

**Final datasheet****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
  - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- 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

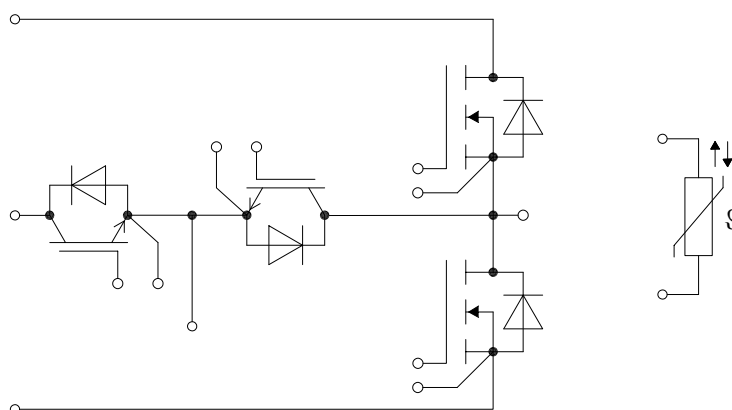
**Description**

Table of contents

	Description .....	1
	Features .....	1
	Potential applications .....	1
	Product validation .....	1
	Table of contents .....	2
1	Package .....	3
2	MOSFET .....	3
3	Body diode (MOSFET) .....	5
4	IGBT, 3-Level .....	6
5	Diode, 3-Level .....	7
6	NTC-Thermistor .....	8
7	Characteristics diagrams .....	10
8	Circuit diagram .....	20
9	Package outlines .....	21
10	Module label code .....	22
	Revision history .....	23
	Disclaimer .....	24

## 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
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, $f = 50 \text{ Hz}$ , $t = 60 \text{ s}$	3.0	kV
Internal isolation		basic insulation (class 1, IEC 61140)	$Al_2O_3$	
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	$R_{CC'+EE'}$	$T_H = 25 \text{ °C}$ , 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	$V_{DSS}$		$T_{vj} = 25 \text{ °C}$	1200	V
Implemented drain current	$I_{DN}$			100	A
Continuous DC drain current	$I_{DDC}$	$T_{vj} = 175 \text{ °C}$ , $V_{GS} = 18 \text{ V}$	$T_H = 65 \text{ °C}$	85	A
Repetitive peak drain current	$I_{DRM}$	verified by design, $t_p$ limited by $T_{vjmax}$		200	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 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	$Q_G$	$V_{DD} = 800\text{ V}, V_{GS} = -3/18\text{ V}, T_{vj} = 25\text{ °C}$			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
Turn-on delay time (inductive load)	$t_{d\ on}$	$I_D = 100\text{ A}, R_{Gon} = 11\text{ Ω}, V_{DD} = 400\text{ V}, V_{GS} = -3/18\text{ V}$	$T_{vj} = 25\text{ °C}$		42		ns
			$T_{vj} = 125\text{ °C}$		44		
			$T_{vj} = 175\text{ °C}$		48		
Rise time (inductive load)	$t_r$	$I_D = 100\text{ A}, R_{Gon} = 11\text{ Ω}, V_{DD} = 400\text{ V}, V_{GS} = -3/18\text{ V}$	$T_{vj} = 25\text{ °C}$		27		ns
			$T_{vj} = 125\text{ °C}$		28		
			$T_{vj} = 175\text{ °C}$		28		

(table continues...)

**Table 5** (continued) **Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off delay time (inductive load)	$t_{d\ off}$	$I_D = 100\ A, R_{Goff} = 0.75\ \Omega, V_{DD} = 400\ V, V_{GS} = -3/18\ V$	$T_{vj} = 25\ ^\circ C$	40		ns
			$T_{vj} = 125\ ^\circ C$	43		
			$T_{vj} = 175\ ^\circ C$	46		
Fall time (inductive load)	$t_f$	$I_D = 100\ A, R_{Goff} = 0.75\ \Omega, V_{DD} = 400\ V, V_{GS} = -3/18\ V$	$T_{vj} = 25\ ^\circ C$	11		ns
			$T_{vj} = 125\ ^\circ C$	12		
			$T_{vj} = 175\ ^\circ C$	13		
Turn-on energy loss per pulse	$E_{on}$	$I_D = 100\ A, V_{DD} = 400\ V, L_\sigma = 15\ nH, V_{GS} = -3/18\ V, R_{Gon} = 11\ \Omega, di/dt = 4.48\ kA/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$	2.25		mJ
			$T_{vj} = 125\ ^\circ C$	2.77		
			$T_{vj} = 175\ ^\circ C$	3.03		
Turn-off energy loss per pulse	$E_{off}$	$I_D = 100\ A, V_{DD} = 400\ V, L_\sigma = 15\ nH, V_{GS} = -3/18\ V, R_{Goff} = 0.75\ \Omega, dv/dt = 39.8\ kV/\mu s (T_{vj} = 175\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$	0.32		mJ
			$T_{vj} = 125\ ^\circ C$	0.35		
			$T_{vj} = 175\ ^\circ C$	0.37		
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 losses and the long-term behavior of the MOSFET and body diode. The design guidelines described in Application Notes AN 2018-09 and AN 2021-13 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 (MOSFET)

**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	$V_{SD}$	$I_{SD} = 100\ A, V_{GS} = -3\ V$	$T_{vj} = 25\ ^\circ C$	4.2	5.35	V
			$T_{vj} = 125\ ^\circ C$	3.9		
			$T_{vj} = 175\ ^\circ C$	3.8		

(table continues...)

**Table 7** (continued) **Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Peak reverse recovery current	$I_{rrm}$	$I_{SD} = 100 \text{ A}$ , $di_s/dt = 1.05 \text{ kA}/\mu\text{s}$ , $V_{DD} = 400 \text{ V}$ , $V_{GS} = -3 \text{ V}$	$T_{vj} = 25 \text{ }^{\circ}\text{C}$	94		A
			$T_{vj} = 125 \text{ }^{\circ}\text{C}$	116		
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$	136		
Recovered charge	$Q_{rr}$	$I_{SD} = 100 \text{ A}$ , $di_s/dt = 1.05 \text{ kA}/\mu\text{s}$ , $V_{DD} = 400 \text{ V}$ , $V_{GS} = -3 \text{ V}$	$T_{vj} = 25 \text{ }^{\circ}\text{C}$	1.3		$\mu\text{C}$
			$T_{vj} = 125 \text{ }^{\circ}\text{C}$	2.11		
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$	2.6		
Reverse recovery energy	$E_{rec}$	$I_{SD} = 100 \text{ A}$ , $di_s/dt = 1.05 \text{ kA}/\mu\text{s}$ ( $T_{vj} = 175 \text{ }^{\circ}\text{C}$ ), $V_{DD} = 400 \text{ V}$ , $V_{GS} = -3 \text{ V}$	$T_{vj} = 25 \text{ }^{\circ}\text{C}$	0.236		mJ
			$T_{vj} = 125 \text{ }^{\circ}\text{C}$	0.452		
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$	0.601		

## 4 IGBT, 3-Level

**Table 8** **Maximum rated values**

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

**Table 9** **Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{\text{CE sat}}$	$I_{\text{C}} = 100 \text{ A}$ , $V_{\text{GE}} = 15 \text{ V}$	$T_{\text{vj}} = 25 \text{ }^{\circ}\text{C}$	0.74	1.17	1.59	V
			$T_{\text{vj}} = 125 \text{ }^{\circ}\text{C}$		1.20		
			$T_{\text{vj}} = 150 \text{ }^{\circ}\text{C}$		1.21		
Gate threshold voltage	$V_{\text{GEth}}$	$I_{\text{C}} = 2 \text{ mA}$ , $V_{\text{CE}} = V_{\text{GE}}$ , $T_{\text{vj}} = 25 \text{ }^{\circ}\text{C}$		3.25	4.0	4.75	V
Gate charge	$Q_{\text{G}}$	$V_{\text{GE}} = \pm 15 \text{ V}$ , $V_{\text{CC}} = 400 \text{ V}$ , $T_{\text{vj}} = 25 \text{ }^{\circ}\text{C}$			0.84		$\mu\text{C}$
Internal gate resistor	$R_{\text{Gint}}$	$T_{\text{vj}} = 25 \text{ }^{\circ}\text{C}$			0.0		$\Omega$
Input capacitance	$C_{\text{ies}}$	$f = 100 \text{ kHz}$ , $T_{\text{vj}} = 25 \text{ }^{\circ}\text{C}$ , $V_{\text{CE}} = 25 \text{ V}$ , $V_{\text{GE}} = 0 \text{ V}$			14.3		nF
Reverse transfer capacitance	$C_{\text{res}}$	$f = 100 \text{ kHz}$ , $T_{\text{vj}} = 25 \text{ }^{\circ}\text{C}$ , $V_{\text{CE}} = 25 \text{ V}$ , $V_{\text{GE}} = 0 \text{ V}$			0.05		nF

(table continues...)

