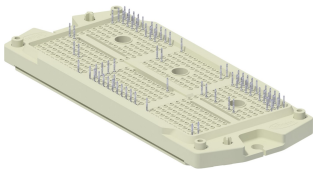
EasyPACK™ module with TRENCHSTOP™ IGBT7 and CoolSiC™ Schottky diode and PressFIT / NTC



Features

- Electrical features
  - V_{CES} = 950 V
  - $I_{C\ nom}$ = 600 A / I_{CRM} = 800 A
  - CoolSiC™ Schottky diode gen 5
  - TRENCHSTOP™ IGBT7
  - $T_{vj,op}$ = 150°C
- Mechanical features
  - Package with CTI > 400
  - PressFIT contact technology
  - Integrated NTC temperature sensor

Potential applications

- Solar applications
- Three-level applications

Product validation

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

Description

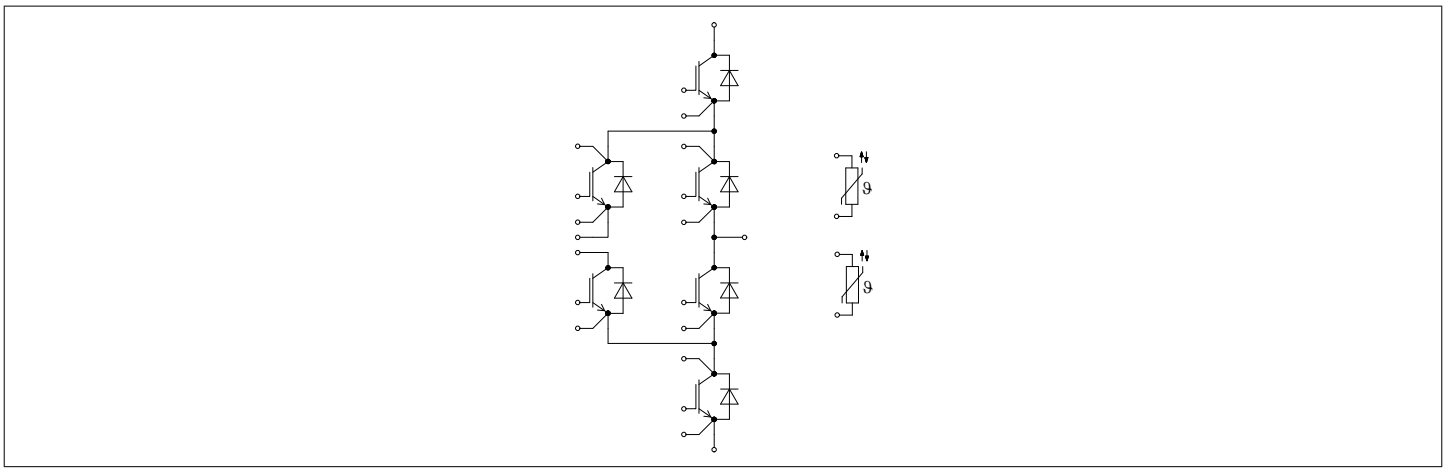


Table of contents

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
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{Creep}	terminal to heatsink	11.0	mm
Clearance	d_{Clear}	terminal to heatsink	9.2	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_H=25°C, per switch			1.8		mΩ
Storage temperature	T_{stg}			-40		125	°C
Terminal connection torque	*M*	- Mounting according to valid application note	M5, Screw	1.3		1.5	Nm
Weight	*G*				112		g

Note: The current under continuous operation is limited to 25A 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	950	V
Implemented collector current	I_{CN}			600	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 65 °C	310	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 4 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\,sat}$	I_C = 400 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.63	1.89	V
			T_{vj} = 125 °C		1.79		
			T_{vj} = 150 °C		1.82		
Gate threshold voltage	V_{GEth}	I_C = 9.25 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		4.35	5.10	5.85	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CE} = 600 V			1.35		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			0.5		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			37.9		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.117		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 950 V, V_{GE} = 0 V	T_{vj} = 25 °C			0.1	mA
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 = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Gon} = 5 Ω	T_{vj} = 25 °C		0.145		µs
			T_{vj} = 125 °C		0.145		
			T_{vj} = 150 °C		0.145		
Rise time (inductive load)	t_r	I_C = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Gon} = 5 Ω	T_{vj} = 25 °C		0.068		µs
			T_{vj} = 125 °C		0.068		
			T_{vj} = 150 °C		0.068		
Turn-off delay time (inductive load)	t_{doff}	I_C = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Goff} = 18 Ω	T_{vj} = 25 °C		0.914		µs
			T_{vj} = 125 °C		0.967		
			T_{vj} = 150 °C		0.991		
Fall time (inductive load)	t_f	I_C = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Goff} = 18 Ω	T_{vj} = 25 °C		0.054		µs
			T_{vj} = 125 °C		0.059		
			T_{vj} = 150 °C		0.061		
Turn-on energy loss per pulse	E_{on}	I_C = 400 A, V_{CE} = 500 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Gon} = 5 Ω, di/dt = 4800 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		19.3		mJ
			T_{vj} = 125 °C		19.3		
			T_{vj} = 150 °C		19.3		
Turn-off energy loss per pulse	E_{off}	I_C = 400 A, V_{CE} = 500 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Goff} = 18 Ω, dv/dt = 3200 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		22.8		mJ
			T_{vj} = 125 °C		24.5		
			T_{vj} = 150 °C		25.4		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, λ_{grease} = 3.3 W/(m·K)			0.182		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 °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	320	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 = 400 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.30	1.40	V
			T_{vj} = 125 °C		1.35		
			T_{vj} = 150 °C		1.35		
Gate threshold voltage	V_{GEth}	I_C = 6.5 mA, V_{CE} = 20 V, T_{vj} = 25 °C		4.15	4.90	5.65	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CE} = 600 V			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			0.1	mA
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 = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Gon} = 12 Ω	T_{vj} = 25 °C		0.445		µs
			T_{vj} = 125 °C		0.409		
			T_{vj} = 150 °C		0.400		

(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 = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Gon} = 12 Ω	T_{vj} = 25 °C		0.099		µs
			T_{vj} = 125 °C		0.113		
			T_{vj} = 150 °C		0.117		
Turn-off delay time (inductive load)	t_{doff}	I_C = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Goff} = 27 Ω	T_{vj} = 25 °C		2.293		µs
			T_{vj} = 125 °C		2.409		
			T_{vj} = 150 °C		2.439		
Fall time (inductive load)	t_f	I_C = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Goff} = 27 Ω	T_{vj} = 25 °C		0.203		µs
			T_{vj} = 125 °C		0.396		
			T_{vj} = 150 °C		0.452		
Turn-on energy loss per pulse	E_{on}	I_C = 400 A, V_{CE} = 500 V, L_σ = 64 nH, V_{GE} = ±15 V, R_{Gon} = 12 Ω, di/dt = 2700 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		13.9		mJ
			T_{vj} = 125 °C		14.5		
			T_{vj} = 150 °C		14.9		
Turn-off energy loss per pulse	E_{off}	I_C = 400 A, V_{CE} = 500 V, L_σ = 64 nH, V_{GE} = ±15 V, R_{Goff} = 27 Ω, dv/dt = 2060 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		60.6		mJ
			T_{vj} = 125 °C		74.3		
			T_{vj} = 150 °C		78.1		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, λ_{grease} = 3.3 W/(m·K)			0.254		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	950	V
Implemented collector current	I_{CN}			400	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 65 °C	200	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 8 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\,sat}$	I_C = 400 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.85	2.25	V
			T_{vj} = 125 °C		2.10		
			T_{vj} = 150 °C		2.15		
Gate threshold voltage	V_{GEth}	I_C = 6.5 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		4.35	5.10	5.85	V
Gate charge	Q_G	V_{GE} = ±15 V, V_{CE} = 600 V			0.9		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			25.2		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.078		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 950 V, V_{GE} = 0 V	T_{vj} = 25 °C			1	mA
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 = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Gon} = 8 Ω	T_{vj} = 25 °C		0.167		µs
			T_{vj} = 125 °C		0.169		
			T_{vj} = 150 °C		0.170		
Rise time (inductive load)	t_r	I_C = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Gon} = 8 Ω	T_{vj} = 25 °C		0.096		µs
			T_{vj} = 125 °C		0.102		
			T_{vj} = 150 °C		0.104		
Turn-off delay time (inductive load)	t_{doff}	I_C = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Goff} = 27 Ω	T_{vj} = 25 °C		0.862		µs
			T_{vj} = 125 °C		0.919		
			T_{vj} = 150 °C		0.940		
Fall time (inductive load)	t_f	I_C = 400 A, V_{CE} = 500 V, V_{GE} = ±15 V, R_{Goff} = 27 Ω	T_{vj} = 25 °C		0.054		µs
			T_{vj} = 125 °C		0.058		
			T_{vj} = 150 °C		0.060		
Turn-on energy loss per pulse	E_{on}	I_C = 400 A, V_{CE} = 500 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Gon} = 8 Ω, di/dt = 3100 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		40.8		mJ
			T_{vj} = 125 °C		38		
			T_{vj} = 150 °C		37.8		
Turn-off energy loss per pulse	E_{off}	I_C = 400 A, V_{CE} = 500 V, L_σ = 35 nH, V_{GE} = ±15 V, R_{Goff} = 27 Ω, dv/dt = 3050 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		25.2		mJ
			T_{vj} = 125 °C		28		
			T_{vj} = 150 °C		29.1		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, λ_{grease} = 3.3 W/(m·K)			0.281		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		150	°C

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	950	V
Continuous DC forward current	I_F			300	A
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	3100	A^2s
			T_{vj} = 150 °C	2900	

Table 10 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 300 A, V_{GE} = 0 V	T_{vj} = 25 °C		2.60	2.90	V
			T_{vj} = 125 °C		2.40		
			T_{vj} = 150 °C		2.35		
Peak reverse recovery current	I_{RM}	V_R = 500 V, I_F = 300 A, V_{GE} = -15 V, -di$_F$/dt = 3000 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		102		A
			T_{vj} = 125 °C		147		
			T_{vj} = 150 °C		163		
Recovered charge	Q_r	V_R = 500 V, I_F = 300 A, V_{GE} = -15 V, -di$_F$/dt = 3000 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		11.3		µC
			T_{vj} = 125 °C		20.3		
			T_{vj} = 150 °C		24.1		
Reverse recovery energy	E_{rec}	V_R = 500 V, I_F = 300 A, V_{GE} = -15 V, -di$_F$/dt = 3000 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		3.37		mJ
			T_{vj} = 125 °C		5.93		
			T_{vj} = 150 °C		7.06		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 3.3 W/(m·K)			0.597		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

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	950	V
Continuous DC forward current	I_F			300	A
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	3100	A^2s
			T_{vj} = 150 °C	2900	

Table 12 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 300 A, V_{GE} = 0 V	T_{vj} = 25 °C		2.60	2.90	V
			T_{vj} = 125 °C		2.40		
			T_{vj} = 150 °C		2.35		
Peak reverse recovery current	I_{RM}	V_R = 500 V, I_F = 300 A, V_{GE} = -15 V, -di$_F$/dt = 2200 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		146		A
			T_{vj} = 125 °C		194		
			T_{vj} = 150 °C		207		
Recovered charge	Q_r	V_R = 500 V, I_F = 300 A, V_{GE} = -15 V, -di$_F$/dt = 2200 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		8.45		µC
			T_{vj} = 125 °C		17.9		
			T_{vj} = 150 °C		21.3		
Reverse recovery energy	E_{rec}	V_R = 500 V, I_F = 300 A, V_{GE} = -15 V, -di$_F$/dt = 2200 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		4.22		mJ
			T_{vj} = 125 °C		8.19		
			T_{vj} = 150 °C		9.6		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 3.3 W/(m·K)			0.393		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

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

(table continues...)

