

EasyPACK™ module with CoolSiC™ Trench MOSFET and PressFIT / NTC / TIM**Features**

- Electrical features
 - $V_{DS} = 1200\text{ V}$
 - $I_{DN} = 100\text{ A}$ / $I_{DRM} = 200\text{ A}$
 - High current density
 - Low switching losses
- Mechanical features
 - Rugged mounting due to integrated mounting clamps
 - Integrated NTC temperature sensor
 - PressFIT contact technology
 - Pre-applied thermal interface material



Typical appearance

Potential applications

- Solar applications
- Three-level applications
- DC charger for EV

Product validation

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

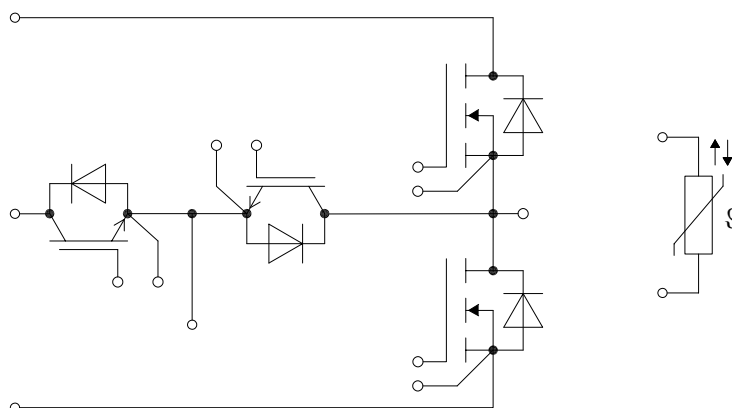
Description

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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 60 \text{ s}$	3.0	kV
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{Creep}	terminal to heatsink	11.5	mm
Creepage distance	d_{Creep}	terminal to terminal	6.3	mm
Clearance	d_{Clear}	terminal to heatsink	10.0	mm
Clearance	d_{Clear}	terminal to terminal	5.0	mm
Comparative tracking index	CTI		>200	
Relative thermal index (electrical)	RTI	housing	140	°C

Table 2 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray inductance module	L_{sCE}			12		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25^\circ\text{C}$, per switch		0.4		mΩ
Storage temperature	T_{stg}		-40		125	°C
Maximum baseplate operation temperature	T_{BPmax}				125	°C
Mounting force per clamp	F		40		80	N
Weight	G			39		g

Note: The current under continuous operation is limited to 25 A rms per connector pin.
Storage and shipment of modules with TIM => see AN2012-07.

2 MOSFET

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage	V_{DSS}		$T_{vj} = 25^\circ\text{C}$	1200	V
Implemented drain current	I_{DN}			100	A
Continuous DC drain current	I_{DDC}	$T_{vj} = 175^\circ\text{C}$, $V_{GS} = 18 \text{ V}$	$T_H = 65^\circ\text{C}$	85	A
Repetitive peak drain current	I_{DRM}	verified by design, t_p limited by T_{vjmax}		200	A

(table continues...)

Table 3 (continued) Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
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 4 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 5 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Drain-source on-resistance	$R_{DS(on)}$	$I_D = 100\text{ A}$	$V_{GS} = 18\text{ V}, T_{vj} = 25\text{ °C}$		8.1	12	mΩ
			$V_{GS} = 18\text{ V}, T_{vj} = 125\text{ °C}$		13.1		
			$V_{GS} = 18\text{ V}, T_{vj} = 175\text{ °C}$		17.4		
			$V_{GS} = 15\text{ V}, T_{vj} = 25\text{ °C}$		9.7		
Gate threshold voltage	$V_{GS(th)}$	$I_D = 40\text{ mA}, V_{DS} = V_{GS}, T_{vj} = 25\text{ °C},$ (tested after 1ms pulse at $V_{GS} = +20\text{ V}$)		3.45	4.3	5.15	V
Total gate charge	Q_G	$V_{DS} = 800\text{ V}, V_{GS} = -3/18\text{ V}$			0.297		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\text{ °C}$			2.1		Ω
Input capacitance	C_{ISS}	$f = 100\text{ kHz}, V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		8.8		nF
Output capacitance	C_{OSS}	$f = 100\text{ kHz}, V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		0.42		nF
Reverse transfer capacitance	C_{rss}	$f = 100\text{ kHz}, V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		0.028		nF
C_{OSS} stored energy	E_{OSS}	$V_{DS} = 800\text{ V}, V_{GS} = -3/18\text{ V}, T_{vj} = 25\text{ °C}$			172		μJ
Drain-source leakage current	I_{DSS}	$V_{DS} = 1200\text{ V}, V_{GS} = -3\text{ V}$	$T_{vj} = 25\text{ °C}$		0.06	380	μA
Gate-source leakage current	I_{GSS}	$V_{DS} = 0\text{ V}, T_{vj} = 25\text{ °C}$	$V_{GS} = 20\text{ V}$			400	nA

(table continues...)

Table 5 (continued) **Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-on delay time (inductive load)	$t_{d\ on}$	$I_D = 100\ A, R_{Gon} = 15\ \Omega,$ $V_{DS} = 400\ V, V_{GS} = -3/18\ V$	$T_{vj} = 25\ ^\circ C$	83		ns
			$T_{vj} = 125\ ^\circ C$	73		
			$T_{vj} = 175\ ^\circ C$	70		
Rise time (inductive load)	t_r	$I_D = 100\ A, R_{Gon} = 15\ \Omega,$ $V_{DS} = 400\ V, V_{GS} = -3/18\ V$	$T_{vj} = 25\ ^\circ C$	106		ns
			$T_{vj} = 125\ ^\circ C$	111		
			$T_{vj} = 175\ ^\circ C$	116		
Turn-off delay time (inductive load)	$t_{d\ off}$	$I_D = 100\ A, R_{Goff} = 3.3\ \Omega,$ $V_{DS} = 400\ V, V_{GS} = -3/18\ V$	$T_{vj} = 25\ ^\circ C$	74		ns
			$T_{vj} = 125\ ^\circ C$	80		
			$T_{vj} = 175\ ^\circ C$	84		
Fall time (inductive load)	t_f	$I_D = 100\ A, R_{Goff} = 3.3\ \Omega,$ $V_{DS} = 400\ V, V_{GS} = -3/18\ V$	$T_{vj} = 25\ ^\circ C$	17		ns
			$T_{vj} = 125\ ^\circ C$	16		
			$T_{vj} = 175\ ^\circ C$	16		
Turn-on energy loss per pulse	E_{on}	$I_D = 100\ A, V_{DS} = 400\ V,$ $L_\sigma = 27\ nH, V_{GS} = -3/18\ V,$ $R_{Gon} = 15\ \Omega, di/dt = 2$ $kA/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$	3.28		mJ
			$T_{vj} = 125\ ^\circ C$	3.97		
			$T_{vj} = 175\ ^\circ C$	4.33		
Turn-off energy loss per pulse	E_{off}	$I_D = 100\ A, V_{DS} = 400\ V,$ $L_\sigma = 27\ nH, V_{GS} = -3/18\ V,$ $R_{Goff} = 3.3\ \Omega, dv/dt = 20.1$ $kV/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$	0.32		mJ
			$T_{vj} = 125\ ^\circ C$	0.38		
			$T_{vj} = 175\ ^\circ C$	0.42		
Thermal resistance, junction to heat sink	R_{thJH}	per MOSFET, Valid with IFX pre-applied Thermal Interface Material			0.581	K/W
Temperature under switching conditions	$T_{vj\ op}$		-40		175	$^\circ C$

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

$T_{vj\ op} > 150^\circ C$ is allowed for operation at overload conditions for MOSFET and body diode. For detailed specifications, please refer to AN 2021-13.

3 Body diode

Table 6 **Maximum rated values**

Parameter	Symbol	Note or test condition	Values	Unit
DC body diode forward current	I_{SD}	$T_{vj} = 175\ ^\circ C, V_{GS} = -3\ V$ $T_H = 65\ ^\circ C$	32	A

Table 7 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_{SD}	$I_{SD} = 100 \text{ A}$, $V_{GS} = -3 \text{ V}$	$T_{vj} = 25 \text{ °C}$	4.2	5.35	V
			$T_{vj} = 125 \text{ °C}$	3.9		
			$T_{vj} = 175 \text{ °C}$	3.8		

4 IGBT, 3-Level

Table 8 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	V_{CES}	$T_{vj} = 25 \text{ °C}$	650	V
Implemented collector current	I_{CN}		200	A
Continuous DC collector current	I_{CDC}	$T_{vj \text{ max}} = 175 \text{ °C}$ $T_H = 65 \text{ °C}$	90	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj \text{ op}}$	200	A
Gate-emitter peak voltage	V_{GES}		±20	V

Table 9 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE \text{ sat}}$	$I_C = 100 \text{ A}$, $V_{GE} = 15 \text{ V}$	$T_{vj} = 25 \text{ °C}$	0.74	1.17	V
			$T_{vj} = 125 \text{ °C}$		1.20	
			$T_{vj} = 150 \text{ °C}$		1.21	
Gate threshold voltage	V_{GEth}	$I_C = 2 \text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25 \text{ °C}$	3.25	4	4.75	V
Gate charge	Q_G	$V_{GE} = \pm 15 \text{ V}$, $V_{CE} = 400 \text{ V}$		0.84		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25 \text{ °C}$		0		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}$, $T_{vj} = 25 \text{ °C}$, $V_{CE} = 25 \text{ V}$, $V_{GE} = 0 \text{ V}$		14.3		nF
Reverse transfer capacitance	C_{res}	$f = 100 \text{ kHz}$, $T_{vj} = 25 \text{ °C}$, $V_{CE} = 25 \text{ V}$, $V_{GE} = 0 \text{ V}$		0.05		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 650 \text{ V}$, $V_{GE} = 0 \text{ V}$ $T_{vj} = 25 \text{ °C}$			1	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0 \text{ V}$, $V_{GE} = 20 \text{ V}$, $T_{vj} = 25 \text{ °C}$			100	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 100 \text{ A}$, $V_{CE} = 400 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 2.7 \text{ Ω}$	$T_{vj} = 25 \text{ °C}$	0.014		μs
			$T_{vj} = 125 \text{ °C}$	0.015		
			$T_{vj} = 150 \text{ °C}$	0.015		

(table continues...)