**Table 9** (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
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)	$t_{don}$	$I_C = 100 \text{ A}$ , $V_{CC} = 400 \text{ V}$ , $V_{GE} = \pm 15 \text{ V}$ , $R_{Gon} = 1.3 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.046		$\mu\text{s}$
			$T_{vj} = 125 \text{ °C}$		0.046		
			$T_{vj} = 150 \text{ °C}$		0.050		
Rise time (inductive load)	$t_r$	$I_C = 100 \text{ A}$ , $V_{CC} = 400 \text{ V}$ , $V_{GE} = \pm 15 \text{ V}$ , $R_{Gon} = 1.3 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.005		$\mu\text{s}$
			$T_{vj} = 125 \text{ °C}$		0.006		
			$T_{vj} = 150 \text{ °C}$		0.007		
Turn-off delay time (inductive load)	$t_{doff}$	$I_C = 100 \text{ A}$ , $V_{CC} = 400 \text{ V}$ , $V_{GE} = \pm 15 \text{ V}$ , $R_{Goff} = 1 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.085		$\mu\text{s}$
			$T_{vj} = 125 \text{ °C}$		0.116		
			$T_{vj} = 150 \text{ °C}$		0.122		
Fall time (inductive load)	$t_f$	$I_C = 100 \text{ A}$ , $V_{CC} = 400 \text{ V}$ , $V_{GE} = \pm 15 \text{ V}$ , $R_{Goff} = 1 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.037		$\mu\text{s}$
			$T_{vj} = 125 \text{ °C}$		0.054		
			$T_{vj} = 150 \text{ °C}$		0.064		
Turn-on energy loss per pulse	$E_{on}$	$I_C = 100 \text{ A}$ , $V_{CC} = 400 \text{ V}$ , $L_\sigma = 15 \text{ nH}$ , $V_{GE} = \pm 15 \text{ V}$ , $R_{Gon} = 1.3 \text{ } \Omega$ , $di/dt = 1050 \text{ A}/\mu\text{s}$ ( $T_{vj} = 150 \text{ °C}$ )	$T_{vj} = 25 \text{ °C}$		0.232		mJ
			$T_{vj} = 125 \text{ °C}$		0.387		
			$T_{vj} = 150 \text{ °C}$		0.444		
Turn-off energy loss per pulse	$E_{off}$	$I_C = 100 \text{ A}$ , $V_{CC} = 400 \text{ V}$ , $L_\sigma = 15 \text{ nH}$ , $V_{GE} = \pm 15 \text{ V}$ , $R_{Goff} = 1 \text{ } \Omega$ , $dv/dt = 5190 \text{ V}/\mu\text{s}$ ( $T_{vj} = 150 \text{ °C}$ )	$T_{vj} = 25 \text{ °C}$		1.12		mJ
			$T_{vj} = 125 \text{ °C}$		1.8		
			$T_{vj} = 150 \text{ °C}$		2.05		
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	$T_{vj\text{ op}}$			-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

(table continues...)

**Table 10** (continued) Maximum rated values

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

**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	$I_{RM}$	$V_{CC} = 400\text{ V}$ , $I_F = 100\text{ A}$ , $V_{GE} = -3\text{ V}$ , $-di_F/dt = 4.48\text{ kA}/\mu\text{s}$ ( $T_{vj} = 150\text{ }^{\circ}\text{C}$ )	$T_{vj} = 25\text{ }^{\circ}\text{C}$		80		A
			$T_{vj} = 125\text{ }^{\circ}\text{C}$		118		
			$T_{vj} = 150\text{ }^{\circ}\text{C}$		130		
Recovered charge	$Q_r$	$V_{CC} = 400\text{ V}$ , $I_F = 100\text{ A}$ , $V_{GE} = -3\text{ V}$ , $-di_F/dt = 4.48\text{ kA}/\mu\text{s}$ ( $T_{vj} = 150\text{ }^{\circ}\text{C}$ )	$T_{vj} = 25\text{ }^{\circ}\text{C}$		3.82		$\mu\text{C}$
			$T_{vj} = 125\text{ }^{\circ}\text{C}$		6.77		
			$T_{vj} = 150\text{ }^{\circ}\text{C}$		7.68		
Reverse recovery energy	$E_{rec}$	$V_{CC} = 400\text{ V}$ , $I_F = 100\text{ A}$ , $V_{GE} = -3\text{ V}$ , $-di_F/dt = 4.48\text{ kA}/\mu\text{s}$ ( $T_{vj} = 150\text{ }^{\circ}\text{C}$ )	$T_{vj} = 25\text{ }^{\circ}\text{C}$		0.694		mJ
			$T_{vj} = 125\text{ }^{\circ}\text{C}$		1.56		
			$T_{vj} = 150\text{ }^{\circ}\text{C}$		1.88		
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

(table continues...)



**Table 12** (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
B-value	$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$		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

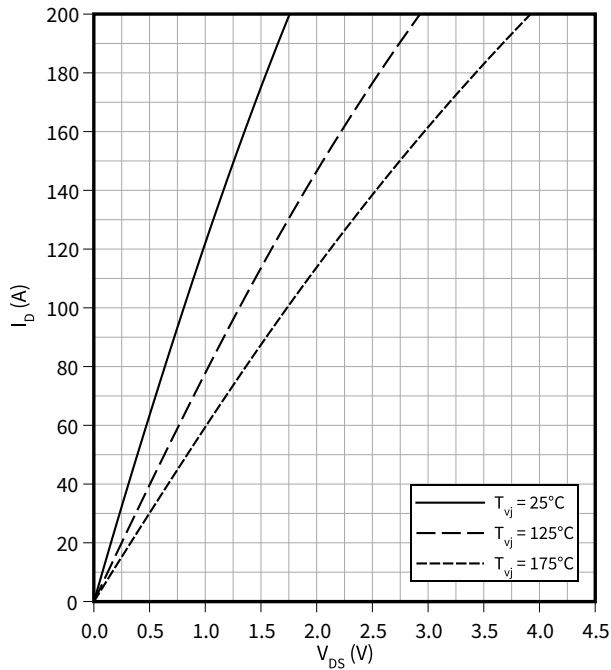
**Note:** For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

