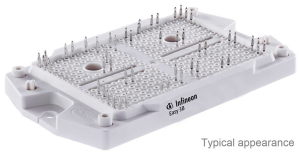
Final datasheet
EasyPACK™ module with CoolSiC™ Trench MOSFET and PressFIT / NTC

Features


Typical appearance

- Electrical features
  - V_{CES} = 1200 V
  - $I_{C\ nom}$ = 200 A / I_{CRM} = 400 A
  - Increased DC-link voltage
  - High current density
  - Low switching losses
  - Suitable Infineon gate drivers can be found under https://www.infineon.com/gdfinder
- Mechanical features
  - High current pin
  - Integrated NTC temperature sensor
  - PressFIT contact technology
  - Rugged mounting due to integrated mounting clamps

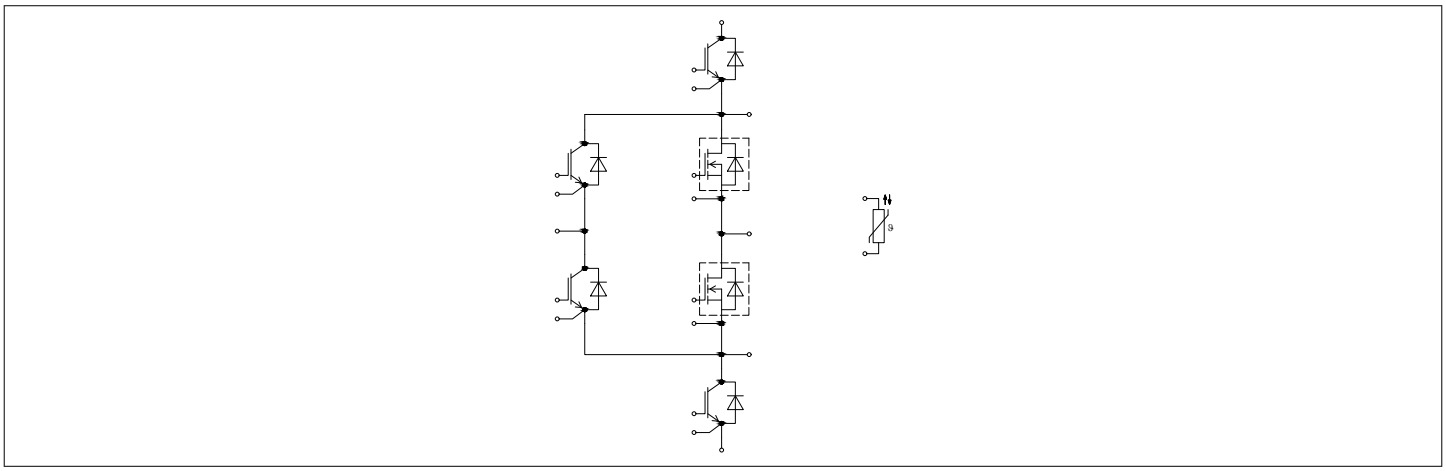
Potential applications

- Three-level applications
- High-frequency switching application
- 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}				39		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	T_H = 25 °C, per switch			2.4		mΩ
Storage temperature	T_{stg}			-40		125	°C
Mounting torque for module mounting	*M*	- Mounting according to valid application note	M5, Screw	1.3		1.5	Nm
Weight	*G*				78		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	950	V
Implemented collector current	I_{CN}			200	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 65 °C	180	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		400	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 = 200 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 = 3.25 mA, V_{CE} = 20 V, 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			2.05		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			1.5		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			24.6		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.114		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 950 V, V_{GE} = 0 V	T_{vj} = 25 °C			37	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 = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 18 Ω	T_{vj} = 25 °C		0.298		µs
			T_{vj} = 125 °C		0.268		
			T_{vj} = 150 °C		0.254		
Rise time (inductive load)	t_r	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 18 Ω	T_{vj} = 25 °C		0.045		µs
			T_{vj} = 125 °C		0.056		
			T_{vj} = 150 °C		0.059		
Turn-off delay time (inductive load)	t_{doff}	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 82 Ω	T_{vj} = 25 °C		3.390		µs
			T_{vj} = 125 °C		3.580		
			T_{vj} = 150 °C		3.590		
Fall time (inductive load)	t_f	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 82 Ω	T_{vj} = 25 °C		0.212		µs
			T_{vj} = 125 °C		0.372		
			T_{vj} = 150 °C		0.443		
Turn-on energy loss per pulse	E_{on}	I_C = 200 A, V_{CC} = 600 V, L_σ = 7 nH, V_{GE} = ±15 V, R_{Gon} = 18 Ω, di/dt = 2800 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		21.9		mJ
			T_{vj} = 125 °C		27		
			T_{vj} = 150 °C		28.5		
Turn-off energy loss per pulse	E_{off}	I_C = 200 A, V_{CC} = 600 V, L_σ = 7 nH, V_{GE} = ±15 V, R_{Goff} = 82 Ω, dv/dt = 1600 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		32		mJ
			T_{vj} = 125 °C		40.3		
			T_{vj} = 150 °C		42.8		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, λ_{grease} = 3.3 W/(m·K)			0.439		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 MOSFET, T2 / T3

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage	V_{DSS}		T_{vj} = 25 °C	1200	V
Implemented drain current	I_{DN}			240	A
Continuous DC drain current	I_{DDC}	T_{vj} = 175 °C, V_{GS} = 18 V	T_H = 65 °C	215	A
Repetitive peak drain current	I_{DRM}	verified by design, t_p limited by T_{vjmax}		530	A
Gate-source voltage, max. transient voltage	V_{GS}	D < 0.01		-10/23	V
Gate-source voltage, max. static voltage	V_{GS}			-7/20	V

Table 6 Recommended values

Parameter	Symbol	Note or test condition	Values	Unit
On-state gate voltage	$V_{GS(on)}$		15...18	V
Off-state gate voltage	$V_{GS(off)}$		-5...0	V

Table 7 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source on-resistance	$R_{DS(on)}$	I_D = 240 A	V_{GS}=18 V, T_{vj} = 25 °C		2.91	3.82	mΩ
			V_{GS}=18 V, T_{vj} = 125 °C		4.7		
			V_{GS}=18 V, T_{vj} = 175 °C		6.24		
			V_{GS}=15 V, T_{vj} = 25 °C		3.4		
Gate threshold voltage	$V_{GS(th)}$	I_D = 112 mA, V_{DS} = V_{GS}, T_{vj} = 25 °C, (tested after 1ms pulse at V_{GS} = +20 V)		3.45	4.3	5.15	V
Total gate charge	Q_G	V_{DD}=800 V, V_{GS} = -3/18 V, T_{vj} = 25 °C			0.8		µC

(table continues...)

Table 7 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Internal gate resistor	R_{Gint}	T_{vj}=25 °C			1.9		Ω
Input capacitance	C_{ISS}	f = 100 kHz, V_{DS}=800 V, V_{GS}=0 V	T_{vj}=25 °C		24.2		nF
Output capacitance	C_{OSS}	f = 100 kHz, V_{DS}=800 V, V_{GS}=0 V	T_{vj}=25 °C		1.2		nF
Reverse transfer capacitance	C_{rss}	f = 100 kHz, V_{DS}=800 V, V_{GS}=0 V	T_{vj}=25 °C		0.079		nF
C_{OSS} stored energy	E_{OSS}	V_{DS}=800 V, V_{GS} = -3/18 V, T_{vj} = 25 °C			473		µJ
Drain-source leakage current	I_{DSS}	V_{DS} = 1200 V, V_{GS} = -3 V	T_{vj} = 25 °C		0.16	378	µA
Gate-source leakage current	I_{GSS}	V_{DS} = 0 V, T_{vj} = 25 °C	V_{GS}=20 V			400	nA
Turn-on delay time (inductive load)	$t_{d\,on}$	I_D = 240 A, R_{Gon} = 4.7 Ω, V_{DD} = 600 V, V_{GS} = -3/18 V, t_{dead} = 1000 ns, 0.1 V_{GS} to 0.1 I_D	T_{vj} = 25 °C		78		ns
			T_{vj} = 125 °C		78		
			T_{vj} = 175 °C		78		
Rise time (inductive load)	t_r	I_D = 240 A, R_{Gon} = 4.7 Ω, V_{DD} = 600 V, V_{GS} = -3/18 V, t_{dead} = 1000 ns, 0.1 I_D to 0.9 I_D	T_{vj} = 25 °C		122		ns
			T_{vj} = 125 °C		115		
			T_{vj} = 175 °C		114		
Turn-off delay time (inductive load)	$t_{d\,off}$	I_D = 240 A, R_{Goff} = 1 Ω, V_{DD} = 600 V, V_{GS} = -3/18 V, 0.9 V_{GS} to 0.9 I_D	T_{vj} = 25 °C		100		ns
			T_{vj} = 125 °C		111		
			T_{vj} = 175 °C		117		
Fall time (inductive load)	t_f	I_D = 240 A, R_{Goff} = 1 Ω, V_{DD} = 600 V, V_{GS} = -3/18 V, 0.9 I_D to 0.1 I_D	T_{vj} = 25 °C		25		ns
			T_{vj} = 125 °C		26		
			T_{vj} = 175 °C		27		
Turn-on energy loss per pulse	E_{on}	I_D = 240 A, V_{DD} = 600 V, L_σ = 7 nH, V_{GS} = -3/18 V, R_{Gon} = 4.7 Ω, di/dt = 5.7 kA/µs (T_{vj} = 175 °C), t_{dead} = 1000 ns	T_{vj} = 25 °C		7.08		mJ
			T_{vj} = 125 °C		7.15		
			T_{vj} = 175 °C		7.16		
Turn-on energy loss per pulse, optimized	$E_{on,o}$	I_D = 240 A, V_{DD} = 600 V, L_σ = 7 nH, V_{GS} = -3/18 V, $R_{Gon,o}$ = 3 Ω, di/dt = 7.1 kA/µs (T_{vj} = 175 °C), t_{dead} = 100 ns	T_{vj} = 25 °C		4.51		mJ
			T_{vj} = 125 °C		4.54		
			T_{vj} = 175 °C		4.55		

(table continues...)

Table 7 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-off energy loss per pulse	E_{off}	I_D = 240 A, V_{DD} = 600 V, L_σ = 7 nH, V_{GS} = -3/18 V, R_{Goff} = 1 Ω, dv/dt = 17.5 kV/µs (T_{vj} = 175 °C)	T_{vj} = 25 °C		3.02		mJ
			T_{vj} = 125 °C		3.51		
			T_{vj} = 175 °C		3.68		
Thermal resistance, junction to heat sink	R_{thJH}	per MOSFET, λ_{grease} = 3.3 W/(m·K)			0.283		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		175	°C

***Note**: The selection of positive and negative gate-source voltages impacts losses and the long-term behavior of the MOSFET and body diode. The design guidelines described in Application Note AN 2018-09 and AN 2021-13 must be considered to ensure sound operation of the device over the planned lifetime.*

Tvj,op > 150°C is allowed for operation at overload conditions for MOSFET and body diode. For detailed specifications, please refer to AN 2021-13

4 Body diode (MOSFET, T2 / T3)

Table 8 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
DC body diode forward current	I_{SD}	T_{vj} = 175 °C, V_{GS} = -3 V	T_H = 65 °C	95	A

Table 9 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_{SD}	I_{SD} = 240 A, V_{GS} = -3 V	T_{vj} = 25 °C		4.11	5.35	V
			T_{vj} = 125 °C		3.85		
			T_{vj} = 175 °C		3.75		
Peak reverse recovery current	I_{rrm}	I_{SD} = 240 A, di_s/dt = 5.5 kA/µs, V_{DD} = 600 V, V_{GS} = -3 V, t_{dead} = 1000 ns	T_{vj} = 25 °C		74		A
			T_{vj} = 125 °C		109		
			T_{vj} = 175 °C		134		
Recovered charge	Q_{rr}	I_{SD} = 240 A, di_s/dt = 5.5 kA/µs, V_{DD} = 600 V, V_{GS} = -3 V, t_{dead} = 1000 ns	T_{vj} = 25 °C		1.3		µC
			T_{vj} = 125 °C		2.7		
			T_{vj} = 175 °C		3.9		
Reverse recovery energy	E_{rec}	I_{SD} = 240 A, di_s/dt = 5.5 kA/µs (T_{vj} = 175 °C), V_{DD} = 600 V, V_{GS} = -3 V, t_{dead} = 1000 ns	T_{vj} = 25 °C		0.38		mJ
			T_{vj} = 125 °C		0.89		
			T_{vj} = 175 °C		1.16		

(table continues...)

Table 9 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Reverse recovery energy, optimized	$E_{rec,o}$	I_{SD} = 240 A, di_s/dt = 6.9 kA/µs (T_{vj} = 175 °C), V_{DD} = 600 V, V_{GS} = -3 V, t_{dead} = 100 ns	T_{vj} = 25 °C		0.46		mJ
			T_{vj} = 125 °C		0.64		
			T_{vj} = 175 °C		0.91		

5 IGBT, T5 / T6

Table 10 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}			200	A
Continuous DC collector current	I_{CDC}	$T_{vj\,max}$ = 175 °C	T_H = 65 °C	160	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\,op}$		400	A
Gate-emitter peak voltage	V_{GES}			±20	V

Table 11 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\,sat}$	I_C = 200 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 = 3.25 mA, V_{CE} = 20 V, 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			2.05		µC
Internal gate resistor	R_{Gint}	T_{vj} = 25 °C			1.5		Ω
Input capacitance	C_{ies}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			24.6		nF
Reverse transfer capacitance	C_{res}	f = 100 kHz, T_{vj} = 25 °C, V_{CE} = 25 V, V_{GE} = 0 V			0.114		nF
Collector-emitter cut-off current	I_{CES}	V_{CE} = 950 V, V_{GE} = 0 V	T_{vj} = 25 °C			32	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25 °C				100	nA

(table continues...)

