

## PrimePACK™3+ B-series module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode and NTC / pre-applied thermal interface material

### Features

- Electrical features
  - $V_{CES} = 2300\text{ V}$
  - $I_{C\text{nom}} = 1800\text{ A} / I_{CRM} = 3600\text{ A}$
  - TRENCHSTOP™ IGBT7
  - $T_{vj,op} = 150^{\circ}\text{C}$
  - Overload operation up to  $175^{\circ}\text{C}$
  - Low  $V_{CE,sat}$
  - Low switching losses
  - High current density
  - Low inductive design
- Mechanical features
  - Package with  $CTI > 400$
  - High creepage and clearance distances
  - High power density
  - Pre-applied thermal interface material



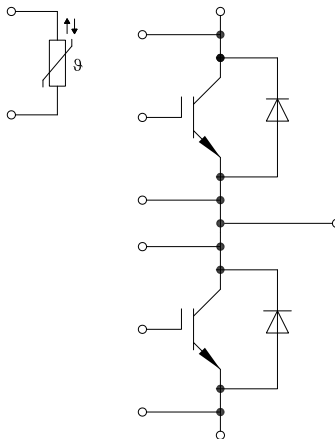
### Potential applications

- Three-level applications
- Solar applications

### Product validation

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

### Description



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## 1 Package

**Table 1** Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	$V_{ISOL}$	RMS, $f = 50$ Hz	4.0	kV
Material of module baseplate			Cu	
Creepage distance	$d_{Creep}$	terminal to heatsink	36.0	mm
Creepage distance	$d_{Creep}$	terminal to terminal	28.0	mm
Clearance	$d_{Clear}$	terminal to heatsink	21.0	mm
Clearance	$d_{Clear}$	terminal to terminal	19.0	mm
Comparative tracking index	$CTI$		> 400	

**Table 2** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray inductance module	$L_{SCE}$			10		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_H = 25^\circ\text{C}$ , per switch		0.09		m $\Omega$
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25^\circ\text{C}$ , per switch		0.1		m $\Omega$
Storage temperature	$T_{stg}$		-40		150	$^\circ\text{C}$
Maximum baseplate operation temperature	$T_{BPmax}$				150	$^\circ\text{C}$
Mounting torque for module mounting	$M$	- Mounting according to valid application note	M5, Screw	3	6	Nm
Terminal connection torque	$M$	- Mounting according to valid application note	M4, Screw	1.8	2.1	Nm
			M8, Screw	8	10	
Weight	$G$			1400		g

## 2 IGBT, Inverter

**Table 3** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	$V_{CES}$	$T_{vj} = 25^\circ\text{C}$	2300	V
Implemented collector current	$I_{CN}$		1800	A
Continuous DC collector current	$I_{CDC}$	$T_{vj\ max} = 150^\circ\text{C}$ $T_H = 45^\circ\text{C}$	1420	A

(table continues...)

**Table 3 (continued) Maximum rated values**

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{vj\ op}$	3600	A
Gate-emitter peak voltage	$V_{GES}$		$\pm 20$	V

**Table 4 Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\ sat}$	$I_C = 1800\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$	1.80	2.26	V
			$T_{vj} = 125\ ^\circ C$	2.15	2.94	
			$T_{vj} = 150\ ^\circ C$	2.25	3.13	
Gate threshold voltage	$V_{GEth}$	$I_C = 49.5\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$	5.15	5.80	6.45	V
Gate charge	$Q_G$	$V_{GE} = \pm 15\ V$		14.6		$\mu C$
Internal gate resistor	$R_{Gint}$	$T_{vj} = 25\ ^\circ C$		0.96		$\Omega$
Input capacitance	$C_{ies}$	$f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		420		nF
Reverse transfer capacitance	$C_{res}$	$f = 1000\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		0.5		nF
Collector-emitter cut-off current	$I_{CES}$	$V_{CE} = 2300\ V, V_{GE} = 0\ V, T_{vj} = 125\ ^\circ C$			30	mA
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0\ V, V_{GE} = 20\ V, T_{vj} = 25\ ^\circ C$			400	nA
Turn-on delay time (inductive load)	$t_{don}$	$I_C = 1800\ A, V_{CE} = 1200\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.530		$\mu s$
			$T_{vj} = 125\ ^\circ C$	0.550		
			$T_{vj} = 150\ ^\circ C$	0.560		
Rise time (inductive load)	$t_r$	$I_C = 1800\ A, V_{CE} = 1200\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.1\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.072		$\mu s$
			$T_{vj} = 125\ ^\circ C$	0.078		
			$T_{vj} = 150\ ^\circ C$	0.083		
Turn-off delay time (inductive load)	$t_{doff}$	$I_C = 1800\ A, V_{CE} = 1200\ V, V_{GE} = \pm 15\ V, R_{Goff} = 1.5\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.955		$\mu s$
			$T_{vj} = 125\ ^\circ C$	1.050		
			$T_{vj} = 150\ ^\circ C$	1.080		
Fall time (inductive load)	$t_f$	$I_C = 1800\ A, V_{CE} = 1200\ V, V_{GE} = \pm 15\ V, R_{Goff} = 1.5\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.770		$\mu s$
			$T_{vj} = 125\ ^\circ C$	1.020		
			$T_{vj} = 150\ ^\circ C$	1.100		
Turn-on time (resistive load)	$t_{on\_R}$	$I_C = 500\ A, V_{CE} = 2000\ V, V_{GE} = \pm 15\ V, R_{Gon} = 0.1\ \Omega$	0.79			$\mu s$

**(table continues...)**

**Table 4 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-on energy loss per pulse	$E_{on}$	$I_C = 1800\text{ A}$ , $V_{CE} = 1200\text{ V}$ , $L_\sigma = 20\text{ nH}$ , $V_{GE} = \pm 15\text{ V}$ , $R_{Gon} = 0.1\ \Omega$ , $di/dt =$ $17500\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ }^\circ\text{C}$ )	$T_{vj} = 25\text{ }^\circ\text{C}$	570		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	815		
			$T_{vj} = 150\text{ }^\circ\text{C}$	915		
Turn-off energy loss per pulse	$E_{off}$	$I_C = 1800\text{ A}$ , $V_{CE} = 1200\text{ V}$ , $L_\sigma = 20\text{ nH}$ , $V_{GE} = \pm 15\text{ V}$ , $R_{Goff} = 1.5\ \Omega$ , $dv/dt =$ $4050\text{ V}/\mu\text{s}$ ( $T_{vj} = 150\text{ }^\circ\text{C}$ )	$T_{vj} = 25\text{ }^\circ\text{C}$	885		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	1160		
			$T_{vj} = 150\text{ }^\circ\text{C}$	1240		
SC data	$I_{SC}$	$V_{GE} \leq 15\text{ V}$ , $V_{CC} = 1200\text{ V}$ , $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 7\ \mu\text{s}$ , $T_{vj} = 150\text{ }^\circ\text{C}$	8000		A
Thermal resistance, junction to heat sink	$R_{thJH}$	per IGBT, Valid with IFX pre-applied Thermal Interface Material				27.4 K/kW
Temperature under switching conditions	$T_{vj\ op}$			-40		150 $^\circ\text{C}$

Note:  $R_{thJH}$  max. value is valid for  $T_C = 105\text{ }^\circ\text{C}$ .