7 Characteristics diagrams

Output characteristic (typical), MOSFET

$I_D = f(V_{DS})$

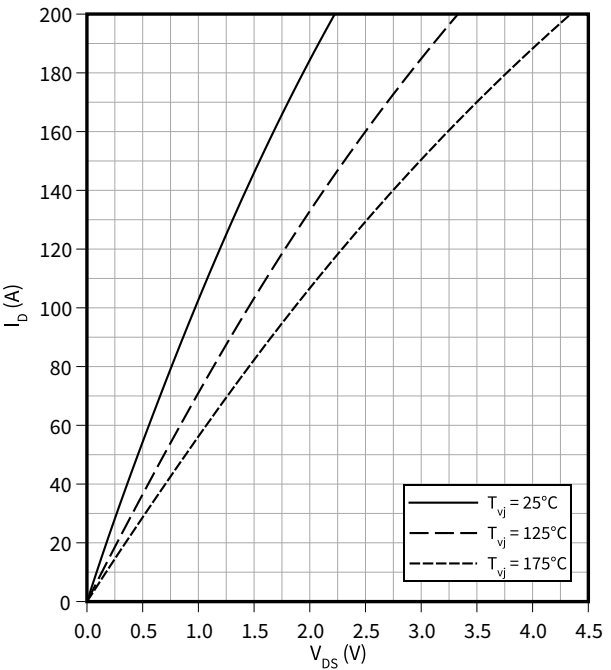
$V_{GS} = 18\text{ V}$



Output characteristic (typical), MOSFET

$I_D = f(V_{DS})$

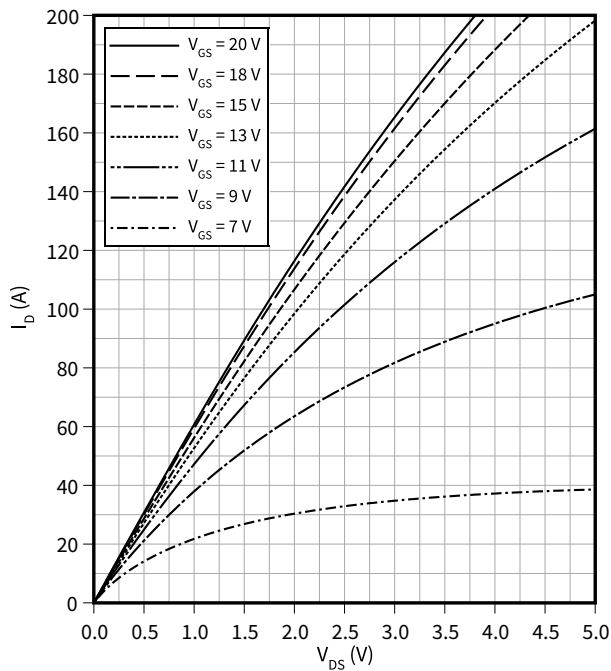
$V_{GS} = 15\text{ V}$



Output characteristic field (typical), MOSFET

$I_D = f(V_{DS})$

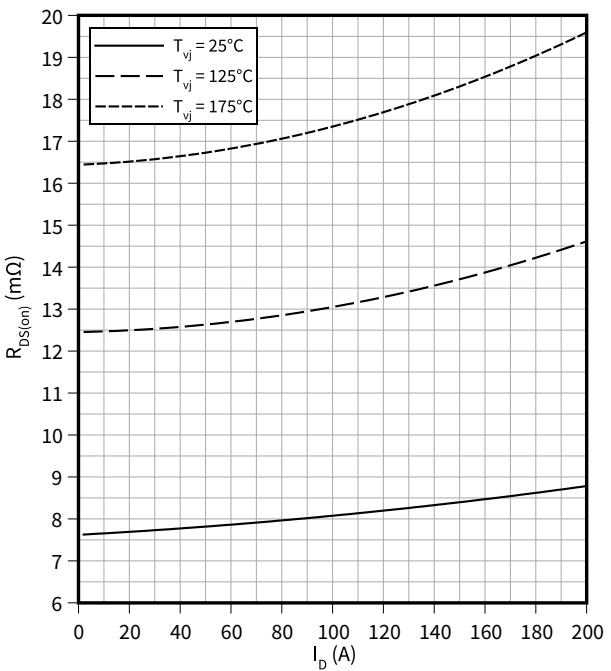
$T_{vj} = 175\text{ °C}$



Drain source on-resistance (typical), MOSFET

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

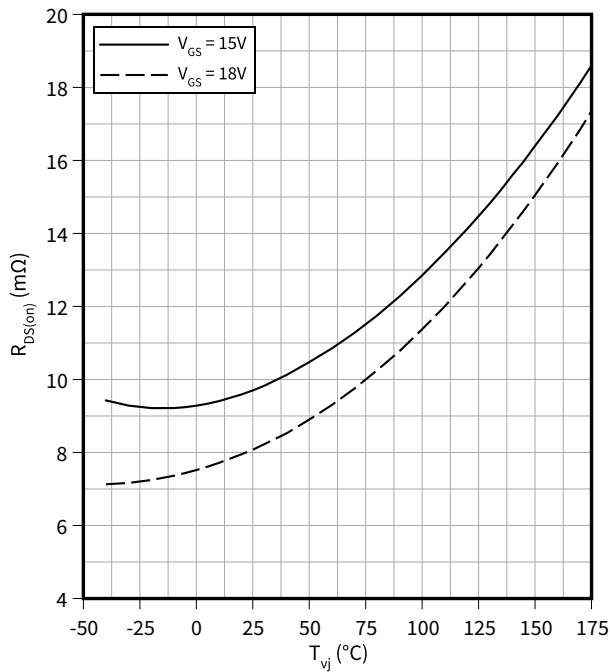
$V_{GS} = 18\text{ V}$



7 Characteristics diagrams

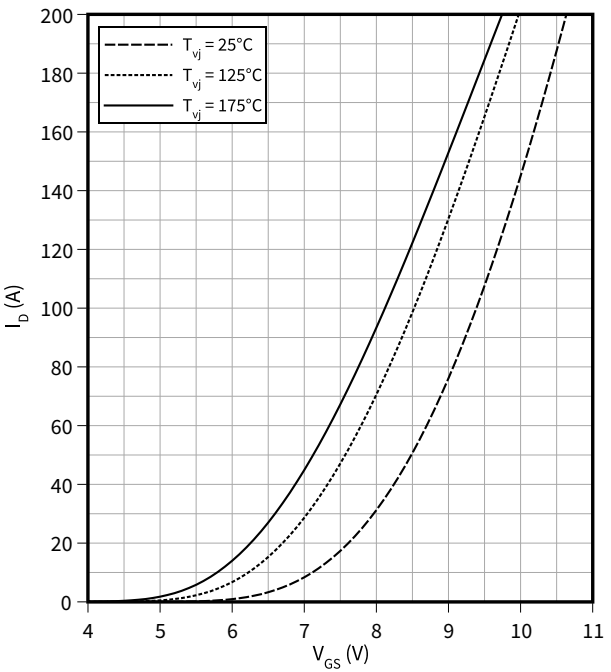
Drain source on-resistance (typical), MOSFET

$R_{DS(on)} = f(T_{vj})$   
 $I_D = 100\text{ A}$



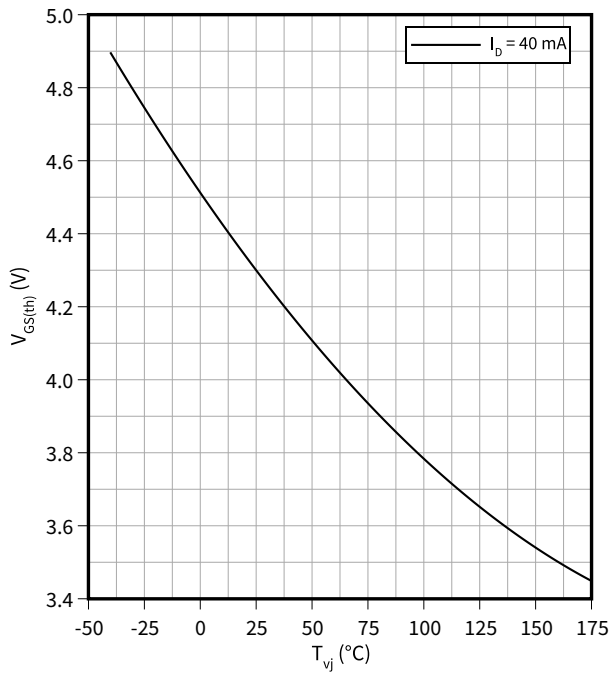
Transfer characteristic (typical), MOSFET

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



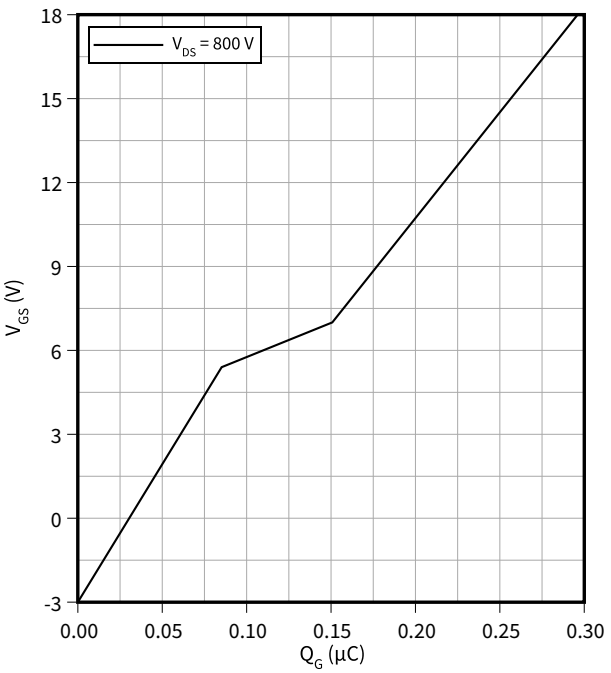
Gate-source threshold voltage (typical), MOSFET

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



Gate charge characteristic (typical), MOSFET

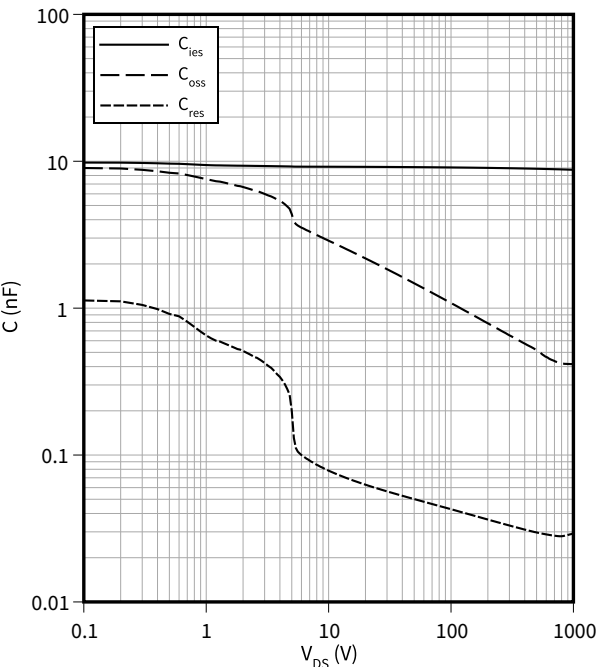
$V_{GS} = f(Q_G)$   
 $I_D = 100\text{ A}, T_{vj} = 25\text{ °C}$



7 Characteristics diagrams

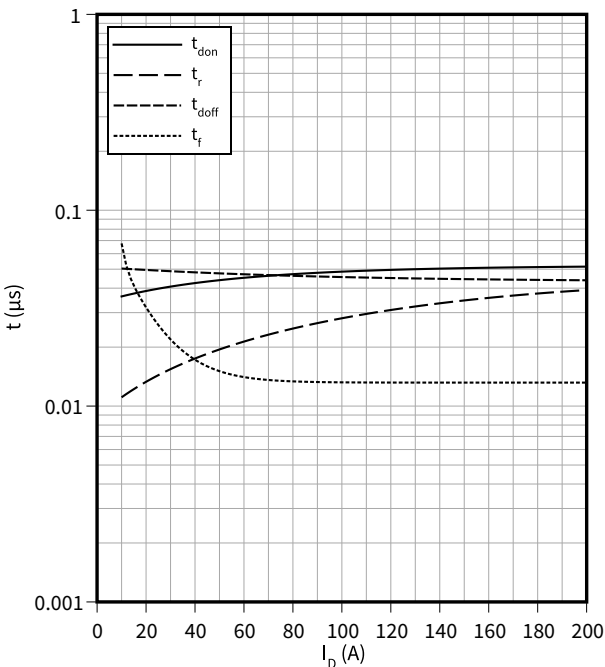
Capacity characteristic (typical), MOSFET