Table 11 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-on delay time (inductive load)	t_{don}	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 18 Ω	T_{vj} = 25 °C		0.269		µs
			T_{vj} = 125 °C		0.255		
			T_{vj} = 150 °C		0.235		
Rise time (inductive load)	t_r	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Gon} = 18 Ω	T_{vj} = 25 °C		0.052		µs
			T_{vj} = 125 °C		0.065		
			T_{vj} = 150 °C		0.066		
Turn-off delay time (inductive load)	t_{doff}	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 82 Ω	T_{vj} = 25 °C		3.420		µs
			T_{vj} = 125 °C		3.580		
			T_{vj} = 150 °C		3.590		
Fall time (inductive load)	t_f	I_C = 200 A, V_{CC} = 600 V, V_{GE} = ±15 V, R_{Goff} = 82 Ω	T_{vj} = 25 °C		0.174		µs
			T_{vj} = 125 °C		0.332		
			T_{vj} = 150 °C		0.363		
Turn-on energy loss per pulse	E_{on}	I_C = 200 A, V_{CC} = 600 V, L_σ = 7 nH, V_{GE} = ±15 V, R_{Gon} = 18 Ω, di/dt = 2500 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		25.6		mJ
			T_{vj} = 125 °C		31.5		
			T_{vj} = 150 °C		34.2		
Turn-off energy loss per pulse	E_{off}	I_C = 200 A, V_{CC} = 600 V, L_σ = 7 nH, V_{GE} = ±15 V, R_{Goff} = 82 Ω, dv/dt = 1600 V/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		29.9		mJ
			T_{vj} = 125 °C		37.7		
			T_{vj} = 150 °C		40.1		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, λ_{grease} = 3.3 W/(m·K)			0.517		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

6 Diode, D1 / D4

Table 12 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
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	7380	A^2s
			T_{vj} = 150 °C	6320	

Table 13 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		1.41	1.64	V
			T_{vj} = 125 °C		1.28		
			T_{vj} = 150 °C		1.25		
Peak reverse recovery current	I_{RM}	V_{CC} = 600 V, I_F = 160 A, V_{GE} = -15 V, -di$_F$/dt = 2500 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		99		A
			T_{vj} = 125 °C		143		
			T_{vj} = 150 °C		155		
Recovered charge	Q_r	V_{CC} = 600 V, I_F = 160 A, V_{GE} = -15 V, -di$_F$/dt = 2500 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		15		µC
			T_{vj} = 125 °C		30		
			T_{vj} = 150 °C		35		
Reverse recovery energy	E_{rec}	V_{CC} = 600 V, I_F = 160 A, V_{GE} = -15 V, -di$_F$/dt = 2500 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		4.47		mJ
			T_{vj} = 125 °C		9.81		
			T_{vj} = 150 °C		11.8		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 3.3 W/(m·K)			0.402		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

7 Diode, D5 / D6

Table 14 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			200	A
Repetitive peak forward current	I_{FRM}	t_P = 1 ms		400	A
I^2t - value	I^2t	t_P = 10 ms, V_R = 0 V	T_{vj} = 125 °C	5060	A^2s
			T_{vj} = 150 °C	4920	

Table 15 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	I_F = 200 A, V_{GE} = 0 V	T_{vj} = 25 °C		1.72	2.10	V
			T_{vj} = 125 °C		1.59		
			T_{vj} = 150 °C		1.56		
Peak reverse recovery current	I_{RM}	V_{CC} = 600 V, I_F = 200 A, V_{GE} = -15 V, -di$_F$/dt = 2800 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		101		A
			T_{vj} = 125 °C		126		
			T_{vj} = 150 °C		134		
Recovered charge	Q_r	V_{CC} = 600 V, I_F = 200 A, V_{GE} = -15 V, -di$_F$/dt = 2800 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		12		µC
			T_{vj} = 125 °C		25		
			T_{vj} = 150 °C		30		
Reverse recovery energy	E_{rec}	V_{CC} = 600 V, I_F = 200 A, V_{GE} = -15 V, -di$_F$/dt = 2800 A/µs (T_{vj} = 150 °C)	T_{vj} = 25 °C		3.57		mJ
			T_{vj} = 125 °C		8.51		
			T_{vj} = 150 °C		10.3		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, λ_{grease} = 3.3 W/(m·K)			0.447		K/W
Temperature under switching conditions	$T_{vj\,op}$			-40		150	°C

8 NTC-Thermistor

Table 16 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

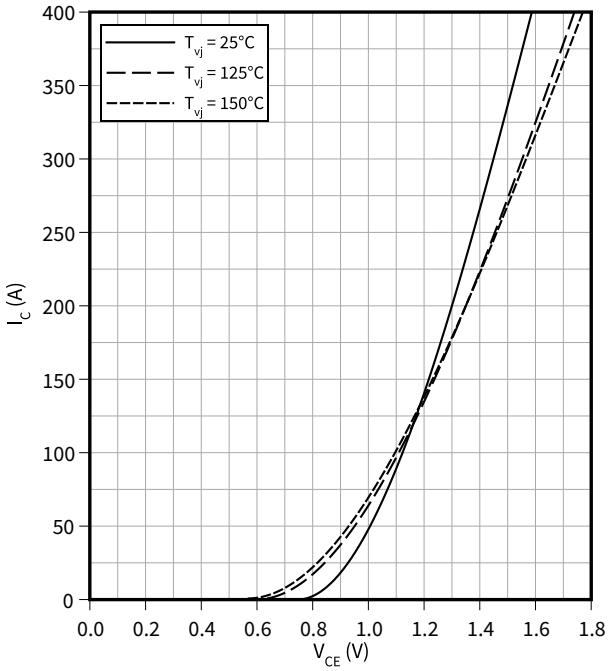
***Note**: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.*

9 Characteristics diagrams

Output characteristic (typical), IGBT, T1 / T4

$I_C = f(V_{CE})$

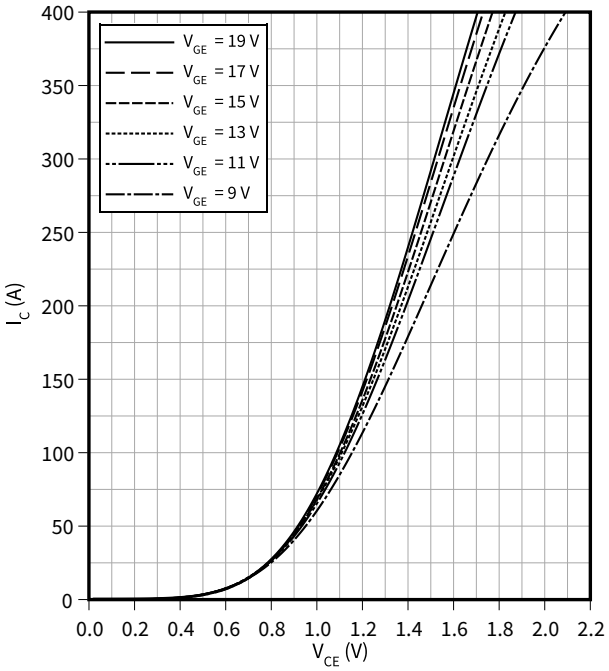
V_{GE} = 15 V



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

$I_C = f(V_{CE})$

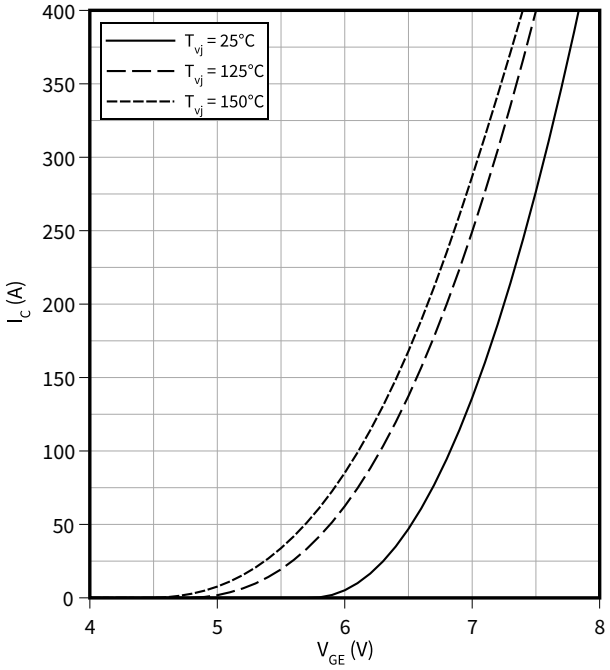
T_{vj} = 150 °C



Transfer characteristic (typical), IGBT, T1 / T4

$I_C = f(V_{GE})$

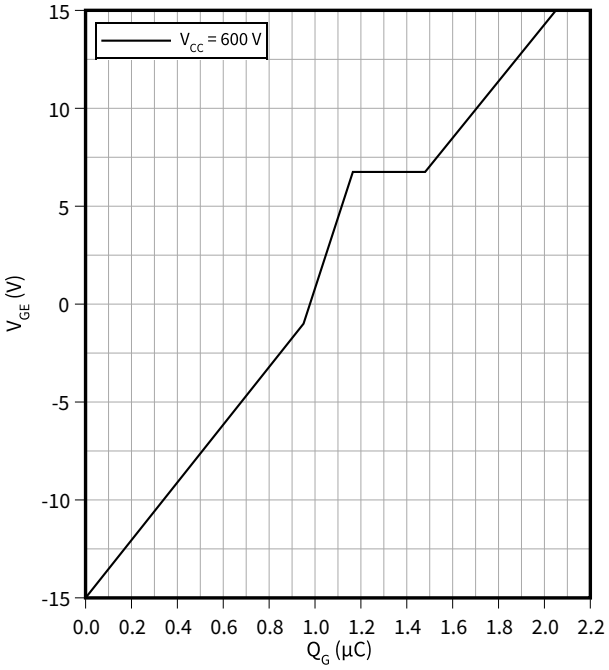
V_{CE} = 20 V



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

$V_{GE} = f(Q_G)$

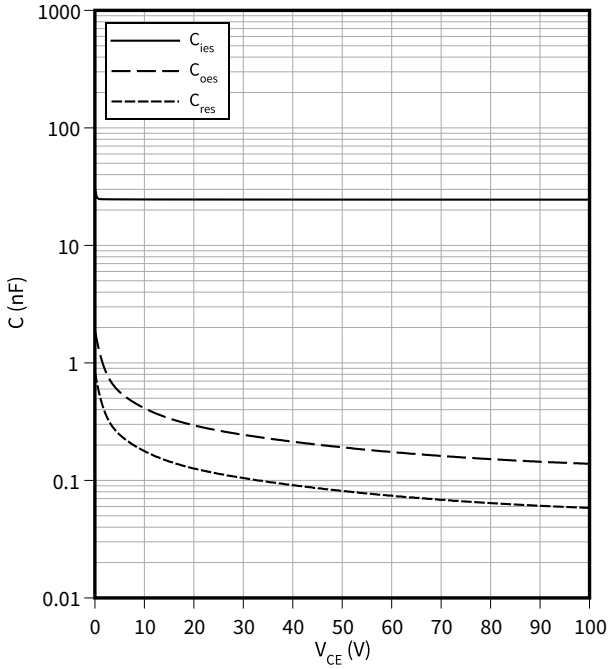
I_C = 200 A, T_{vj} = 25 °C



Capacity characteristic (typical), IGBT, T1 / T4

$C = f(V_{CE})$

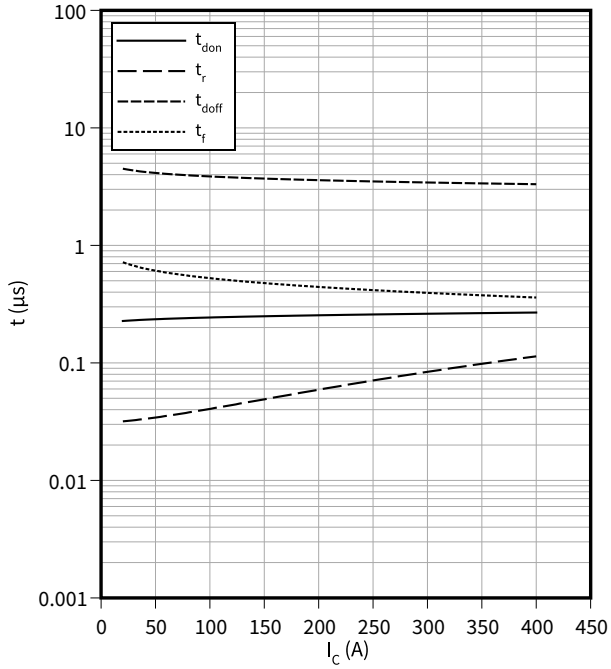
$f = 100\ kHz$, $V_{GE} = 0\ V$, $T_{vj} = 25\ °C$



Switching times (typical), IGBT, T1 / T4

$t = f(I_C)$

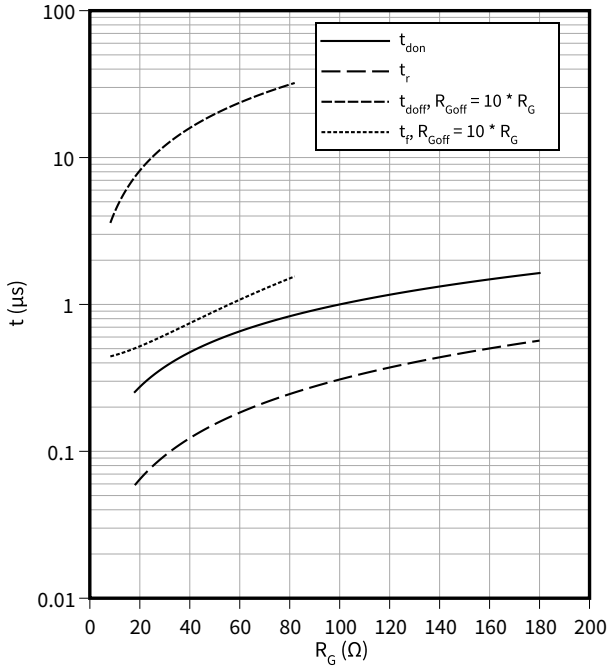
$V_{CC} = 600\ V$, $T_{vj} = 150\ °C$, $R_{Goff} = 82\ Ω$, $R_{Gon} = 18\ Ω$, $V_{GE} = ±15\ V$