### 3 Diode, Inverter

**Table 5 Maximum rated values**

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak reverse voltage	$V_{RRM}$	$T_{vj} = 25\text{ }^\circ\text{C}$	2300	V	
Continuous DC forward current	$I_F$		1800	A	
Repetitive peak forward current	$I_{FRM}$	$t_p = 1\text{ ms}$	3600	A	
$I^2t$ - value	$I^2t$	$t_p = 10\text{ ms}$ , $V_R = 0\text{ V}$	$T_{vj} = 125\text{ }^\circ\text{C}$	220	kA <sup>2</sup> s
			$T_{vj} = 150\text{ }^\circ\text{C}$	205	
Maximum power dissipation	$P_{RQM}$	$T_{vj} = 150\text{ }^\circ\text{C}$	2700	kW	

**Table 6 Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Forward voltage	$V_F$	$I_F = 1800\text{ A}$ , $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$		3.25	3.64	V
			$T_{vj} = 125\text{ }^\circ\text{C}$		3.00	3.33	
			$T_{vj} = 150\text{ }^\circ\text{C}$		2.95	3.22	

(table continues...)

**Table 6 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Peak reverse recovery current	$I_{RM}$	$V_R = 1200\text{ V}$ , $I_F = 1800\text{ A}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 17500\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ °C}$ )	$T_{vj} = 25\text{ °C}$	1700		A
			$T_{vj} = 125\text{ °C}$	1870		
			$T_{vj} = 150\text{ °C}$	1880		
Recovered charge	$Q_r$	$V_R = 1200\text{ V}$ , $I_F = 1800\text{ A}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 17500\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ °C}$ )	$T_{vj} = 25\text{ °C}$	300		$\mu\text{C}$
			$T_{vj} = 125\text{ °C}$	625		
			$T_{vj} = 150\text{ °C}$	740		
Reverse recovery energy	$E_{rec}$	$V_R = 1200\text{ V}$ , $I_F = 1800\text{ A}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 17500\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ °C}$ )	$T_{vj} = 25\text{ °C}$	240		mJ
			$T_{vj} = 125\text{ °C}$	500		
			$T_{vj} = 150\text{ °C}$	590		
Thermal resistance, junction to heat sink	$R_{thJH}$	per diode, Valid with IFX pre-applied Thermal Interface Material			53.6	K/kW
Temperature under switching conditions	$T_{vj\text{op}}$		-40		150	$^{\circ}\text{C}$

Note:  $R_{thJH}$  max. value is valid for  $T_C = 90\text{ °C}$ .

## 4 IGBT, 3-Level

**Table 7 Maximum rated values**

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	$V_{CES}$	$T_{vj} = 25\text{ °C}$	2300	V
Implemented collector current	$I_{CN}$		1800	A
Continuous DC collector current	$I_{CDC}$	$T_{vj\text{max}} = 150\text{ °C}$ $T_H = 45\text{ °C}$	1420	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{vj\text{op}}$	3600	A
Gate-emitter peak voltage	$V_{GES}$		$\pm 20$	V

**Table 8 Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\text{sat}}$	$I_C = 1800\text{ A}$ , $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$	1.80	2.26	V
			$T_{vj} = 125\text{ °C}$	2.15	2.94	
			$T_{vj} = 150\text{ °C}$	2.25	3.13	
Gate threshold voltage	$V_{GEth}$	$I_C = 49.5\text{ mA}$ , $V_{CE} = V_{GE}$ , $T_{vj} = 25\text{ °C}$	5.15	5.80	6.45	V

(table continues...)

**Table 8 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Gate charge	$Q_G$	$V_{GE} = \pm 15\text{ V}$		14.6		$\mu\text{C}$
Internal gate resistor	$R_{Gint}$	$T_{vj} = 25\text{ }^\circ\text{C}$		0.96		$\Omega$
Input capacitance	$C_{ies}$	$f = 1000\text{ kHz}, T_{vj} = 25\text{ }^\circ\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		420		nF
Reverse transfer capacitance	$C_{res}$	$f = 1000\text{ kHz}, T_{vj} = 25\text{ }^\circ\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		0.5		nF
Collector-emitter cut-off current	$I_{CES}$	$V_{CE} = 2300\text{ V}, V_{GE} = 0\text{ V}$ $T_{vj} = 125\text{ }^\circ\text{C}$			30	mA
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25\text{ }^\circ\text{C}$			400	nA
Turn-on delay time (inductive load)	$t_{don}$	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$	0.555		$\mu\text{s}$
			$T_{vj} = 125\text{ }^\circ\text{C}$	0.580		
			$T_{vj} = 150\text{ }^\circ\text{C}$	0.590		
Rise time (inductive load)	$t_r$	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}$	$T_{vj} = 25\text{ }^\circ\text{C}$	0.190		$\mu\text{s}$
			$T_{vj} = 125\text{ }^\circ\text{C}$	0.205		
			$T_{vj} = 150\text{ }^\circ\text{C}$	0.215		
Turn-off delay time (inductive load)	$t_{doff}$	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Goff} = 1.5\text{ }\Omega$	$T_{vj} = 25\text{ }^\circ\text{C}$	0.885		$\mu\text{s}$
			$T_{vj} = 125\text{ }^\circ\text{C}$	0.955		
			$T_{vj} = 150\text{ }^\circ\text{C}$	0.980		
Fall time (inductive load)	$t_f$	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, R_{Goff} = 1.5\text{ }\Omega$	$T_{vj} = 25\text{ }^\circ\text{C}$	0.630		$\mu\text{s}$
			$T_{vj} = 125\text{ }^\circ\text{C}$	0.875		
			$T_{vj} = 150\text{ }^\circ\text{C}$	0.930		
Turn-on energy loss per pulse	$E_{on}$	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, L_\sigma = 50\text{ nH}, V_{GE} = \pm 15\text{ V}, R_{Gon} = 0.1\text{ }\Omega, di/dt = 6700\text{ A}/\mu\text{s} (T_{vj} = 150\text{ }^\circ\text{C})$	$T_{vj} = 25\text{ }^\circ\text{C}$	240		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	380		
			$T_{vj} = 150\text{ }^\circ\text{C}$	430		
Turn-off energy loss per pulse	$E_{off}$	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, L_\sigma = 50\text{ nH}, V_{GE} = \pm 15\text{ V}, R_{Goff} = 1.5\text{ }\Omega, dv/dt = 3150\text{ V}/\mu\text{s} (T_{vj} = 150\text{ }^\circ\text{C})$	$T_{vj} = 25\text{ }^\circ\text{C}$	490		mJ
			$T_{vj} = 125\text{ }^\circ\text{C}$	630		
			$T_{vj} = 150\text{ }^\circ\text{C}$	665		
Thermal resistance, junction to heat sink	$R_{thJH}$	per IGBT, Valid with IFX pre-applied Thermal Interface Material			27.4	K/kW
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	$^\circ\text{C}$

Note:  $R_{thJH}$  max. value is valid for  $T_C = 105\text{ }^\circ\text{C}$ .