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



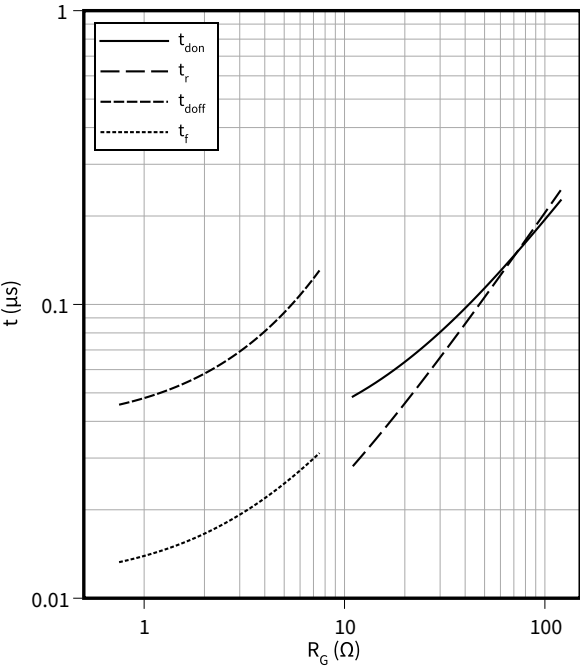
Switching times (typical), MOSFET

$t = f(I_D)$   
 $R_{Goff} = 0.75\text{ }\Omega$ ,  $R_{Gon} = 11\text{ }\Omega$ ,  $V_{DD} = 400\text{ V}$ ,  $T_{vj} = 175\text{ °C}$ ,  $V_{GS} = -3/18\text{ V}$



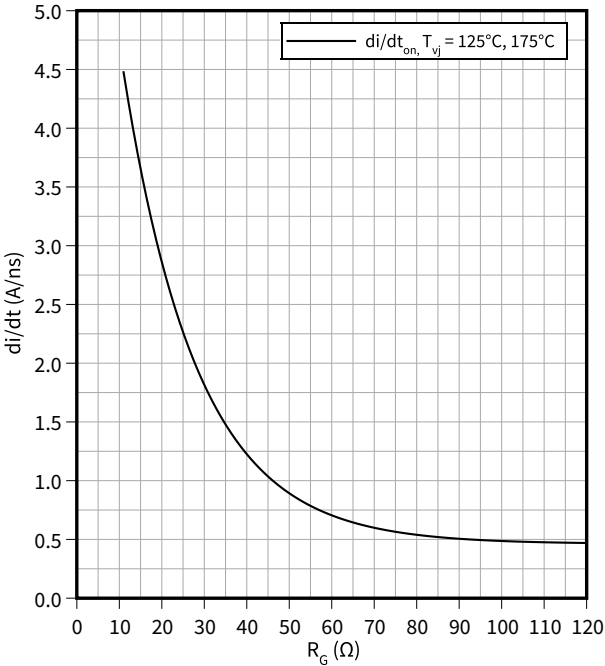
Switching times (typical), MOSFET

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



Current slope (typical), MOSFET

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

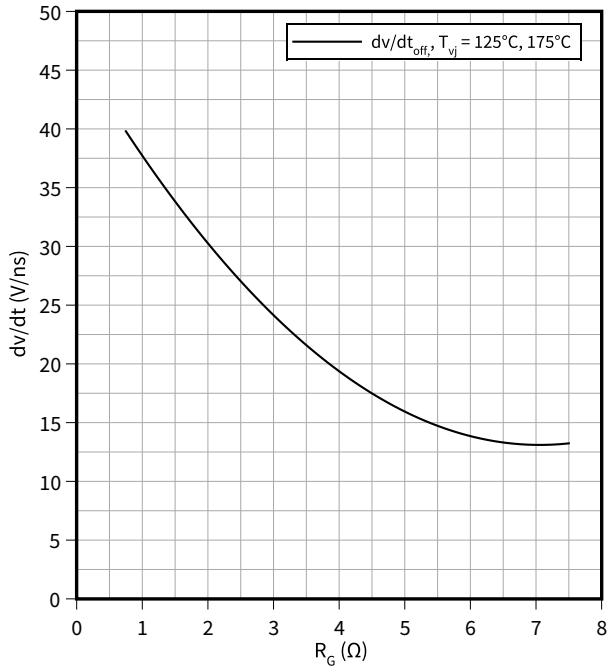


7 Characteristics diagrams

Voltage slope (typical), MOSFET

$dv/dt = f(R_G)$

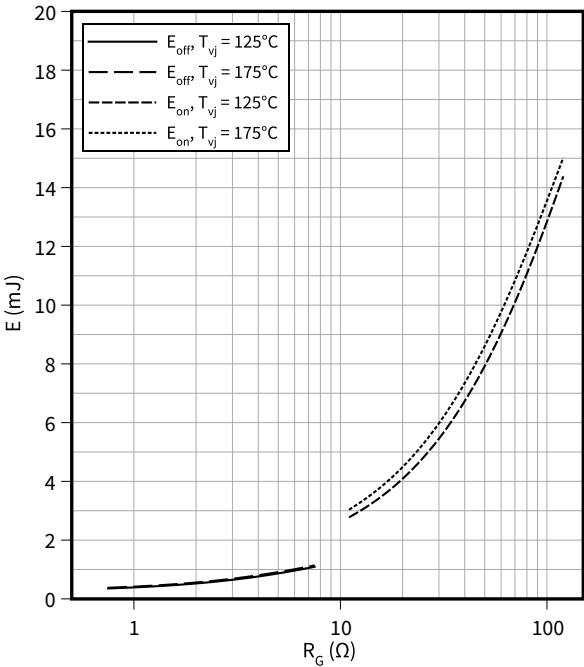
$V_{DD} = 400\text{ V}$ ,  $I_D = 100\text{ A}$ ,  $V_{GS} = -3/18\text{ V}$



Switching losses (typical), MOSFET

$E = f(R_G)$

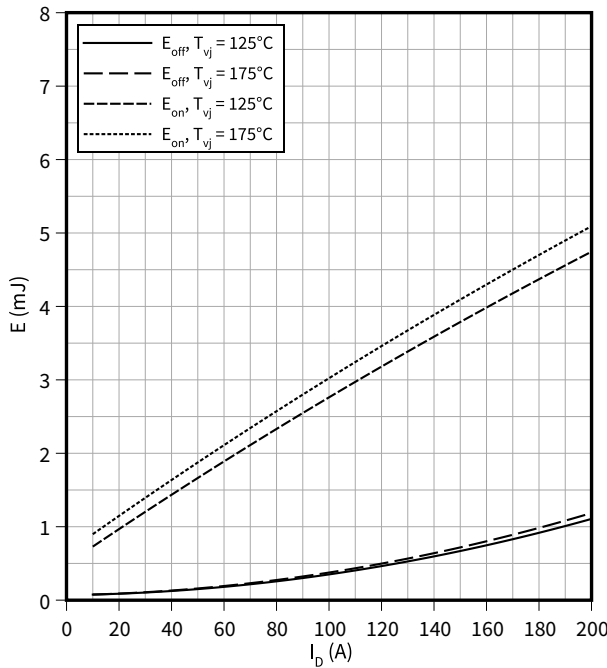
$V_{DD} = 400\text{ V}$ ,  $I_D = 100\text{ A}$ ,  $V_{GS} = -3/18\text{ V}$



Switching losses (typical), MOSFET

$E = f(I_D)$

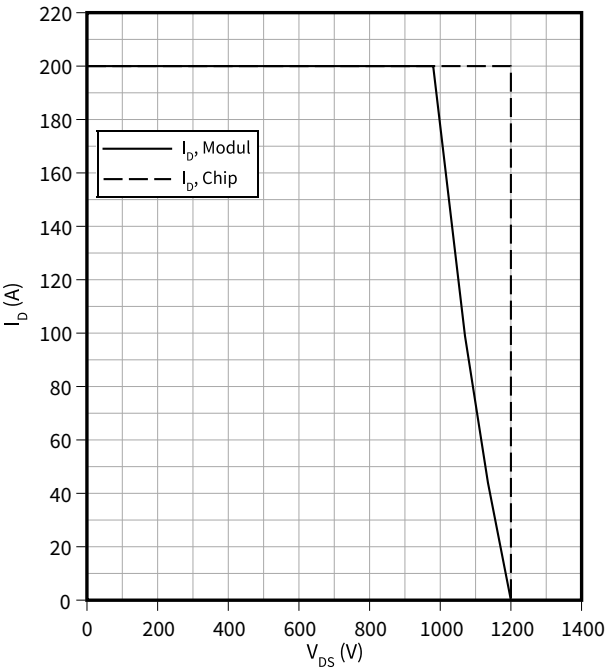
$R_{Goff} = 0.75\text{ }\Omega$ ,  $R_{Gon} = 11\text{ }\Omega$ ,  $V_{DD} = 400\text{ V}$ ,  $V_{GS} = -3/18\text{ V}$



Reverse bias safe operating area (RBSOA), MOSFET

$I_D = f(V_{DS})$

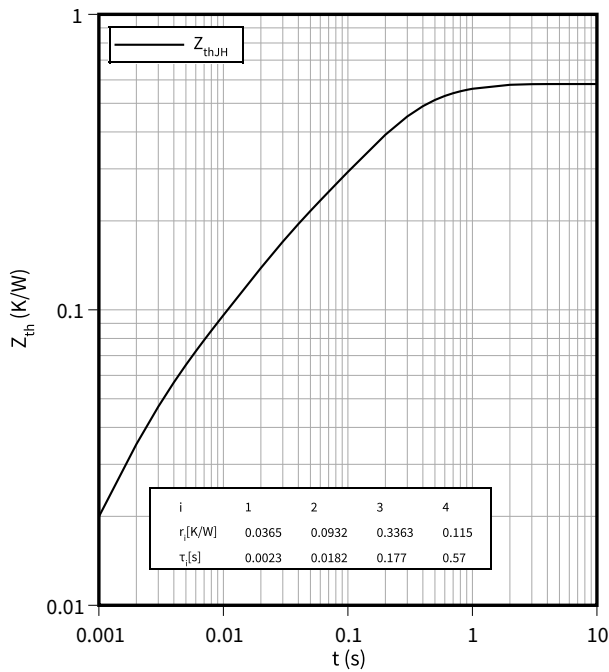
$R_{Goff} = 0.75\text{ }\Omega$ ,  $T_{vj} = 175^\circ\text{C}$ ,  $V_{GS} = -3/18\text{ V}$