Table 13 (continued) Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Continuous DC forward current	I_F			160	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		320	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	3050	A^2s
			T_{vj} = 150 °C	2780	

Table 14 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 160 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.45	1.75	V
			T_{vj} = 125 °C		1.75		
			T_{vj} = 150 °C		1.85		
Peak reverse recovery current	I_{RM}	V_R = 500 V, I_F = 160 A, V_{GE} = -15 V, -di$_F$/dt = 3500 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		71.4		A
			T_{vj} = 125 °C		71.4		
			T_{vj} = 150 °C		71.4		
Recovered charge	Q_r	V_R = 500 V, I_F = 160 A, V_{GE} = -15 V, -di$_F$/dt = 3500 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		1.29		µC
			T_{vj} = 125 °C		1.29		
			T_{vj} = 150 °C		1.29		
Reverse recovery energy	E_{rec}	V_R = 500 V, I_F = 160 A, V_{GE} = -15 V, -di$_F$/dt = 3500 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		0.66		mJ
			T_{vj} = 125 °C		0.66		
			T_{vj} = 150 °C		0.66		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 3.3 W/(m·K)			0.430		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

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

(table continues...)

Table 15 (continued) Characteristic values

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

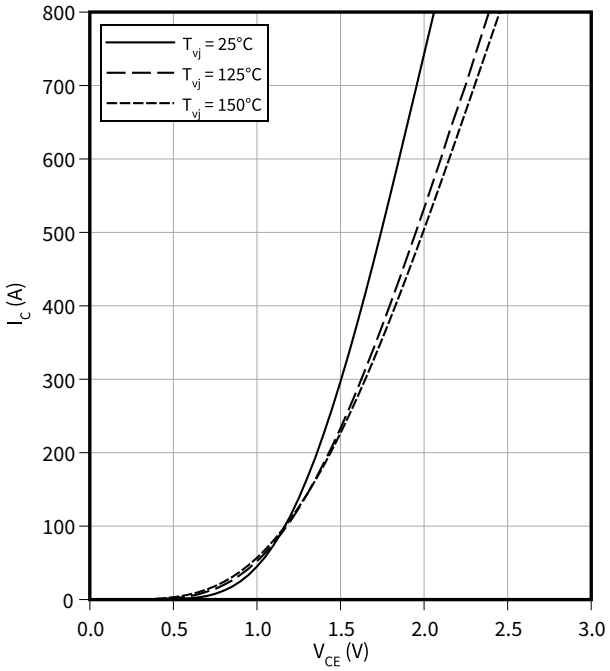
Note: Specification according to the valid application note.

9 Characteristics diagrams

Output characteristic (typical), IGBT, T1 / T4

$I_C = f(V_{CE})$

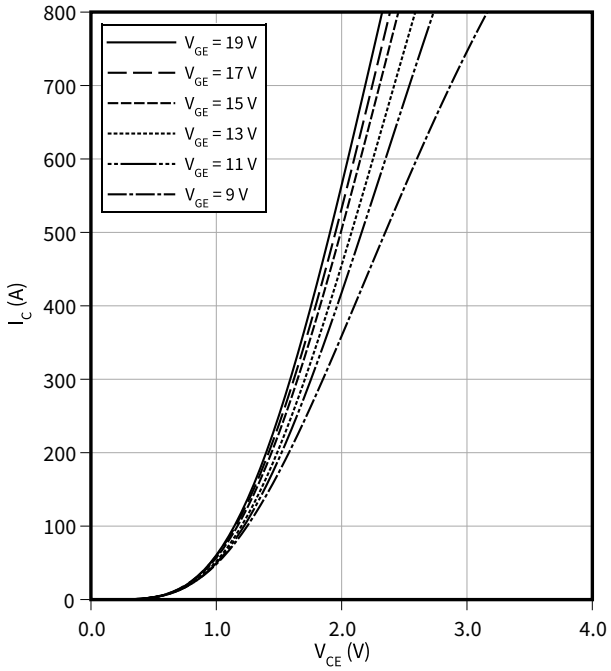
V_{GE} = 15 V



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

$I_C = f(V_{CE})$

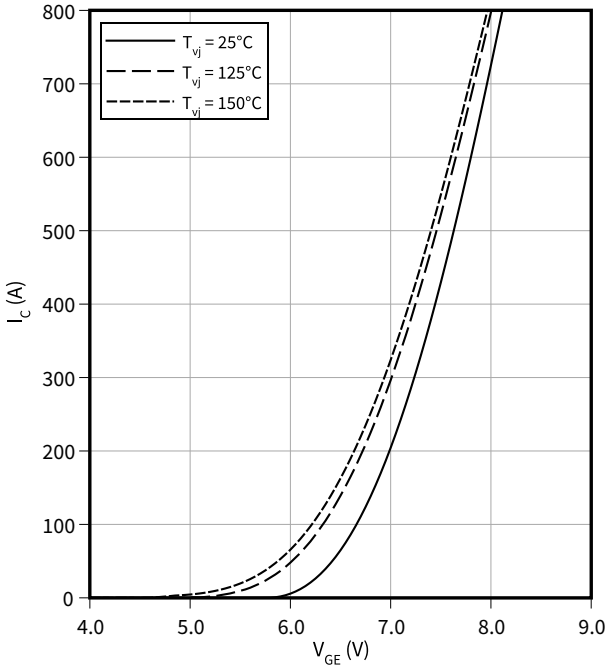
T_{vj} = 150 °C



Transfer characteristic (typical), IGBT, T1 / T4

$I_C = f(V_{GE})$

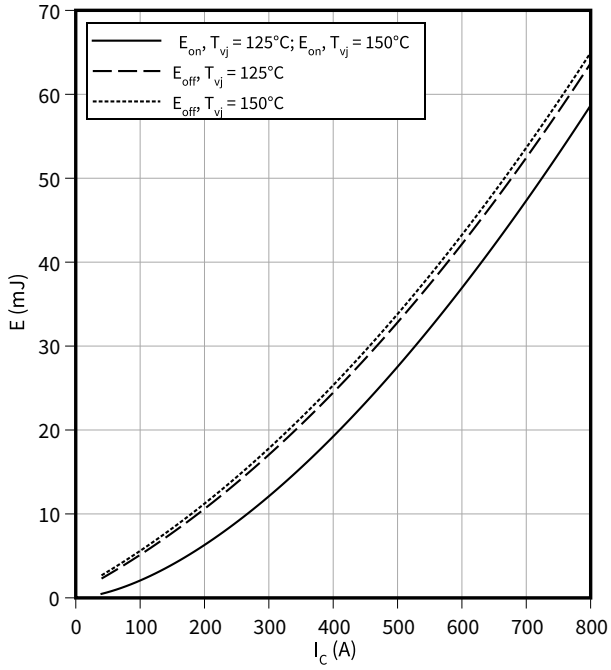
V_{CE} = 20 V



Switching losses (typical), IGBT, T1 / T4

$E = f(I_C)$

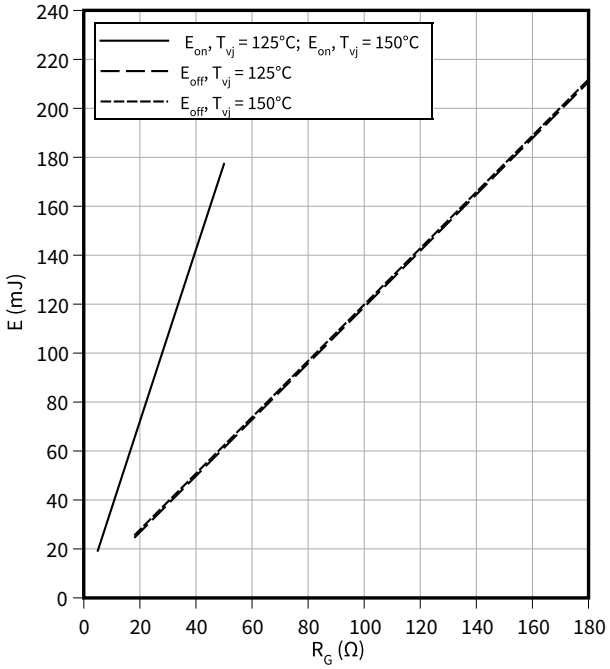
R_{Goff} = 18 Ω, R_{Gon} = 5 Ω, V_{CE} = 500 V, V_{GE} = -15 / 15 V



Switching losses (typical), IGBT, T1 / T4

$E = f(R_G)$

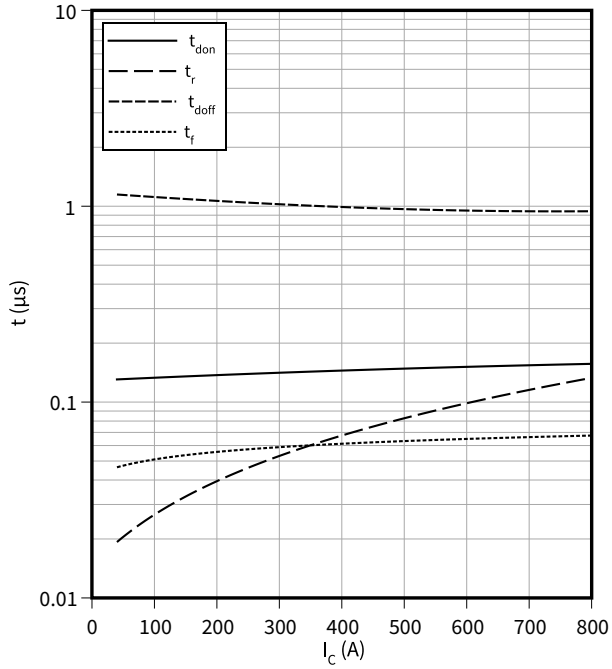
$I_C = 400$ A, $V_{CE} = 500$ V, $V_{GE} = -15 / 15$ V