Switching times (typical), IGBT, T1 / T4

$t = f(R_G)$

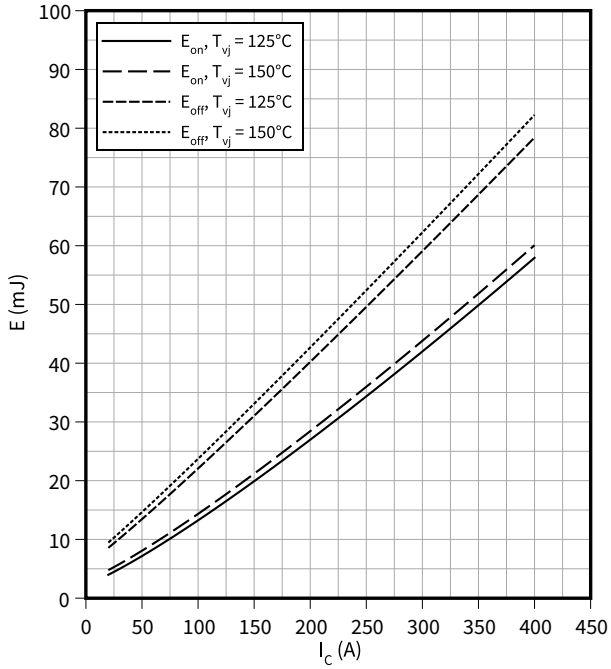
$V_{GE} = ±15\ V$, $I_C = 200\ A$, $V_{CC} = 600\ V$, $T_{vj} = 150\ °C$



Switching losses (typical), IGBT, T1 / T4

$E = f(I_C)$

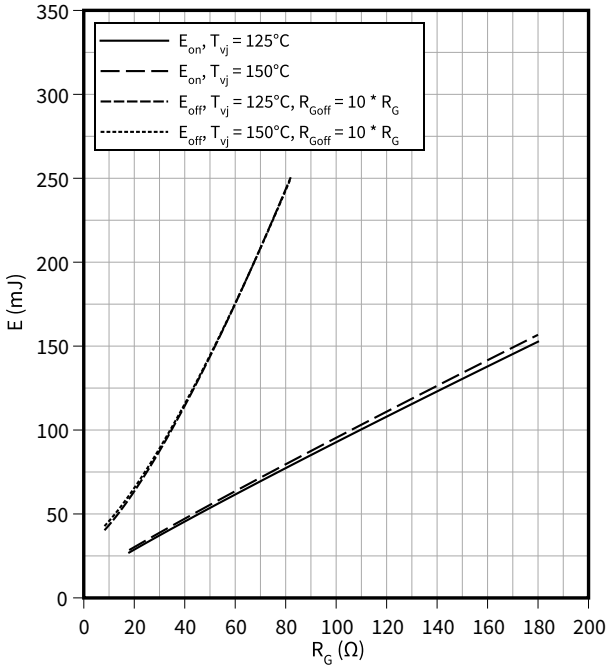
$R_{Goff} = 82\ Ω$, $R_{Gon} = 18\ Ω$, $V_{GE} = ±15\ V$, $V_{CC} = 600\ V$



Switching losses (typical), IGBT, T1 / T4

$E = f(R_G)$

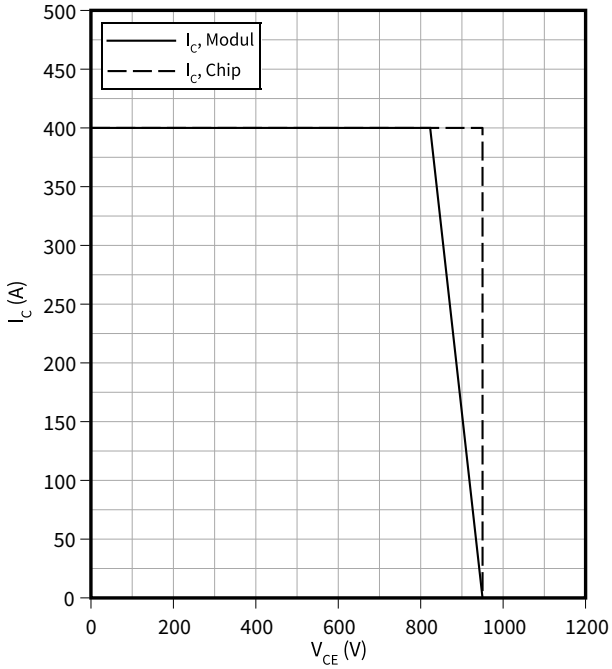
$V_{GE} = \pm 15$ V, $I_C = 200$ A, $V_{CC} = 600$ V



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

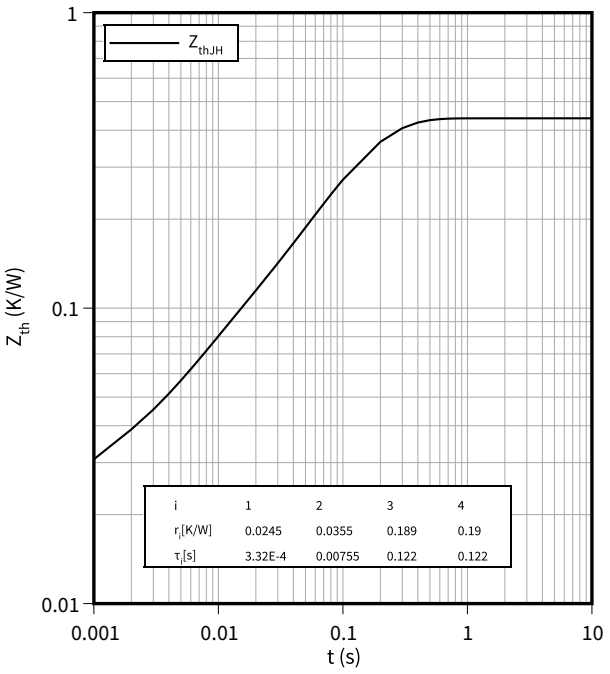
$I_C = f(V_{CE})$

$R_{Goff} = 82\ \Omega$, $V_{GE} = \pm 15$ V, $T_{vj} = 150$ °C



Transient thermal impedance, IGBT, T1 / T4

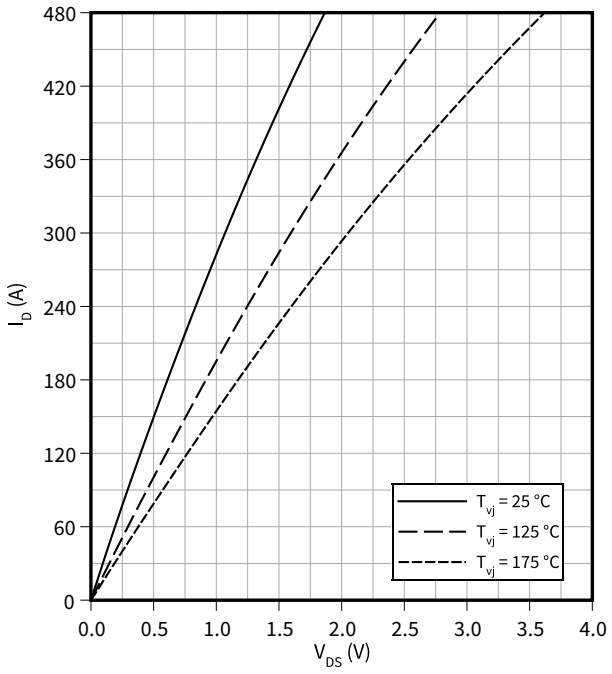
$Z_{th} = f(t)$



Output characteristic (typical), MOSFET, T2 / T3

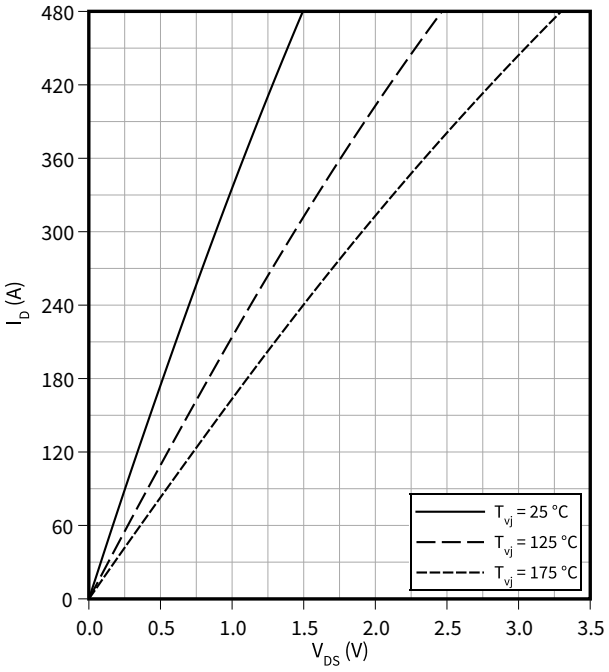
$I_D = f(V_{DS})$

$V_{GS} = 15$ V



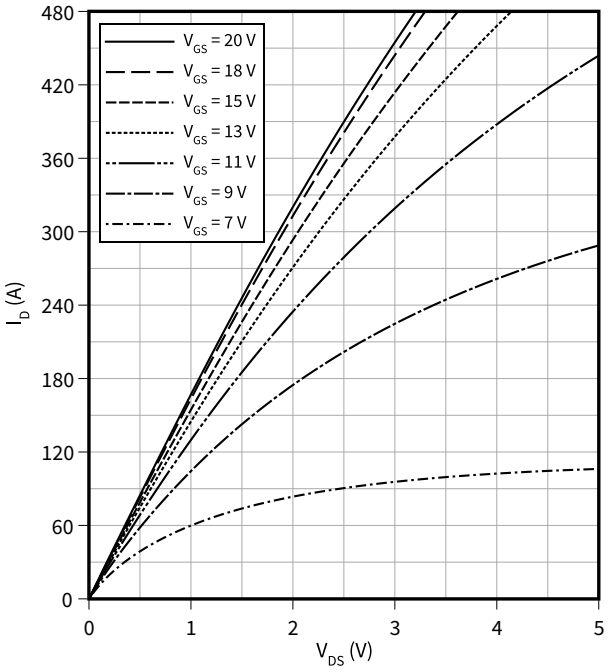
Output characteristic (typical), MOSFET, T2 / T3

$I_D = f(V_{DS})$
$V_{GS} = 18$ V



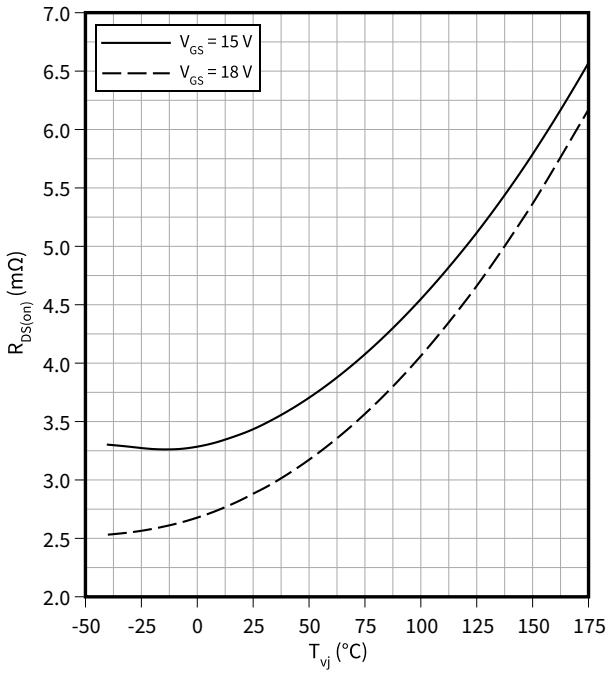
Output characteristic field (typical), MOSFET, T2 / T3

$I_D = f(V_{DS})$
$T_{vj} = 175$ °C



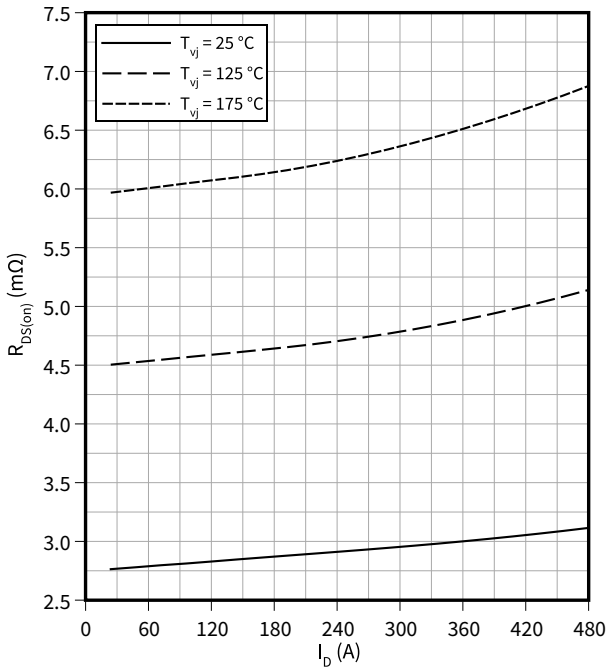
Drain source on-resistance (typical), MOSFET, T2 / T3