7 Characteristics diagrams

Transient thermal impedance, MOSFET

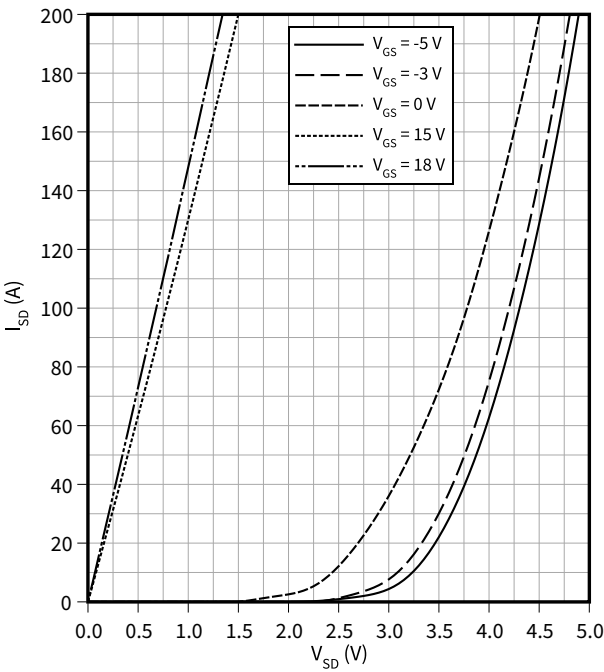
$Z_{th} = f(t)$



Forward characteristic body diode (typical), MOSFET

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

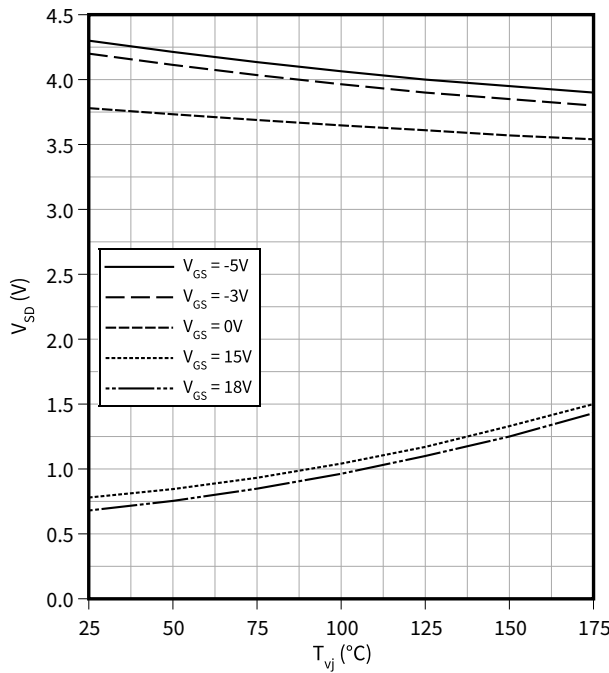
$T_{vj} = 25^\circ\text{C}$



Forward voltage of body diode (typical), MOSFET

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

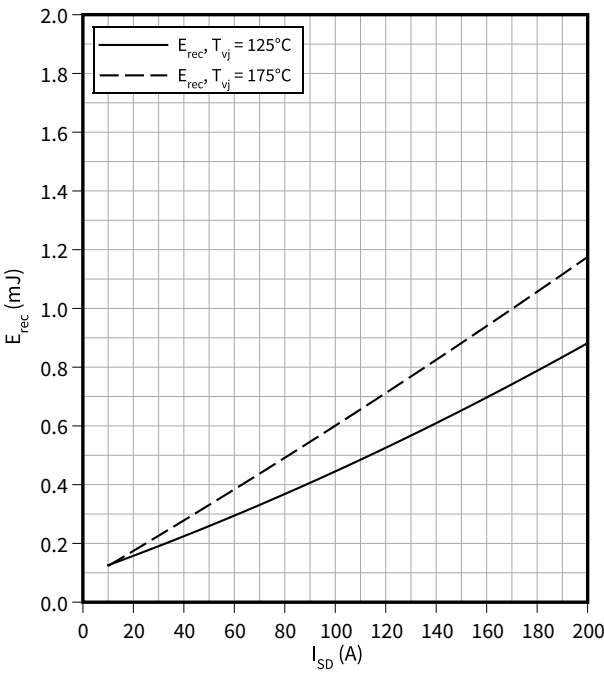
$I_{SD} = 100\text{ A}$



Switching losses body diode (typical), MOSFET

$E_{rec} = f(I_{SD})$

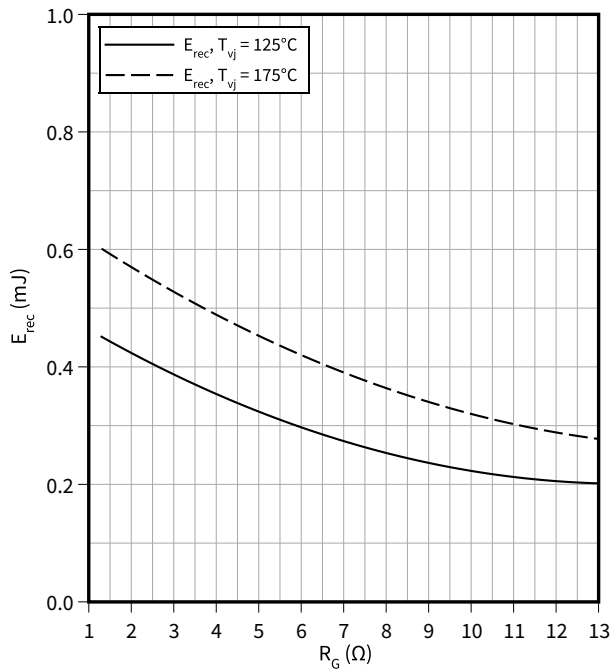
$R_{Gon} = 1.3\ \Omega, V_{DD} = 400\text{ V}$



7 Characteristics diagrams

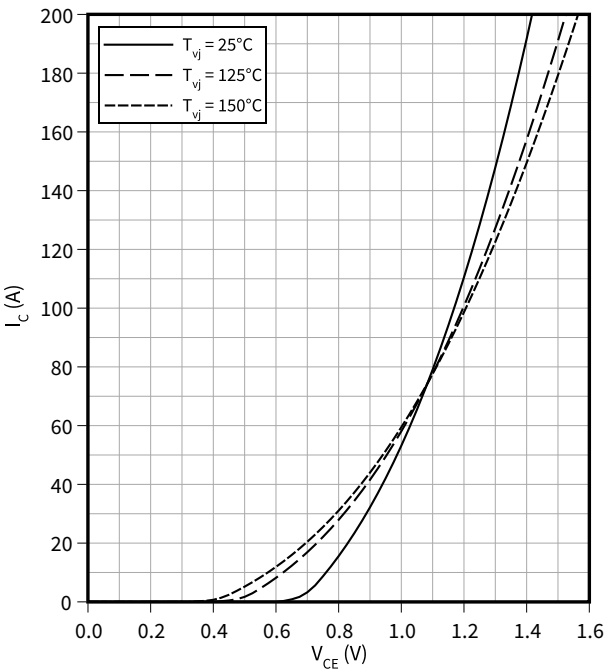
Switching losses body diode (typical), MOSFET

$E_{rec} = f(R_G)$   
 $V_{DD} = 400\text{ V}, I_{SD} = 100\text{ A}$



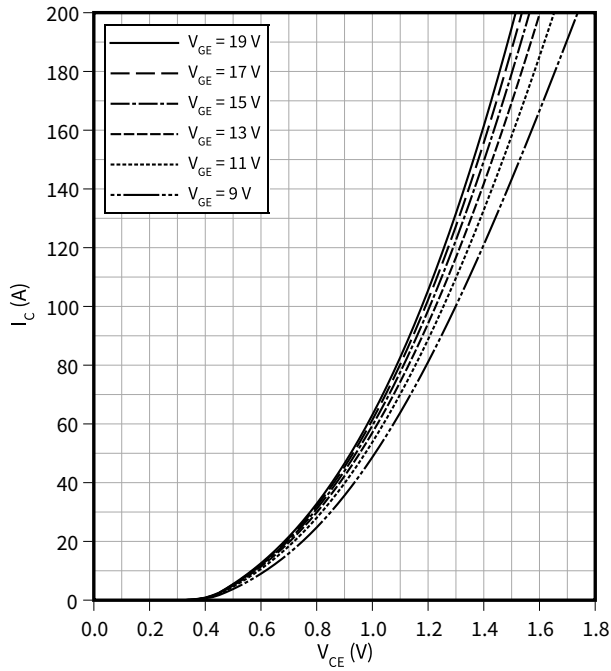
Output characteristic (typical), IGBT, 3-Level

