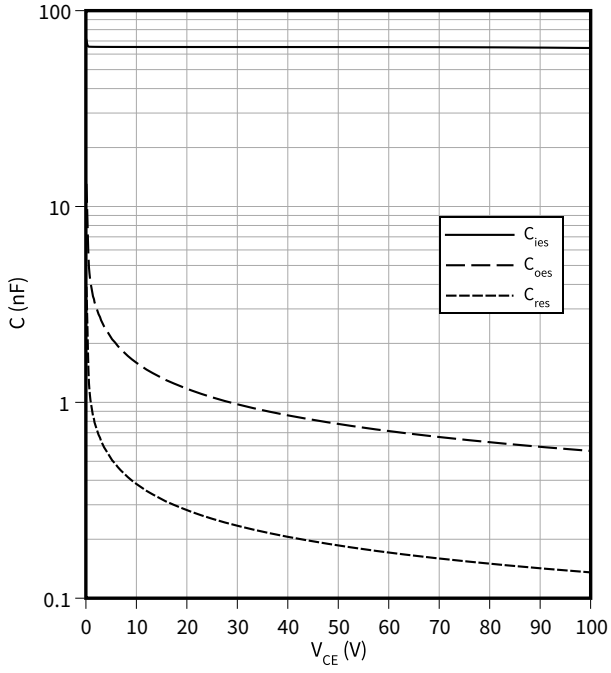
Gate charge characteristic (typical), IGBT, T2 / T3

$V_{GE} = f(Q_G)$
$I_C = 600\ A,\ T_{vj} = 25\ °C$



Capacity characteristic (typical), IGBT, T2 / T3

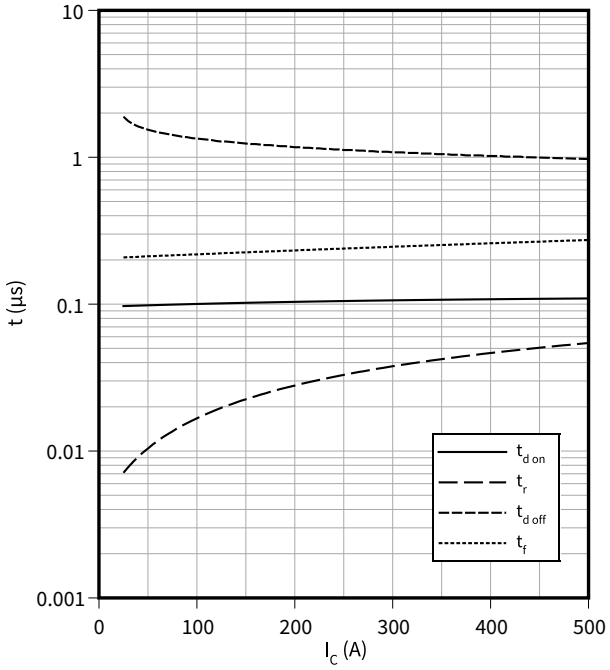
$C = f(V_{CE})$
$f = 100\ kHz,\ V_{GE} = 0\ V,\ T_{vj} = 25\ °C$



Switching times (typical), IGBT, T2 / T3

$t = f(I_C)$

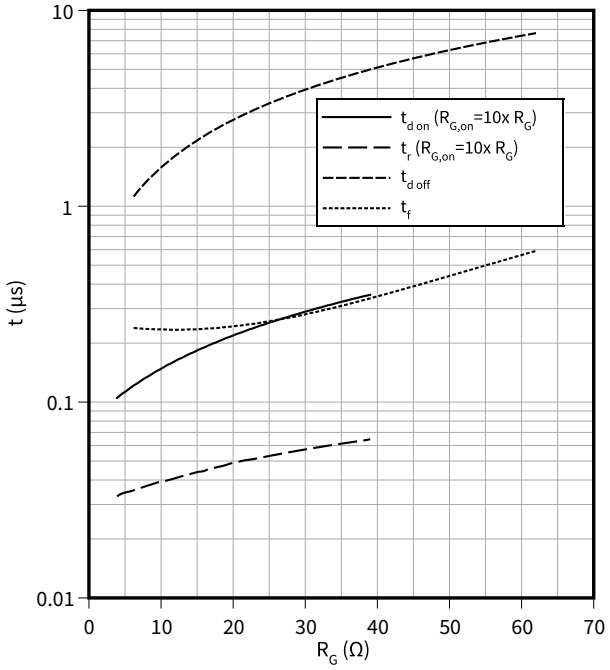
V_{CC} = 600 V, T_{vj} = 175 °C, R_{Goff} = 6.2 Ω, R_{Gon} = 0.39 Ω, V_{GE} = -5/15 V