## 5 Diode, 3-Level

**Table 9** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak reverse voltage	$V_{RRM}$	$T_{vj} = 25\text{ °C}$	2300	V
Continuous DC forward current	$I_F$		1800	A
Repetitive peak forward current	$I_{FRM}$	$t_p = 1\text{ ms}$	3600	A

**Table 10** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$V_F$	$I_F = 1800\text{ A}$ , $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$	3.25	3.64	V
			$T_{vj} = 125\text{ °C}$	3.00	3.33	
			$T_{vj} = 150\text{ °C}$	2.95	3.22	
Peak reverse recovery current	$I_{RM}$	$V_R = 600\text{ V}$ , $I_F = 1800\text{ A}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 8200\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ °C}$ )	$T_{vj} = 25\text{ °C}$	1120		A
			$T_{vj} = 125\text{ °C}$	1450		
			$T_{vj} = 150\text{ °C}$	1530		
Recovered charge	$Q_r$	$V_R = 600\text{ V}$ , $I_F = 1800\text{ A}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 8200\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ °C}$ )	$T_{vj} = 25\text{ °C}$	295		$\mu\text{C}$
			$T_{vj} = 125\text{ °C}$	580		
			$T_{vj} = 150\text{ °C}$	665		
Reverse recovery energy	$E_{rec}$	$V_R = 600\text{ V}$ , $I_F = 1800\text{ A}$ , $V_{GE} = -15\text{ V}$ , $-di_F/dt = 8200\text{ A}/\mu\text{s}$ ( $T_{vj} = 150\text{ °C}$ )	$T_{vj} = 25\text{ °C}$	170		mJ
			$T_{vj} = 125\text{ °C}$	320		
			$T_{vj} = 150\text{ °C}$	365		
Thermal resistance, junction to heat sink	$R_{thJH}$	per diode, Valid with IFX pre-applied Thermal Interface Material			53.6	K/kW
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	$^{\circ}\text{C}$

**Note:** Dynamic data for 3-level valid in conjunction with FF2400RB12IP7.  
 $T_{vj\text{ op}}$  up to 175 °C is allowed for operations in overload conditions. For detailed specifications please refer to AN2021-11.  
 $R_{thJH}$  max. value is valid for  $T_C = 90\text{ °C}$ .

## 6 NTC-Thermistor

**Table 11** 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 $R_{100}$	$\Delta R/R$	$T_{NTC} = 100\text{ °C}, R_{100} = 493\ \Omega$	-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

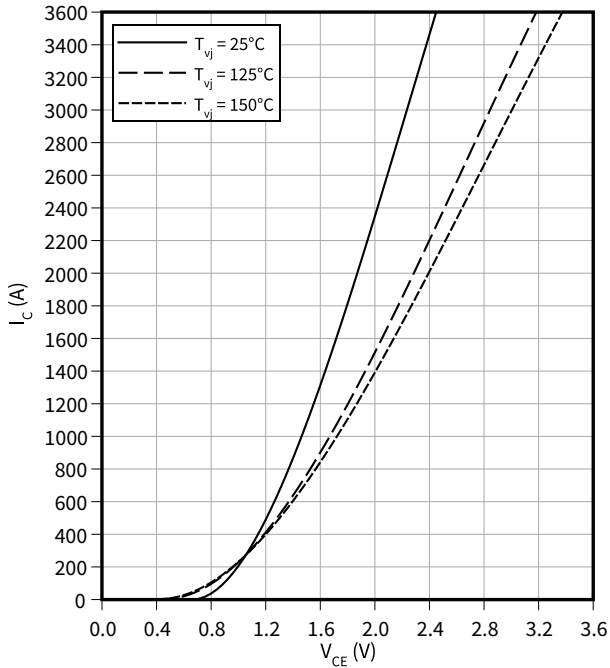
Note: For detailed specifications please refer to AN2009-10.

## 7 Characteristics diagrams

### Output characteristic (typical), IGBT, Inverter

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

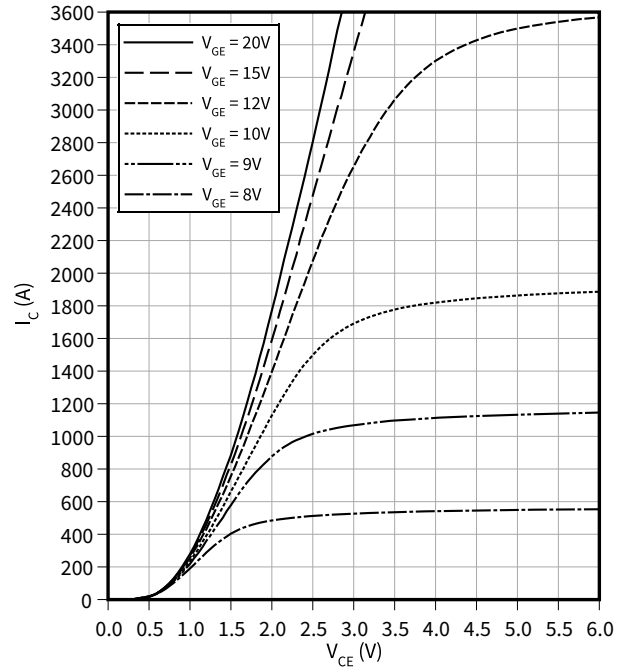
$$V_{GE} = 15 \text{ V}$$



### Output characteristic field (typical), IGBT, Inverter

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

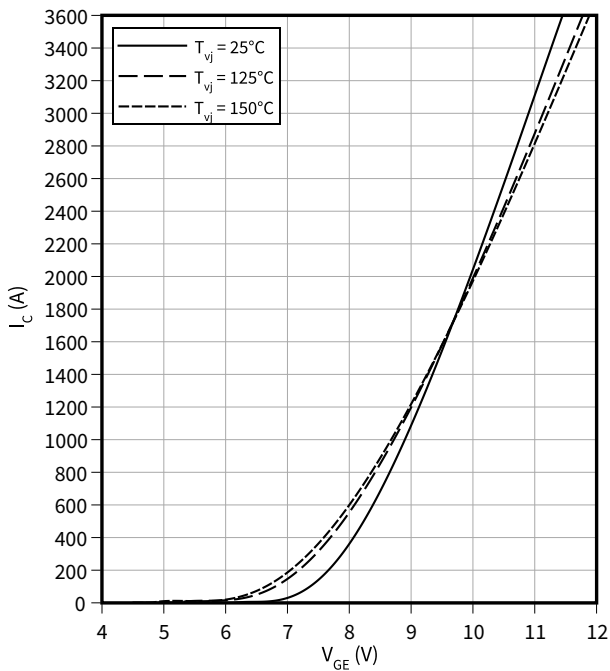
$$T_{vj} = 150 \text{ °C}$$



### Transfer characteristic (typical), IGBT, Inverter

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

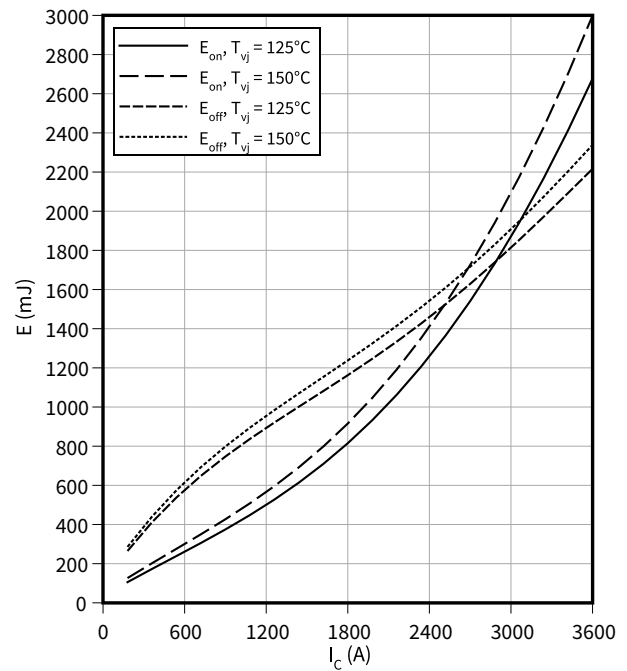
$$V_{CE} = 20 \text{ V}$$



### Switching losses (typical), IGBT, Inverter

$$E = f(I_C)$$

$$R_{Goff} = 1.5 \text{ } \Omega, R_{Gon} = 0.1 \text{ } \Omega, V_{CE} = 1200 \text{ V}, V_{GE} = \pm 15 \text{ V}$$