$I_C = f(V_{CE})$   
 $V_{GE} = 15\text{ V}$



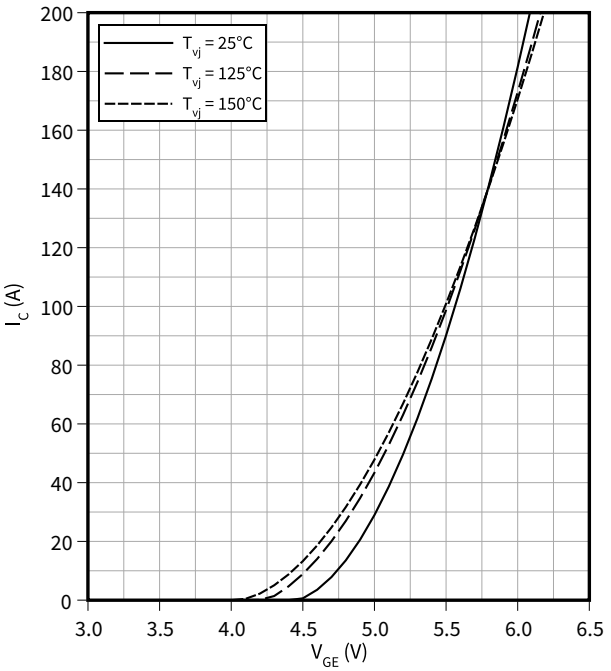
Output characteristic field (typical), IGBT, 3-Level

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



Transfer characteristic (typical), IGBT, 3-Level

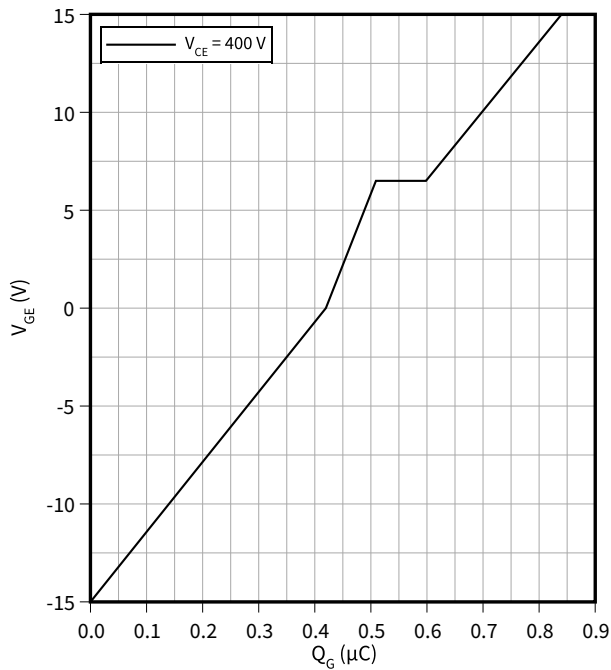
$I_C = f(V_{GE})$   
 $V_{CE} = 20\text{ V}$



7 Characteristics diagrams

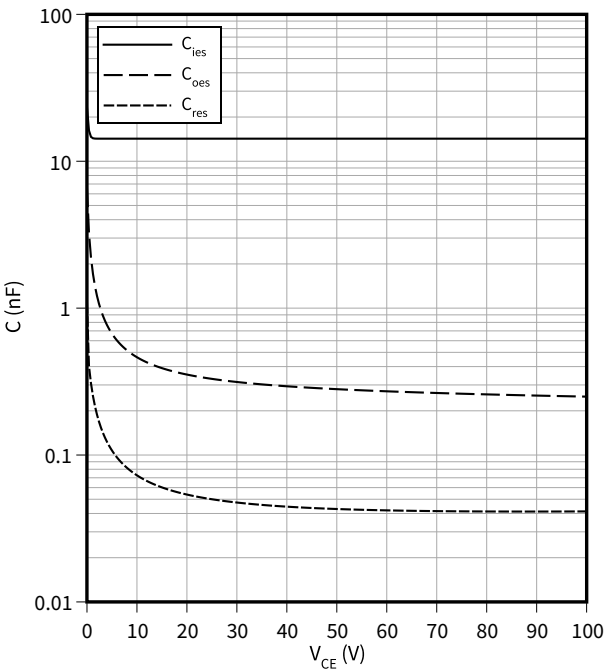
Gate charge characteristic (typical), IGBT, 3-Level

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



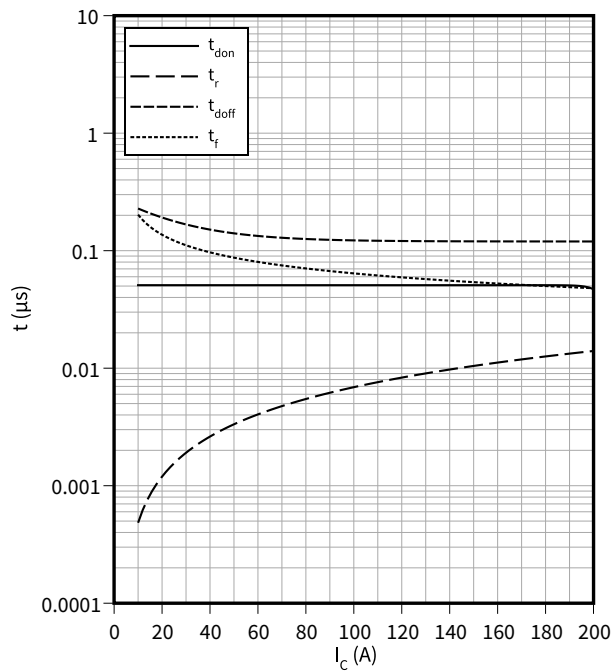
Capacity characteristic (typical), IGBT, 3-Level

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



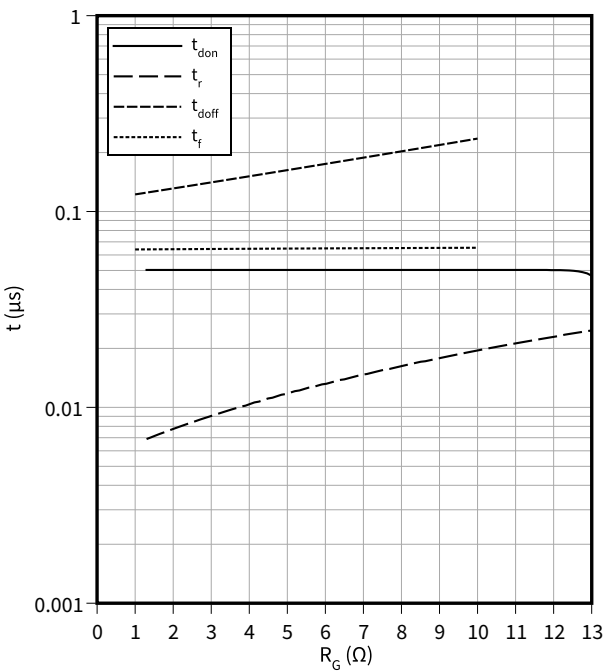
Switching times (typical), IGBT, 3-Level

$t = f(I_C)$   
 $R_{Goff} = 1\text{ }Ω$ ,  $R_{Gon} = 1.3\text{ }Ω$ ,  $V_{GE} = ±15\text{ V}$ ,  $V_{CC} = 400\text{ V}$ ,  $T_{vj} = 150\text{ °C}$



Switching times (typical), IGBT, 3-Level

$t = f(R_G)$   
 $V_{GE} = ±15\text{ V}$ ,  $I_C = 100\text{ A}$ ,  $V_{CC} = 400\text{ V}$ ,  $T_{vj} = 150\text{ °C}$

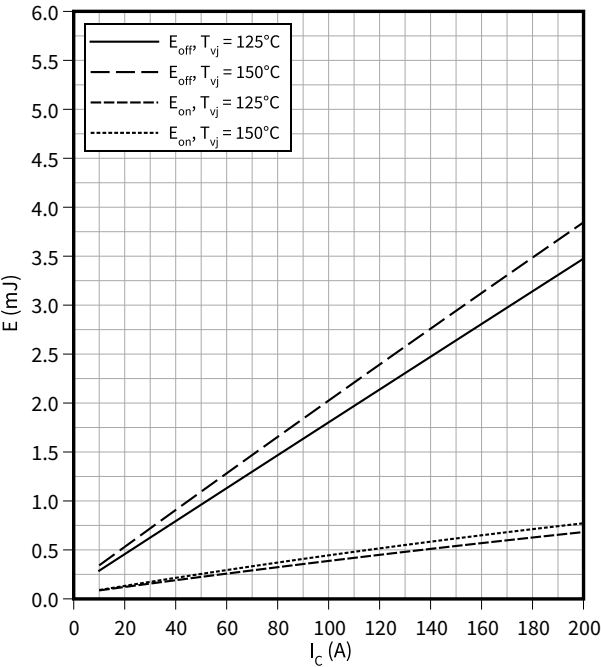




7 Characteristics diagrams

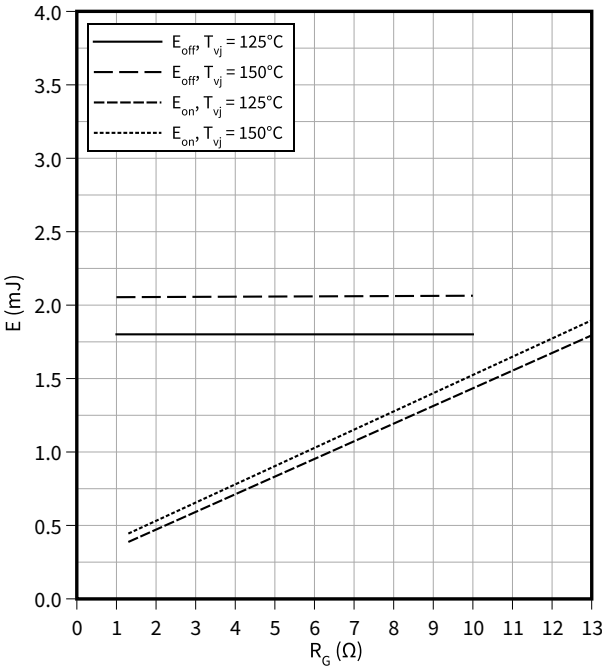
Switching losses (typical), IGBT, 3-Level