Switching times (typical), IGBT, T2 / T3

$t = f(R_G)$

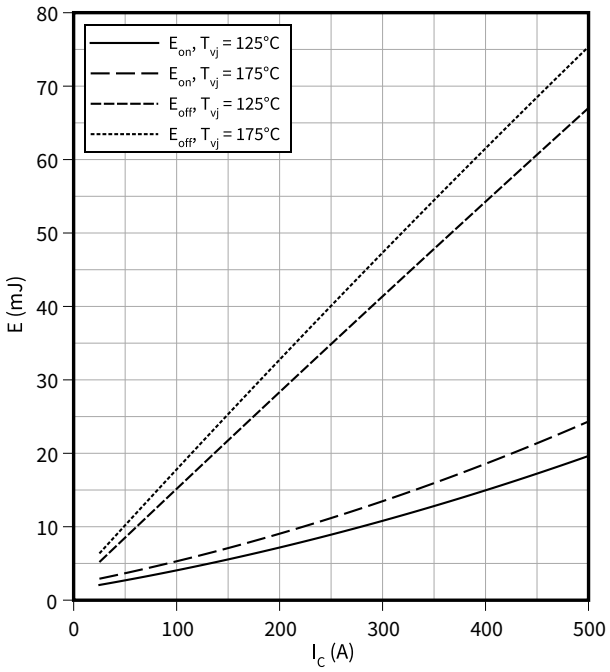
V_{GE} = -5/15 V, I_C = 250 A, V_{CC} = 600 V, T_{vj} = 175 °C



Switching losses (typical), IGBT, T2 / T3

$E = f(I_C)$

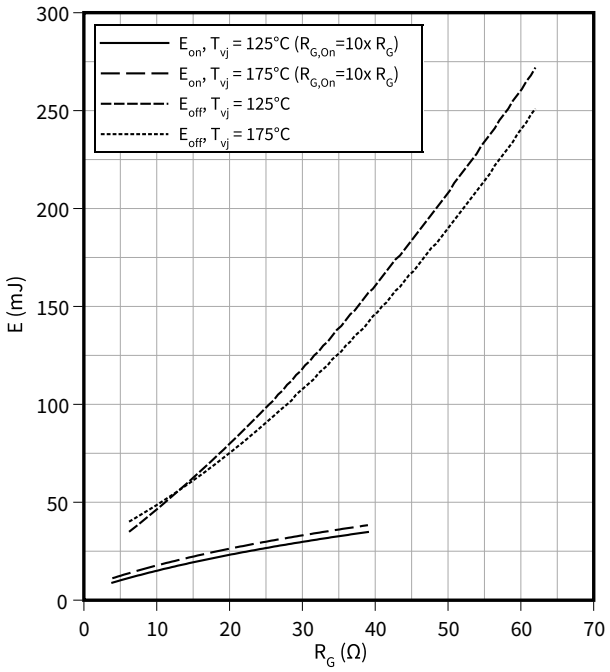
R_{Goff} = 6.2 Ω, R_{Gon} = 0.39 Ω, V_{GE} = -5/15 V, V_{CC} = 600 V



Switching losses (typical), IGBT, T2 / T3

$E = f(R_G)$

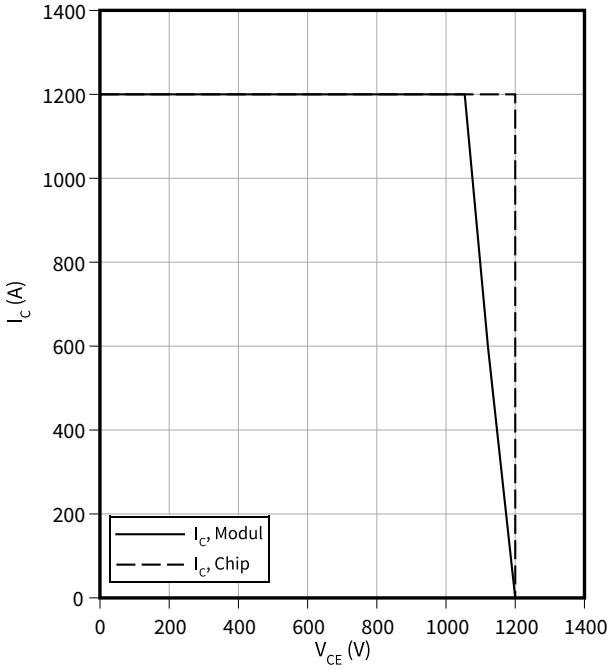
V_{GE} = -5/15 V, I_C = 250 A, V_{CC} = 600 V