Table 9 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rise time (inductive load)	t_r	$I_C = 100 \text{ A}$, $V_{CE} = 400 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 2.7 \Omega$	$T_{vj} = 25 \text{ °C}$	0.009		μs
			$T_{vj} = 125 \text{ °C}$	0.010		
			$T_{vj} = 150 \text{ °C}$	0.011		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 100 \text{ A}$, $V_{CE} = 400 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 39 \Omega$	$T_{vj} = 25 \text{ °C}$	0.650		μs
			$T_{vj} = 125 \text{ °C}$	0.680		
			$T_{vj} = 150 \text{ °C}$	0.700		
Fall time (inductive load)	t_f	$I_C = 100 \text{ A}$, $V_{CE} = 400 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 39 \Omega$	$T_{vj} = 25 \text{ °C}$	0.023		μs
			$T_{vj} = 125 \text{ °C}$	0.045		
			$T_{vj} = 150 \text{ °C}$	0.055		
Turn-on energy loss per pulse	E_{on}	$I_C = 100 \text{ A}$, $V_{CE} = 400 \text{ V}$, $L_\sigma = 27 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 2.7 \Omega$, $di/dt = 7600 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	0.264		mJ
			$T_{vj} = 125 \text{ °C}$	0.394		
			$T_{vj} = 150 \text{ °C}$	0.438		
Turn-off energy loss per pulse	E_{off}	$I_C = 100 \text{ A}$, $V_{CE} = 400 \text{ V}$, $L_\sigma = 27 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 39 \Omega$, $dv/dt = 4800 \text{ V}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	1.7		mJ
			$T_{vj} = 125 \text{ °C}$	2.05		
			$T_{vj} = 150 \text{ °C}$	2.31		
Thermal resistance, junction to heat sink	R_{thJH}	per IGBT, Valid with IFX pre-applied Thermal Interface Material			0.723	K/W
Temperature under switching conditions	$T_{vj op}$			-40	150	°C

5 Diode, 3-Level

Table 10 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25 \text{ °C}$	650	V
Implemented forward current	I_{FN}			150	A
Continuous DC forward current	I_F			100	A
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$		200	A
I^2t - value	I^2t	$V_R = 0 \text{ V}$, $t_P = 10 \text{ ms}$	$T_{vj} = 125 \text{ °C}$	1270	A^2s
			$T_{vj} = 150 \text{ °C}$	1480	

Table 11 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 100\text{ A}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ }^{\circ}\text{C}$	0.74	1.35	1.86	V
			$T_{vj} = 125\text{ }^{\circ}\text{C}$		1.29		
			$T_{vj} = 150\text{ }^{\circ}\text{C}$		1.25		
Peak reverse recovery current	I_{RM}	$I_F = 100\text{ A}$, $V_R = 400\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 2000\text{ A}/\mu\text{s}$ ($T_{vj} = 150\text{ }^{\circ}\text{C}$)	$T_{vj} = 25\text{ }^{\circ}\text{C}$		64.2		A
			$T_{vj} = 125\text{ }^{\circ}\text{C}$		99.8		
			$T_{vj} = 150\text{ }^{\circ}\text{C}$		114		
Recovered charge	Q_r	$I_F = 100\text{ A}$, $V_R = 400\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 2000\text{ A}/\mu\text{s}$ ($T_{vj} = 150\text{ }^{\circ}\text{C}$)	$T_{vj} = 25\text{ }^{\circ}\text{C}$		3.99		μC
			$T_{vj} = 125\text{ }^{\circ}\text{C}$		7.07		
			$T_{vj} = 150\text{ }^{\circ}\text{C}$		9.8		
Reverse recovery energy	E_{rec}	$I_F = 100\text{ A}$, $V_R = 400\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 2000\text{ A}/\mu\text{s}$ ($T_{vj} = 150\text{ }^{\circ}\text{C}$)	$T_{vj} = 25\text{ }^{\circ}\text{C}$		0.45		mJ
			$T_{vj} = 125\text{ }^{\circ}\text{C}$		1		
			$T_{vj} = 150\text{ }^{\circ}\text{C}$		1.35		
Thermal resistance, junction to heat sink	R_{thJH}	per diode, Valid with IFX pre-applied Thermal Interface Material				0.802	K/W
Temperature under switching conditions	$T_{vj\text{ op}}$			-40		150	$^{\circ}\text{C}$

6 NTC-Thermistor

Table 12 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25 \text{ °C}$		5		kΩ
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100 \text{ °C}$, $R_{100} = 493 \text{ Ω}$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25 \text{ °C}$			20	mW
B-value	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$		3375		K
B-value	$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$		3411		K
B-value	$B_{25/100}$	$R_2 = R_{25} \exp[B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$		3433		K

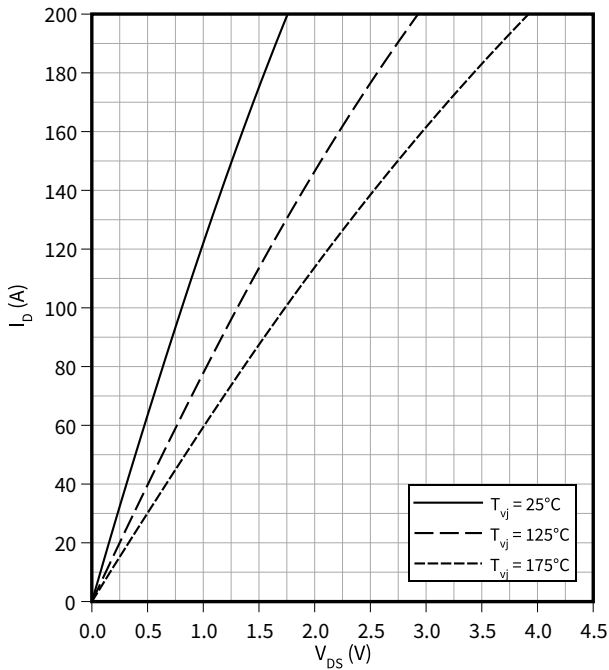
Note: Specification according to the valid application note.