Switching times (typical), IGBT, T1 / T4

$t = f(I_C)$

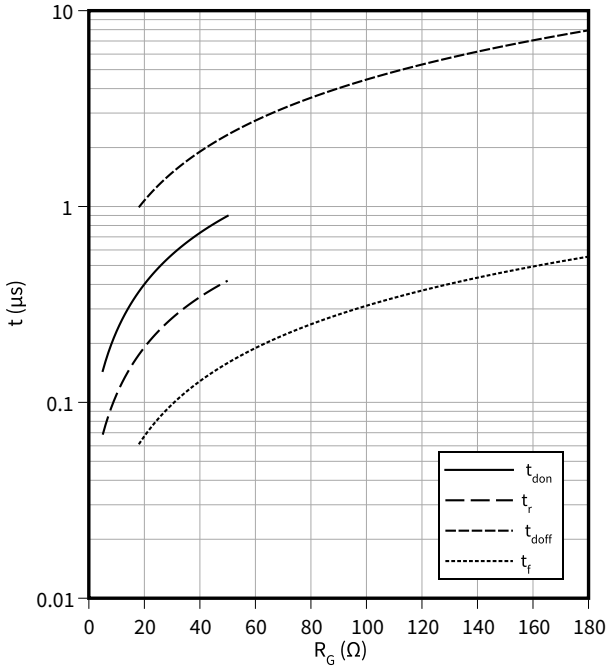
$R_{Goff} = 18\ \Omega$, $R_{Gon} = 5\ \Omega$, $V_{GE} = \pm 15$ V, $V_{CE} = 500$ V, $T_{vj} = 150$ °C



Switching times (typical), IGBT, T1 / T4

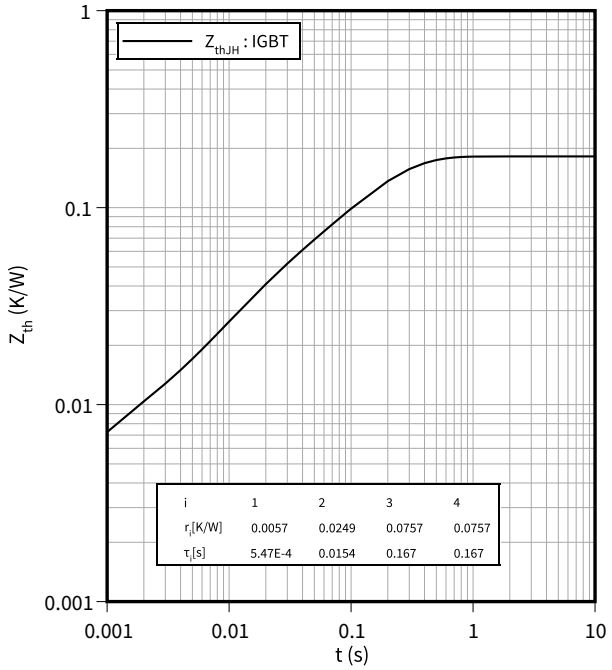
$t = f(R_G)$

$I_C = 400$ A, $V_{CE} = 500$ V, $V_{GE} = -15 / 15$ V, $T_{vj} = 150$ °C



Transient thermal impedance , IGBT, T1 / T4

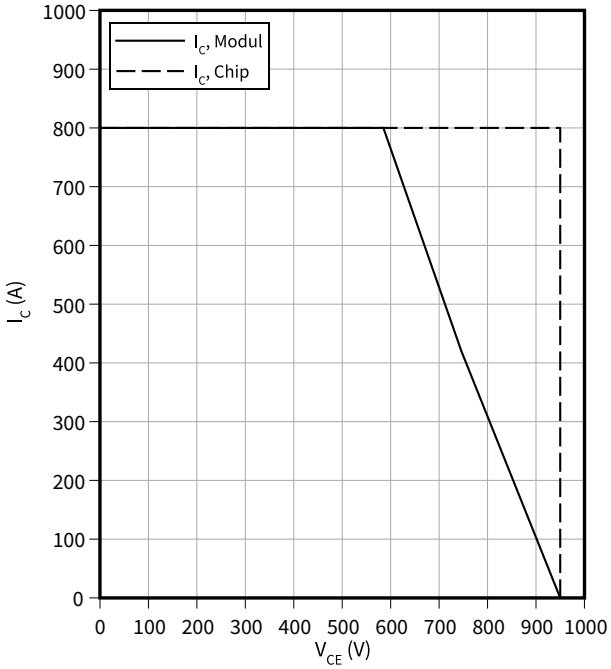
$Z_{th} = f(t)$



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

$I_C = f(V_{CE})$

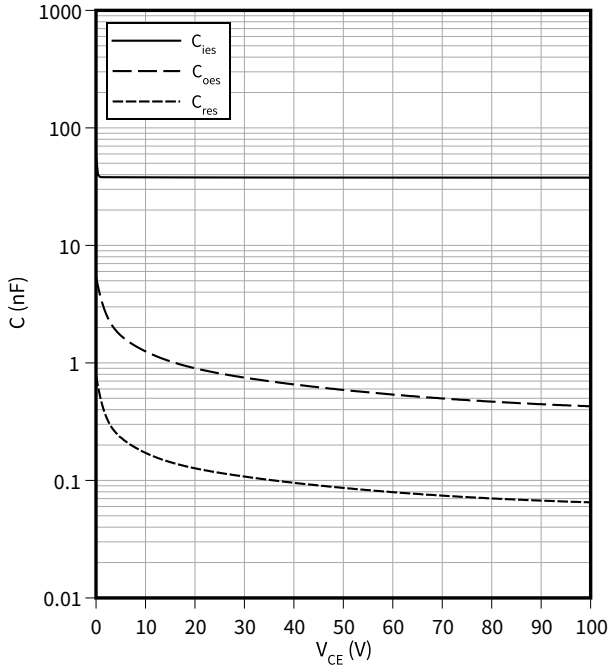
$R_{Goff} = 18\ \Omega$, $V_{GE} = \pm 15$ V, $T_{vj} = 150$ °C



Capacity characteristic (typical), IGBT, T1 / T4

$C = f(V_{CE})$

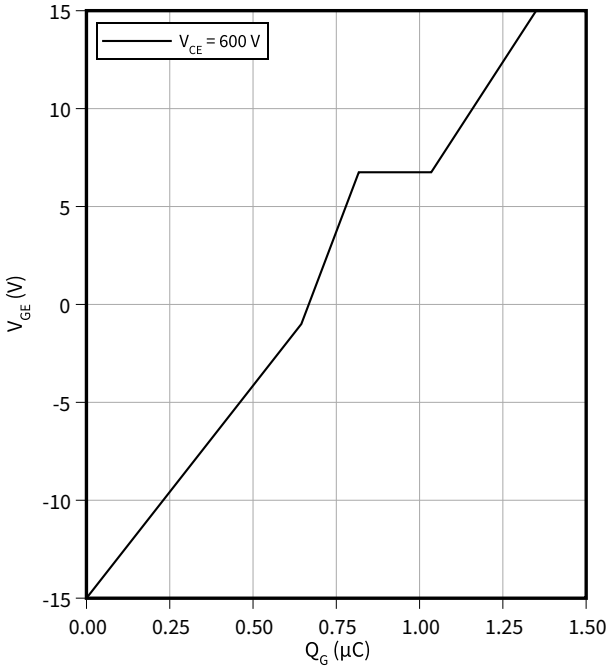
f = 100 kHz, $V_{GE} = 0$ V, $T_{vj} = 25$ °C



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

$V_{GE} = f(Q_G)$

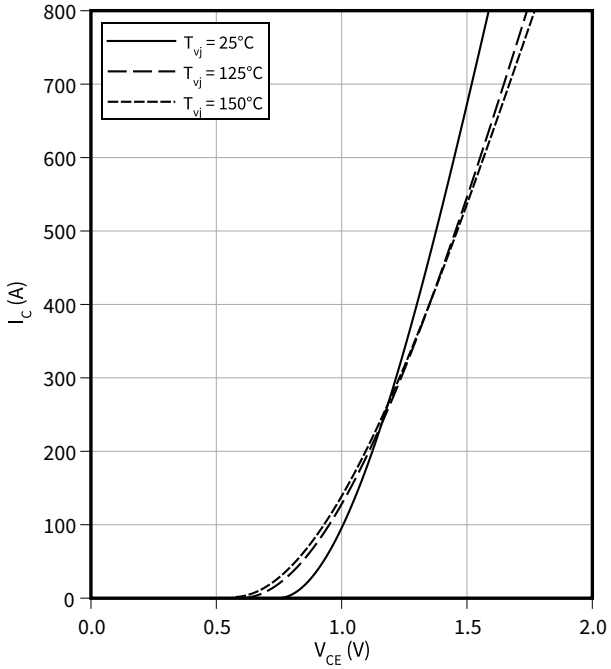
$I_C = 600$ A, $T_{vj} = 25$ °C



Output characteristic (typical), IGBT, T2 / T3

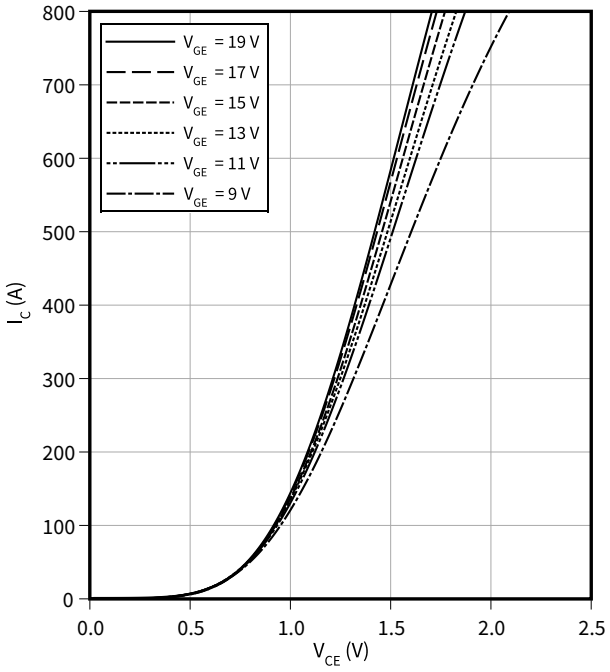
$I_C = f(V_{CE})$

$V_{GE} = 15$ V



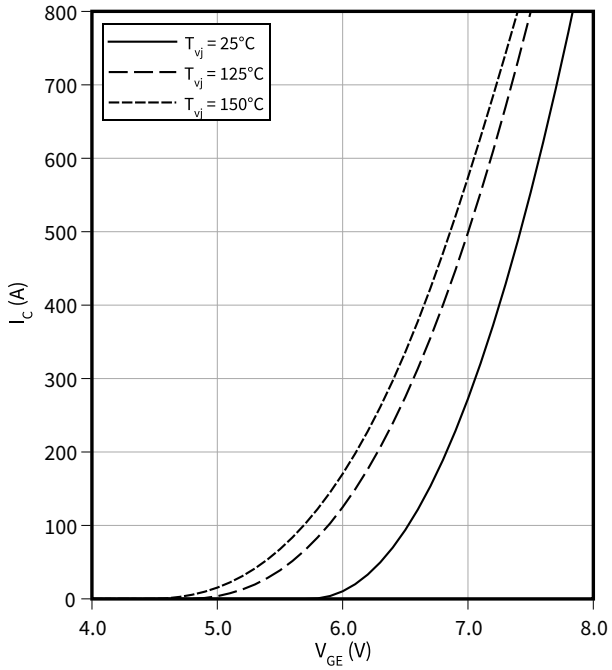
Output characteristic field (typical), IGBT, T2 / T3