$R_{DS(on)} = f(T_{vj})$
$I_D = 240$ A



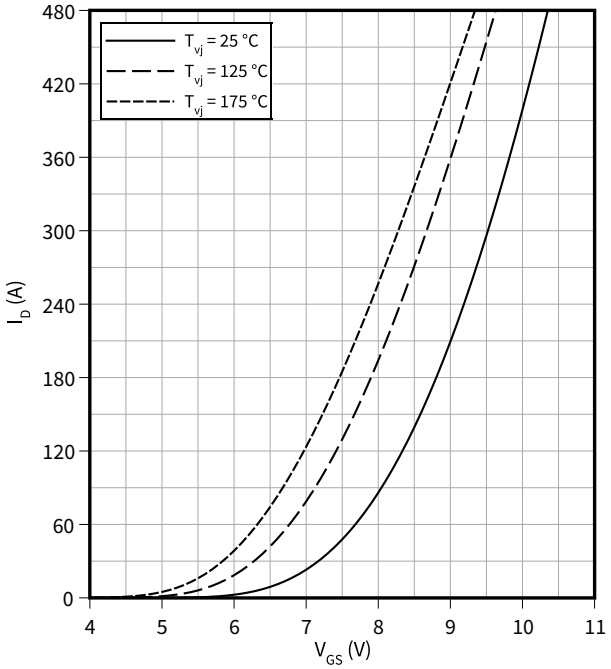
Drain source on-resistance (typical), MOSFET, T2 / T3

$R_{DS(on)} = f(I_D)$
$V_{GS} = 18$ V



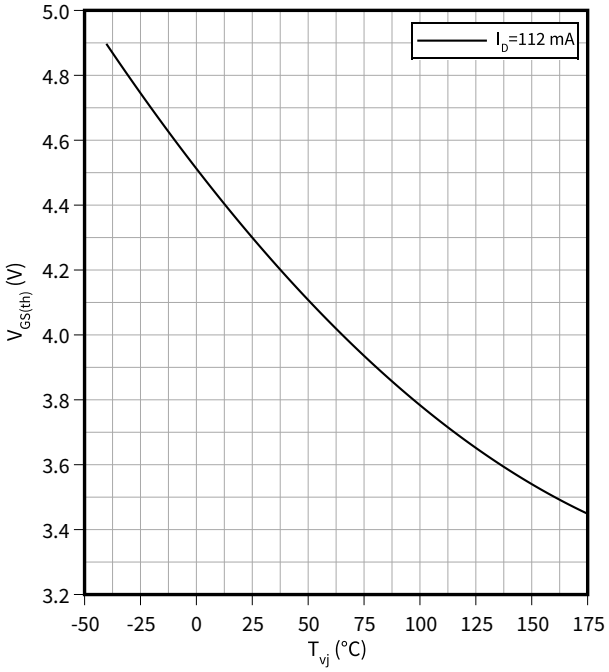
Transfer characteristic (typical), MOSFET, T2 / T3

$I_D = f(V_{GS})$
$V_{DS} = 20$ V



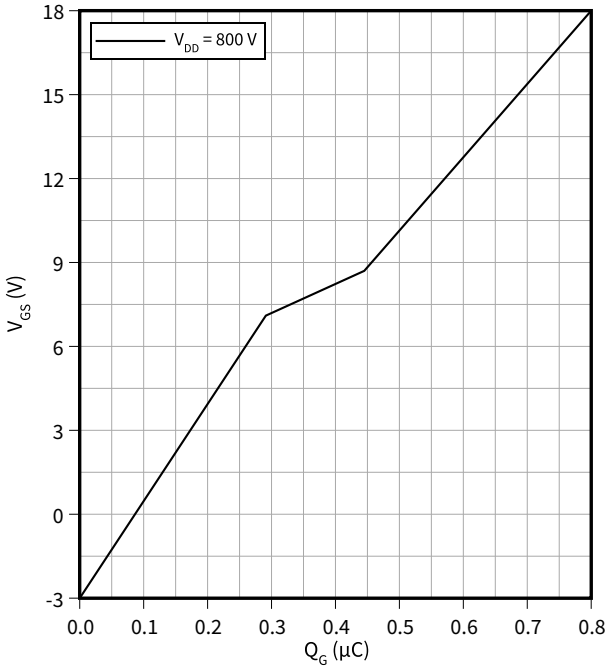
Gate-source threshold voltage (typical), MOSFET, T2 / T3

$V_{GS(th)} = f(T_{vj})$
$V_{GS} = V_{DS}$, $I_D = 112$ mA



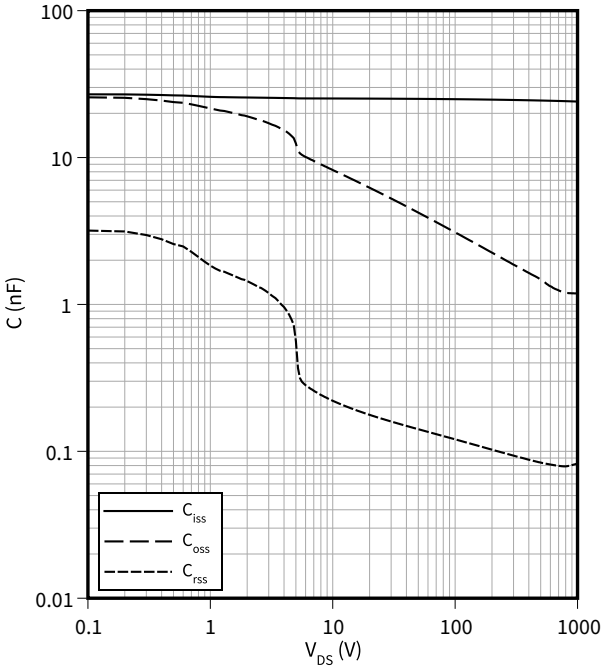
Gate charge characteristic (typical), MOSFET, T2 / T3

$V_{GS} = f(Q_G)$
$I_D = 240$ A, $T_{vj} = 25$ °C



Capacity characteristic (typical), MOSFET, T2 / T3

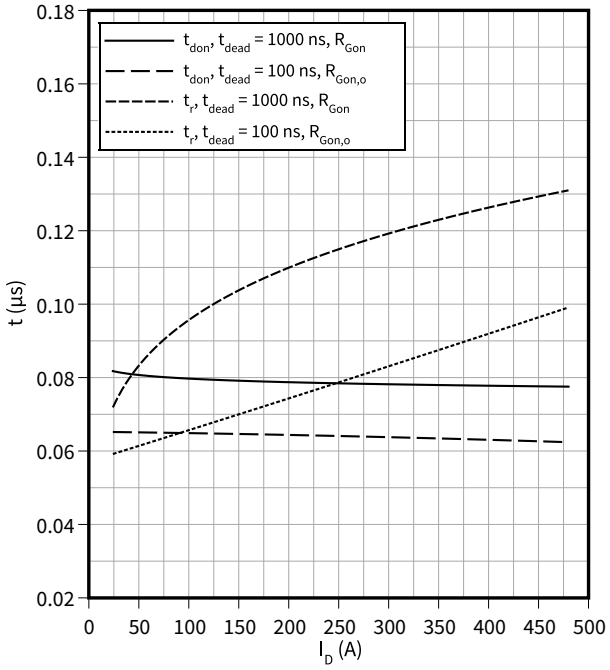
$C = f(V_{DS})$
$f = 100$ kHz, $T_{vj} = 25$ °C, $V_{GS} = 0$ V



Switching times (typical), MOSFET, T2 / T3

$t = f(I_D)$

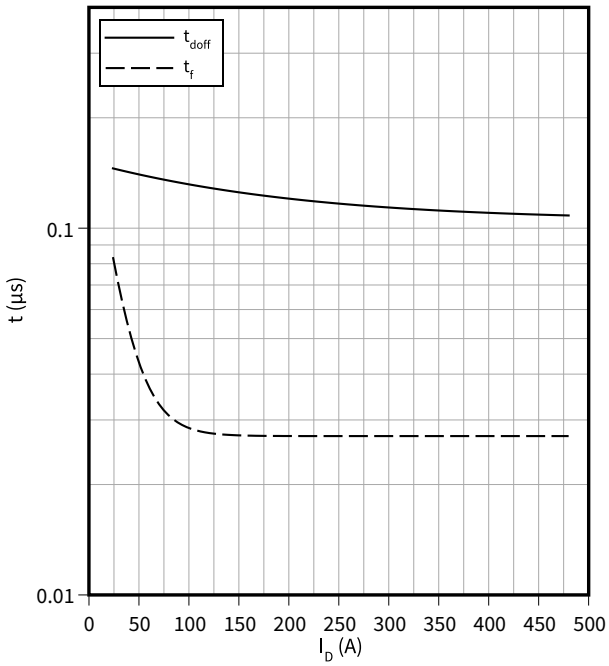
V_{DD} = 600 V, R_{Gon} = 4.7 Ω, $R_{Gon,o}$ = 3 Ω, T_{vj} = 175 °C, V_{GS} = -3/18 V



Switching times (typical), MOSFET, T2 / T3

$t = f(I_D)$

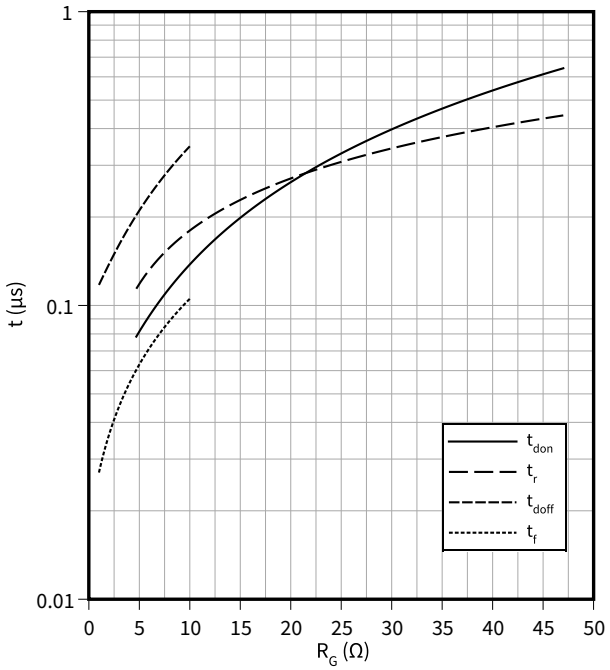
R_{Goff} = 1 Ω, V_{DD} = 600 V, T_{vj} = 175 °C, V_{GS} = -3/18 V



Switching times (typical), MOSFET, T2 / T3

$t = f(R_G)$

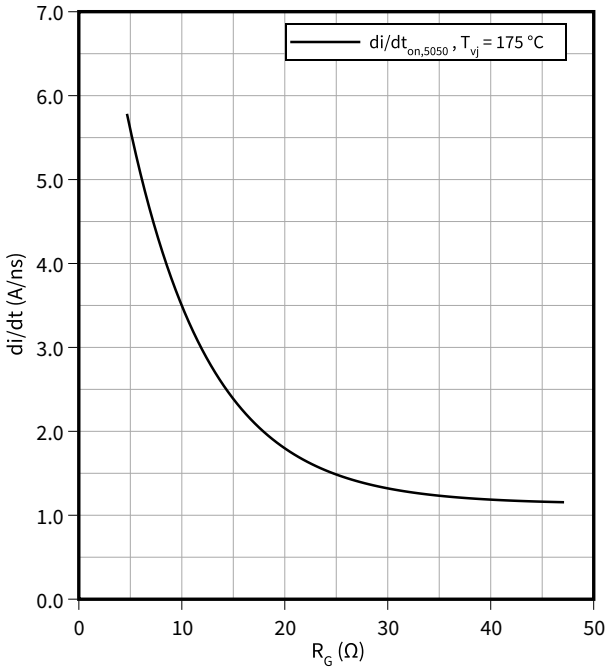
V_{DD} = 600 V, t_{dead} = 1000 ns, I_D = 240 A, T_{vj} = 175 °C, V_{GS} = -3/18 V



Current slope (typical), MOSFET, T2 / T3

$di/dt = f(R_G)$

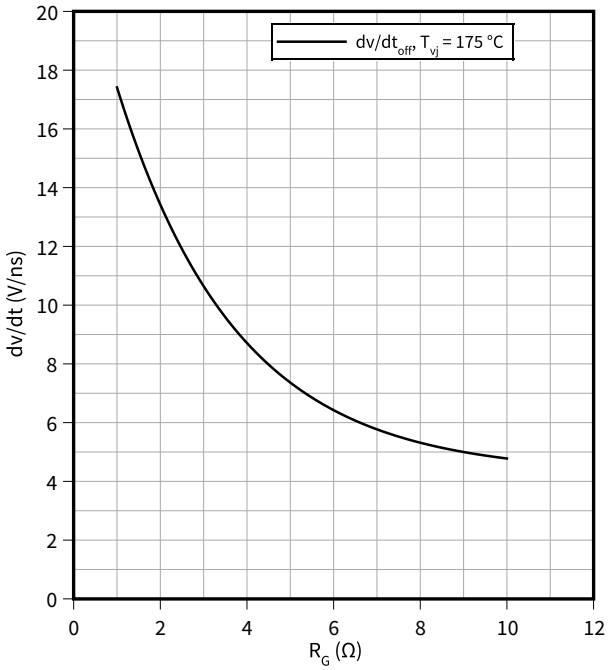
V_{DD} = 600 V, t_{dead} = 1000 ns, I_D = 240 A, V_{GS} = -3/18 V



Voltage slope (typical), MOSFET, T2 / T3

$dv/dt = f(R_G)$

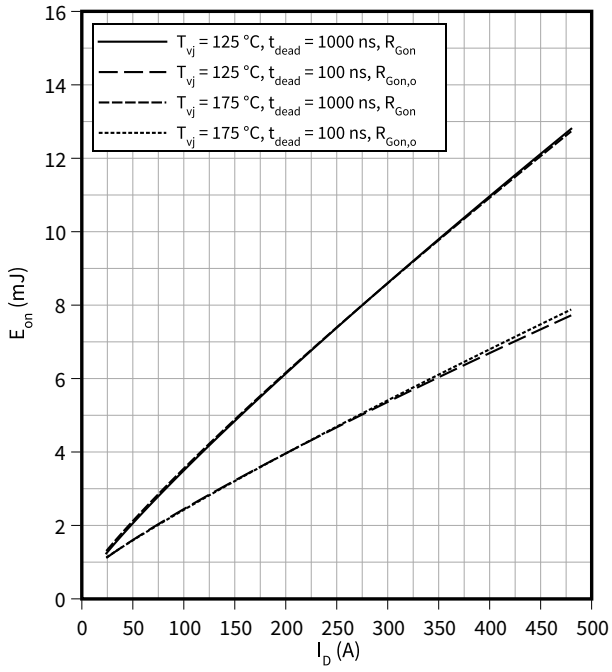
V_{DD} = 600 V, I_D = 240 A, V_{GS} = -3/18 V