7 Characteristics diagrams

output characteristic (typical), MOSFET

$I_D = f(V_{DS})$

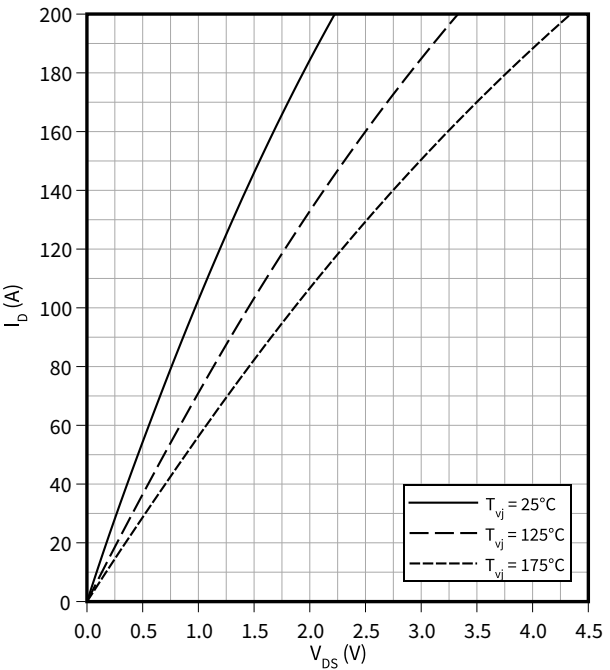
$V_{GS} = 18\text{ V}$



output characteristic (typical), MOSFET

$I_D = f(V_{DS})$

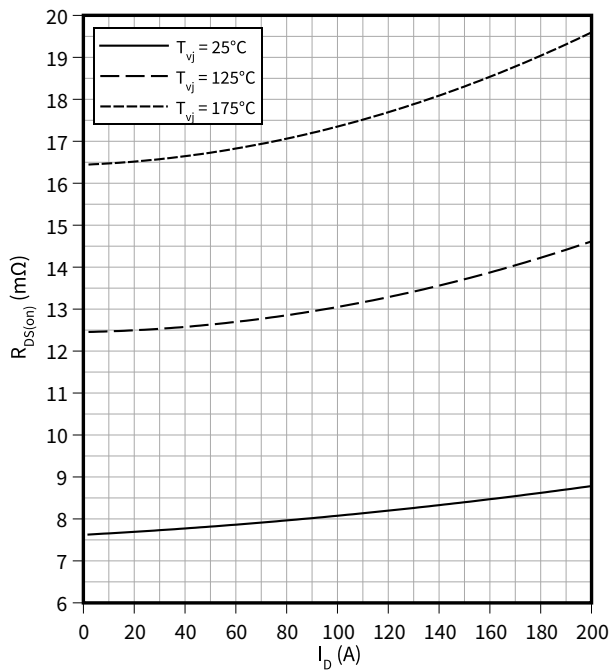
$V_{GS} = 15\text{ V}$



Drain source on-resistance (typical), MOSFET

$R_{DS(on)} = f(I_D)$

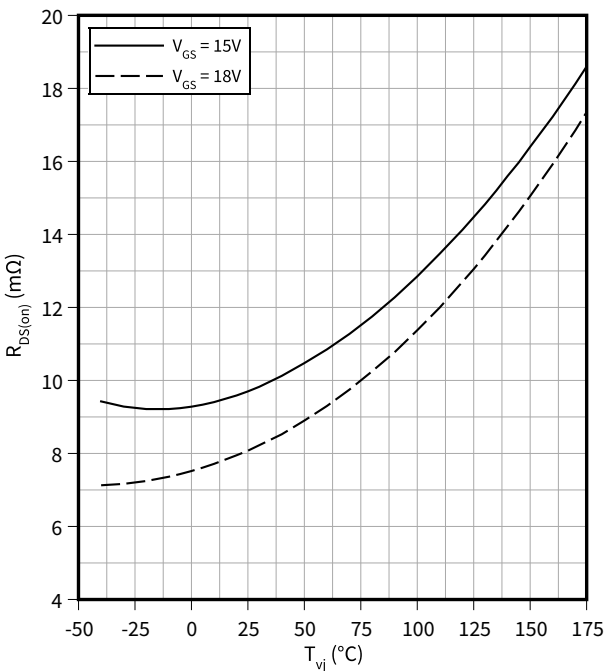
$V_{GS} = 18\text{ V}$



Drain source on-resistance (typical), MOSFET

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

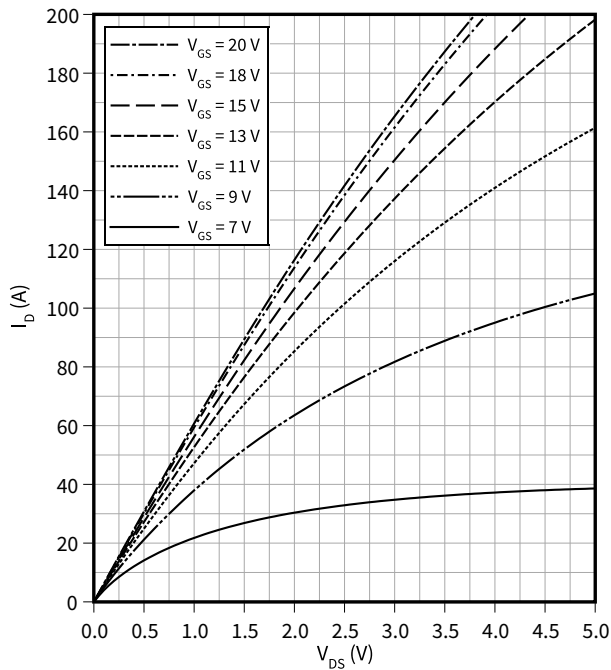
$I_D = 100\text{ A}$



7 Characteristics diagrams

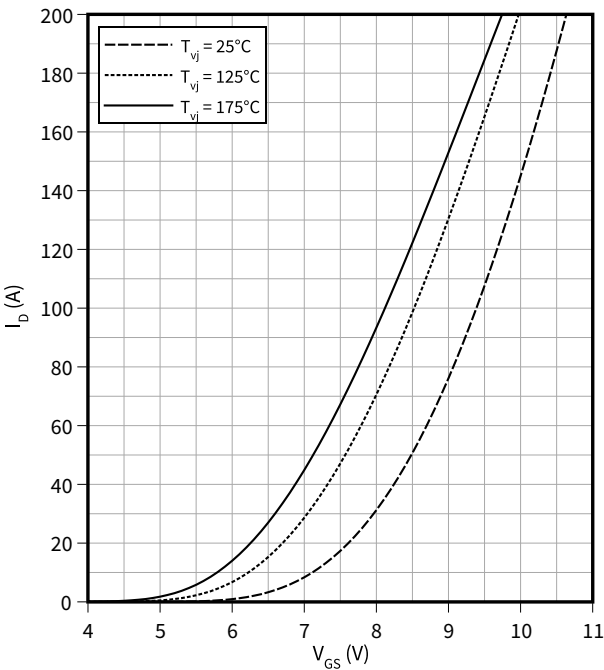
Output characteristic field (typical), MOSFET

$I_D = f(V_{DS})$
 $T_{vj} = 175\text{ °C}$



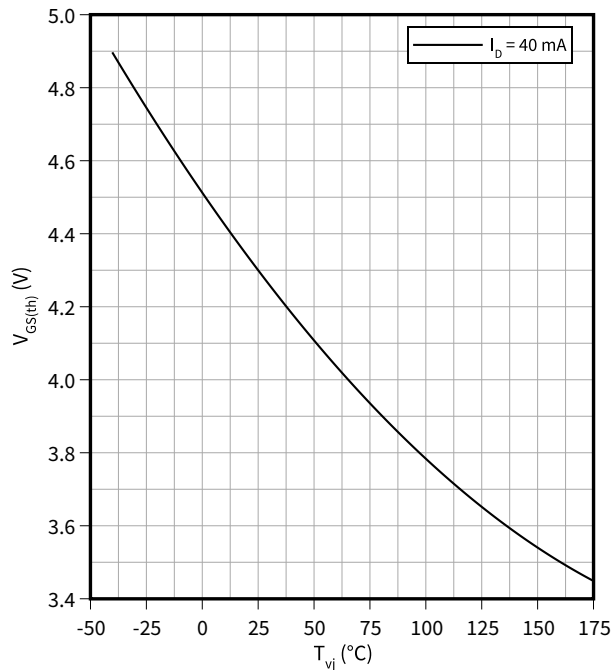
Transfer characteristic (typical), MOSFET

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



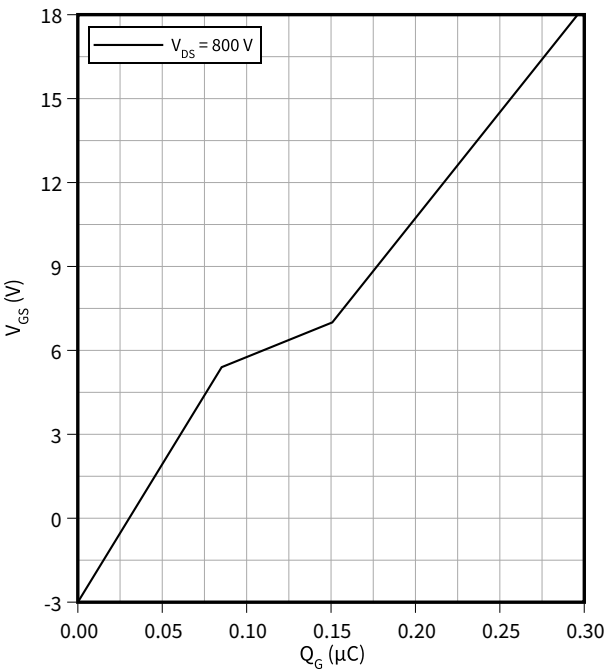
Gate-source threshold voltage (typical), MOSFET

$V_{GS(th)} = f(T_{vj})$
 $V_{GS} = V_{DS}$



Gate charge characteristic (typical), MOSFET

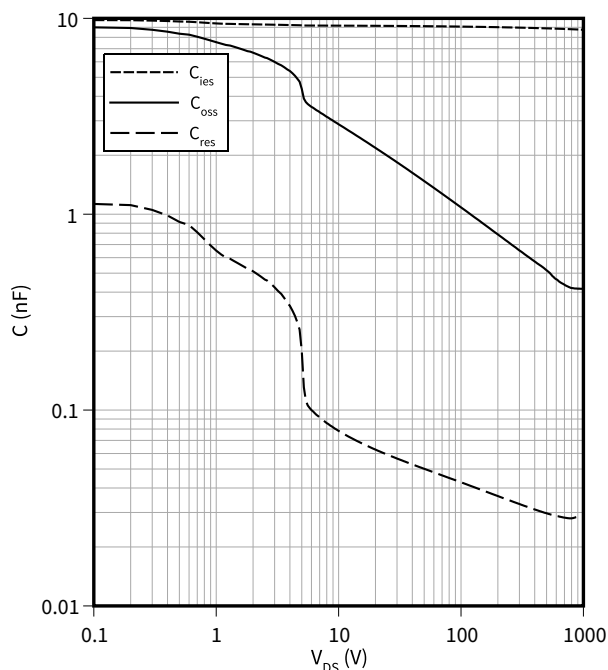
$V_{GS} = f(Q_G)$
 $I_D = 100\text{ A}, T_{vj} = 25\text{ °C}$