$I_C = f(V_{CE})$
$T_{vj} = 150\ °C$



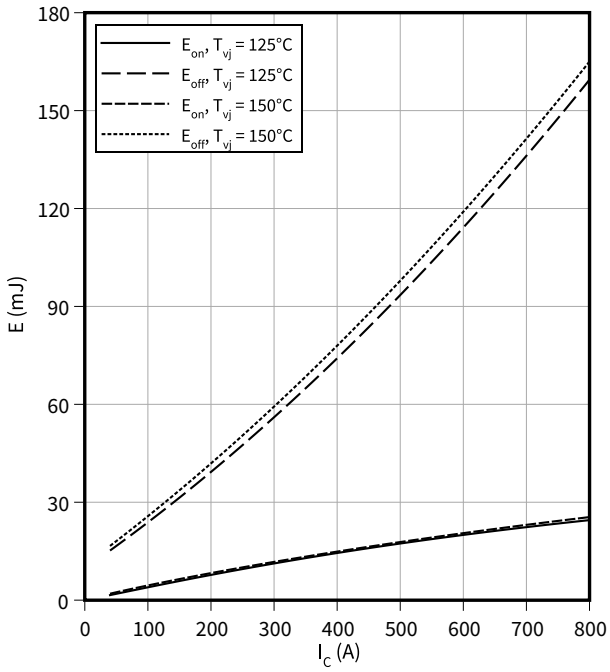
Transfer characteristic (typical), IGBT, T2 / T3

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



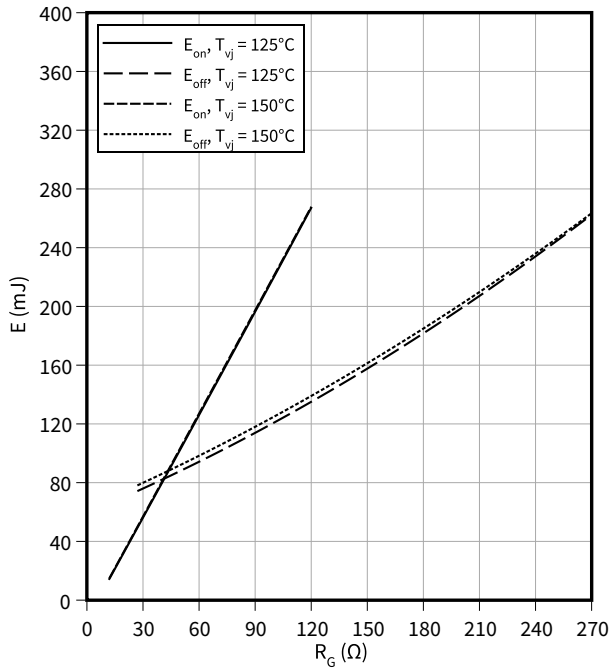
Switching losses (typical), IGBT, T2 / T3

$E = f(I_C)$
$R_{Goff} = 27\ \Omega$, $R_{Gon} = 12\ \Omega$, $V_{CE} = 500\ V$, $V_{GE} = -15\ /\ 15\ V$



Switching losses (typical), IGBT, T2 / T3

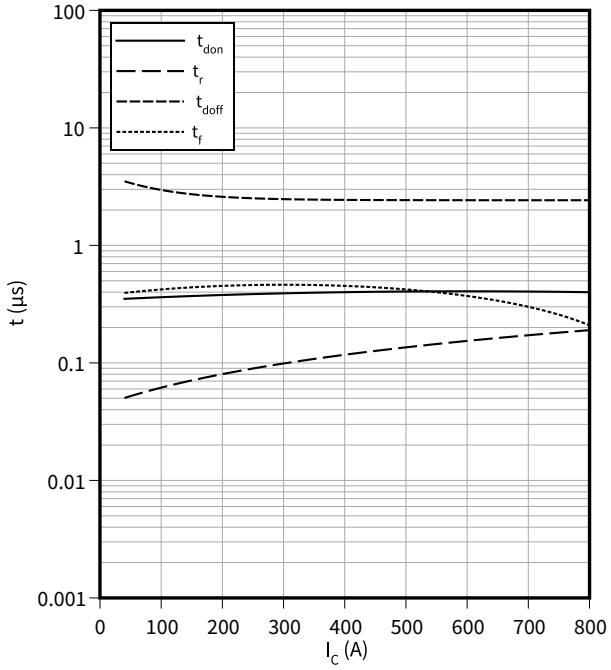
$E = f(R_G)$
$I_C = 400\ A$, $V_{CE} = 500\ V$, $V_{GE} = -15\ /\ 15\ V$



Switching times (typical), IGBT, T2 / T3

$t = f(I_C)$

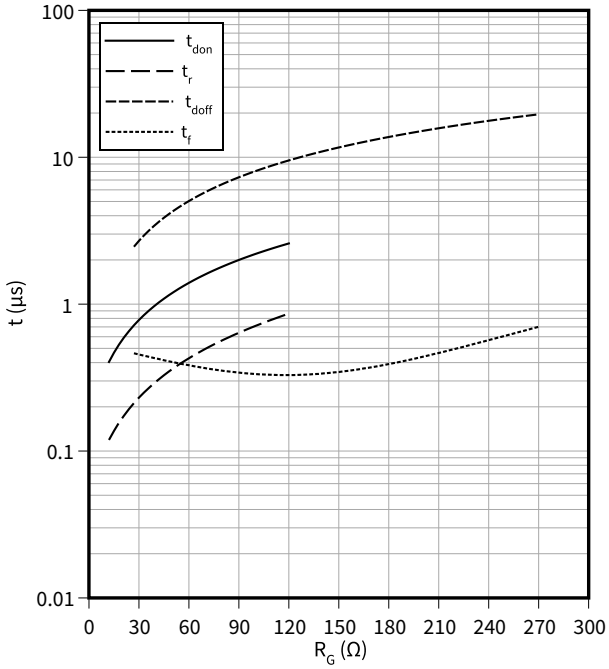
R_{Goff} = 27 Ω, R_{Gon} = 12 Ω, V_{CE} = 500 V, V_{GE} = -15 / 15 V, T_{vj} = 150 °C



Switching times (typical), IGBT, T2 / T3

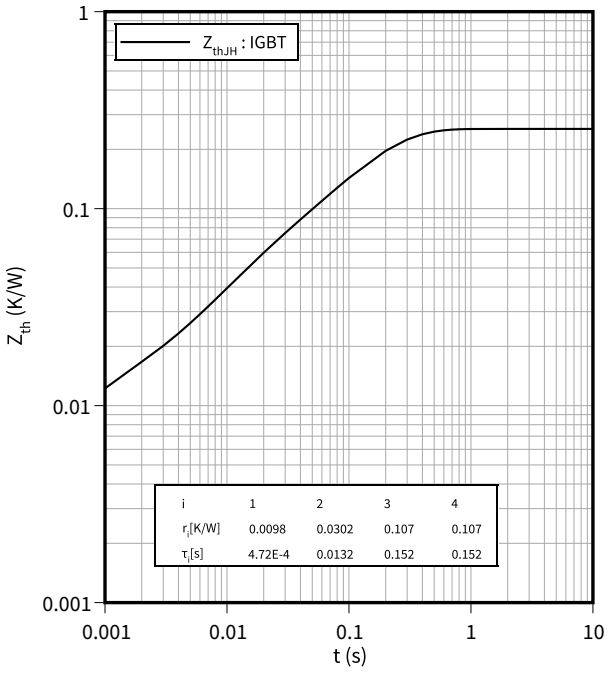
$t = f(R_G)$

I_C = 400 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, T_{vj} = 150 °C



Transient thermal impedance , IGBT, T2 / T3

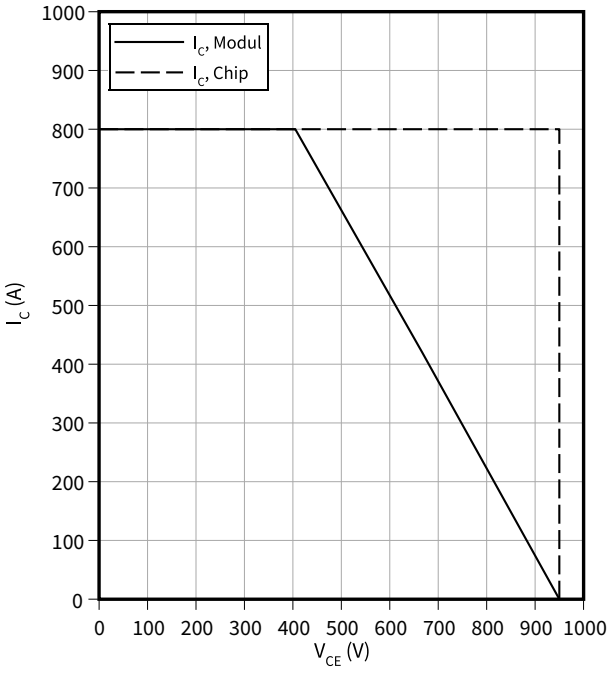
$Z_{th} = f(t)$



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

$I_C = f(V_{CE})$

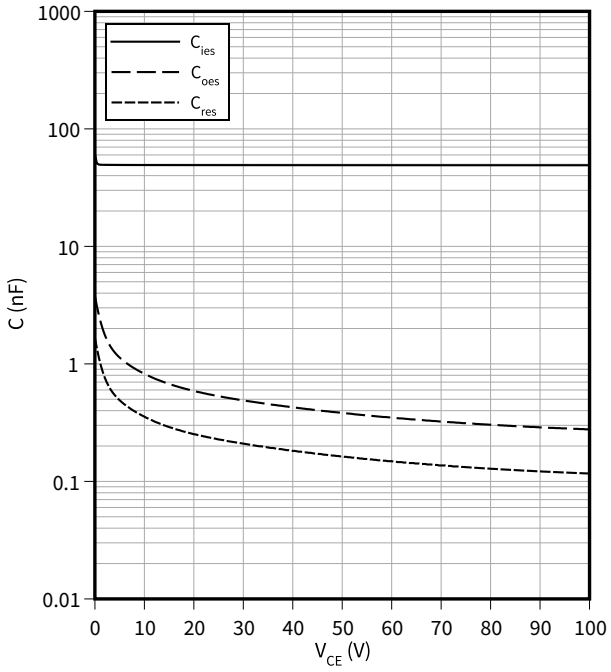
R_{Goff} = 27 Ω, V_{GE} = ±15 V, T_{vj} = 150 °C