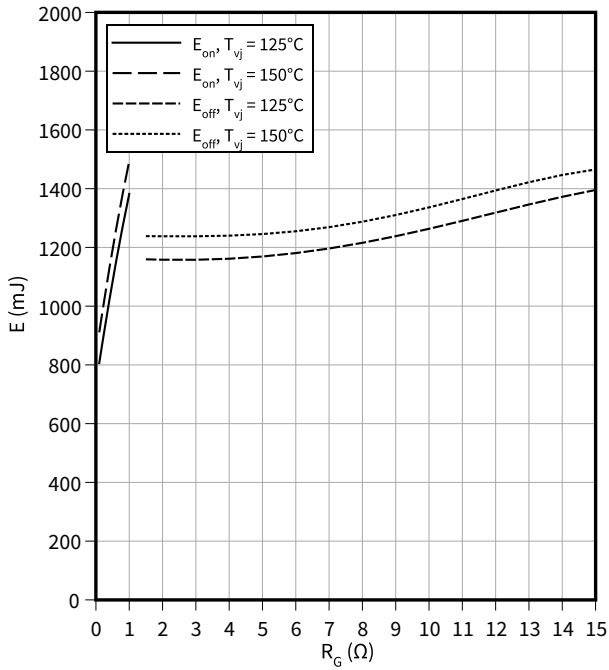


7 Characteristics diagrams

**Switching losses (typical), IGBT, Inverter**

$E = f(R_G)$

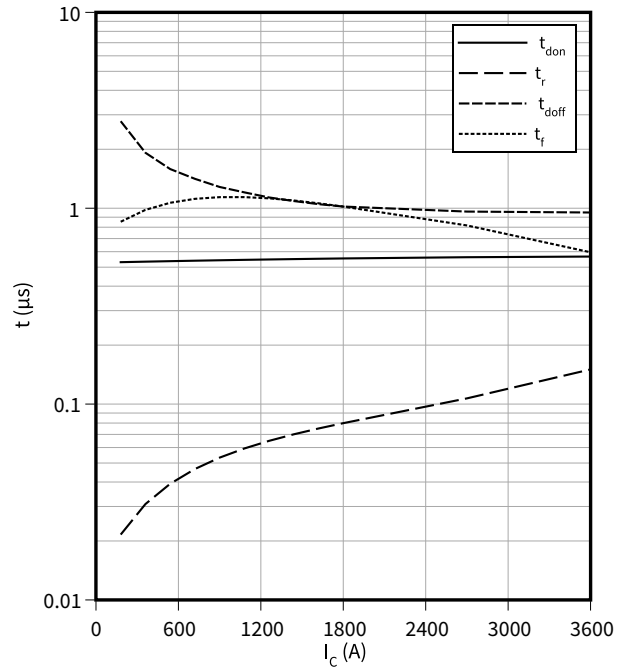
$I_C = 1800 \text{ A}$ ,  $V_{CE} = 1200 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$



**Switching times (typical), IGBT, Inverter**

$t = f(I_C)$

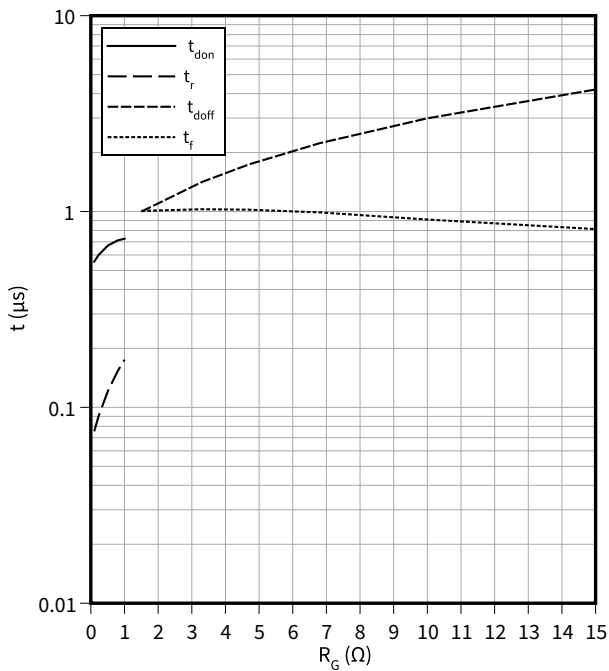
$R_{Goff} = 1.5 \Omega$ ,  $R_{Gon} = 0.1 \Omega$ ,  $V_{CE} = 1200 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 150 \text{ °C}$



**Switching times (typical), IGBT, Inverter**

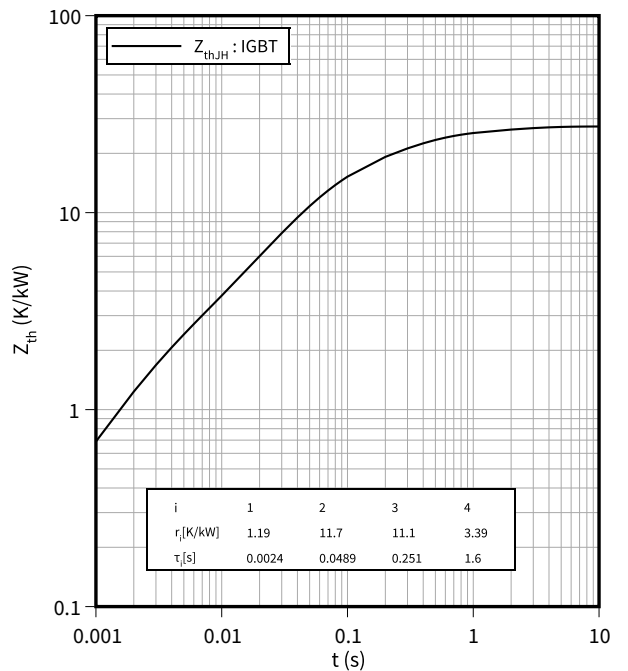
$t = f(R_G)$

$V_{CE} = 1200 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 1800 \text{ A}$ ,  $T_{vj} = 150 \text{ °C}$