Capacity characteristic (typical), MOSFET

$$C = f(V_{DS})$$

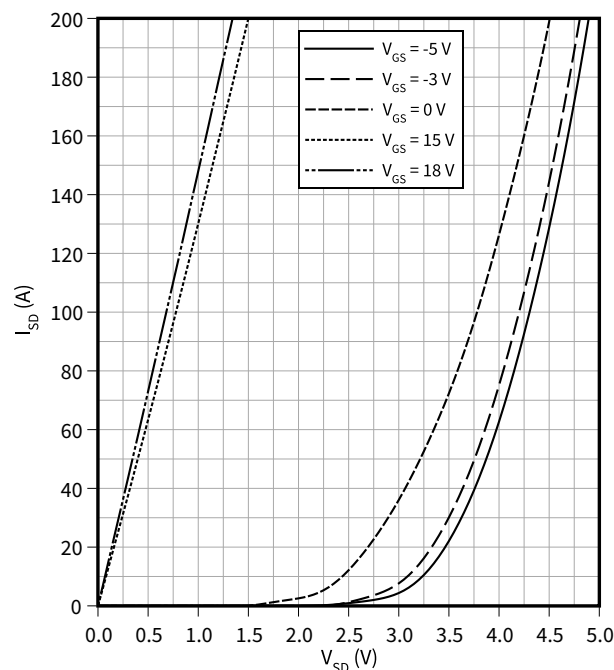
$f = 100 \text{ kHz}$, $T_{vj} = 25^\circ\text{C}$, $V_{GS} = 0 \text{ V}$



Forward characteristic body diode (typical), MOSFET

$$I_{SD} = f(V_{SD})$$

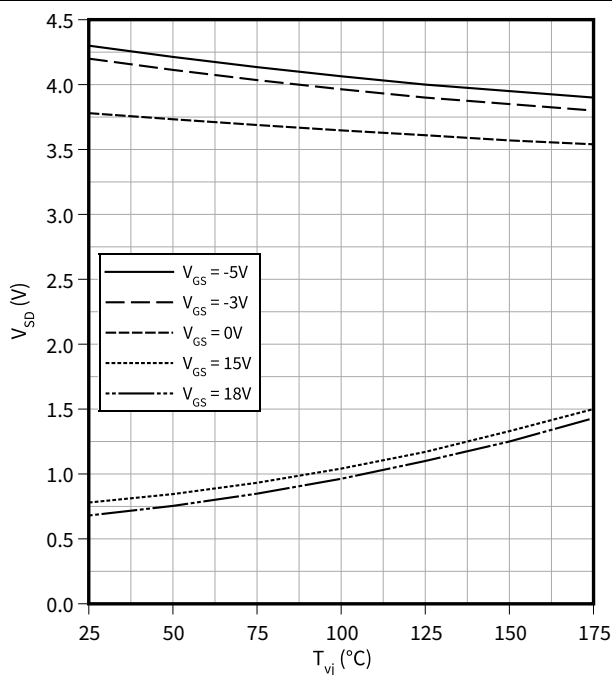
$T_{vj} = 25^\circ\text{C}$



Forward voltage of body diode (typical), MOSFET

$$V_{SD} = f(T_{vj})$$

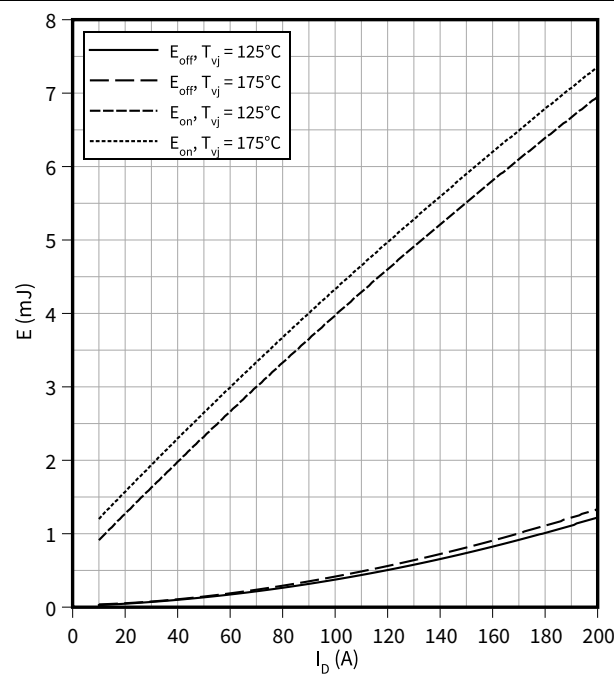
$I_{SD} = 100 \text{ A}$



Switching losses (typical), MOSFET

$$E = f(I_D)$$

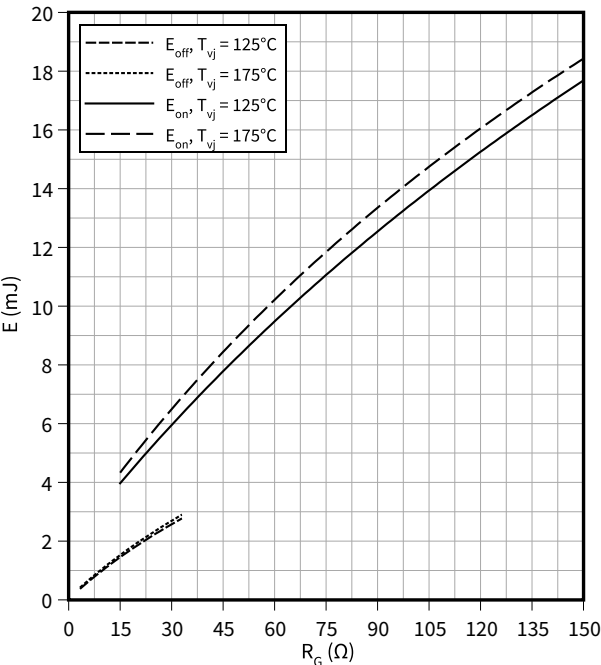
$R_{Goff} = 3.3 \Omega$, $R_{Gon} = 15 \Omega$, $V_{DS} = 400 \text{ V}$, $V_{GS} = -3/18 \text{ V}$



7 Characteristics diagrams

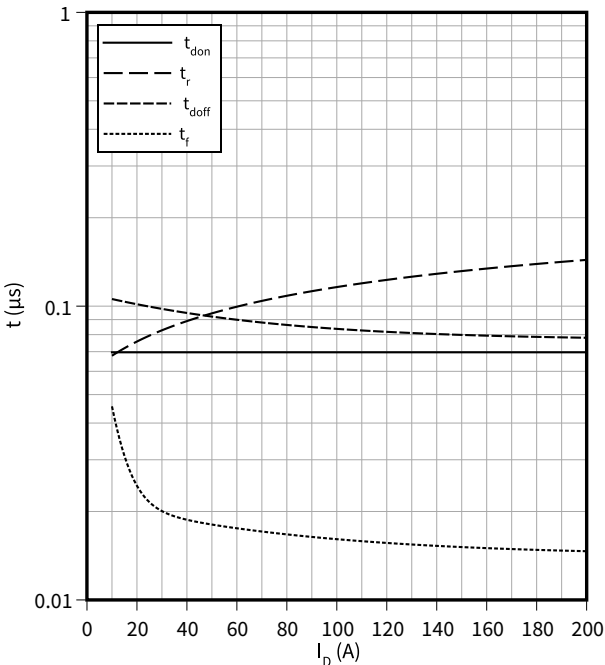
Switching losses (typical), MOSFET

$E = f(R_G)$
 $V_{DS} = 400\text{ V}$, $I_D = 100\text{ A}$, $V_{GS} = -3/18\text{ V}$



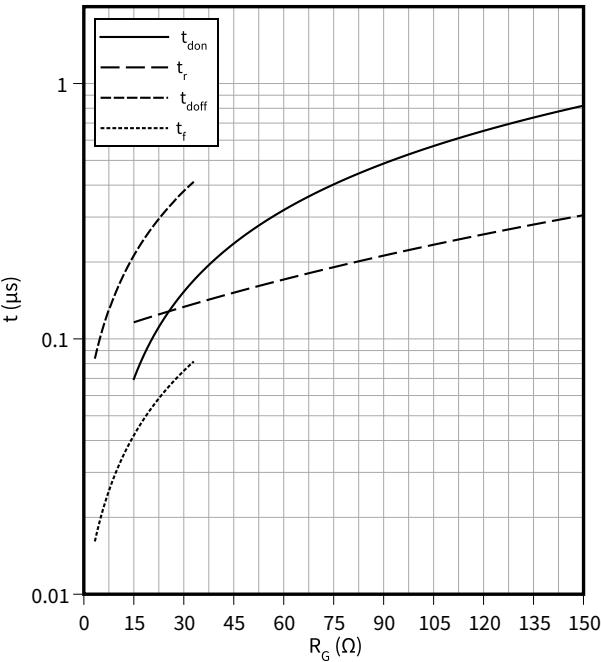
Switching times (typical), MOSFET

$t = f(I_D)$
 $R_{Goff} = 3.3\text{ }\Omega$, $R_{Gon} = 15\text{ }\Omega$, $V_{DS} = 400\text{ V}$, $T_{vj} = 175\text{ }^\circ\text{C}$, $V_{GS} = -3/18\text{ V}$