$E = f(I_C)$   
 $R_{Goff} = 1 \Omega$ ,  $R_{Gon} = 1.3 \Omega$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $V_{CC} = 400 \text{ V}$



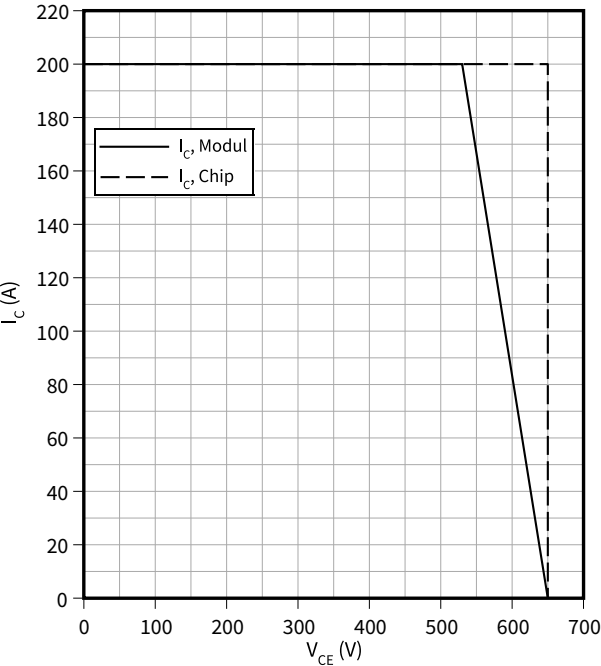
Switching losses (typical), IGBT, 3-Level

$E = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 100 \text{ A}$ ,  $V_{CC} = 400 \text{ V}$



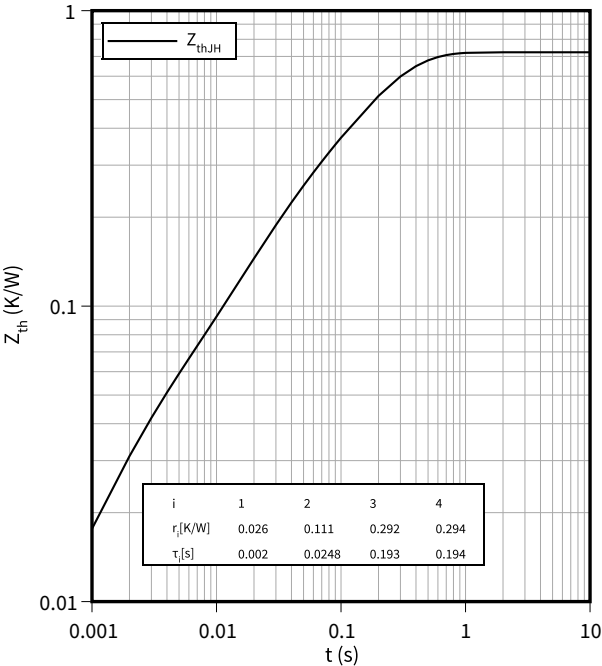
Reverse bias safe operating area (RBSOA), IGBT, 3-Level

$I_C = f(V_{CE})$   
 $R_{Goff} = 1 \Omega$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 150 \text{ °C}$



Transient thermal impedance, IGBT, 3-Level

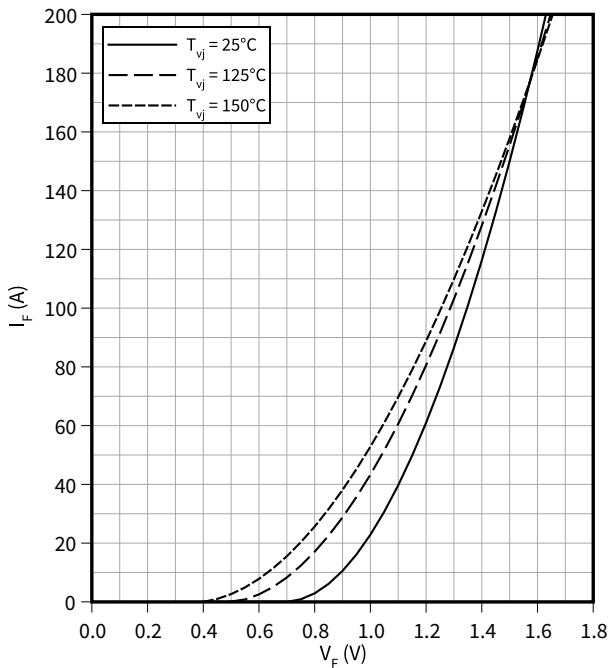
$Z_{th} = f(t)$



7 Characteristics diagrams

Forward characteristic (typical), Diode, 3-Level

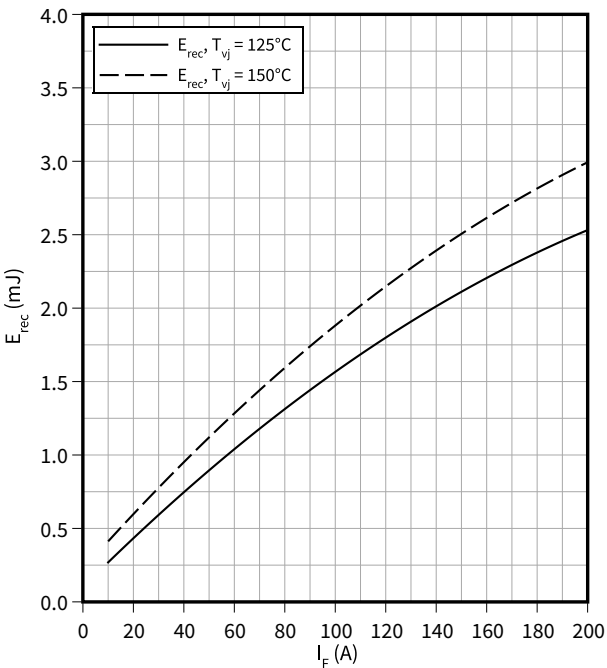
$I_F = f(V_F)$



Switching losses (typical), Diode, 3-Level

$E_{rec} = f(I_F)$

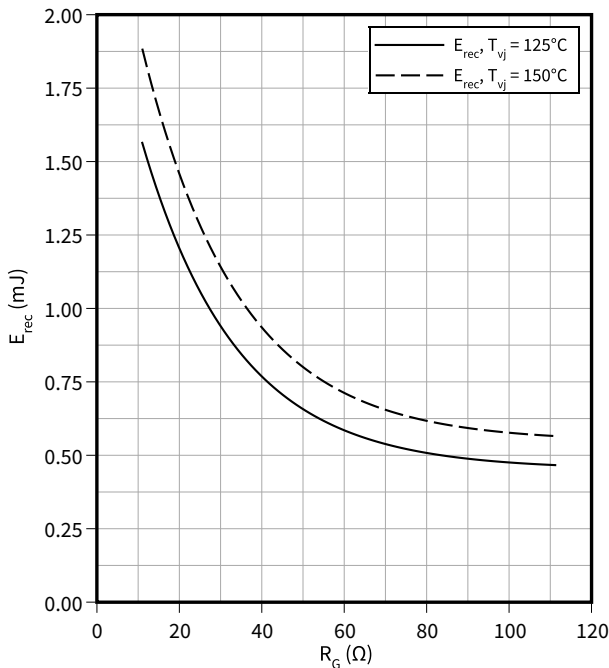
$R_{Gon} = 11\ \Omega, V_{CC} = 400\ \text{V}$