**Transient thermal impedance, IGBT, Inverter**

$Z_{th} = f(t)$

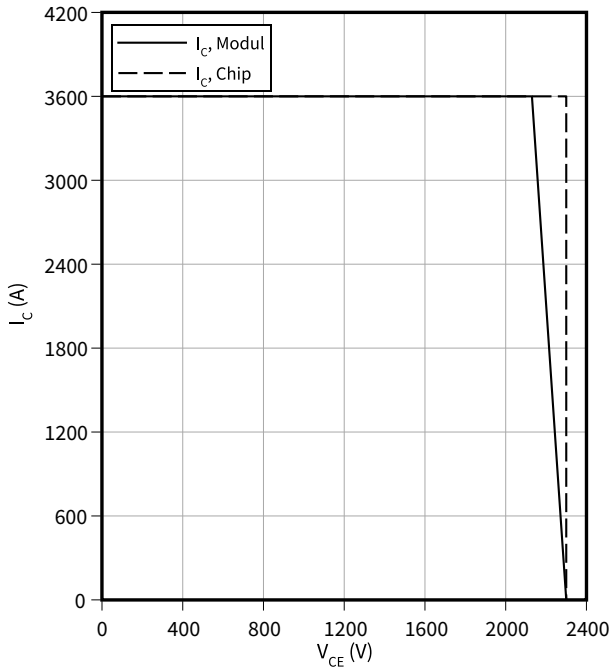


7 Characteristics diagrams

**Reverse bias safe operating area (RBSOA), IGBT, Inverter**

$I_C = f(V_{CE})$

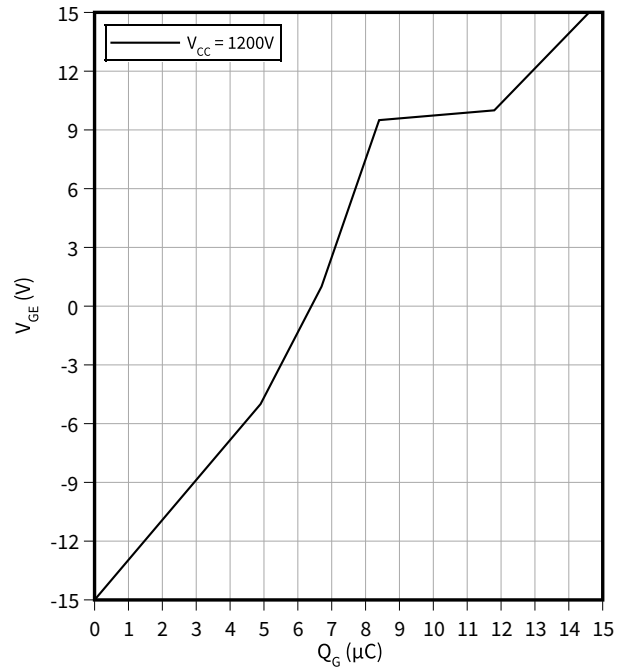
$R_{Goff} = 1.5 \Omega$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 150 \text{ }^\circ\text{C}$



**Gate charge characteristic (typical), IGBT, Inverter**

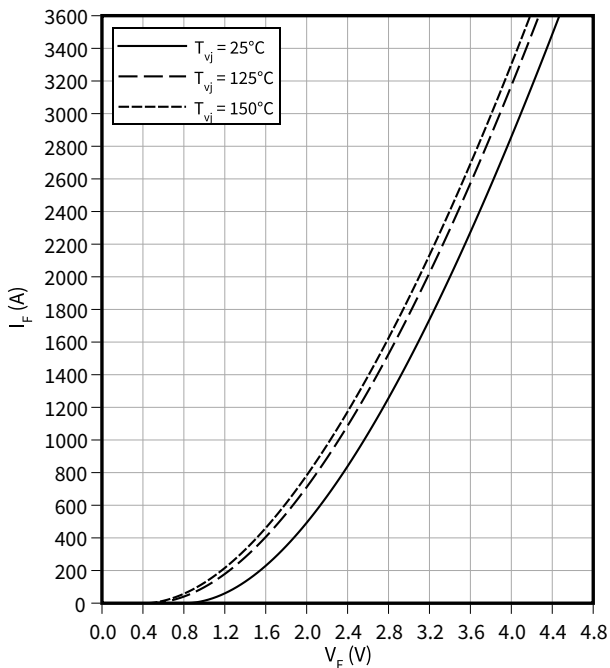
$V_{GE} = f(Q_G)$

$I_C = 1800 \text{ A}$ ,  $T_{vj} = 25 \text{ }^\circ\text{C}$



**Forward characteristic (typical), Diode, Inverter**

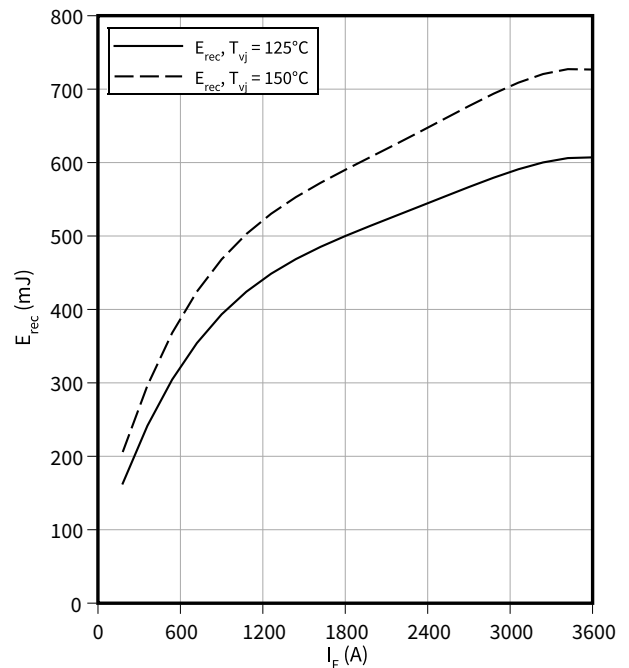
$I_F = f(V_F)$



**Switching losses (typical), Diode, Inverter**

$E_{rec} = f(I_F)$

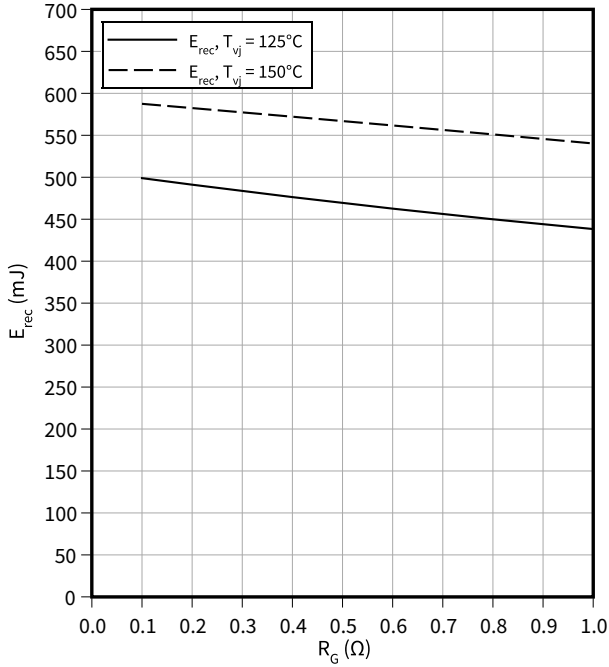
$V_{CE} = 1200 \text{ V}$ ,  $R_{Gon} = R_{Gon}(\text{IGBT})$