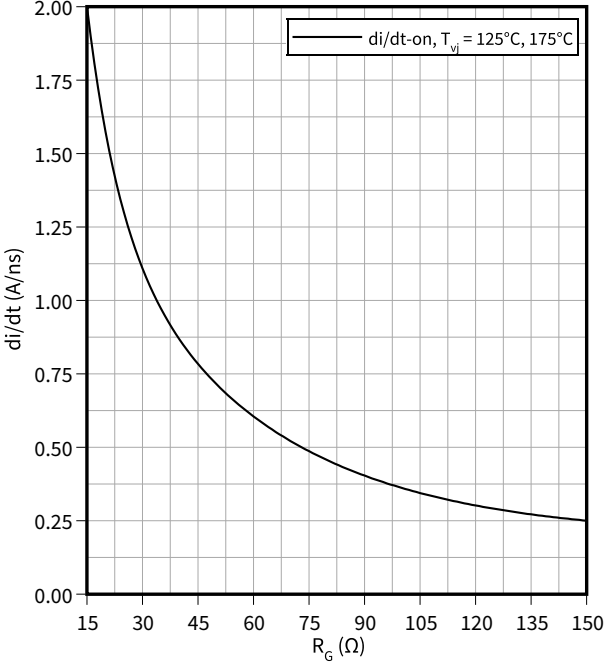
Switching times (typical), MOSFET

$t = f(R_G)$
 $V_{DS} = 400\text{ V}$, $I_D = 100\text{ A}$, $T_{vj} = 175\text{ }^\circ\text{C}$, $V_{GS} = -3/18\text{ V}$



Current slope (typical), MOSFET

$di/dt = f(R_G)$
 $V_{DS} = 400\text{ V}$, $I_D = 100\text{ A}$, $V_{GS} = -3/18\text{ V}$

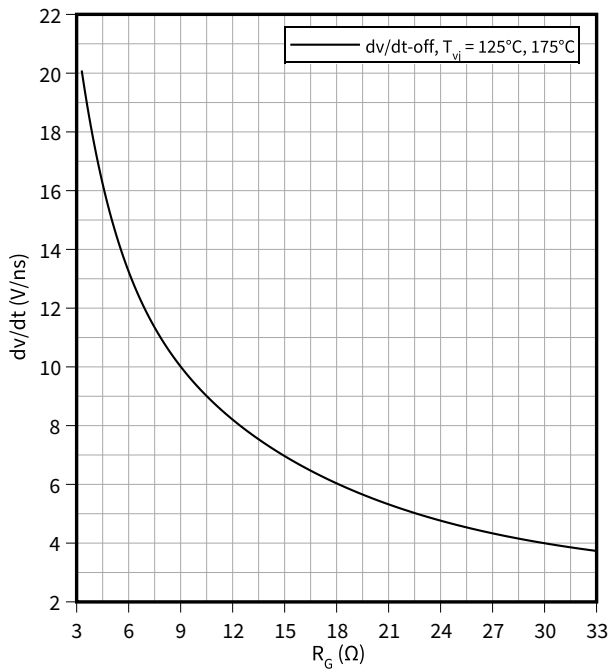


7 Characteristics diagrams

Voltage slope (typical), MOSFET

$dv/dt = f(R_G)$

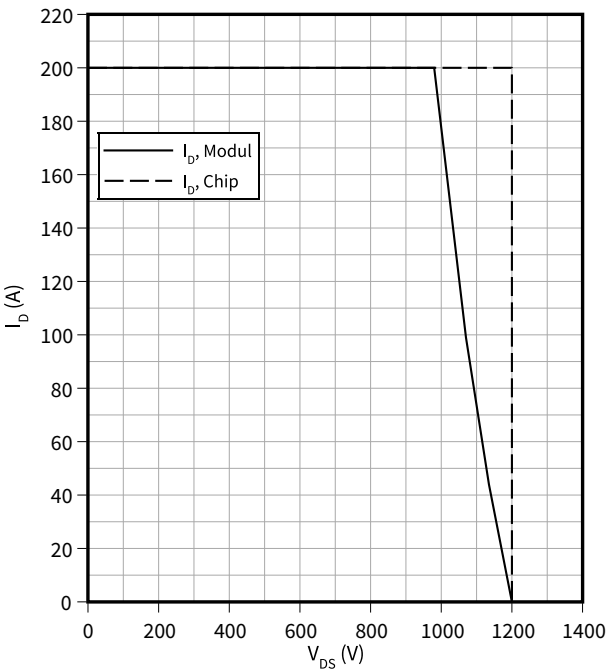
$V_{DS} = 400\text{ V}, I_D = 100\text{ A}, V_{GS} = -3/18\text{ V}$



Reverse bias safe operating area (RBSOA), MOSFET

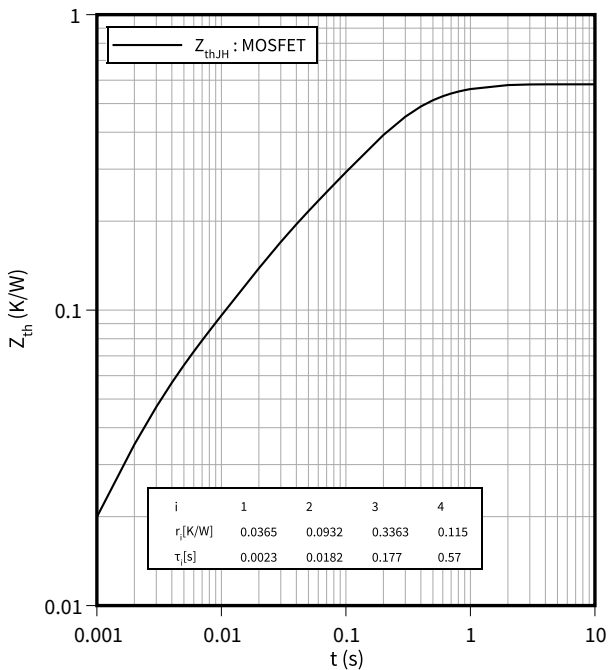
$I_D = f(V_{DS})$

$R_{Goff} = 3.3\ \Omega, T_{vj} = 175^\circ\text{C}, V_{GS} = -3/18\text{ V}$



Transient thermal impedance, MOSFET

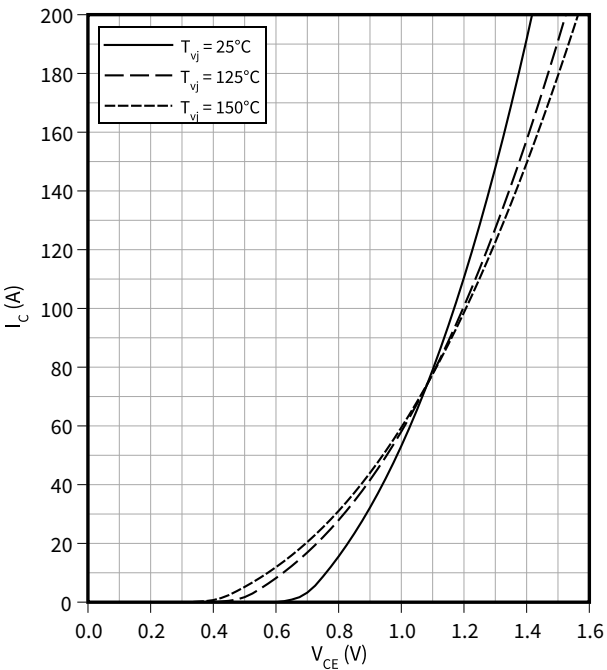
$Z_{th} = f(t)$



Output characteristic (typical), IGBT, 3-Level

$I_C = f(V_{CE})$

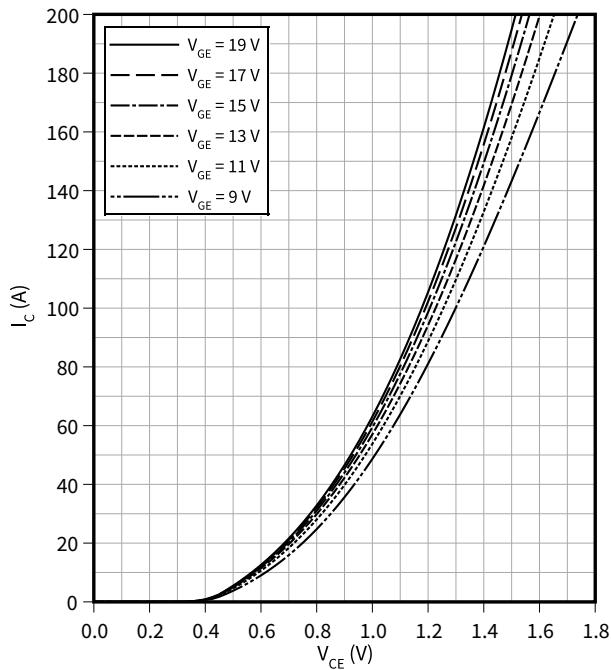
$V_{GE} = 15\text{ V}$



7 Characteristics diagrams

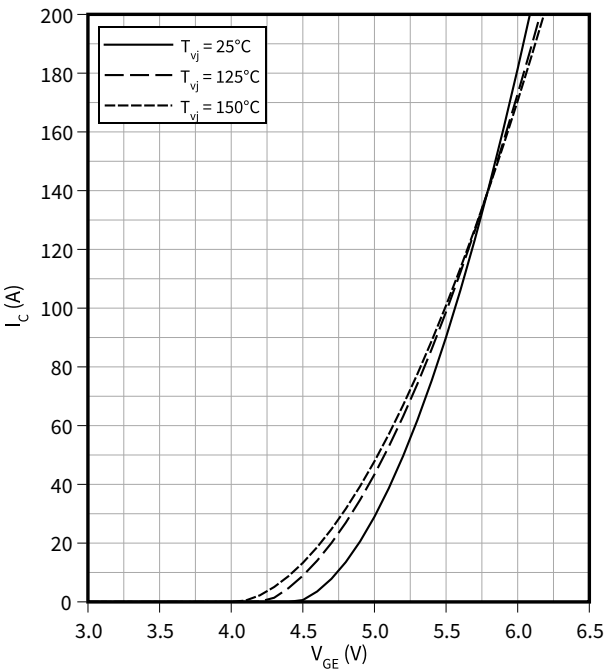
Output characteristic field (typical), IGBT, 3-Level