Switching losses (typical), MOSFET, T2 / T3

$E_{on} = f(I_D)$

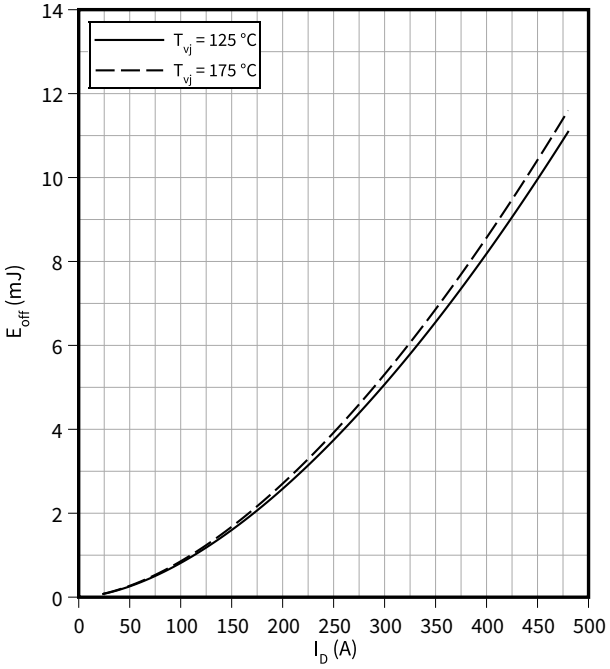
R_{Gon} = 4.7 Ω, V_{DD} = 600 V, $R_{Gon,o}$ = 3 Ω, V_{GS} = -3/18 V



Switching losses (typical), MOSFET, T2 / T3

$E_{off} = f(I_D)$

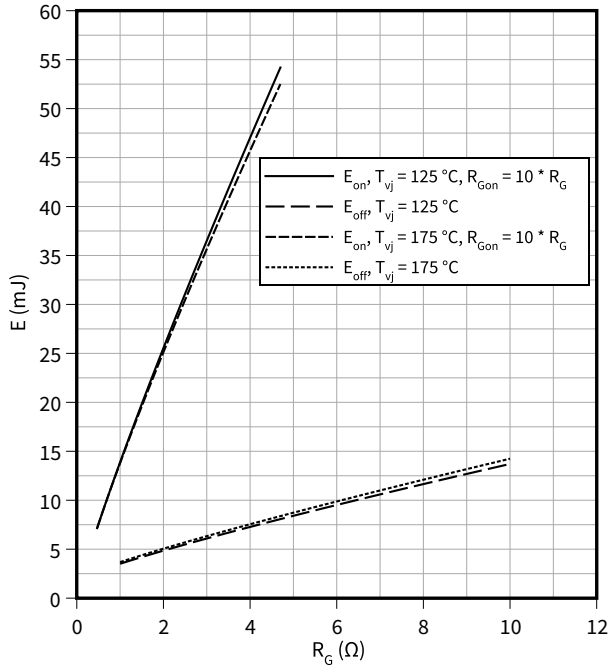
R_{Goff} = 1 Ω, V_{DD} = 600 V, V_{GS} = -3/18 V



Switching losses (typical), MOSFET, T2 / T3

$E = f(R_G)$

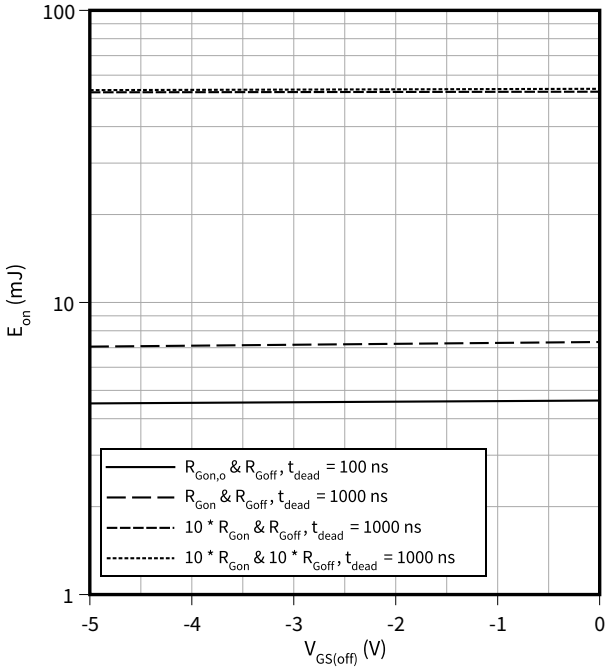
V_{DD} = 600 V, t_{dead} = 1000 ns, I_D = 240 A, V_{GS} = -3/18 V



Switching losses (typical), MOSFET, T2 / T3

$E_{on} = f(V_{GS(off)})$

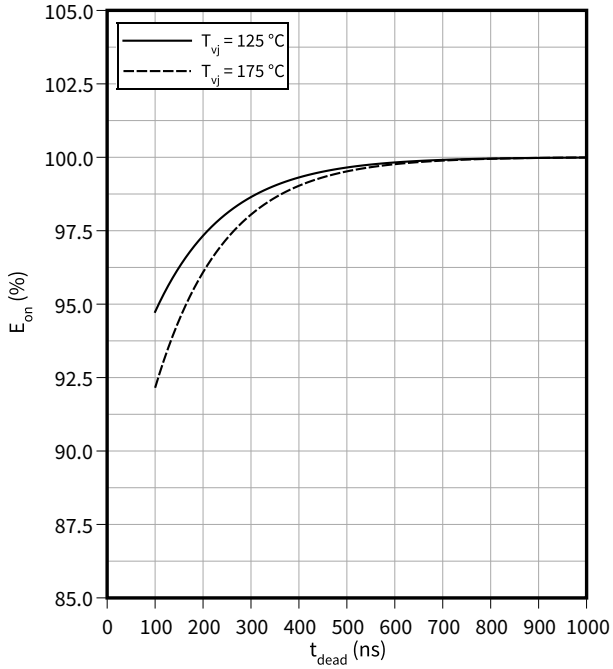
R_{Goff} = 1 Ω, V_{DD} = 600 V, R_{Gon} = 4.7 Ω, $V_{GS(on)}$ = 18 V, I_D = 240 A, $R_{Gon,o}$ = 3 Ω, T_{vj} = 175 °C



Switching losses (typical), MOSFET, T2 / T3

$E_{on} = f(t_{dead})$

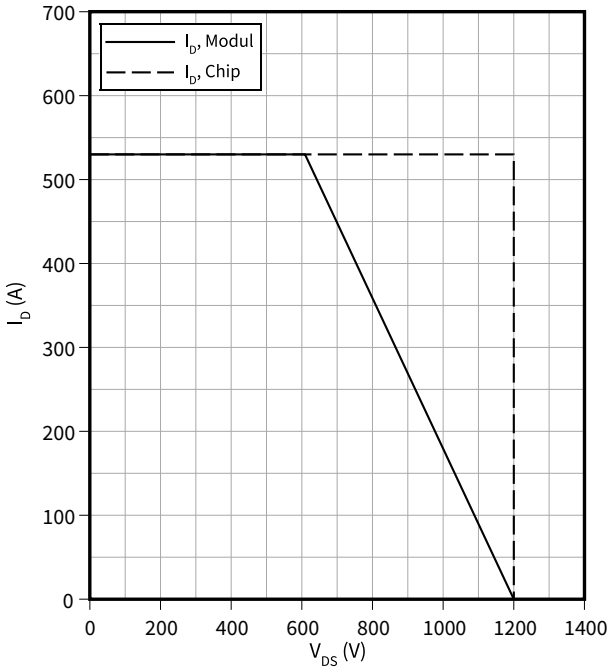
R_{Gon} = 4.7 Ω, I_D = 240 A, V_{DD} = 600 V, V_{GS} = -3/18 V



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

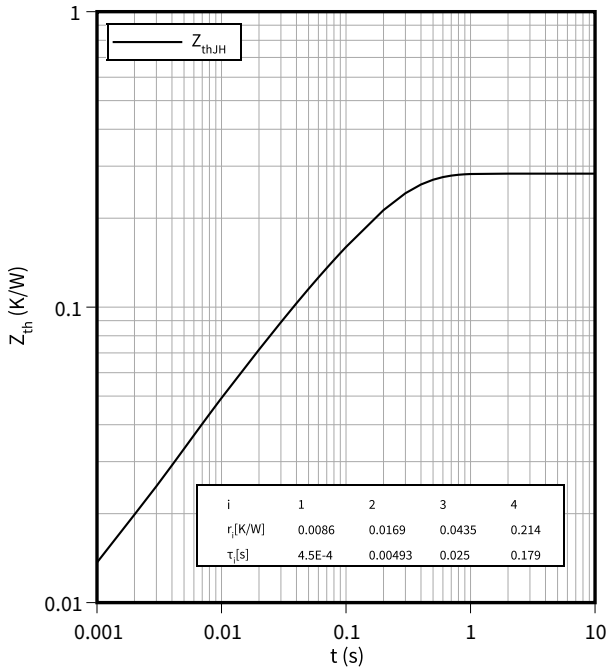
$I_D = f(V_{DS})$

R_{Goff} = 1 Ω, T_{vj} = 175 °C, V_{GS} = -3/18 V



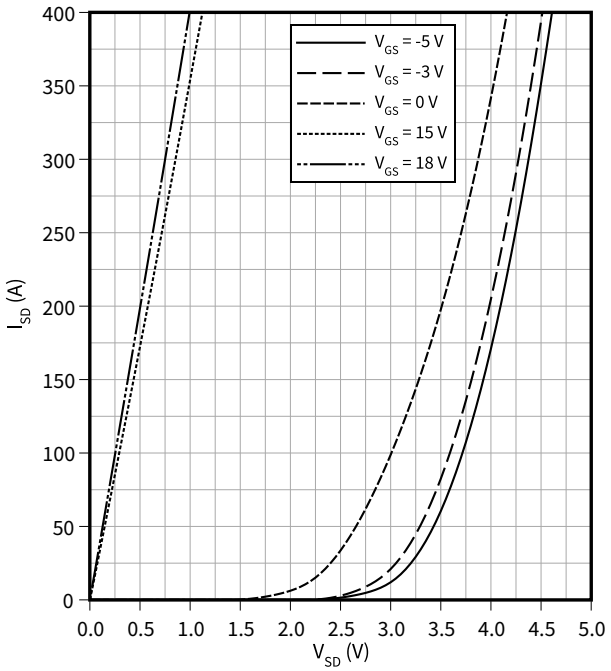
Transient thermal impedance, MOSFET, T2 / T3

$Z_{th} = f(t)$



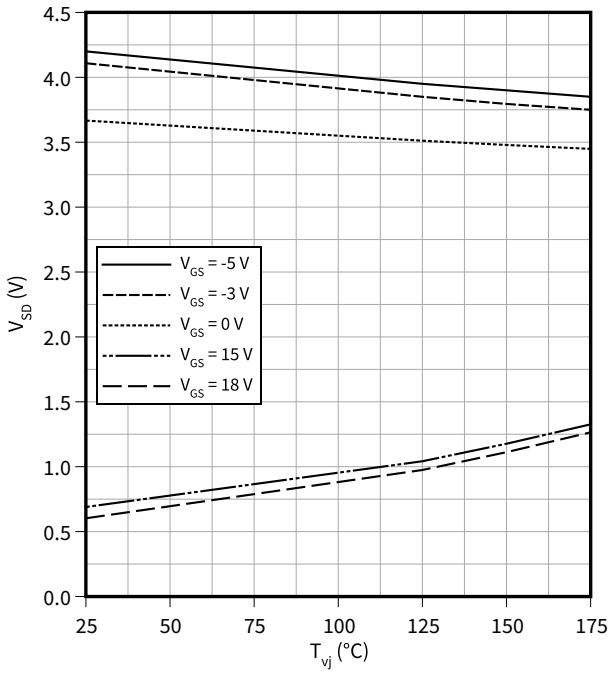
Forward characteristic body diode (typical), MOSFET, T2 / T3

$I_{SD} = f(V_{SD})$
$T_{vj} = 25\ °C$



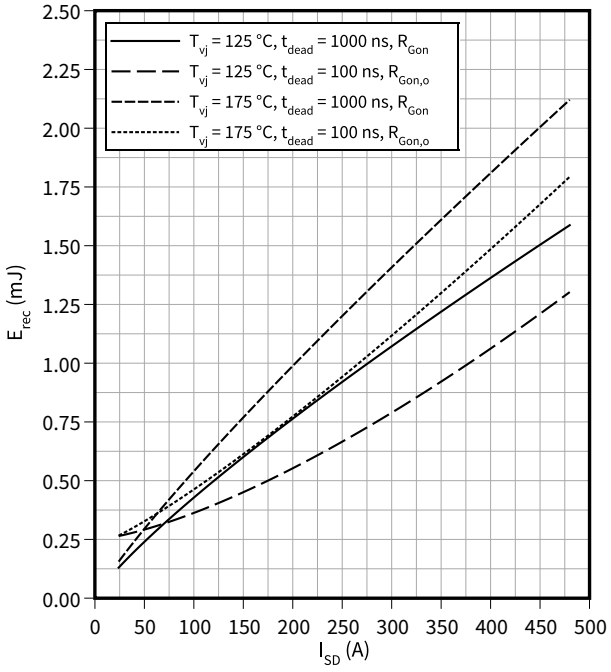
Forward voltage of body diode (typical), MOSFET, T2 / T3