7 Characteristics diagrams

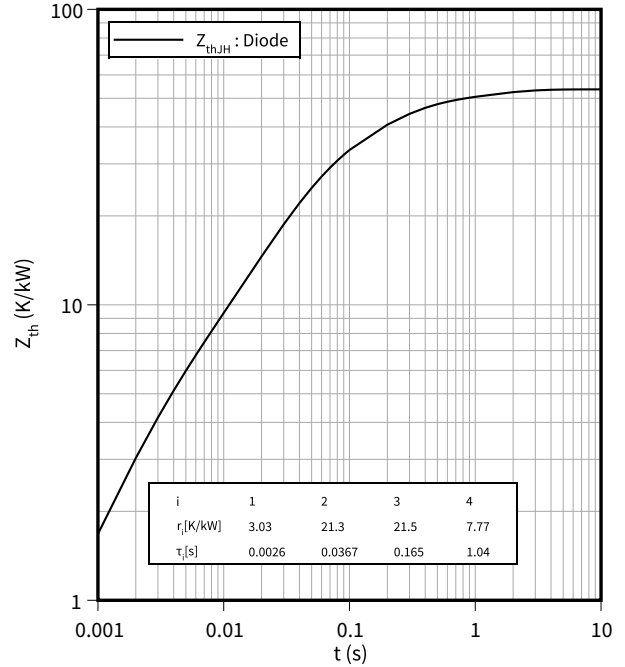
**Switching losses (typical), Diode, Inverter**

$E_{rec} = f(R_G)$   
 $I_F = 1800 \text{ A}$ ,  $V_{CE} = 1200 \text{ V}$



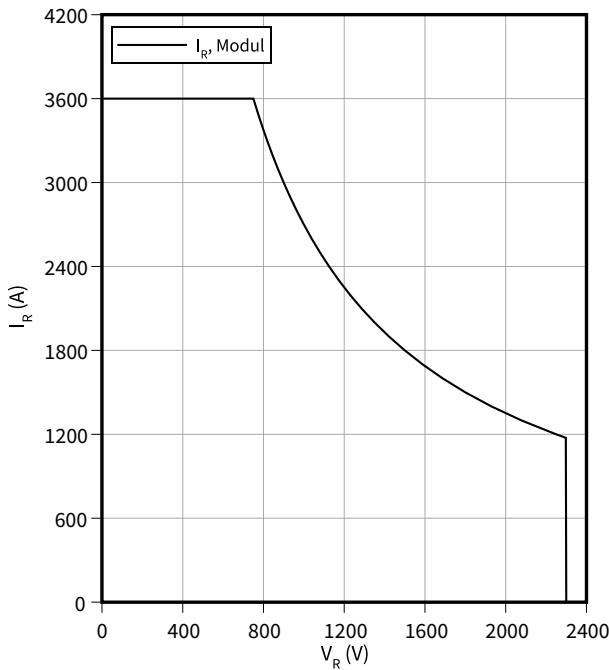
**Transient thermal impedance, Diode, Inverter**

$Z_{th} = f(t)$



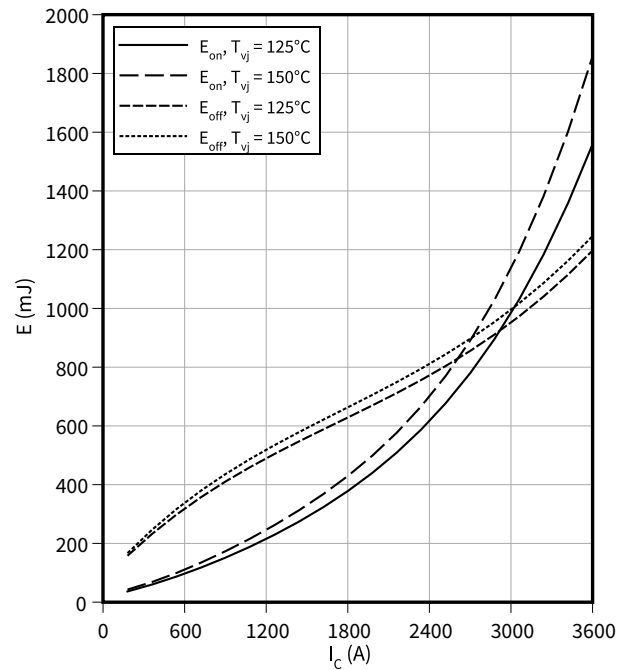
**Safe operating area (SOA), Diode, Inverter**

$I_R = f(V_R)$   
 $T_{vj} = 150 \text{ °C}$



**Switching losses (typical), IGBT, 3-Level**

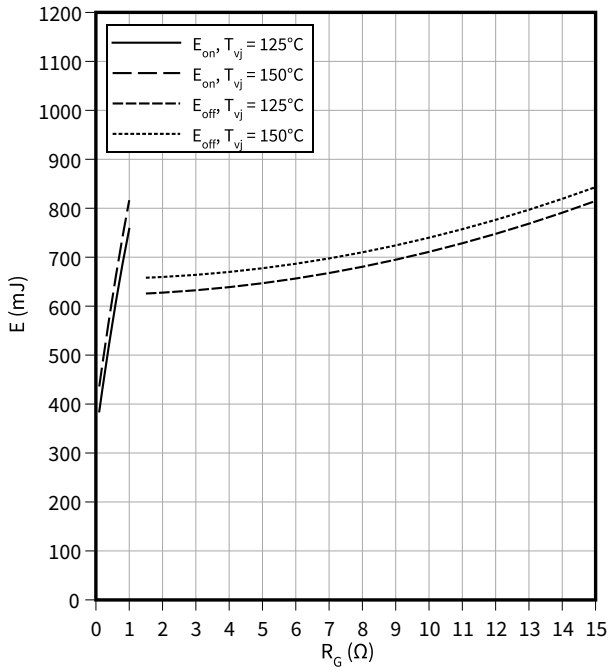
$E = f(I_C)$   
 $R_{Goff} = 1.5 \text{ } \Omega$ ,  $R_{Gon} = 0.1 \text{ } \Omega$ ,  $V_{CE} = 600 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$



**Switching losses (typical), IGBT, 3-Level**

$E = f(R_G)$

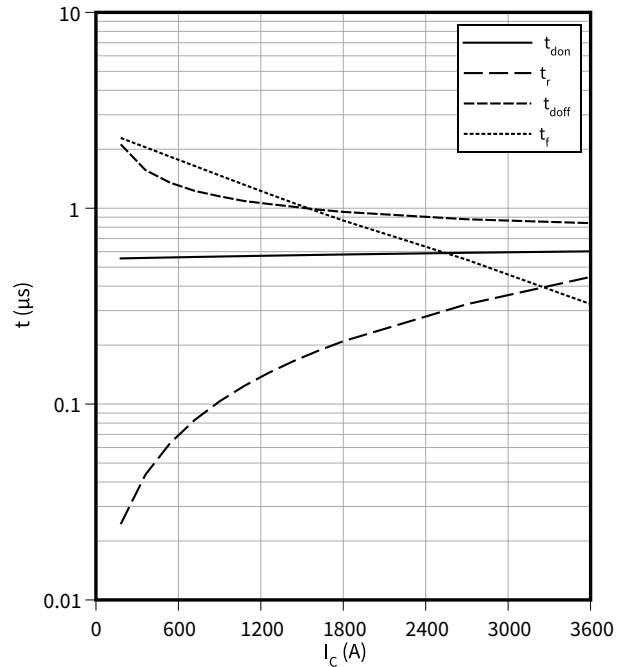
$I_C = 1800 \text{ A}$ ,  $V_{CE} = 600 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$