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

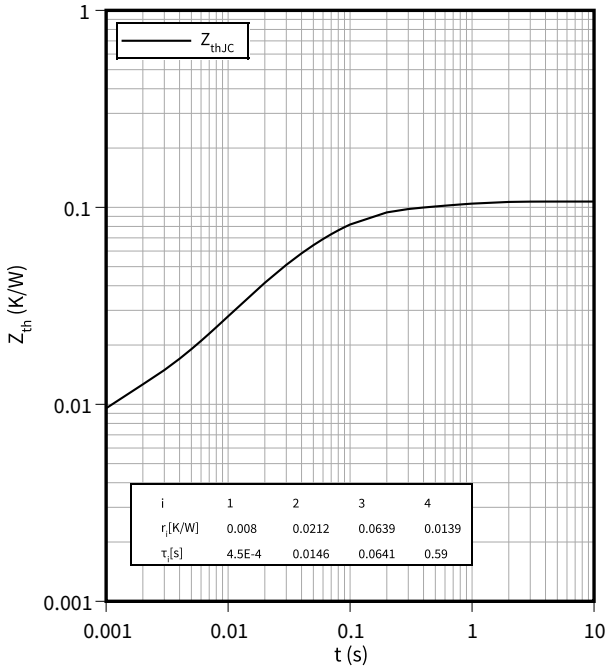
$I_C = f(V_{CE})$

$R_{Goff} = 6.2\ \Omega$, $V_{GE} = -5/15$ V, $T_{vj} = 175$ °C



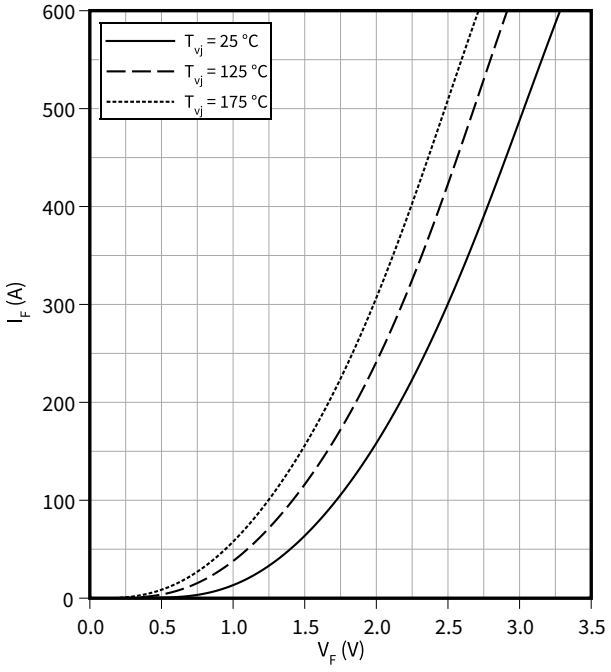
Transient thermal impedance, IGBT, T2 / T3