$V_{SD} = f(T_{vj})$
$I_{SD} = 240\ A$



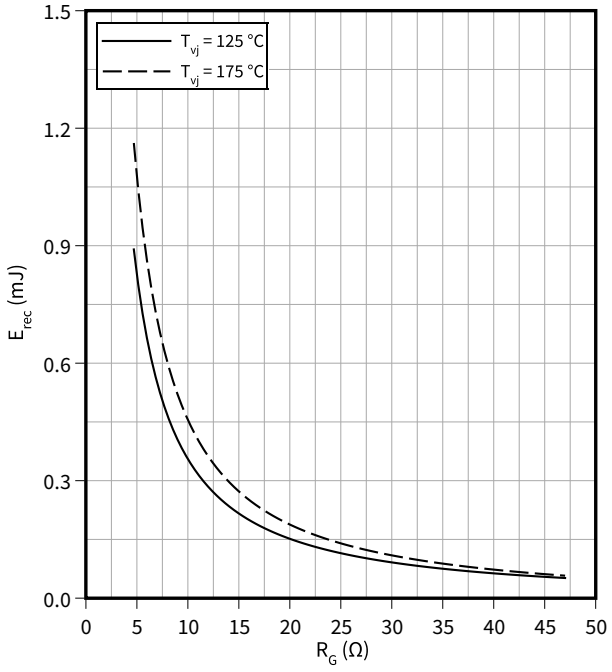
Switching losses body diode (typical), MOSFET, T2 / T3

$E_{rec} = f(I_{SD})$
$R_{Gon} = 4.7\ \Omega$, $R_{Gon,o} = 3\ \Omega$, $V_{DD} = 600\ V$



Switching losses body diode (typical), MOSFET, T2 / T3

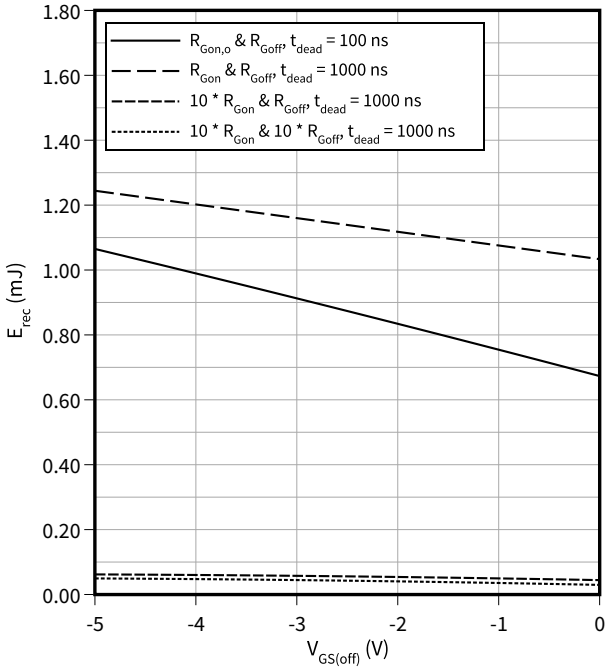
$E_{rec} = f(R_G)$
$t_{dead} = 1000\ ns$, $I_{SD} = 240\ A$, $V_{DD} = 600\ V$



Switching losses body diode (typical), MOSFET, T2 / T3

$E_{rec} = f(V_{GS(off)})$

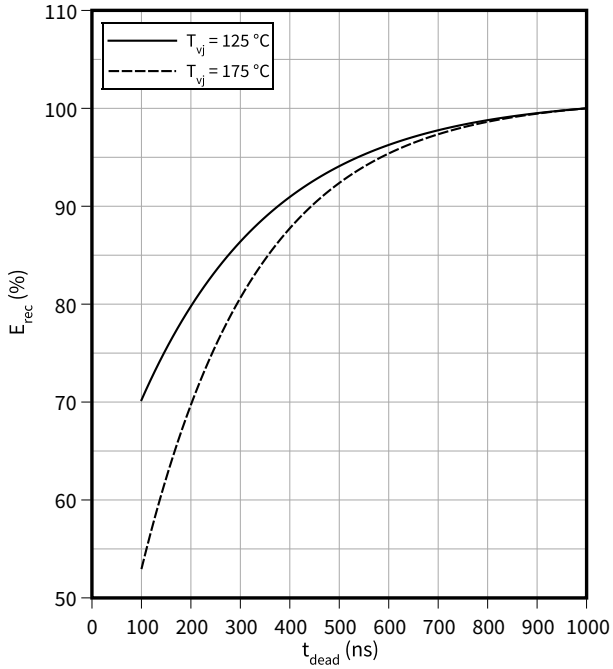
R_{Goff} = 1 Ω, R_{Gon} = 4.7 Ω, $V_{GS(on)}$ = 18 V, I_{SD} = 240 A, $R_{Gon,o}$ = 3 Ω, V_{DD} = 600 V, T_{vj} = 175 °C



Switching losses body diode (typical), MOSFET, T2 / T3

$E_{rec} = f(t_{dead})$

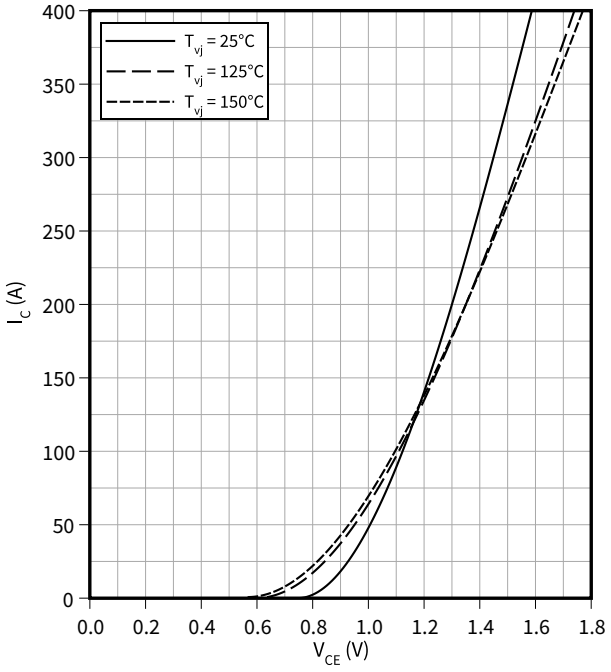
R_{Gon} = 4.7 Ω, I_D = 240 A, V_{DD} = 600 V, V_{GS} = -3/18 V



Output characteristic (typical), IGBT, T5 / T6

$I_C = f(V_{CE})$

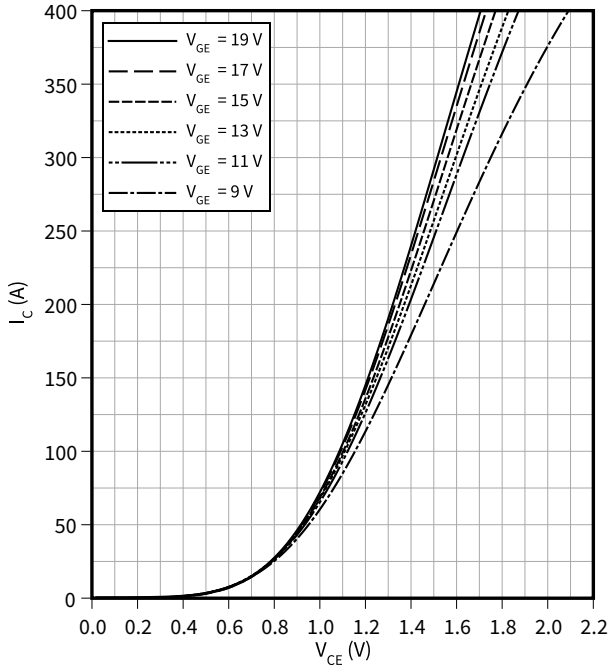
V_{GE} = 15 V



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

$I_C = f(V_{CE})$

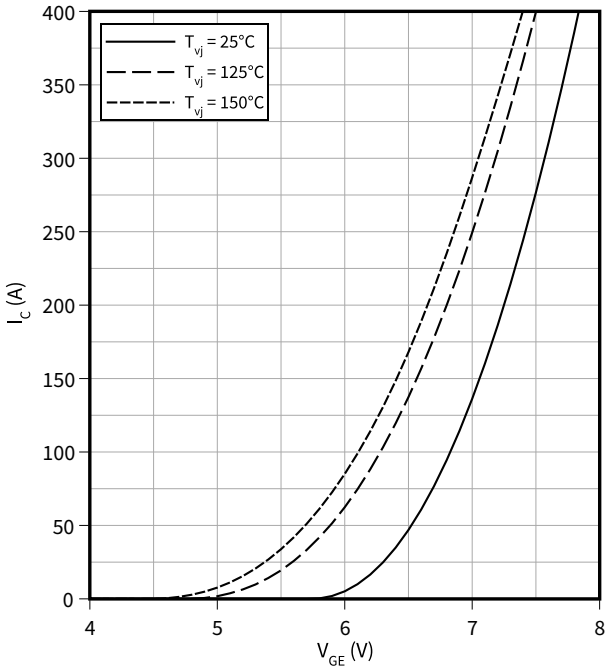
T_{vj} = 150 °C



Transfer characteristic (typical), IGBT, T5 / T6

$I_C = f(V_{GE})$

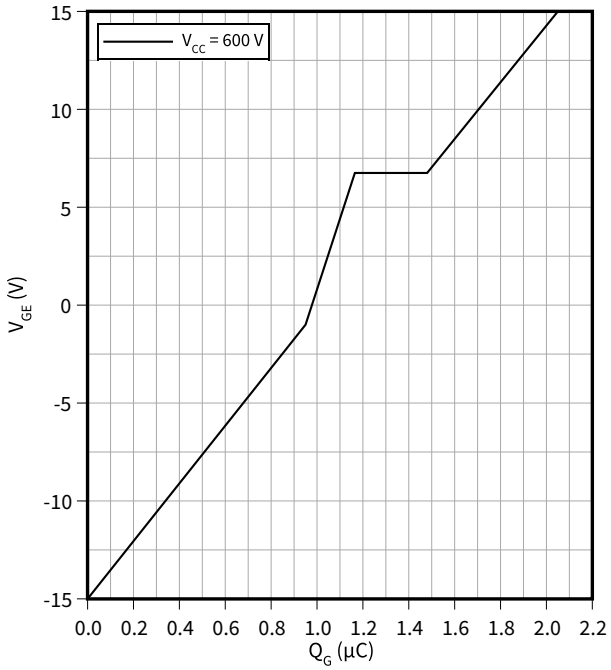
$V_{CE} = 20$ V



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

$V_{GE} = f(Q_G)$

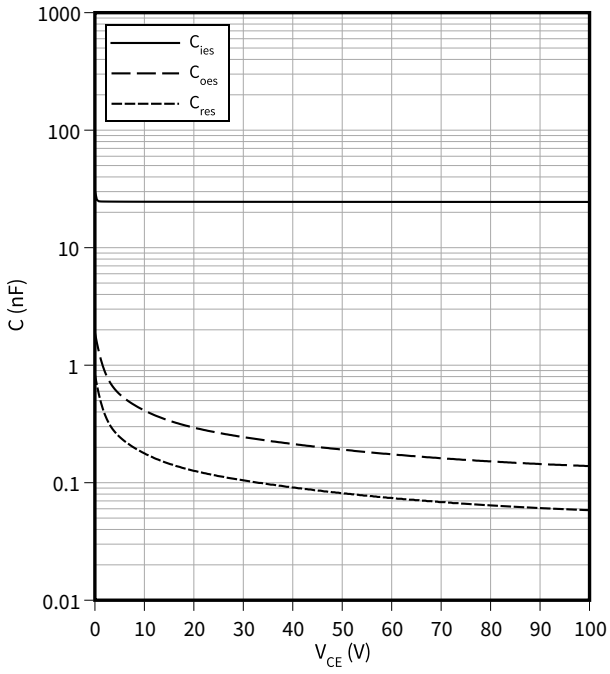
$I_C = 200$ A, $T_{vj} = 25$ °C



Capacity characteristic (typical), IGBT, T5 / T6

$C = f(V_{CE})$

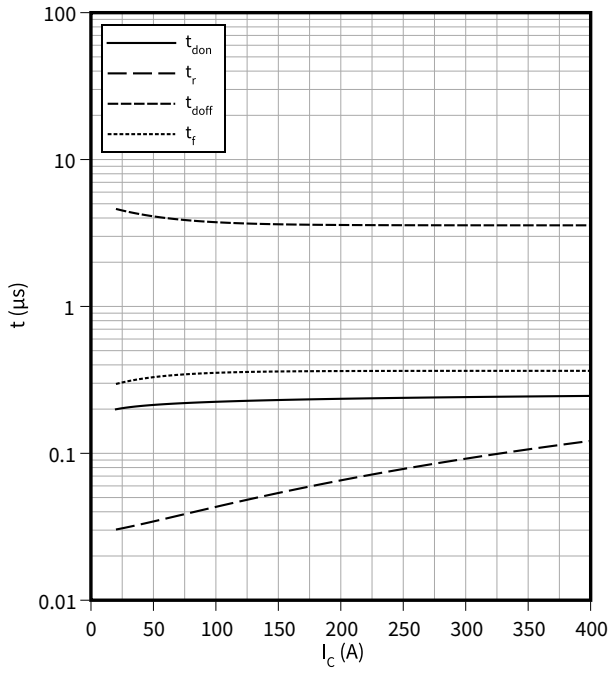
$f = 100$ kHz, $V_{GE} = 0$ V, $T_{vj} = 25$ °C