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



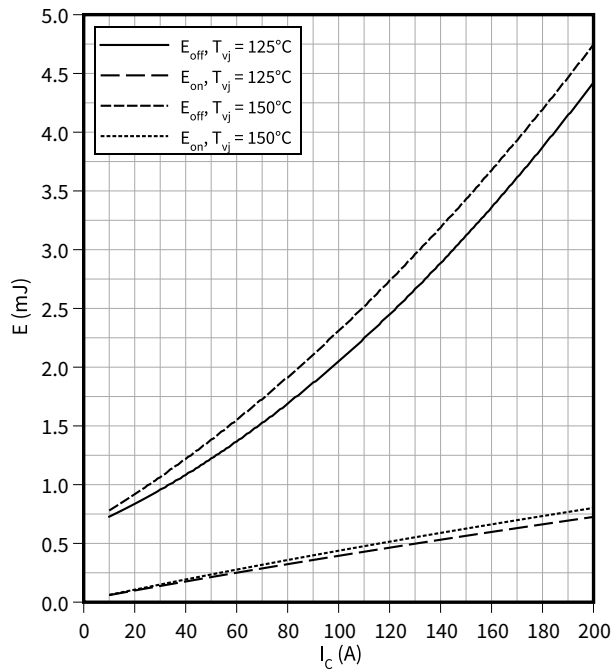
Transfer characteristic (typical), IGBT, 3-Level

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



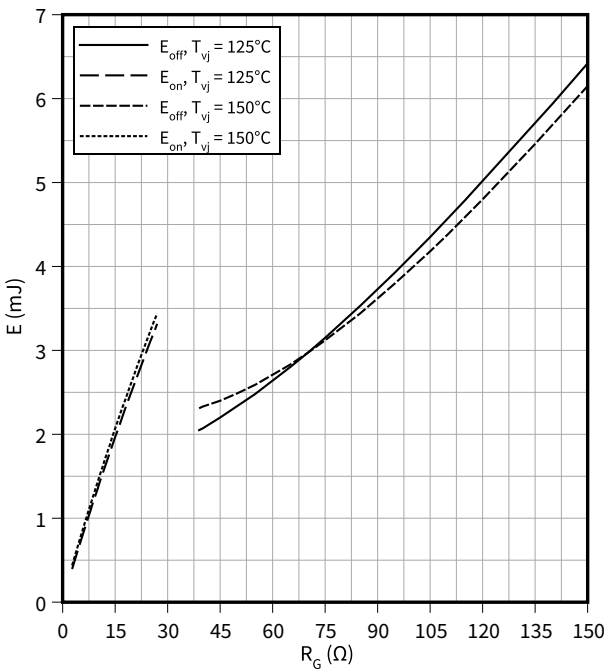
Switching losses (typical), IGBT, 3-Level

$E = f(I_C)$
 $R_{Goff} = 39\text{ }\Omega$, $R_{Gon} = 2.7\text{ }\Omega$, $V_{CE} = 400\text{ V}$, $V_{GE} = -15\text{ V} / +15\text{ V}$



Switching losses (typical), IGBT, 3-Level

$E = f(R_G)$
 $I_C = 100\text{ A}$, $V_{CE} = 400\text{ V}$, $V_{GE} = -15\text{ V} / +15\text{ V}$

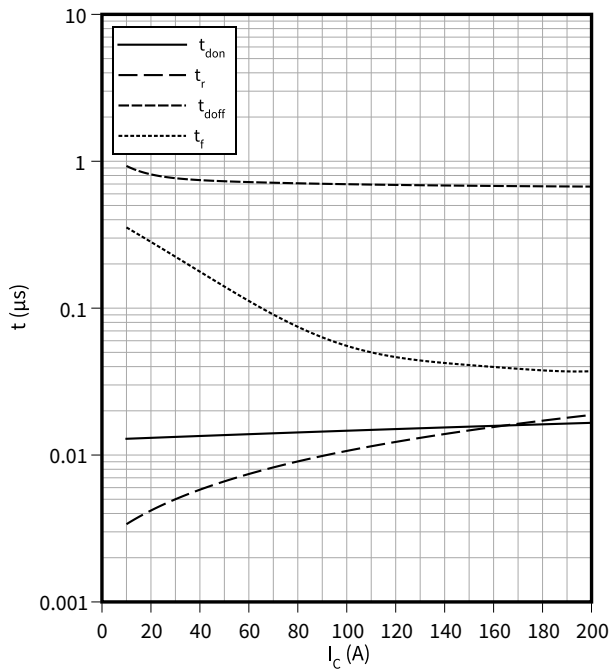


7 Characteristics diagrams

Switching times (typical), IGBT, 3-Level

$t = f(I_C)$

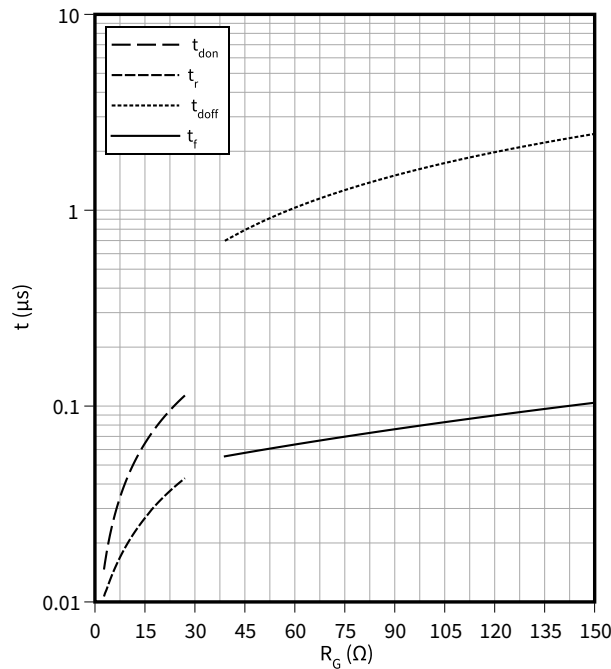
$R_{Goff} = 39 \Omega$, $R_{Gon} = 2.7 \Omega$, $R_{Gon} = 2.7 \Omega$, $V_{CE} = 400 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 150 \text{ }^\circ\text{C}$



Switching times (typical), IGBT, 3-Level

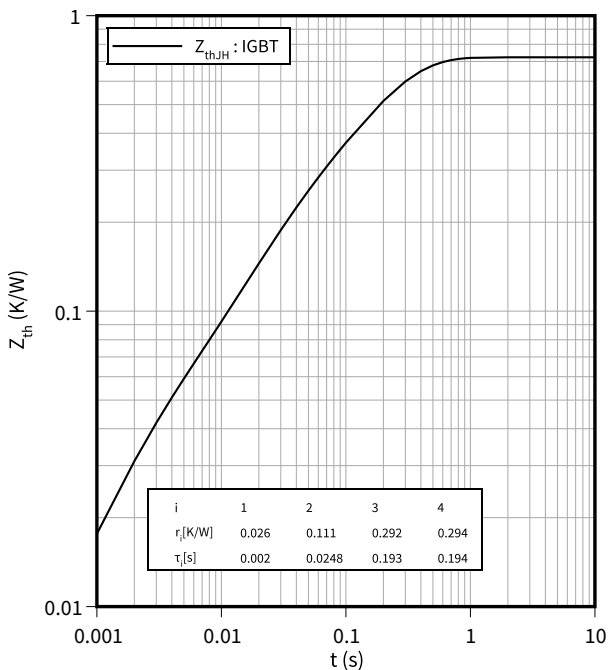
$t = f(R_G)$

$I_C = 100 \text{ A}$, $V_{CE} = 400 \text{ V}$, $V_{GE} = -15 / +15 \text{ V}$, $T_{vj} = 150 \text{ }^\circ\text{C}$