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D1 / D4

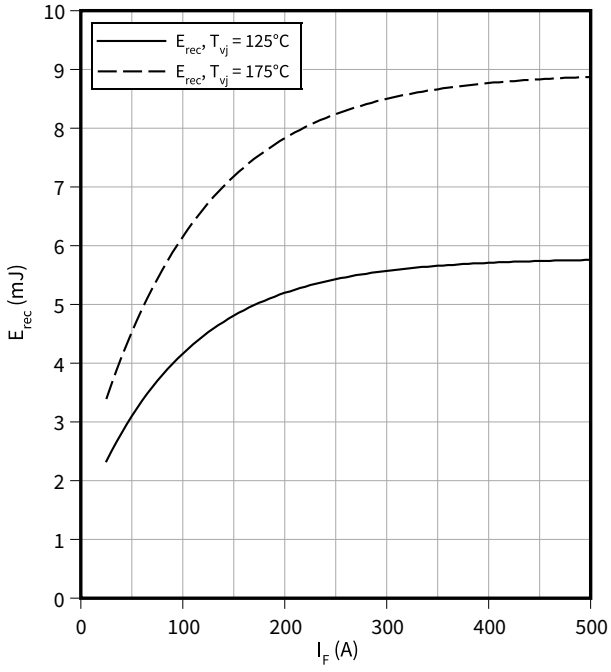
$I_F = f(V_F)$



Switching losses (typical), Diode, D1 / D4

$E_{rec} = f(I_F)$

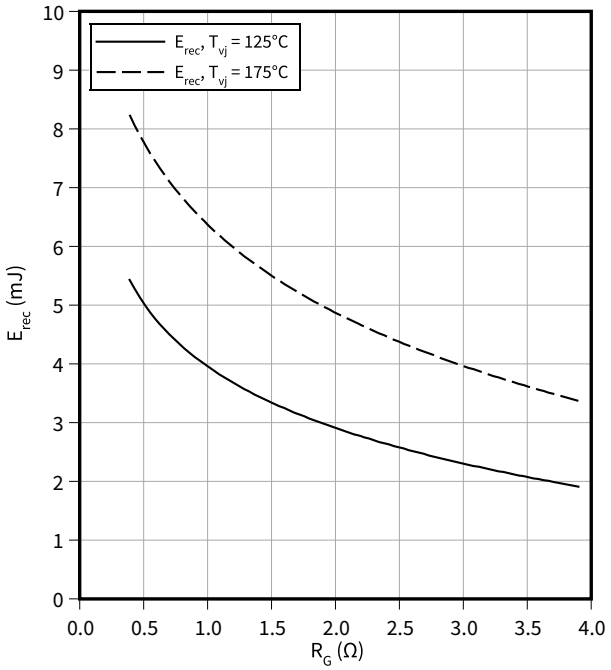
$R_G = 0.39\ \Omega$, $V_{CC} = 600$ V



Switching losses (typical), Diode, D1 / D4

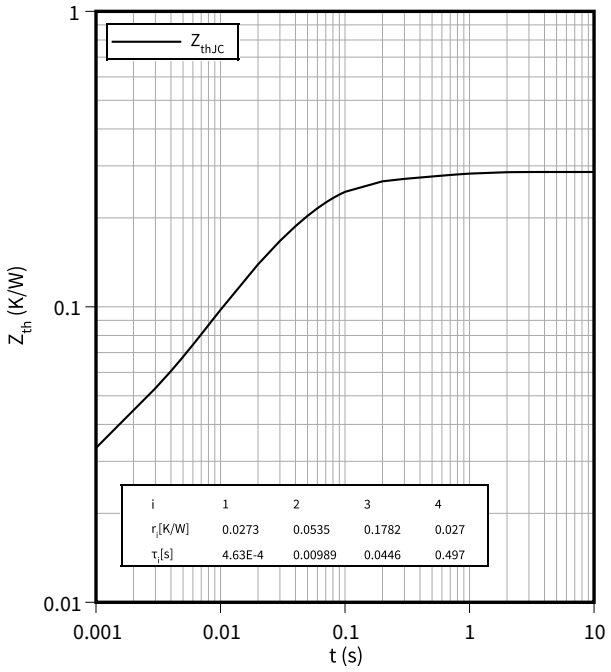
$E_{rec} = f(R_G)$

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



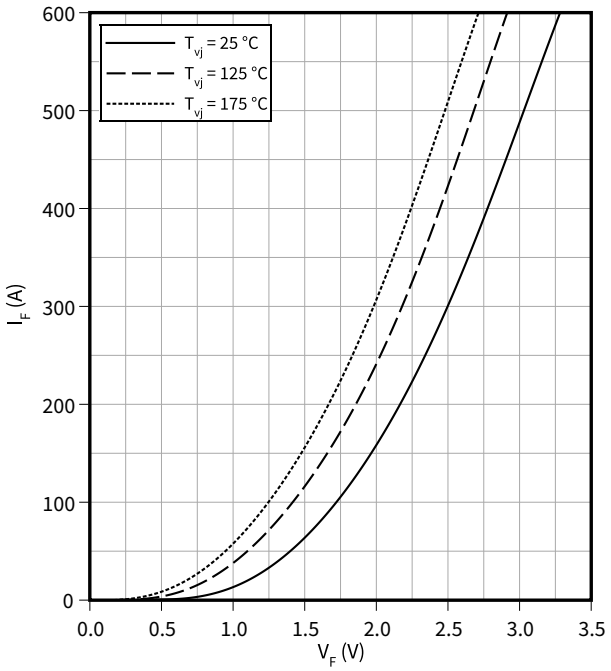
Transient thermal impedance, Diode, D1 / D4