Switching times (typical), IGBT, T5 / T6

$t = f(I_C)$

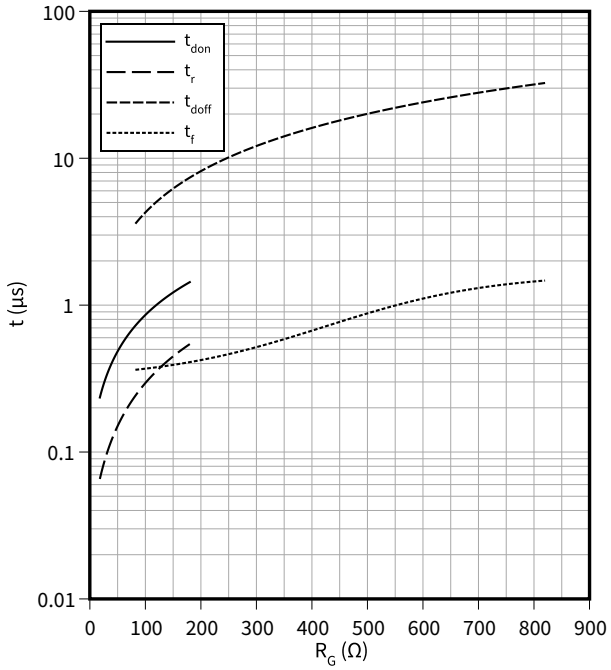
$R_{Goff} = 82\ \Omega$, $R_{Gon} = 18\ \Omega$, $V_{GE} = \pm 15$ V, $V_{CC} = 600$ V, $T_{vj} = 150$ °C



Switching times (typical), IGBT, T5 / T6

$t = f(R_G)$

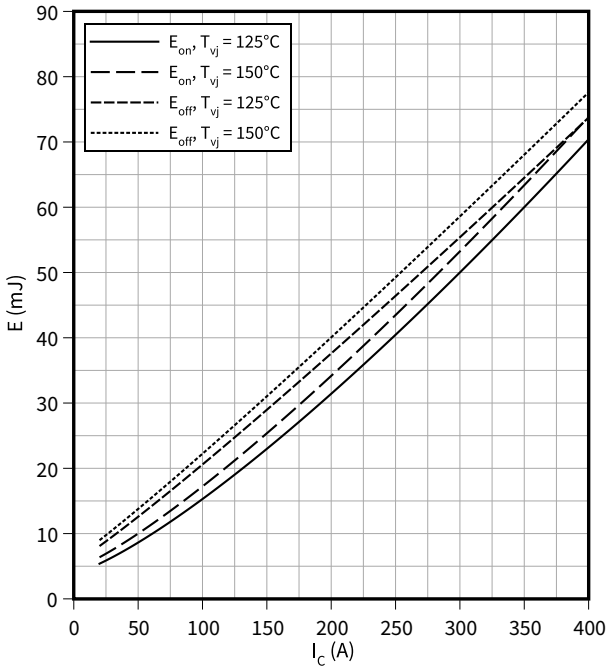
V_{GE} = ±15 V, I_C = 200 A, V_{CC} = 600 V, T_{vj} = 150 °C



Switching losses (typical), IGBT, T5 / T6

$E = f(I_C)$

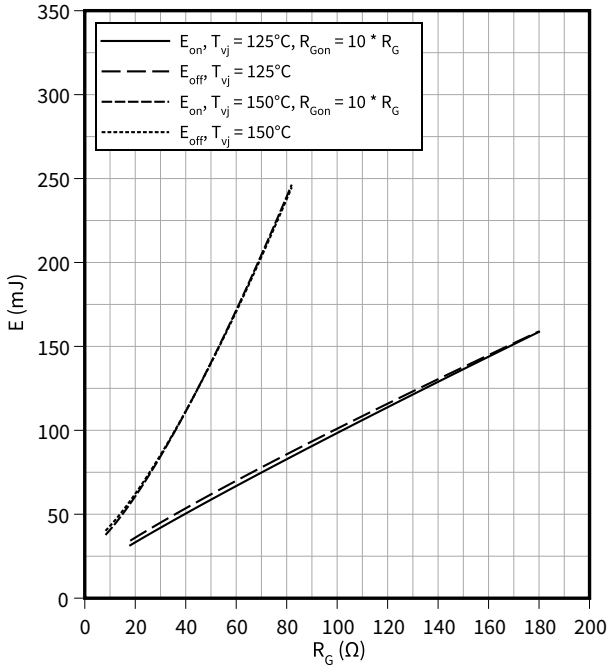
R_{Goff} = 82 Ω, R_{Gon} = 18 Ω, V_{GE} = ±15 V, V_{CC} = 600 V



Switching losses (typical), IGBT, T5 / T6

$E = f(R_G)$

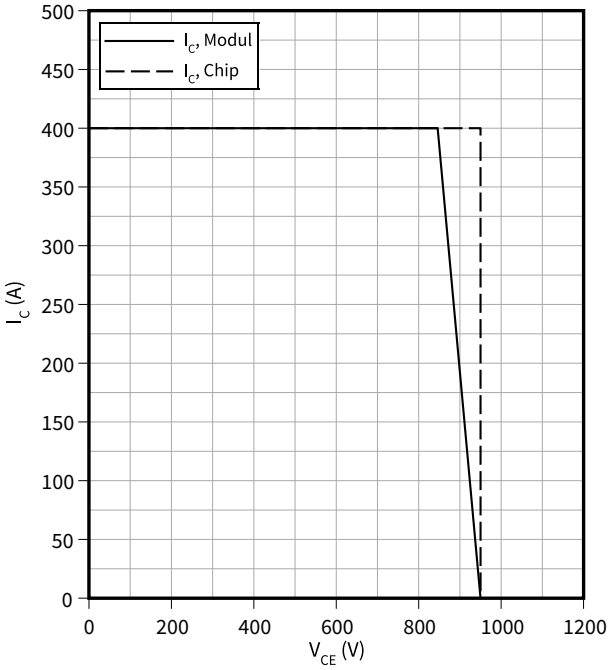
V_{GE} = ±15 V, I_C = 200 A, V_{CC} = 600 V



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

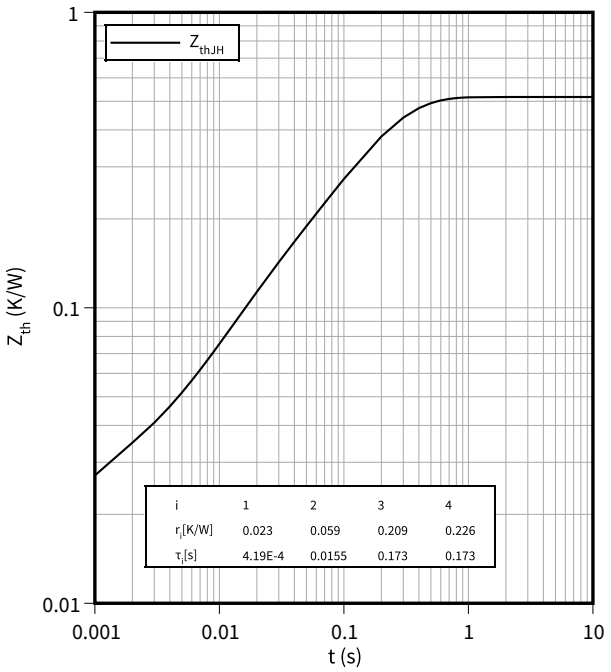
$I_C = f(V_{CE})$

R_{Goff} = 82 Ω, V_{GE} = ±15 V, T_{vj} = 150 °C



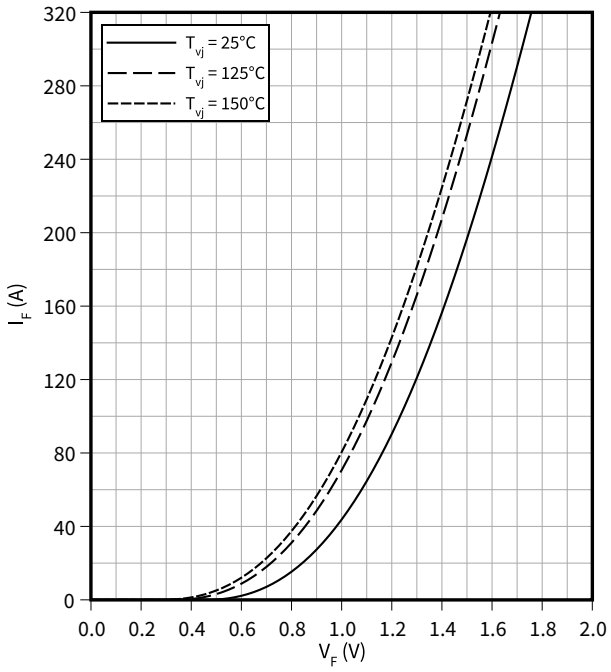
Transient thermal impedance, IGBT, T5 / T6

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D1 / D4

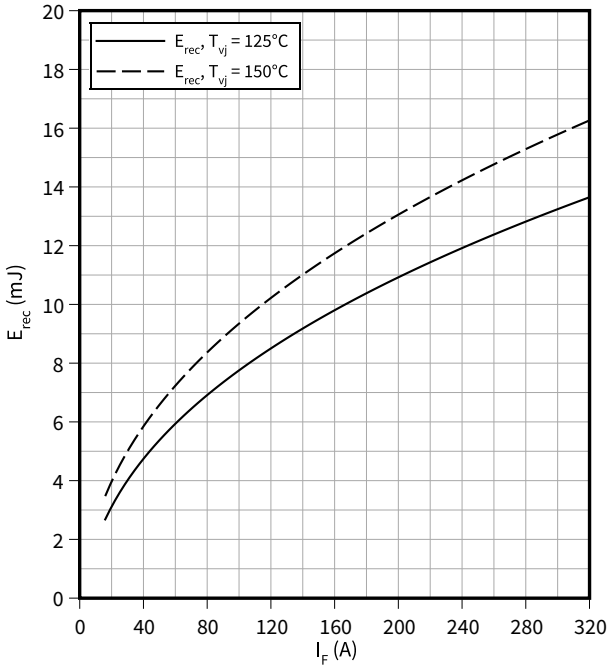
$I_F = f(V_F)$



Switching losses (typical), Diode, D1 / D4

$E_{rec} = f(I_F)$

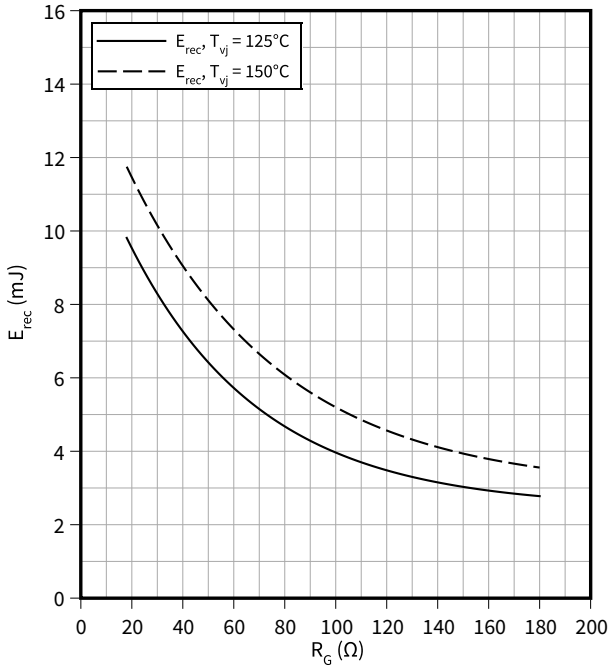
$R_G = 18\ \Omega$, $V_{CC} = 600\ V$



Switching losses (typical), Diode, D1 / D4

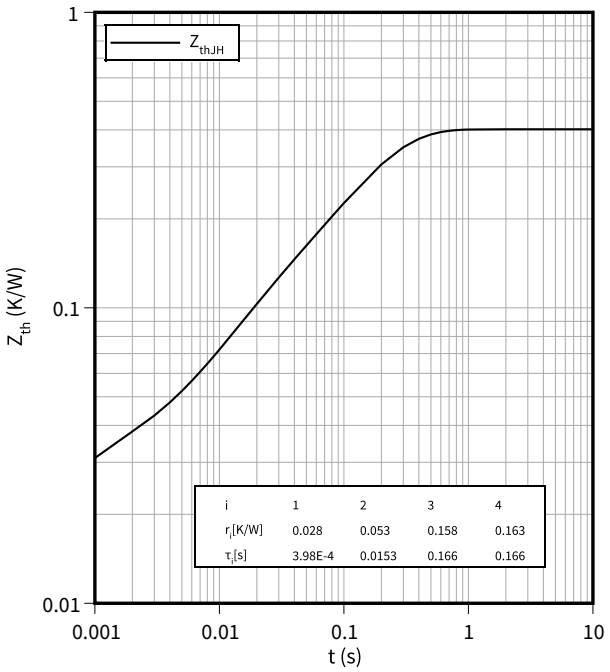
$E_{rec} = f(R_G)$

$I_F = 160\ A$, $V_{CC} = 600\ V$



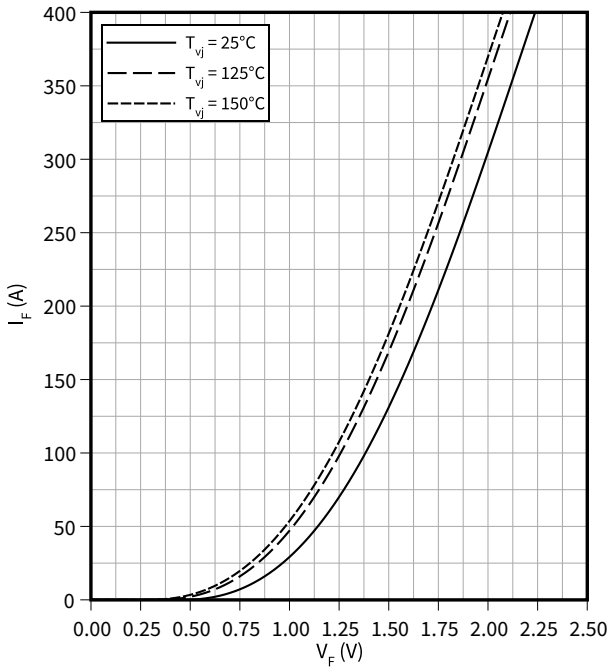
Transient thermal impedance, Diode, D1 / D4