Capacity characteristic (typical), IGBT, T2 / T3

$C = f(V_{CE})$

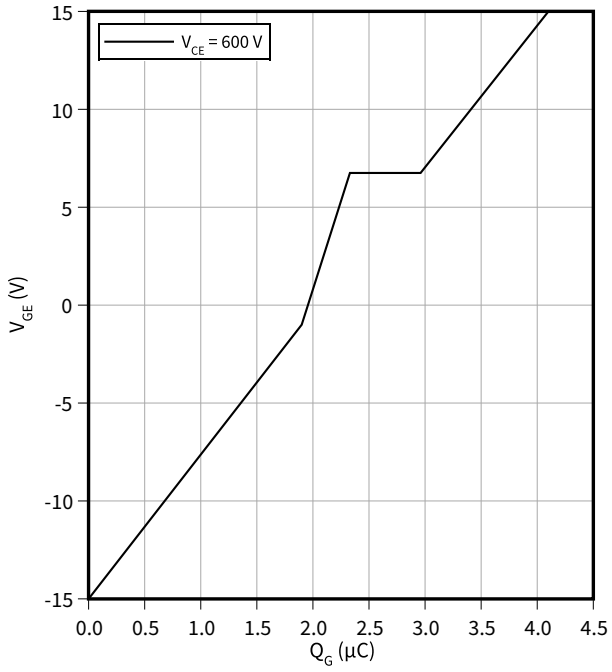
$f = 100\ kHz, V_{GE} = 0\ V, T_{vj} = 25\ °C$



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

$V_{GE} = f(Q_G)$

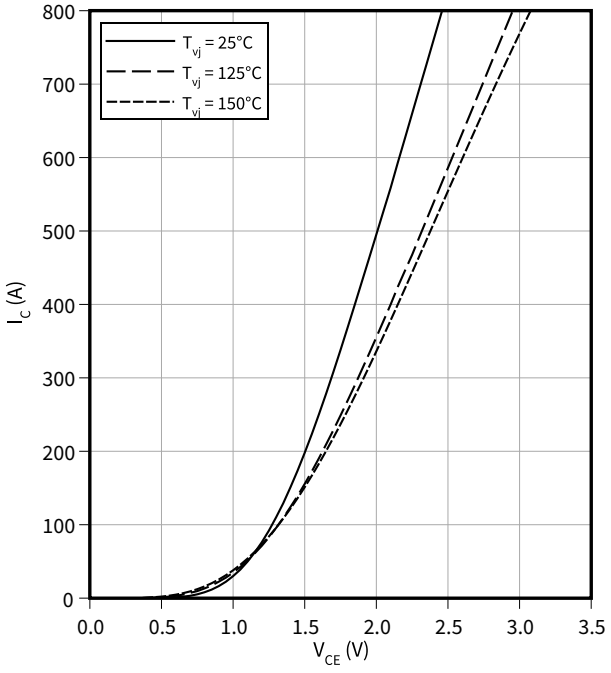
$I_C = 400\ A, T_{vj} = 25\ °C$



Output characteristic (typical), IGBT, T5 / T6

$I_C = f(V_{CE})$

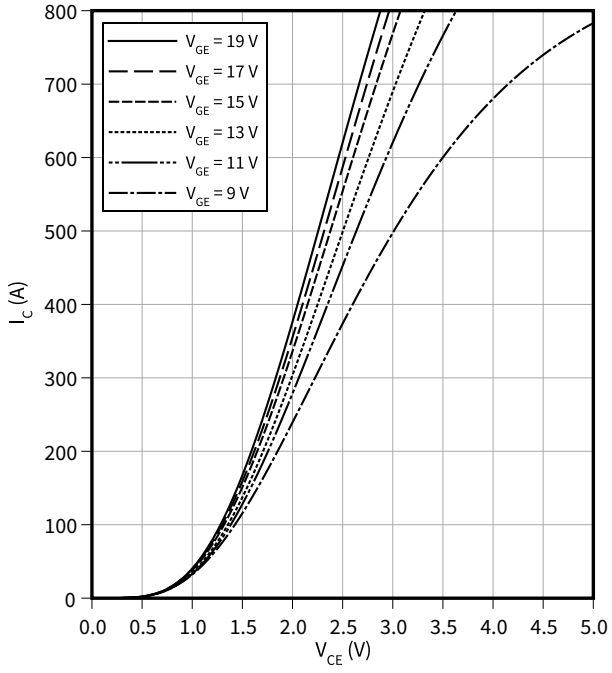
$V_{GE} = 15\ V$



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

$I_C = f(V_{CE})$

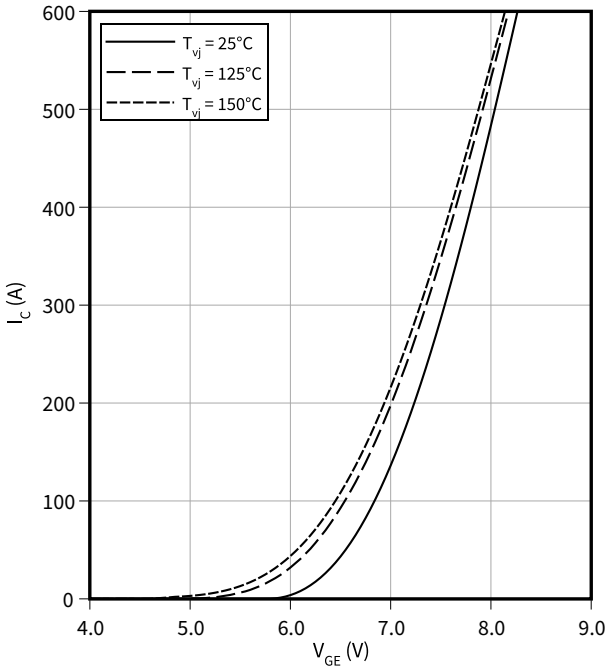
$T_{vj} = 150\ °C$



Transfer characteristic (typical), IGBT, T5 / T6

$I_C = f(V_{GE})$

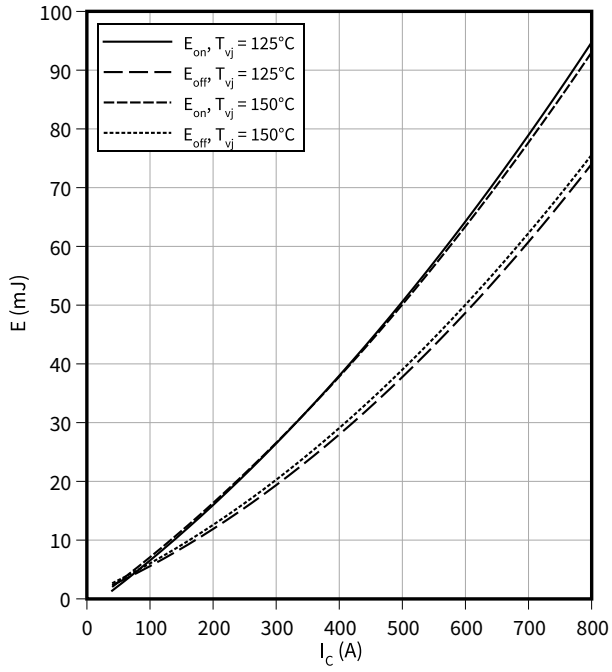
V_{CE} = 20 V



Switching losses (typical), IGBT, T5 / T6

$E = f(I_C)$

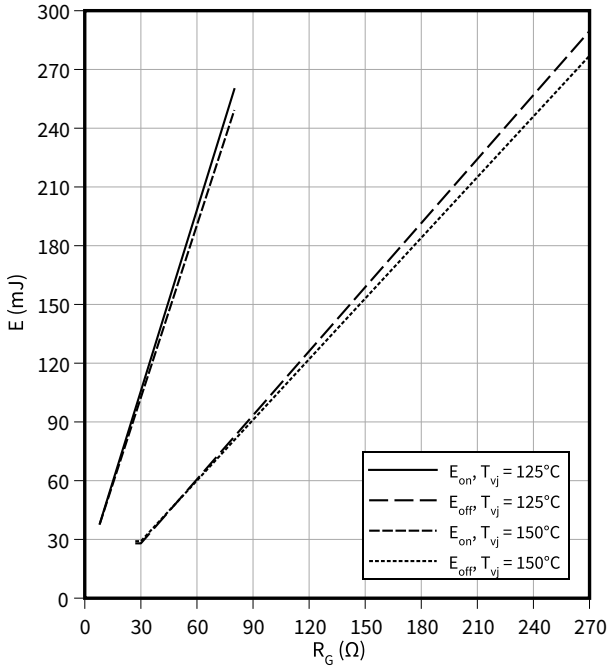
R_{Goff} = 27 Ω, R_{Gon} = 8 Ω, V_{CE} = 500 V, V_{GE} = -15 / 15 V



Switching losses (typical), IGBT, T5 / T6

$E = f(R_G)$

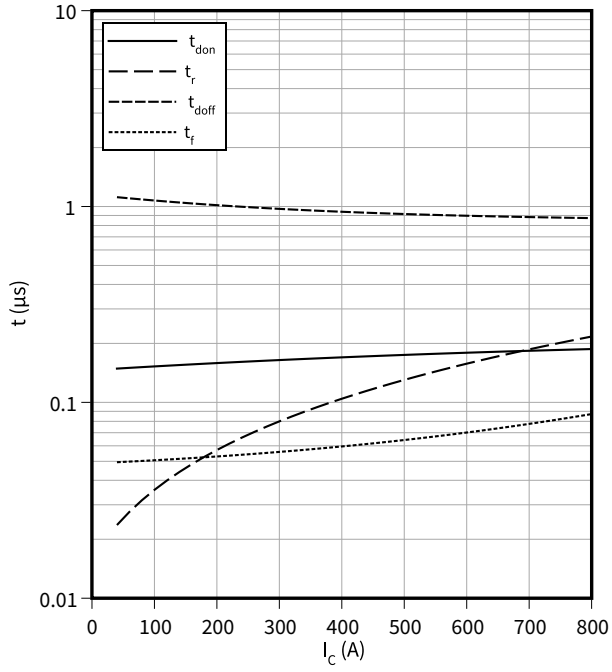
I_C = 400 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V



Switching times (typical), IGBT, T5 / T6

$t = f(I_C)$

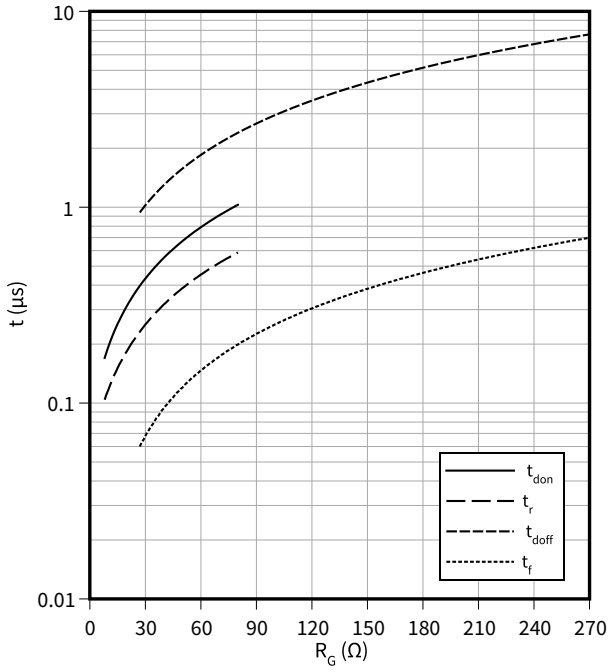
R_{Goff} = 27 Ω, R_{Gon} = 8 Ω, V_{GE} = ±15 V, V_{CE} = 500 V, T_{vj} = 150 °C