**Switching times (typical), IGBT, 3-Level**

$t = f(I_C)$

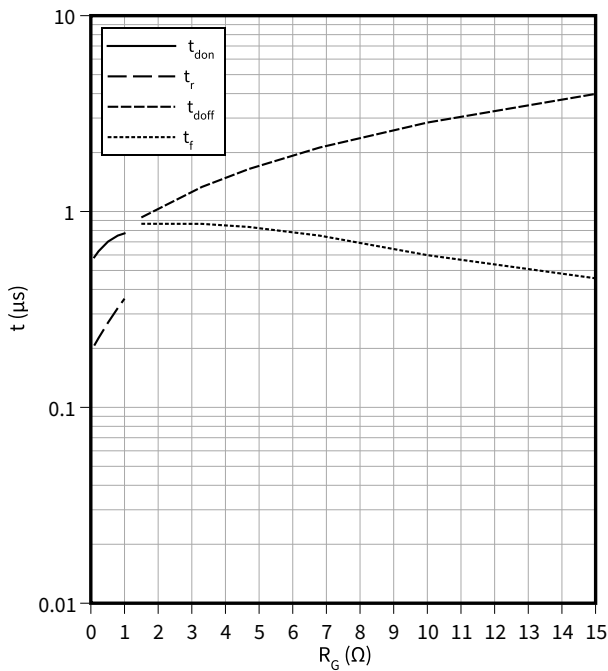
$R_{Goff} = 1.5 \Omega$ ,  $R_{Gon} = 0.1 \Omega$ ,  $V_{CE} = 600 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 150 \text{ °C}$



**Switching times (typical), IGBT, 3-Level**

$t = f(R_G)$

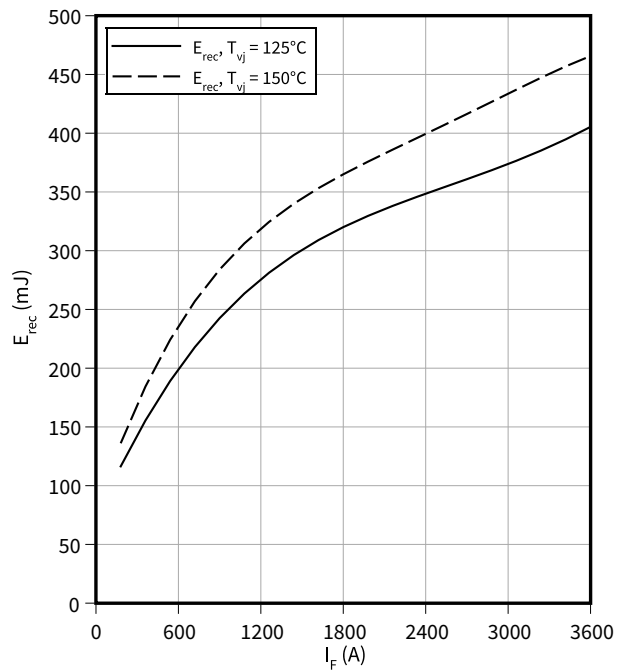
$I_C = 1800 \text{ A}$ ,  $V_{CE} = 600 \text{ V}$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  $T_{vj} = 150 \text{ °C}$



**Switching losses (typical), Diode, 3-Level**

$E_{rec} = f(I_F)$

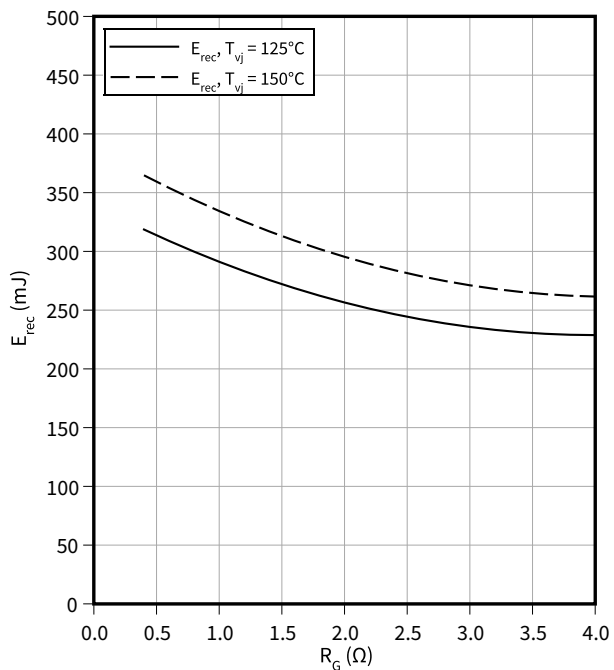
$V_{CE} = 600 \text{ V}$ ,  $R_{Gon} = R_{Gon}(\text{IGBT})$