$Z_{th} = f(t)$



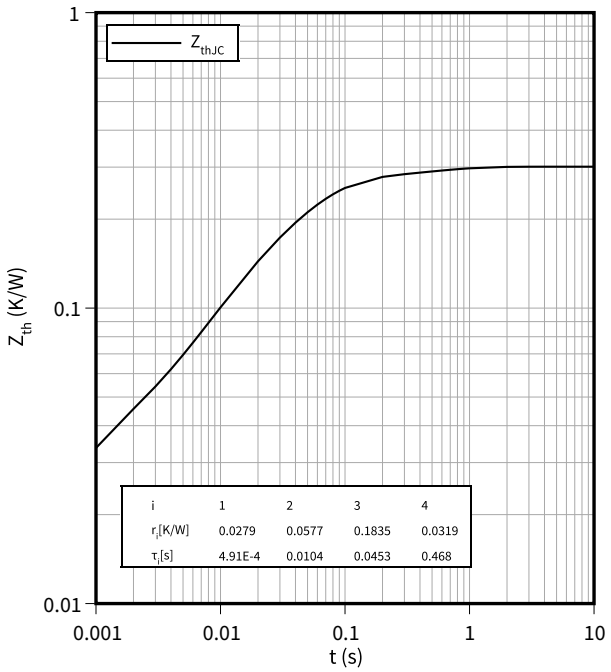
Forward characteristic (typical), Diode, D2 / D3

$I_F = f(V_F)$



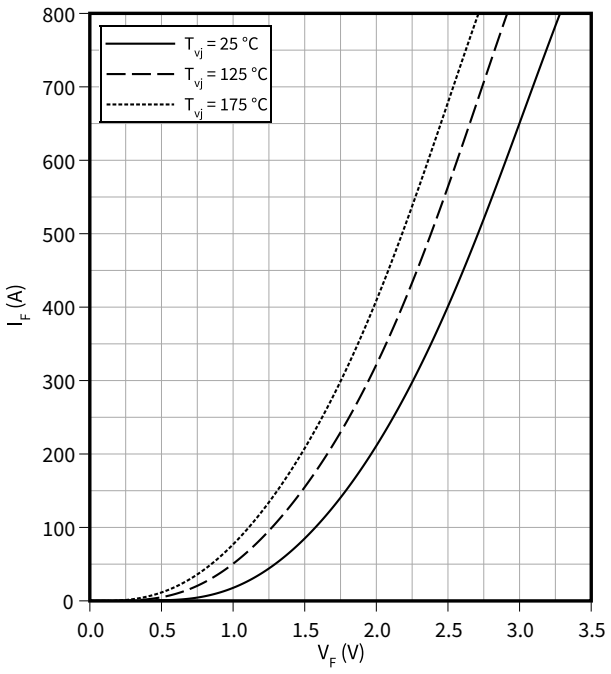
Transient thermal impedance, Diode, D2 / D3