Switching losses (typical), Diode, 3-Level

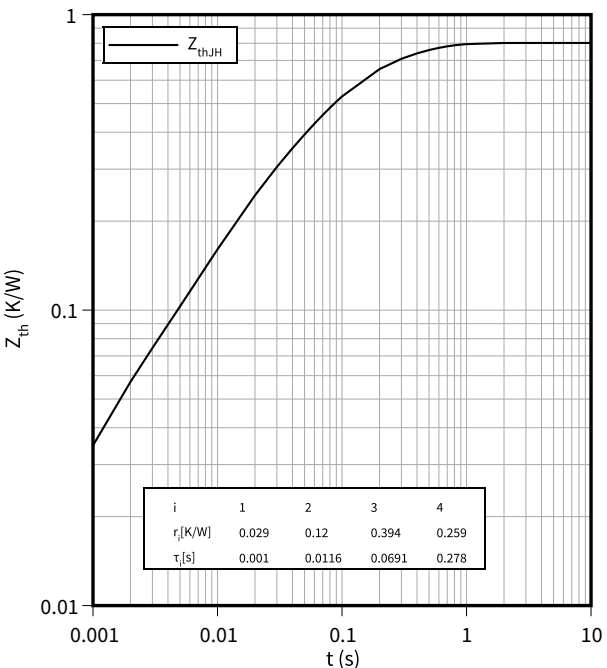
$E_{rec} = f(R_G)$

$I_F = 100\ \text{A}, V_{CC} = 400\ \text{V}$



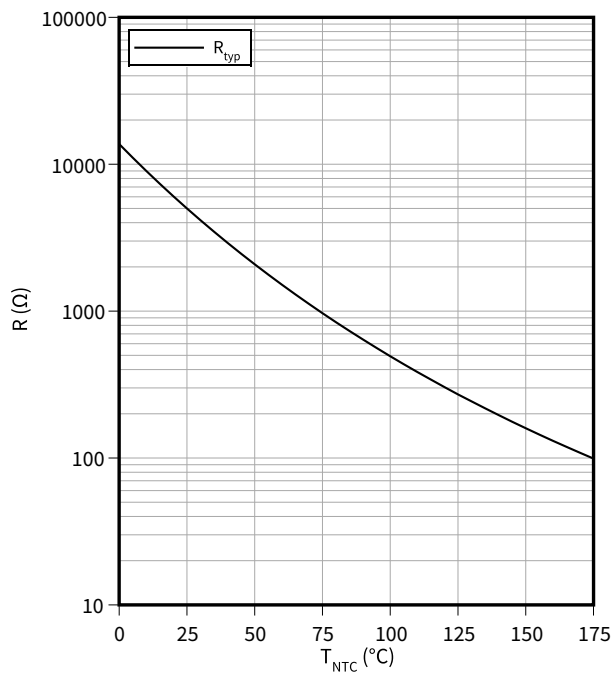
Transient thermal impedance, Diode, 3-Level

$Z_{th} = f(t)$

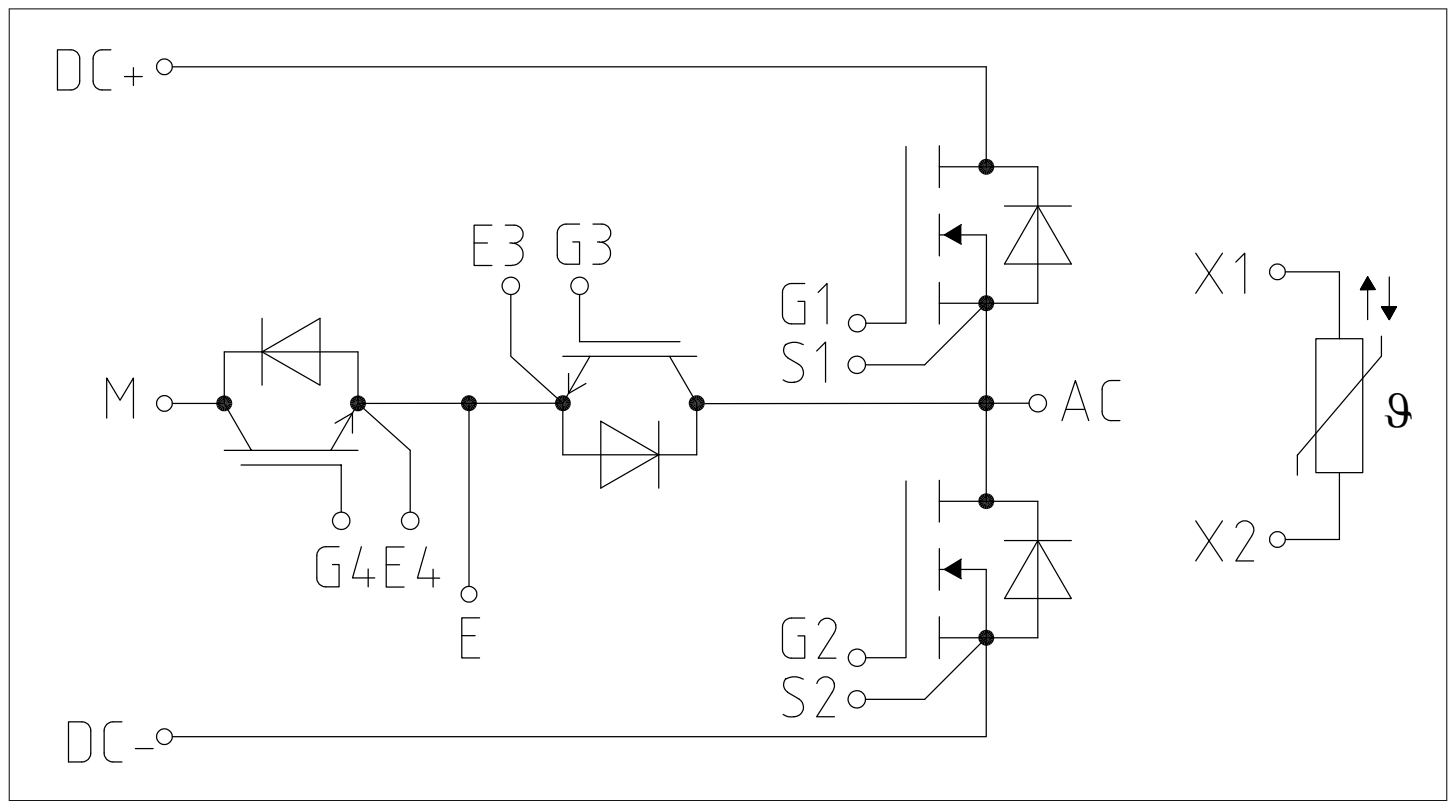


Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$

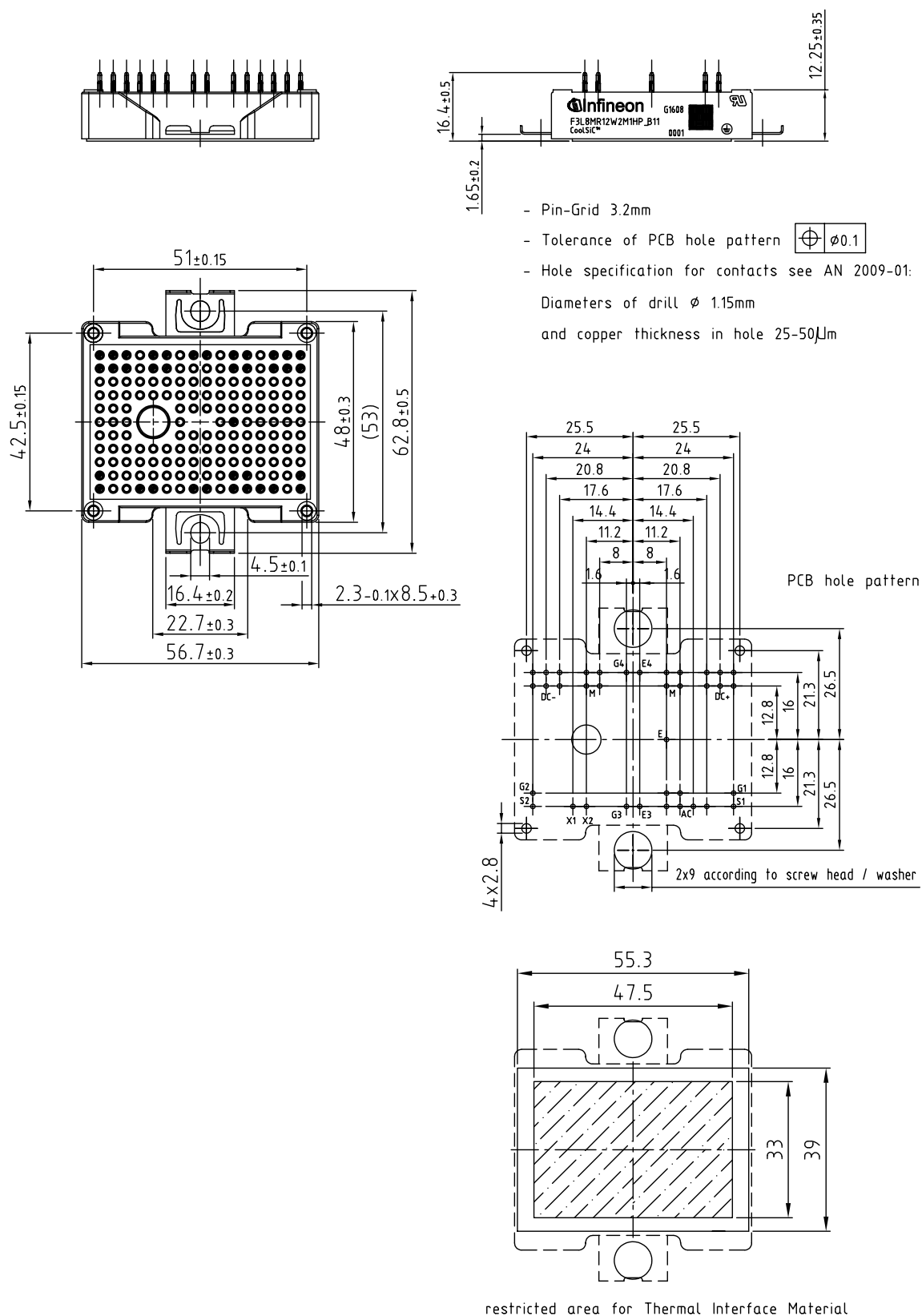


## 8 Circuit diagram



### 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	<div> 71549142846550549911530</div> <div> 71549142846550549911530</div>		

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	2022-03-11	Final datasheet
1.20	2025-04-28	Final datasheet

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**Email:** [erratum@infineon.com](mailto:erratum@infineon.com)

**Document reference**  
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