Switching times (typical), IGBT, T5 / T6

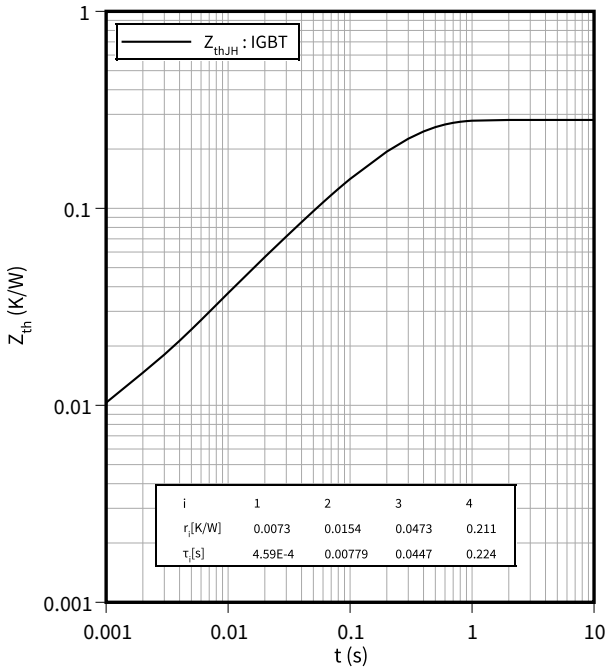
$t = f(R_G)$

$I_C = 400$ A, $V_{CE} = 500$ V, $T_{vj} = 150$ °C, $V_{GE} = \pm 15$ V



Transient thermal impedance , IGBT, T5 / T6

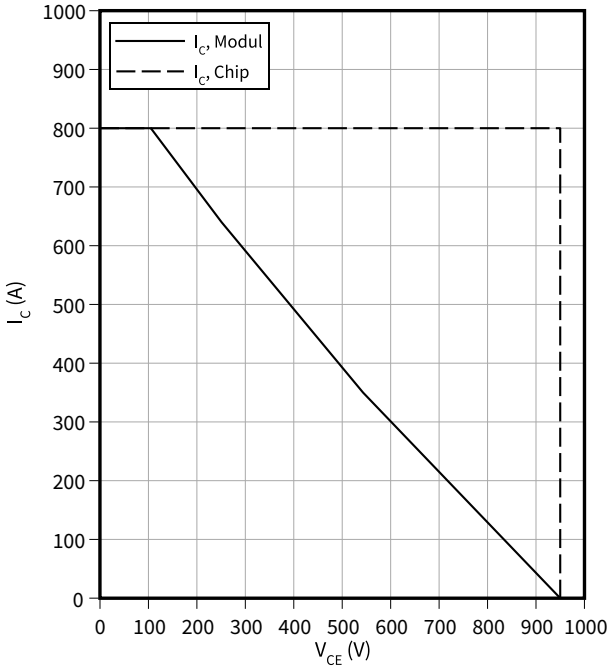
$Z_{th} = f(t)$



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

$I_C = f(V_{CE})$

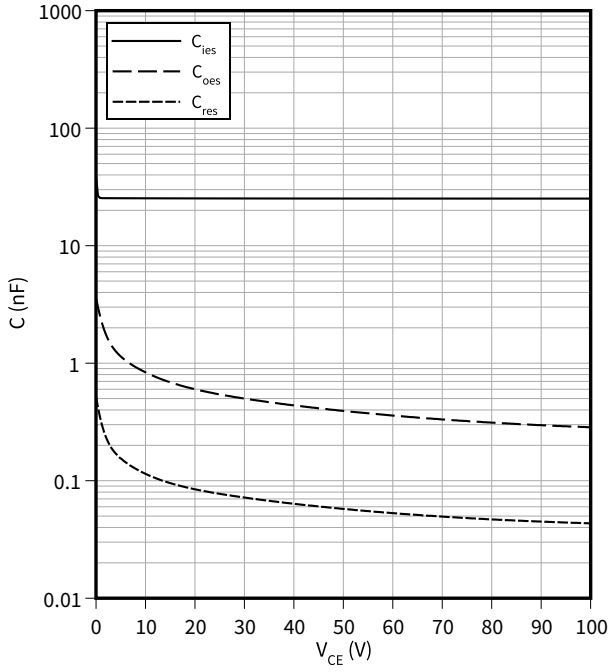
$R_{Goff} = 27\ \Omega$, $V_{GE} = \pm 15$ V, $T_{vj} = 150$ °C



Capacity characteristic (typical), IGBT, T5 / T6

$C = f(V_{CE})$

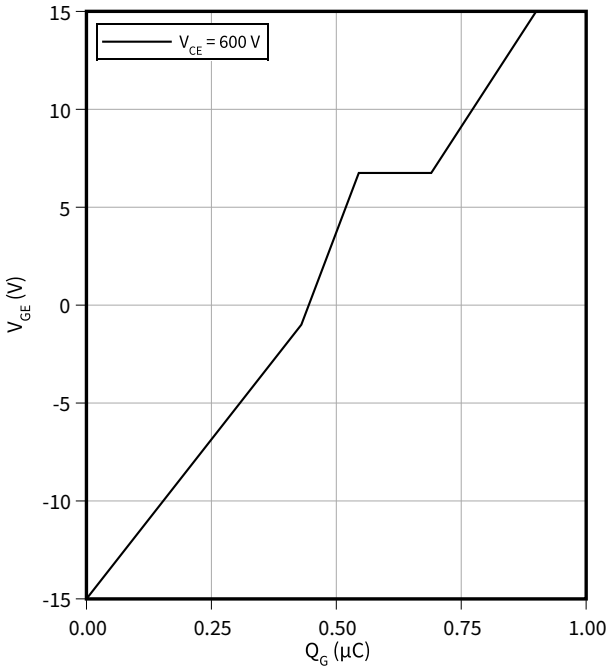
$f = 100$ kHz, $V_{GE} = 0$ V, $T_{vj} = 25$ °C