**Switching losses (typical), Diode, 3-Level**

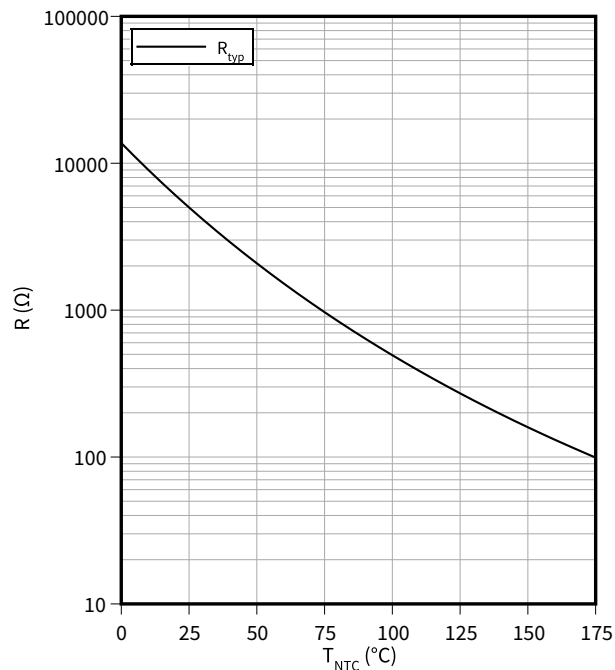
$E_{rec} = f(R_G)$

$V_{CE} = 600\text{ V}, I_F = 1800\text{ A}$



**Temperature characteristic (typical), NTC-Thermistor**

$R = f(T_{NTC})$



### 8 Circuit diagram

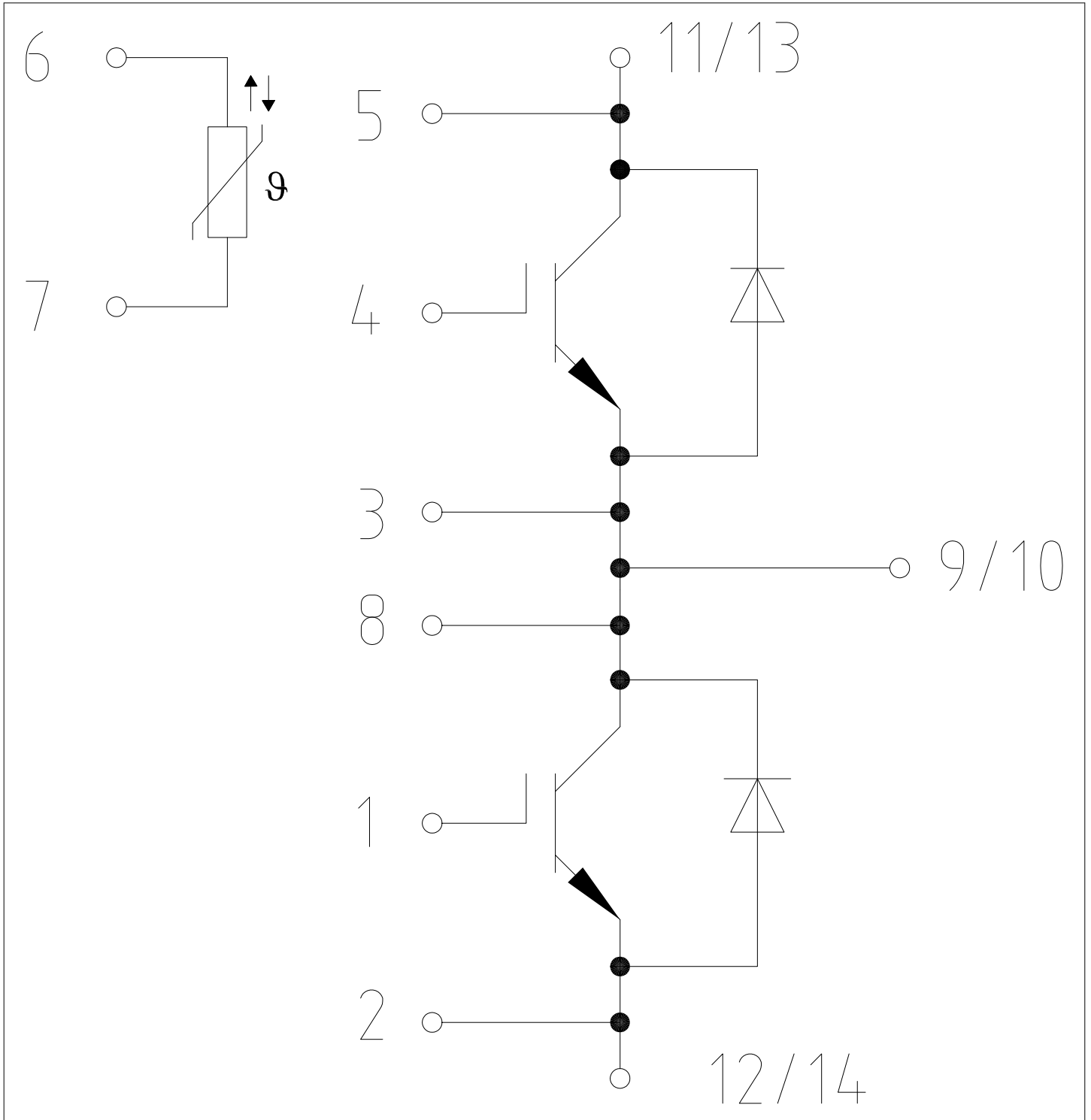
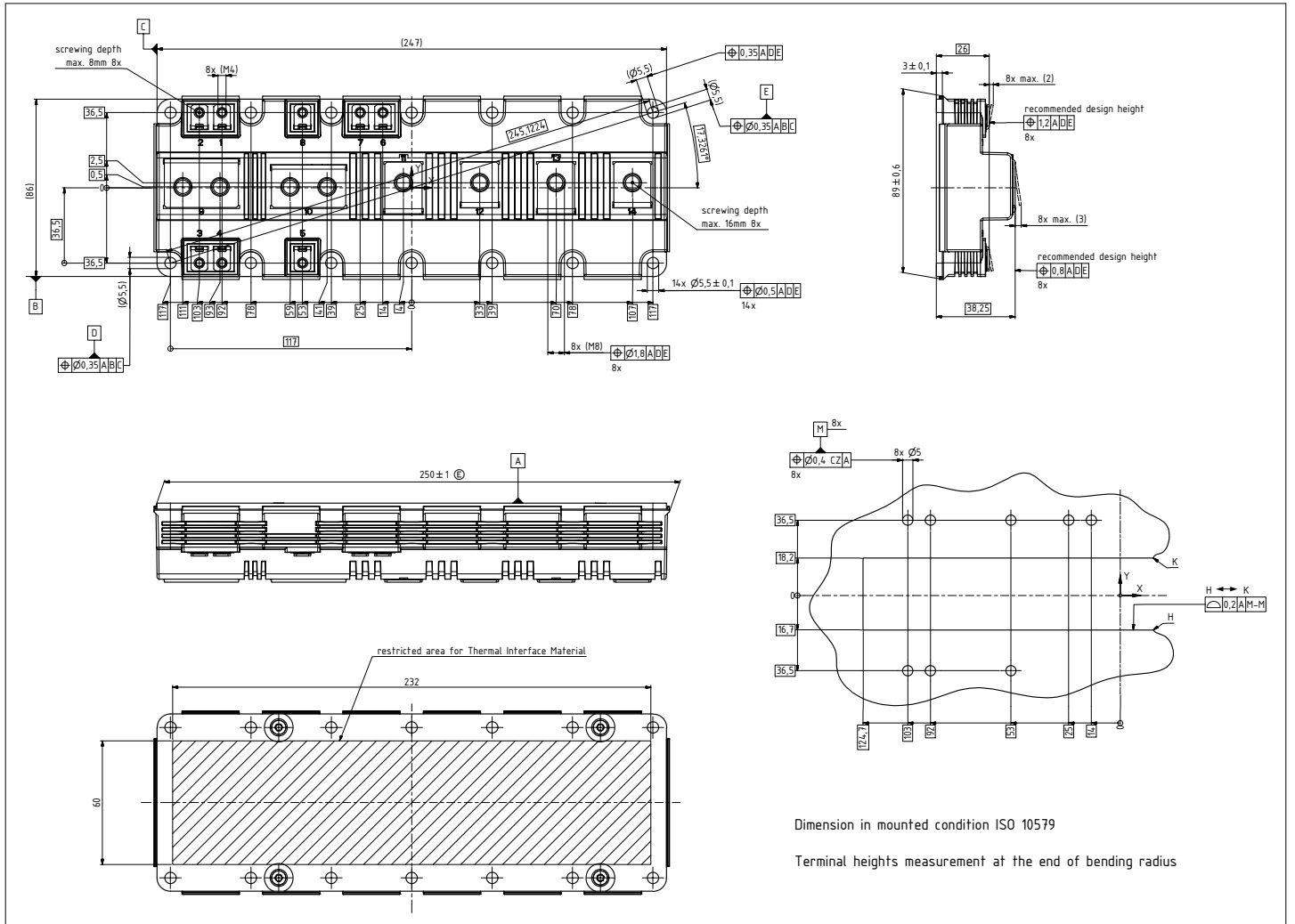



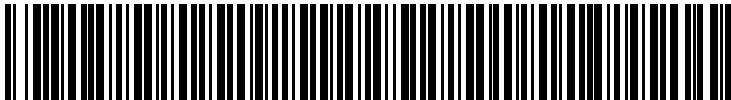
Figure 1

## 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
1.00	2022-05-03	Final datasheet

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

**Document reference**

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