Transient thermal impedance, IGBT, 3-Level

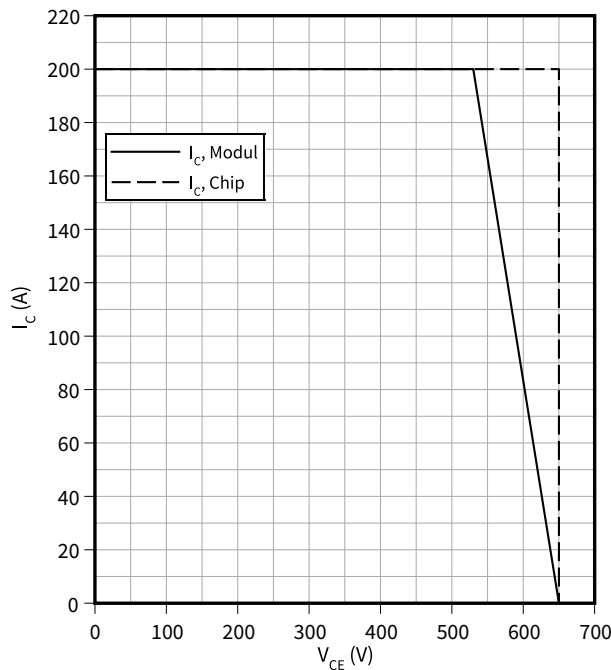
$Z_{th} = f(t)$



Reverse bias safe operating area (RBSOA), IGBT, 3-Level

$I_C = f(V_{CE})$

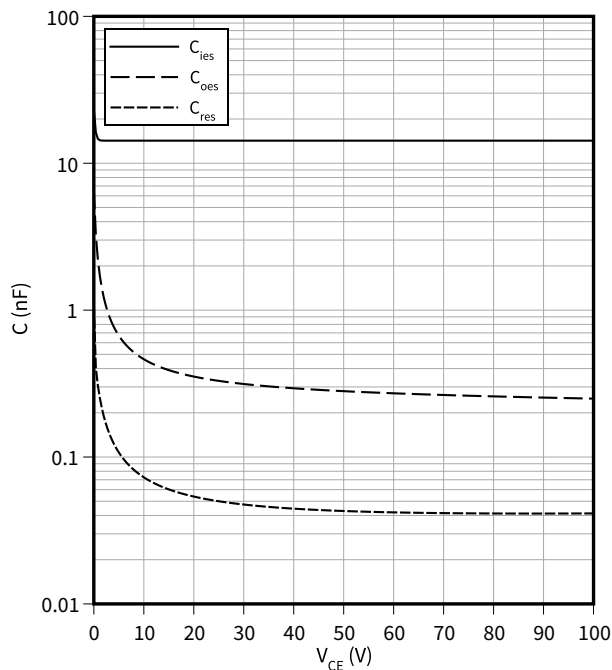
$T_{vj} = 150 \text{ }^\circ\text{C}$, $R_{Goff} = 39 \Omega$, $V_{GE} = \pm 15 \text{ V}$



Capacity characteristic (typical), IGBT, 3-Level

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

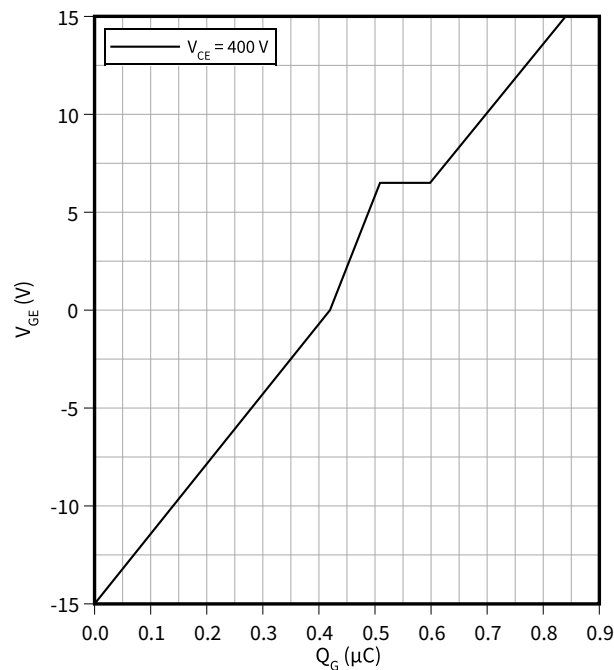
$f = 100 \text{ kHz}$, $V_{GE} = 0 \text{ V}$, $T_{vj} = 25^\circ\text{C}$



Gate charge characteristic (typical), IGBT, 3-Level

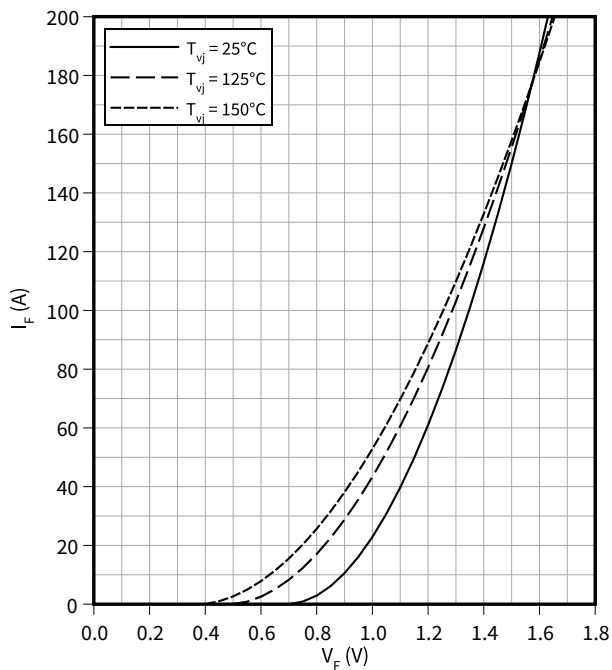
$$V_{GE} = f(Q_G)$$

$I_C = 100 \text{ A}$, $T_{vj} = 25^\circ\text{C}$



Forward characteristic (typical), Diode, 3-Level

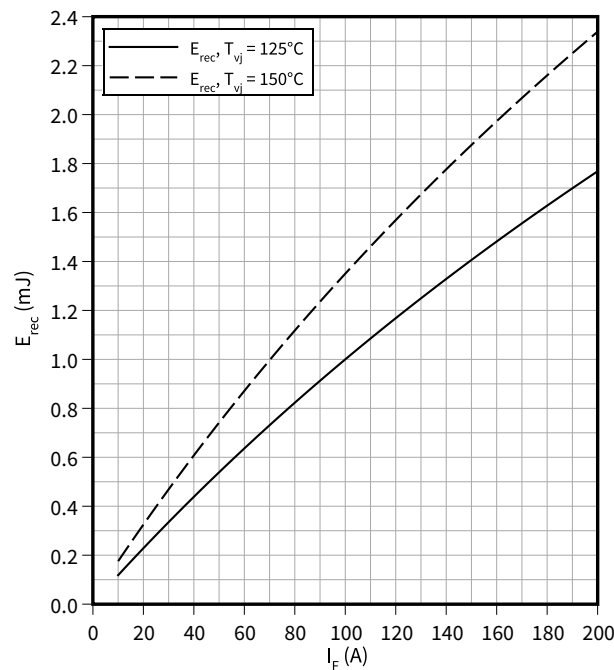
$$I_F = f(V_F)$$



Switching losses (typical), Diode, 3-Level

$$E_{rec} = f(I_F)$$

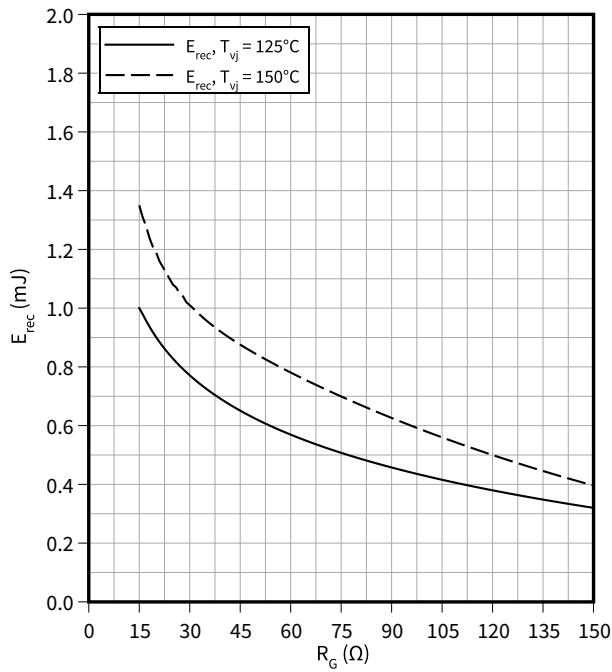
$R_G = 15 \Omega$, $V_R = 400 \text{ V}$



7 Characteristics diagrams

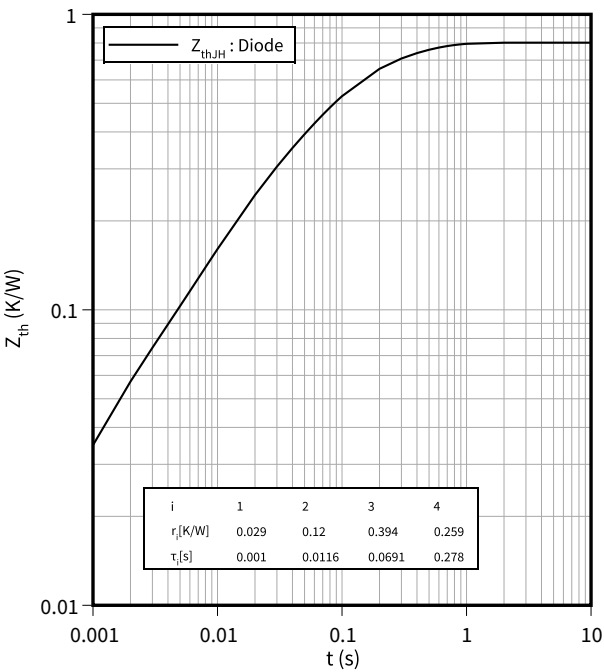
Switching losses (typical), Diode, 3-Level