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

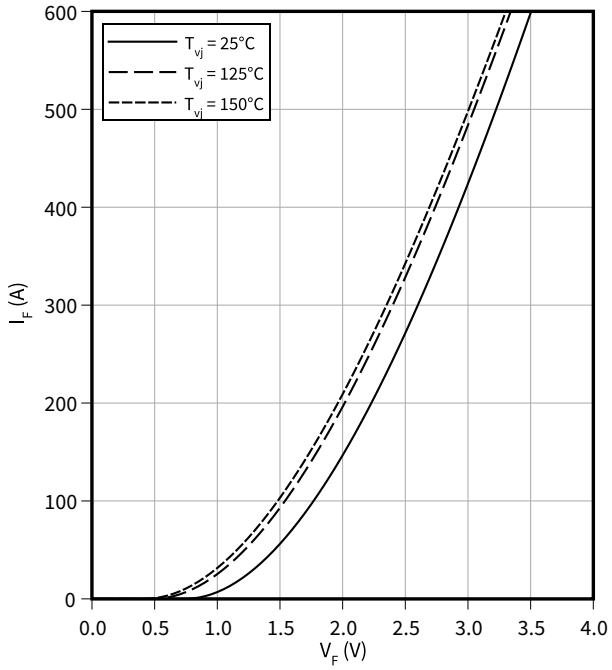
$V_{GE} = f(Q_G)$

$I_C = 400\ A$, $T_{vj} = 25\ °C$



Forward characteristic (typical), Diode, D1 / D4

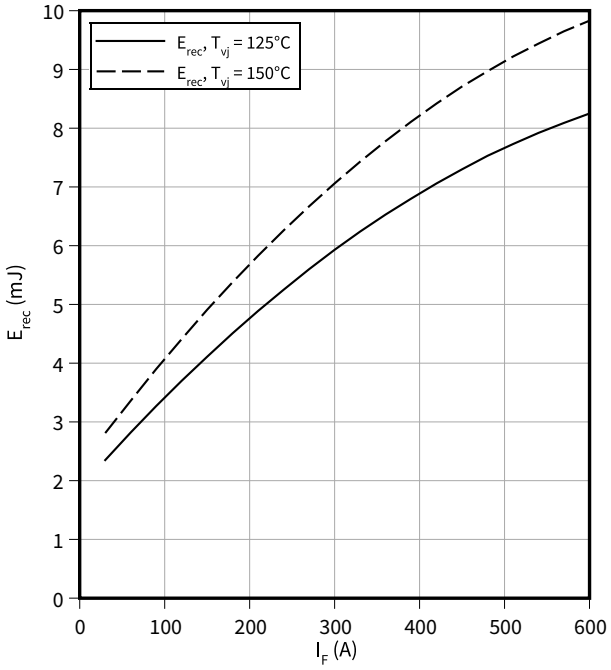
$I_F = f(V_F)$



Switching losses (typical), Diode, D1 / D4

$E_{rec} = f(I_F)$

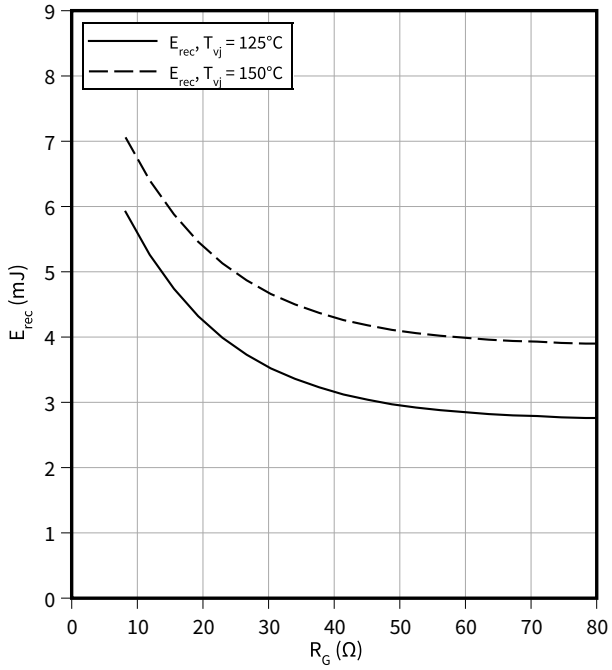
$R_G = 8\ \Omega$, $V_R = 500\ V$



Switching losses (typical), Diode, D1 / D4

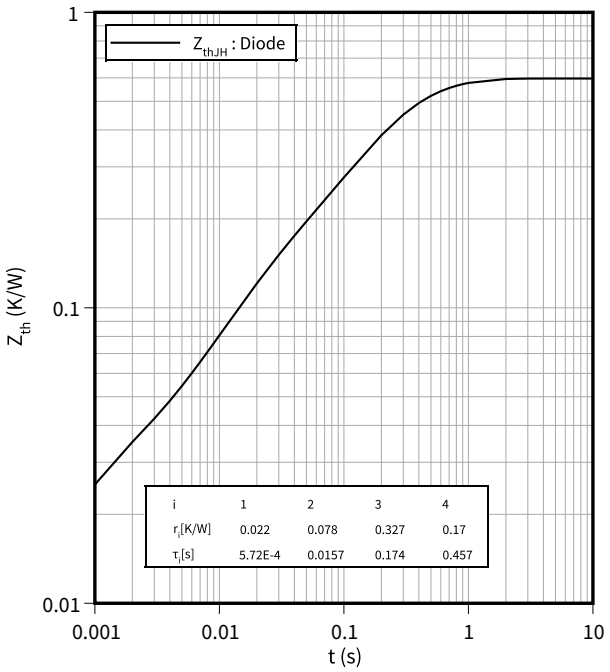
$E_{rec} = f(R_G)$

$I_F = 300\ A$, $V_R = 500\ V$



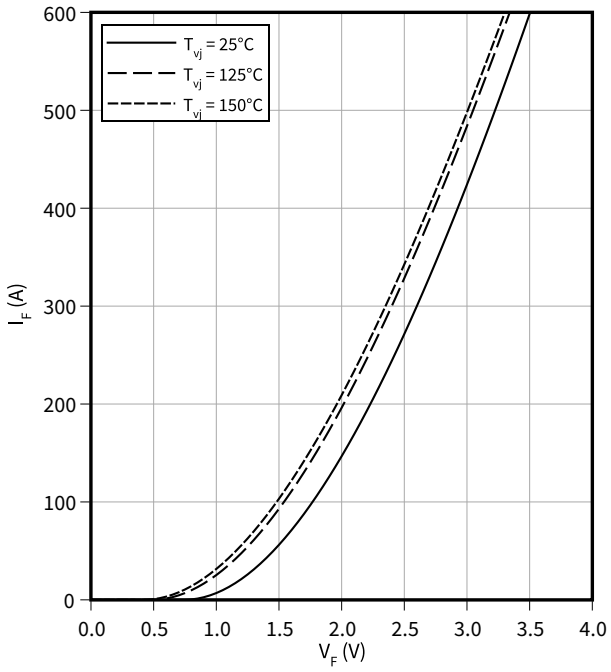
Transient thermal impedance, Diode, D1 / D4

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D2 / D3

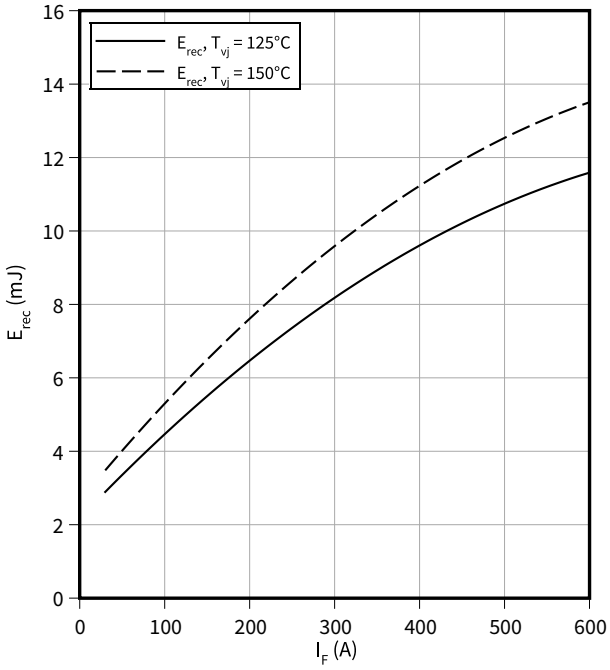
$I_F = f(V_F)$



Switching losses (typical), Diode, D2 / D3

$E_{rec} = f(I_F)$

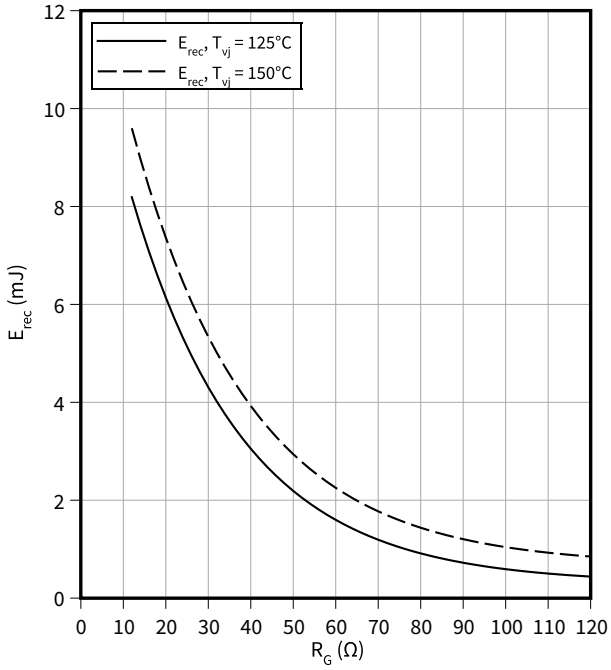
$R_G = 12\ \Omega$, $V_R = 500$ V



Switching losses (typical), Diode, D2 / D3

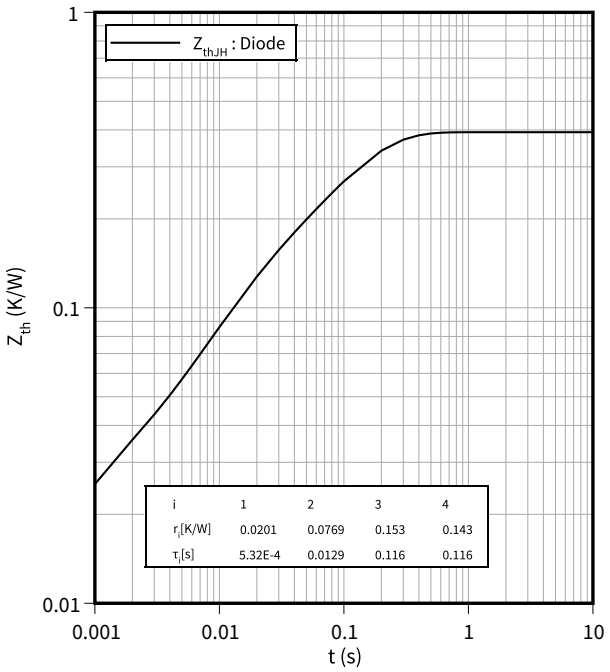
$E_{rec} = f(R_G)$

$I_F = 300$ A, $V_R = 500$ V



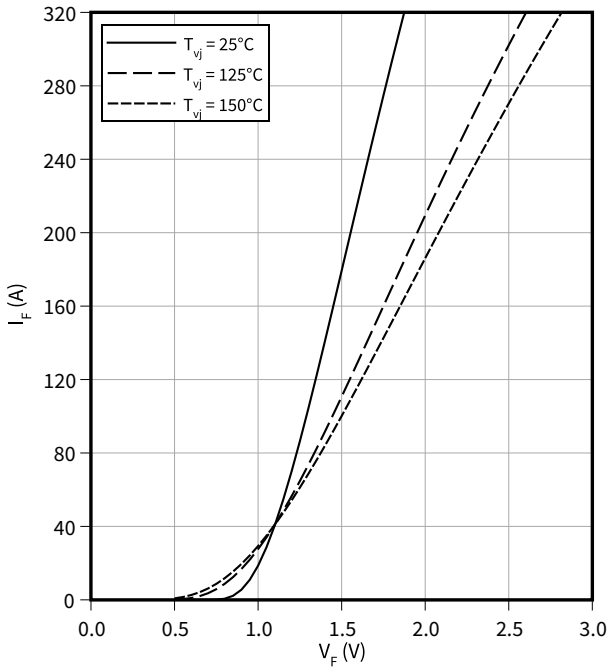
Transient thermal impedance, Diode, D2 / D3