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D5 / D6

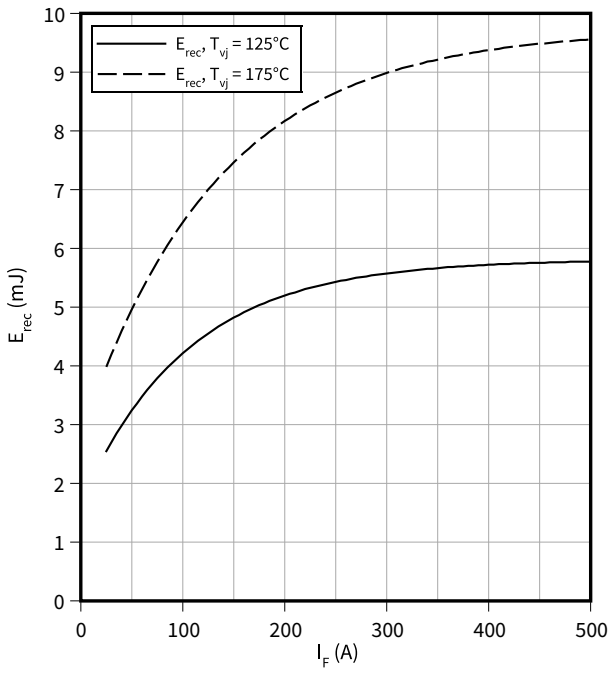
$I_F = f(V_F)$



Switching losses (typical), Diode, D5 / D6

$E_{rec} = f(I_F)$

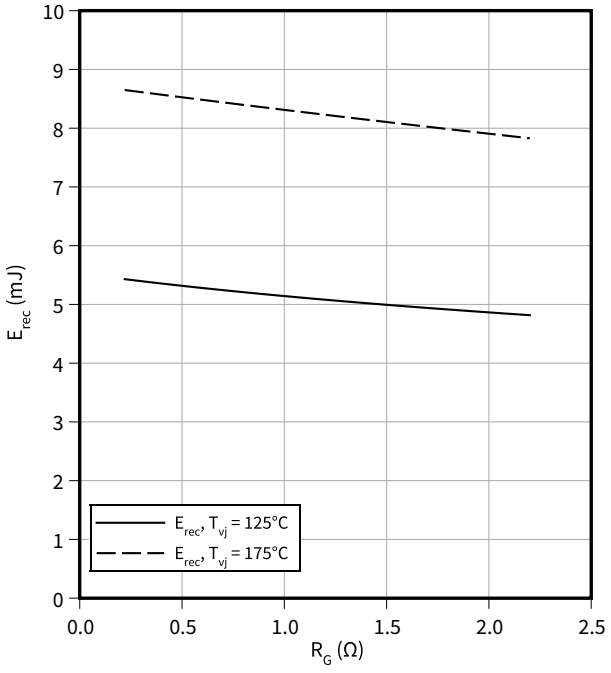
$R_G = 0.22\ \Omega$, $V_{CC} = 600\ V$



Switching losses (typical), Diode, D5 / D6

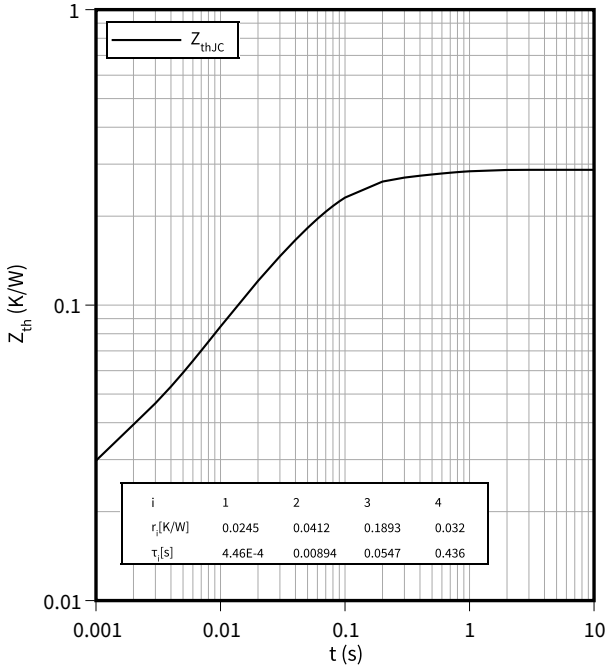
$E_{rec} = f(R_G)$

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



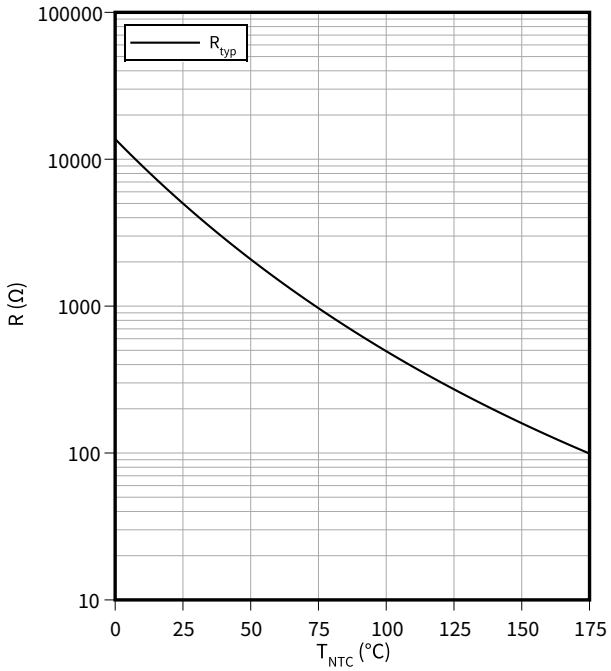
Transient thermal impedance, Diode, D5 / D6