$E_{rec} = f(R_G)$
 $I_F = 100\text{ A}, V_R = 400\text{ V}$



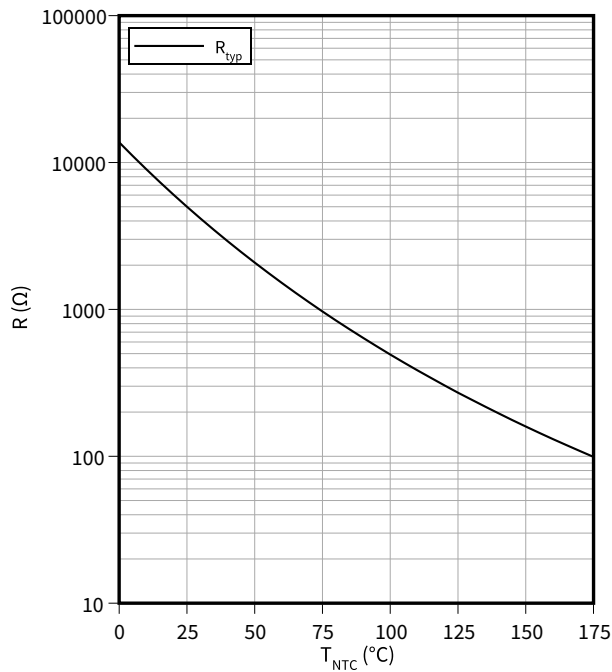
Transient thermal impedance, Diode, 3-Level

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



8 Circuit diagram

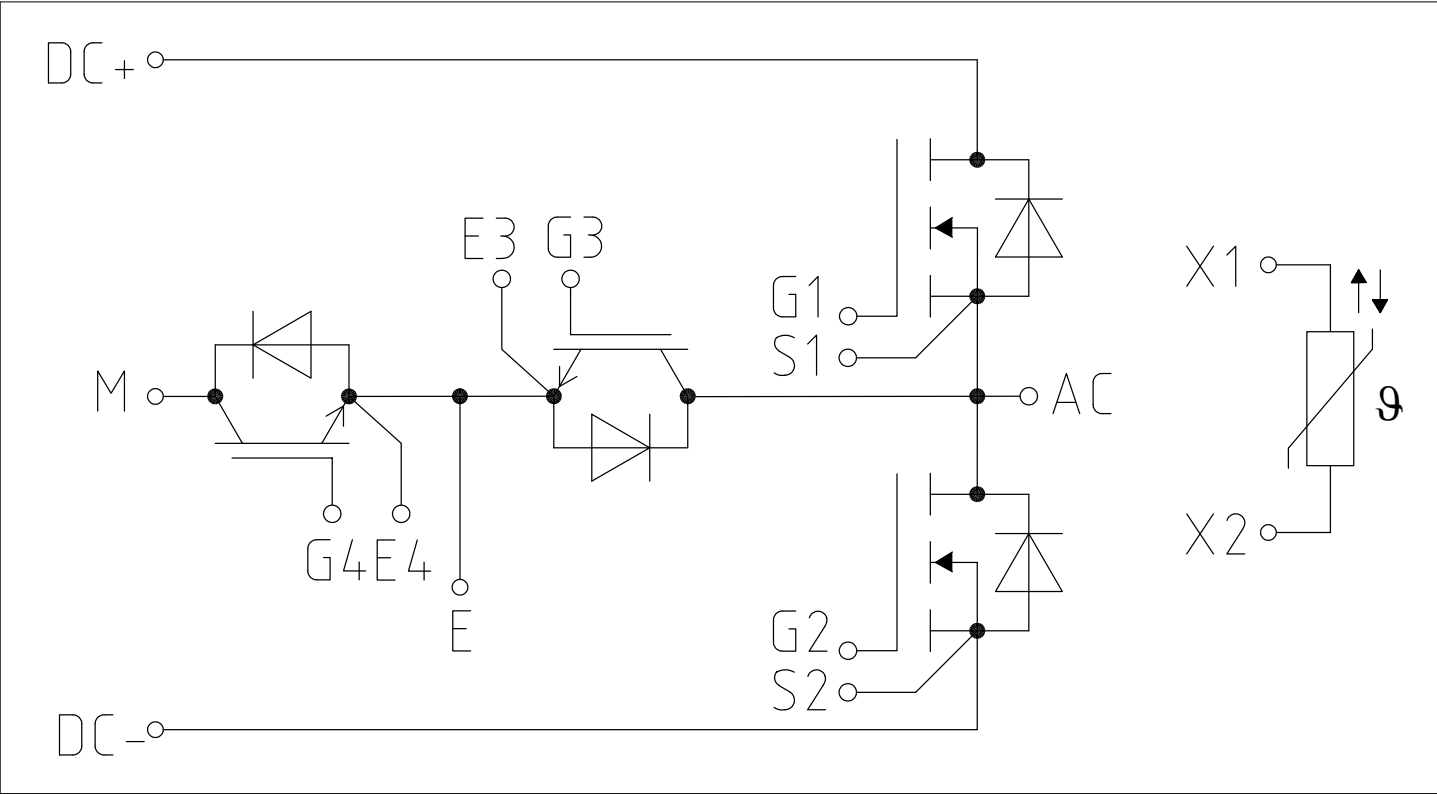


Figure 1

9 Package outlines

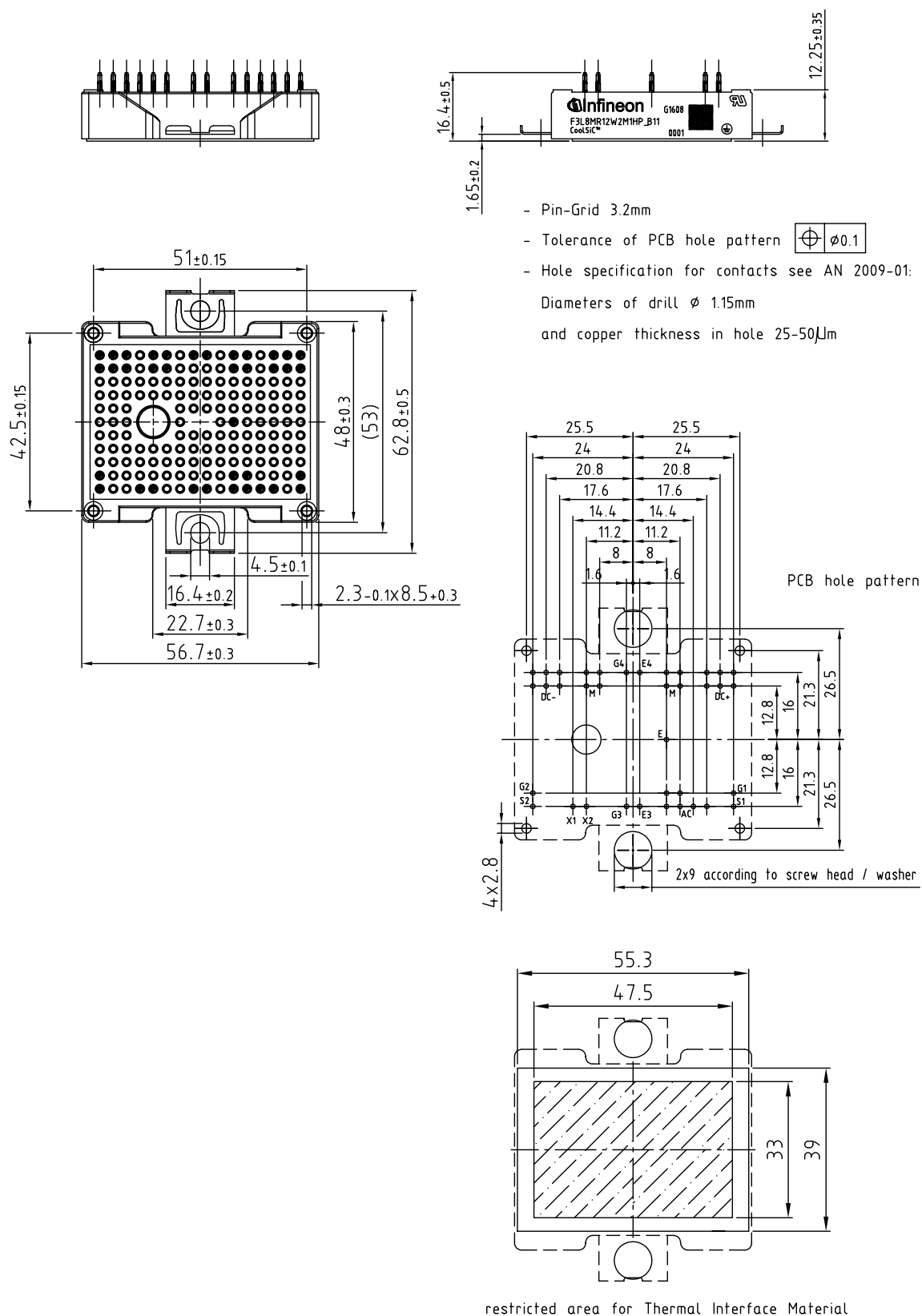


Figure 2

10 Module label code

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

Figure 3

Revision history

Document revision	Date of release	Description of changes
0.10	2021-04-07	
1.00	2022-03-09	Final datasheet
1.10	2022-03-10	Final datasheet

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