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D5 / D6

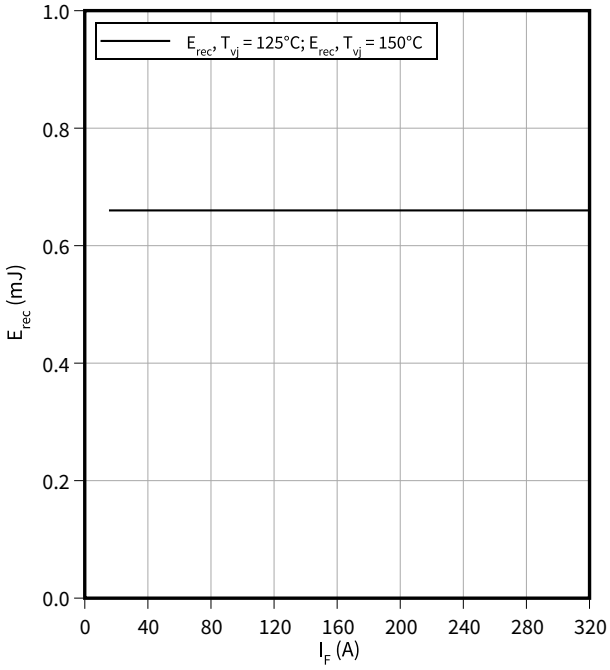
$I_F = f(V_F)$



Switching losses (typical), Diode, D5 / D6

$E_{rec} = f(I_F)$

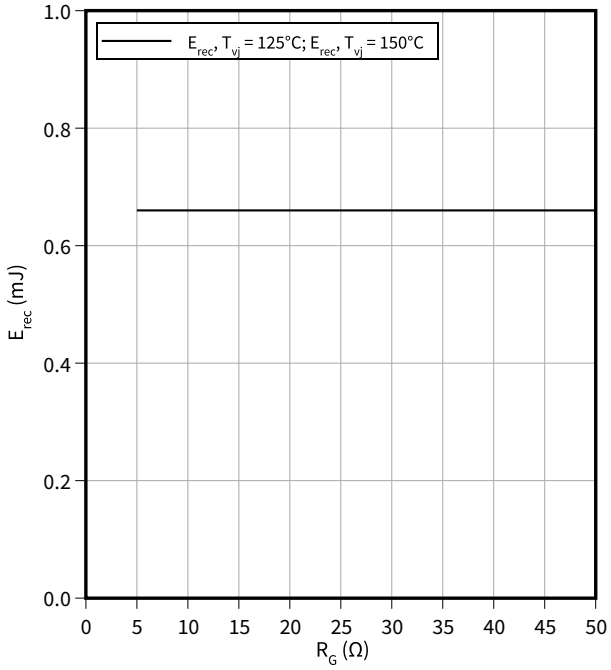
$R_G = 5\ \Omega$, $V_R = 500$ V



Switching losses (typical), Diode, D5 / D6

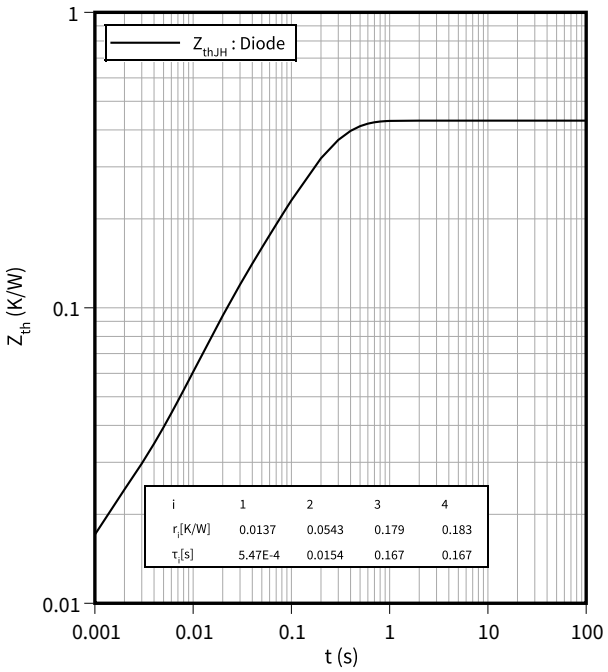
$E_{rec} = f(R_G)$

$I_F = 160$ A, $V_R = 500$ V



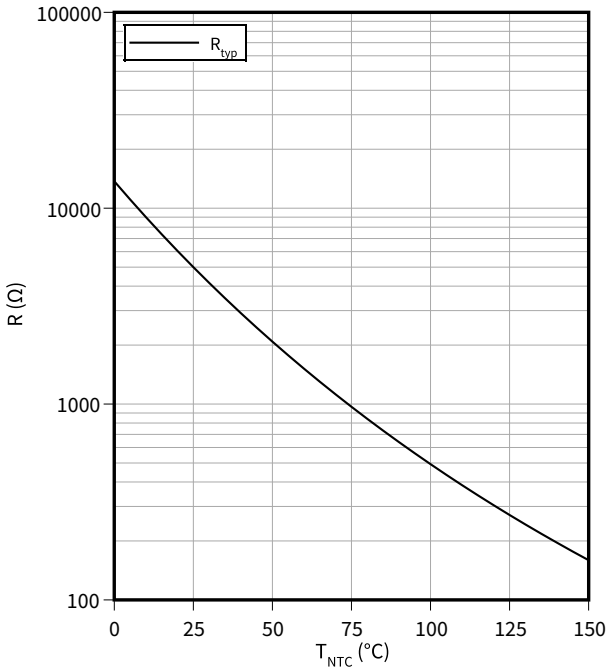
Transient thermal impedance, Diode, D5 / D6

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



10 Circuit diagram

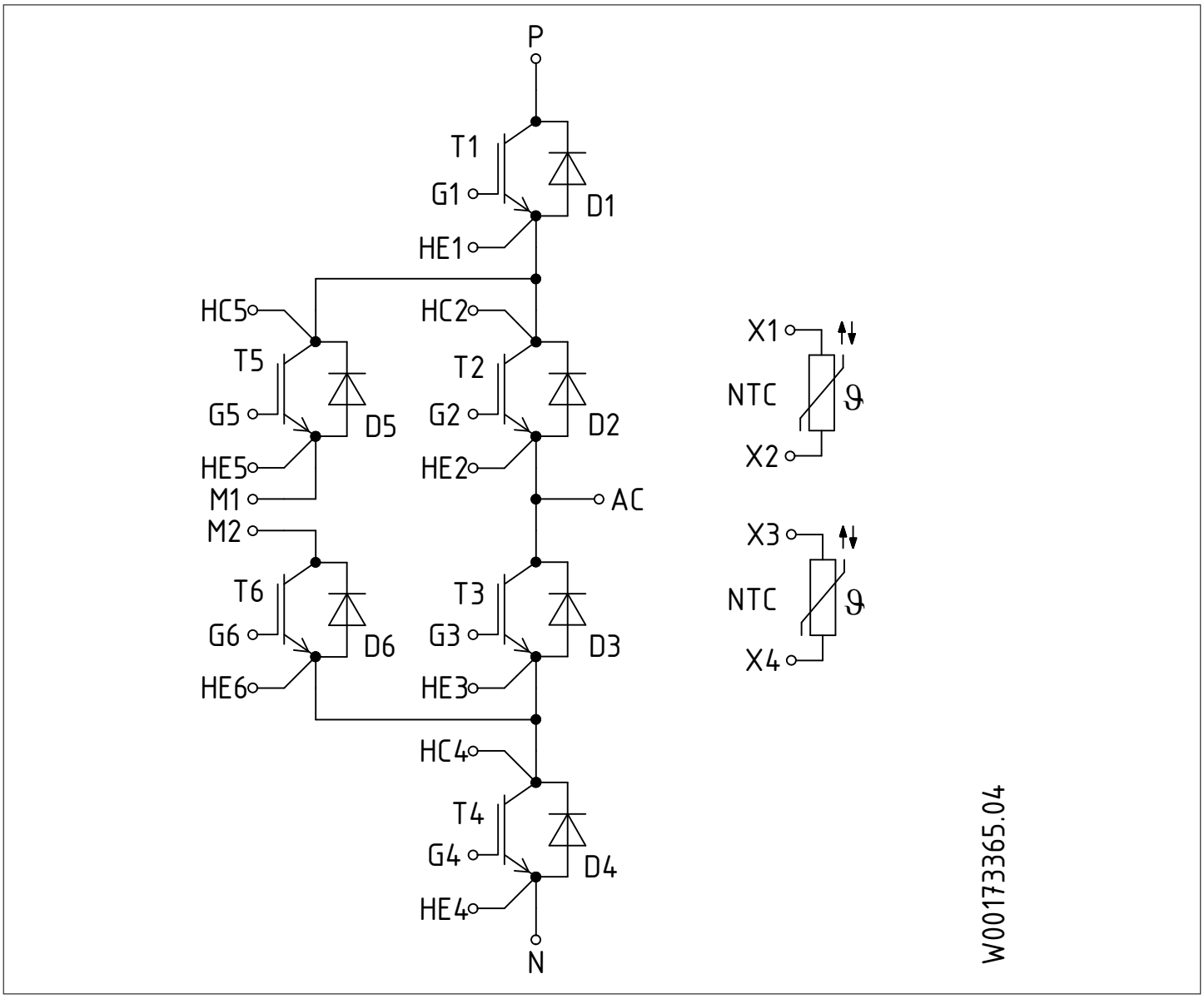


Figure 1

11 Package outlines

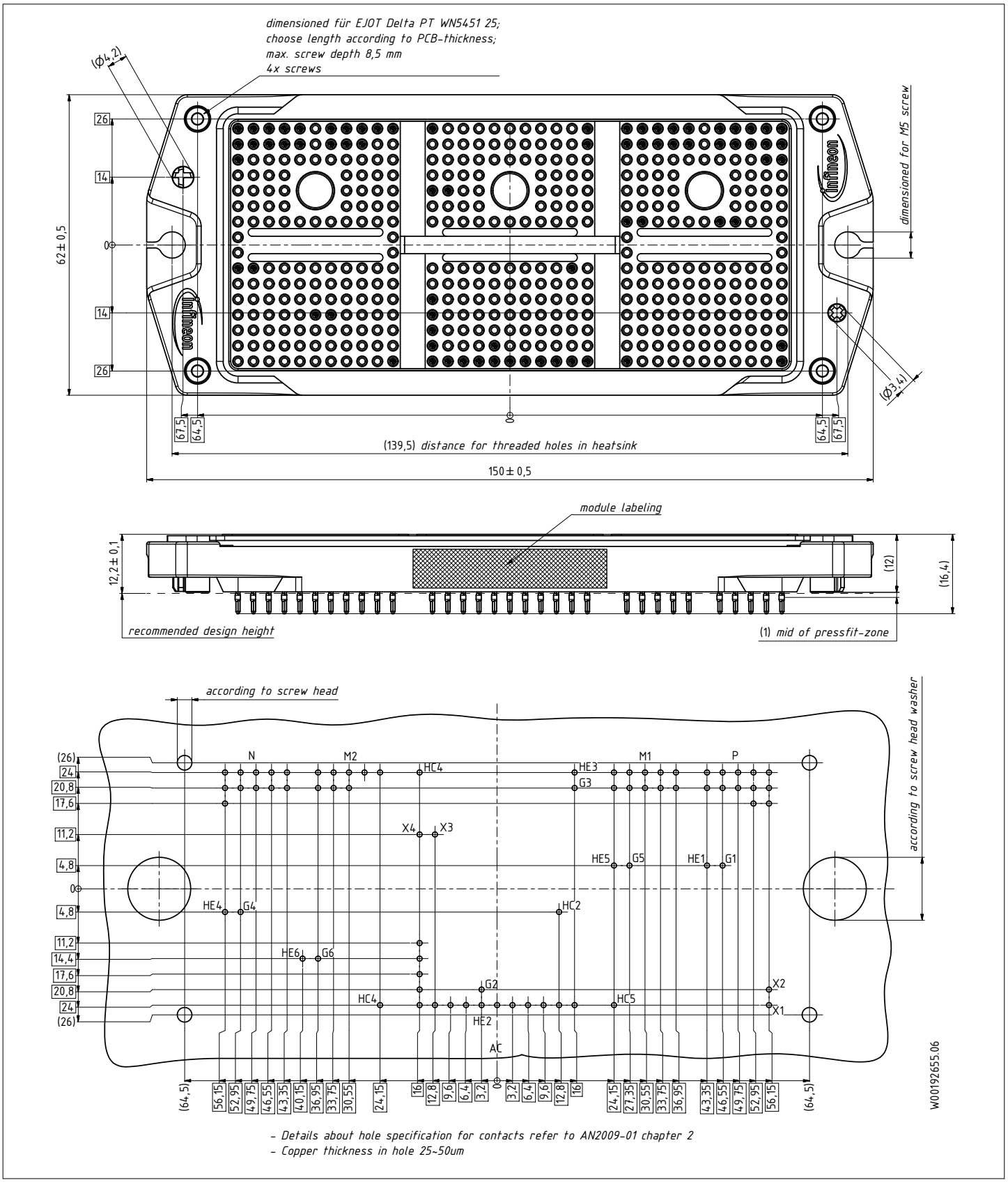


Figure 2

12 Module label code

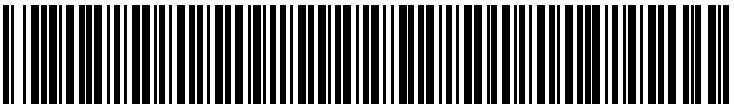
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production week)	*Digit* 1 – 5 6 - 11 12 - 19 20 – 21 22 – 23	*Example* 71549 142846 55054991 15 30
Example	 71549142846550549911530	 71549142846550549911530	

Figure 3

Revision history

Document revision	Date of release	Description of changes
0.10	2021-08-17	Target datasheet
1.00	2022-05-06	Final datasheet

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