$Z_{th} = f(t)$



Forward characteristic (typical), Diode, D5 / D6

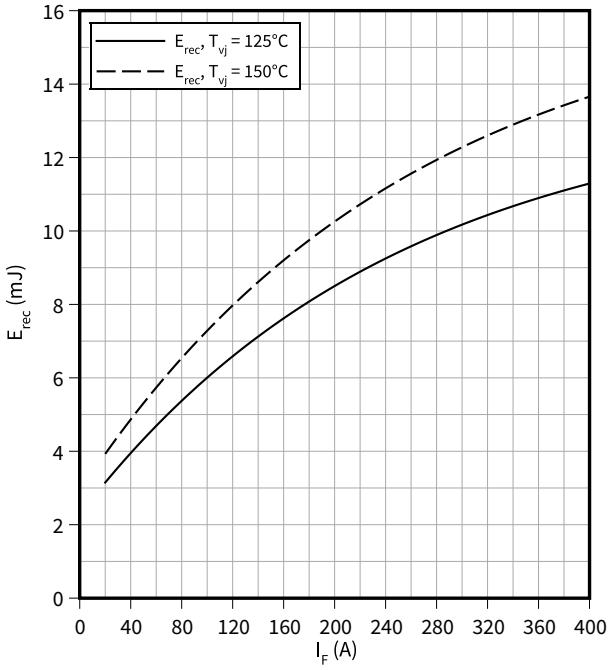
$I_F = f(V_F)$



Switching losses (typical), Diode, D5 / D6

$E_{rec} = f(I_F)$

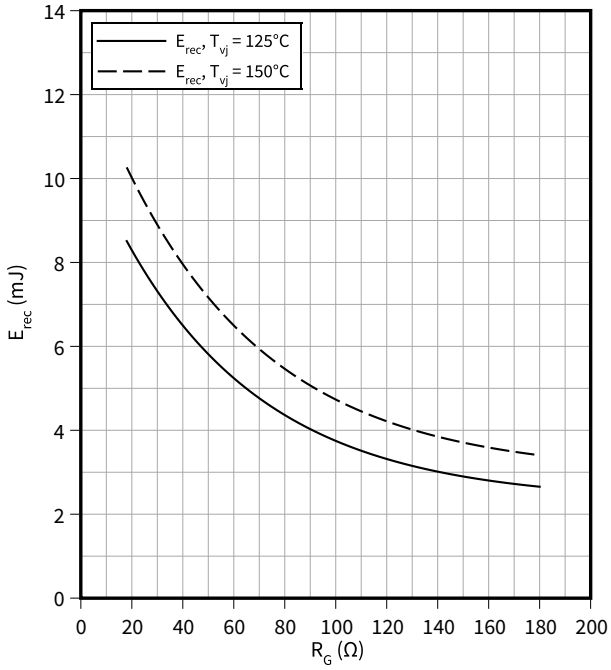
$R_{Gon} = 18\ \Omega$, $V_{CC} = 600$ V



Switching losses (typical), Diode, D5 / D6

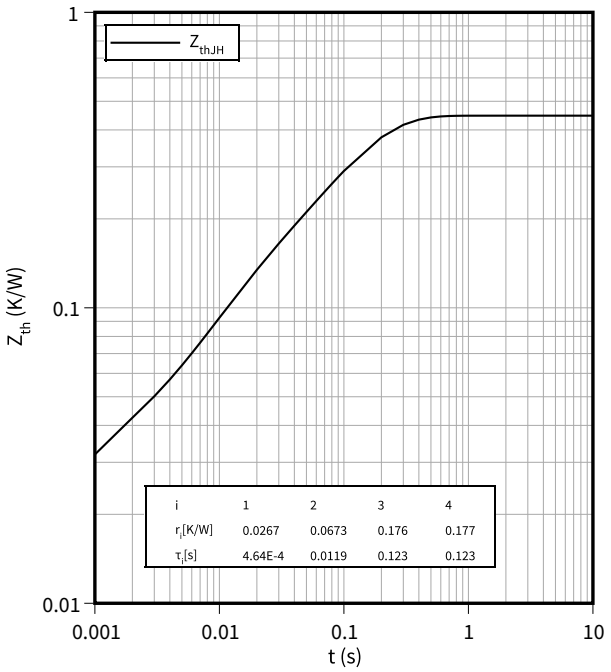
$E_{rec} = f(R_G)$

$I_F = 200$ A, $V_{CC} = 600$ V



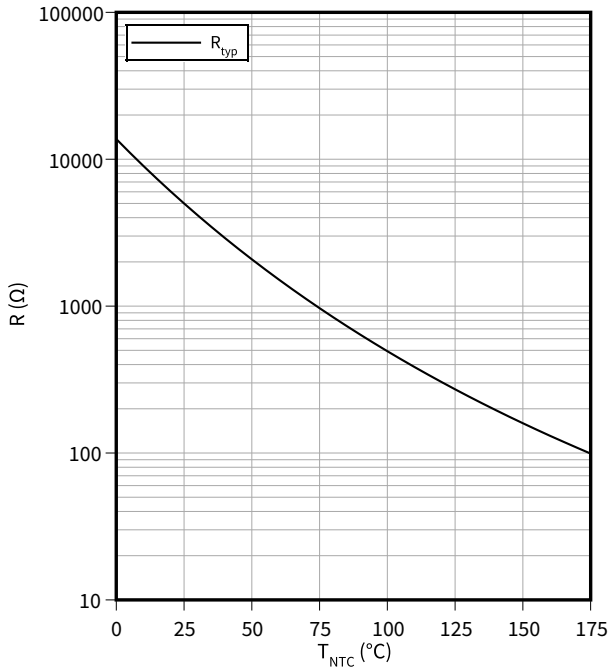
Transient thermal impedance, Diode, D5 / D6

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



10 Circuit diagram

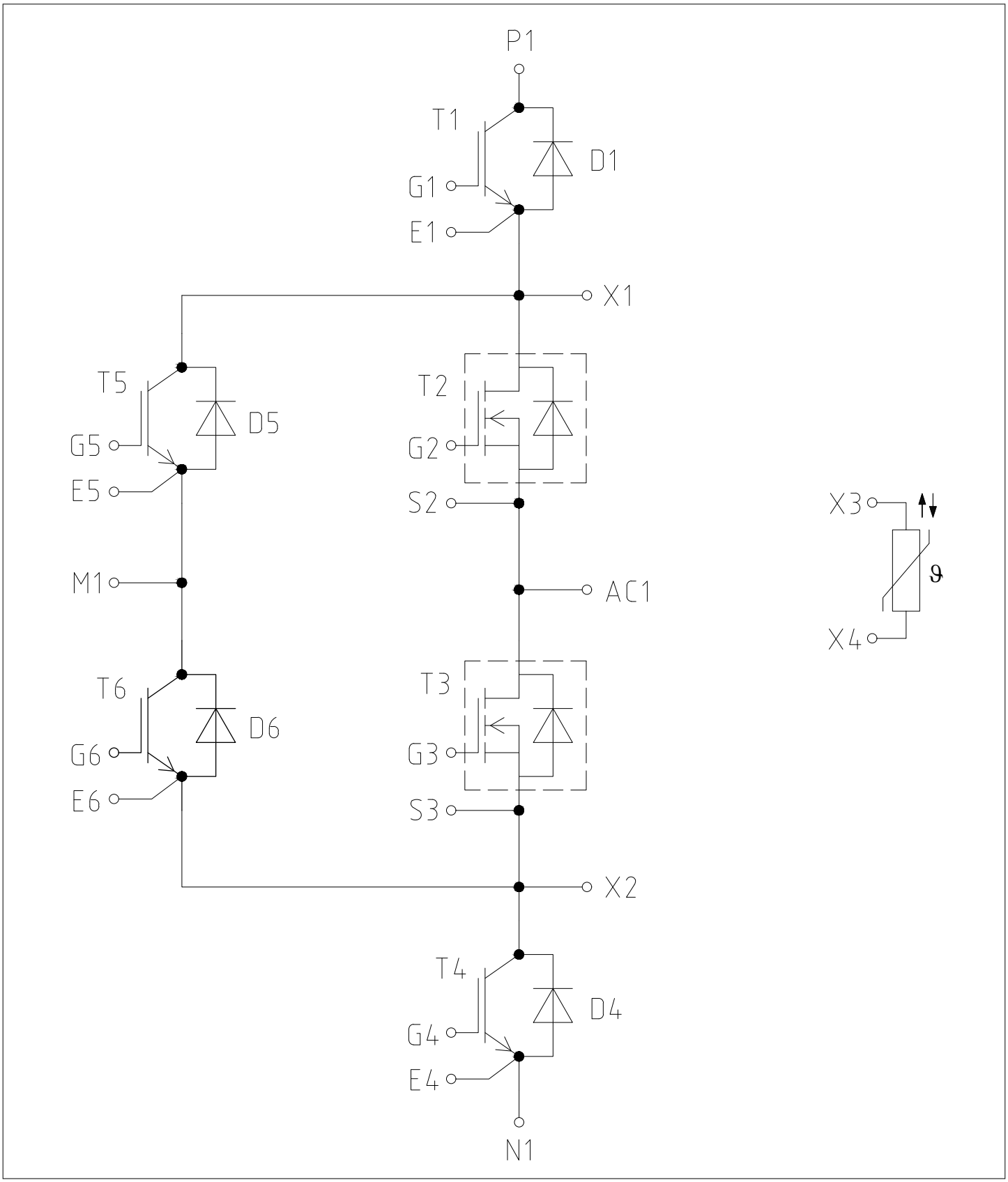


Figure 1

11 Package outlines

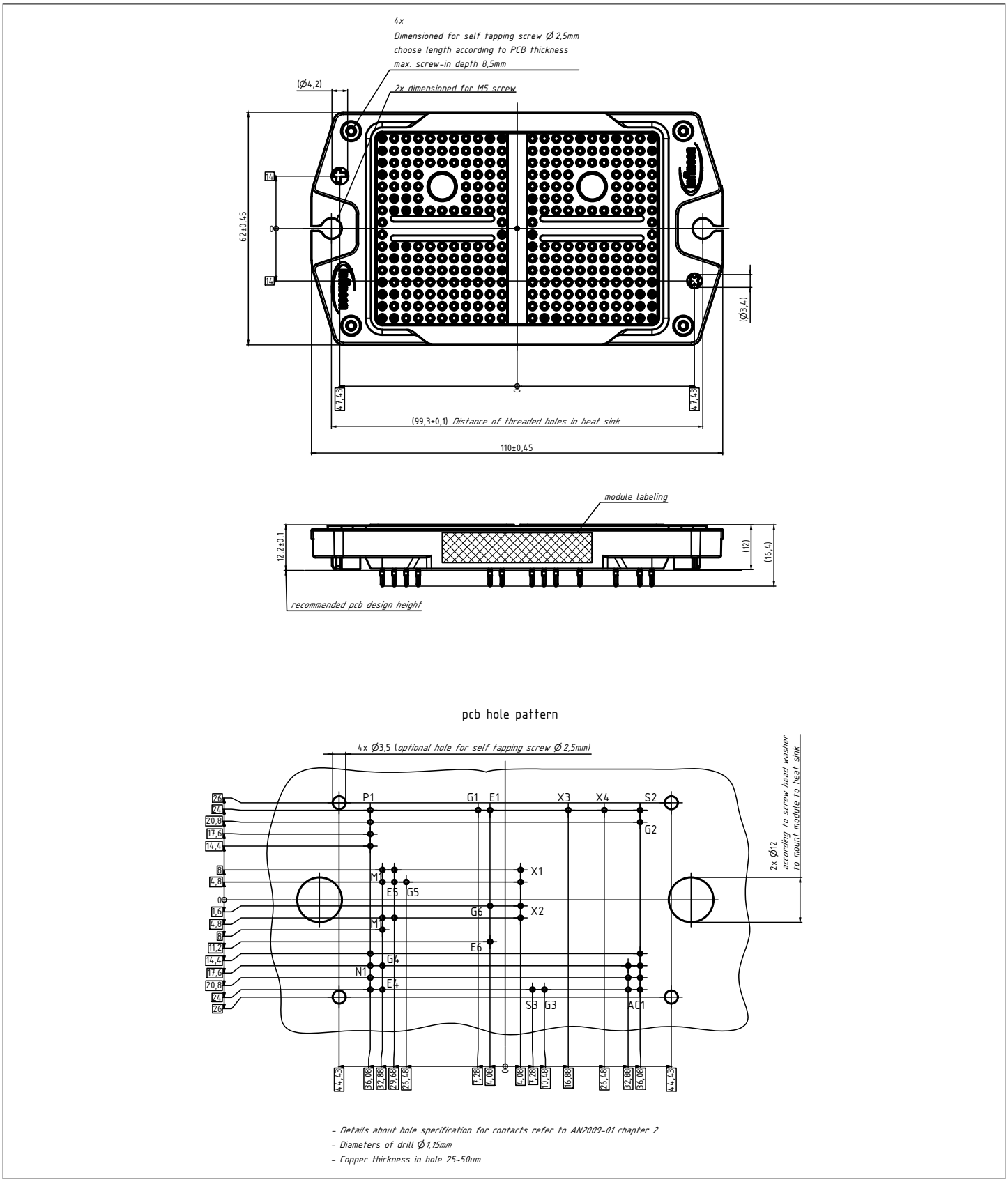


Figure 2

12 Module label code

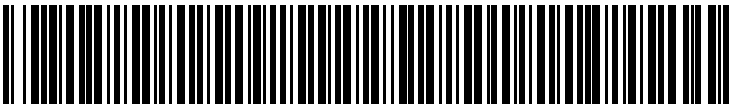
Module label code			
Code format	Data Matrix		Barcode Code128
Encoding	ASCII text		Code Set A
Symbol size	16x16		23 digits
Standard	IEC24720 and IEC16022		IEC8859-1
Code content	*Content* Module serial number Module material number Production order number Date code (production year) Date code (production 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 version	Date of release	Description of changes
0.10	2023-12-20	Initial version
1.00	2024-11-12	Final datasheet
1.10	2024-11-18	Final datasheet
1.20	2025-04-01	Final datasheet

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