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



9 Circuit diagram

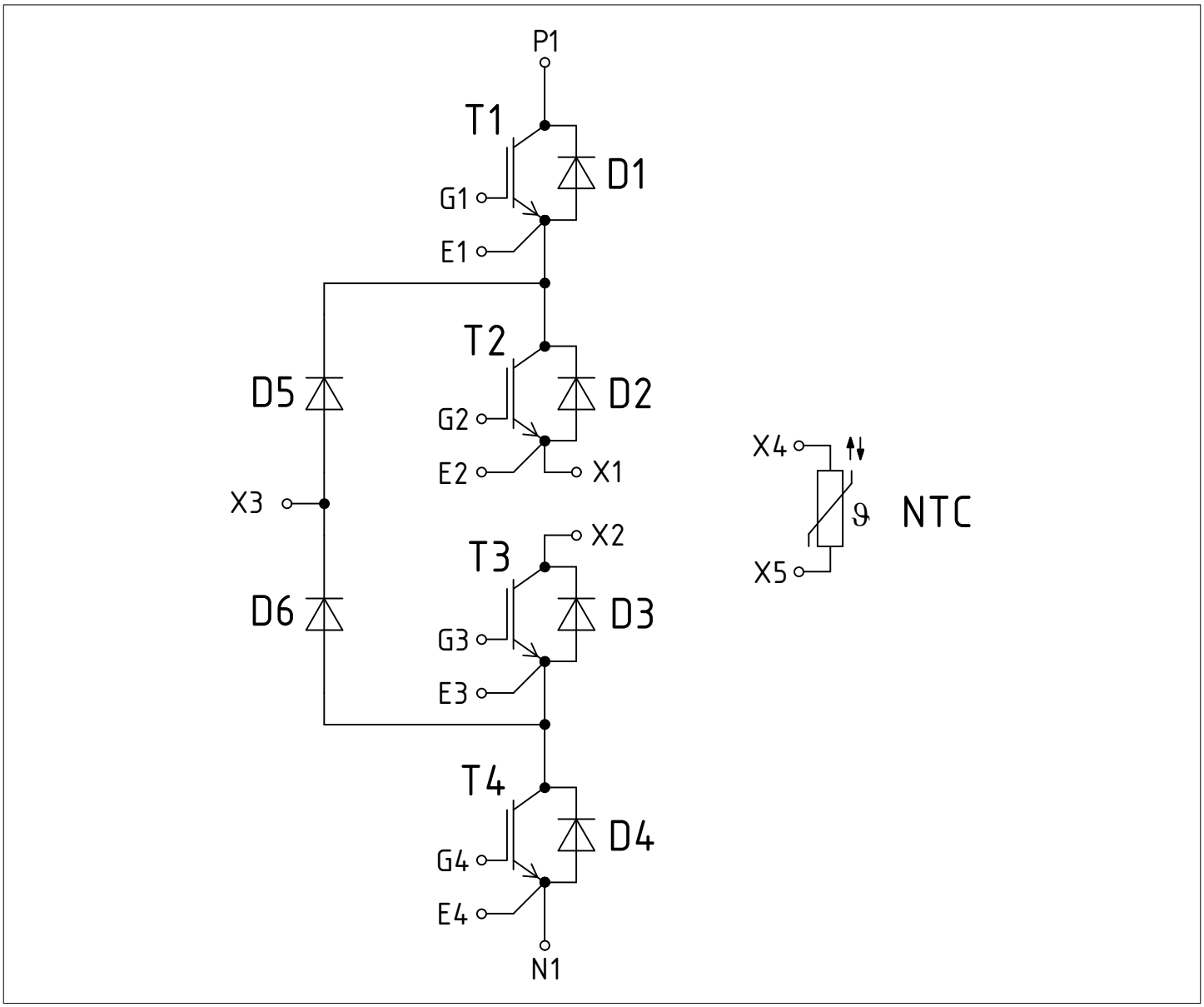


Figure 1

10 Package outlines

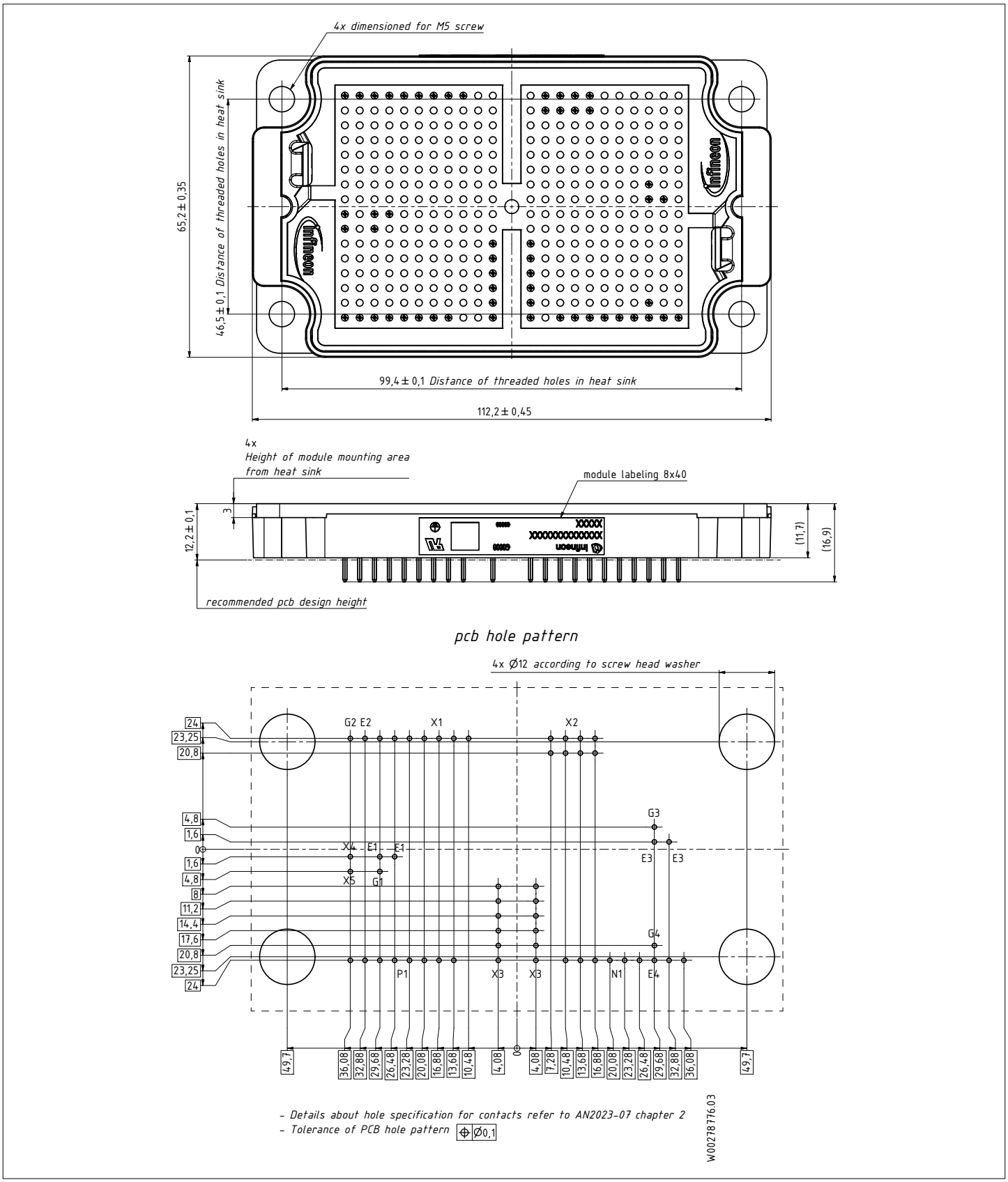


Figure 2

11 Module label code

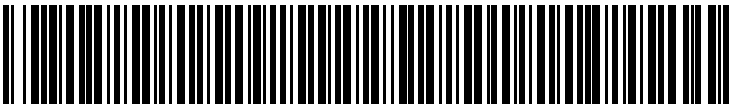
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production 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 version	Date of release	Description of changes
1.00	2026-02-02	Initial version
1.10	2026-02-23	Final Datasheet

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