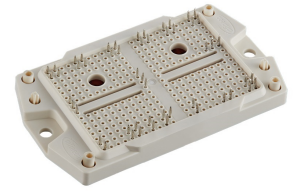


EasyPACK™ module with TRENCHSTOP™ 5 and Emitter Controlled 3 diode and PressFIT / NTC

Features

- Electrical features
 - $V_{CES} = 650\text{ V}$
 - $I_{C\text{ nom}} = 100\text{ A} / I_{CRM} = 200\text{ A}$
 - Low switching losses
- Mechanical features
 - Al_2O_3 substrate with low thermal resistance
 - Integrated NTC temperature sensor
 - PressFIT contact technology



Potential applications

- Solar applications
- 3-level-applications

Product validation

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

Description

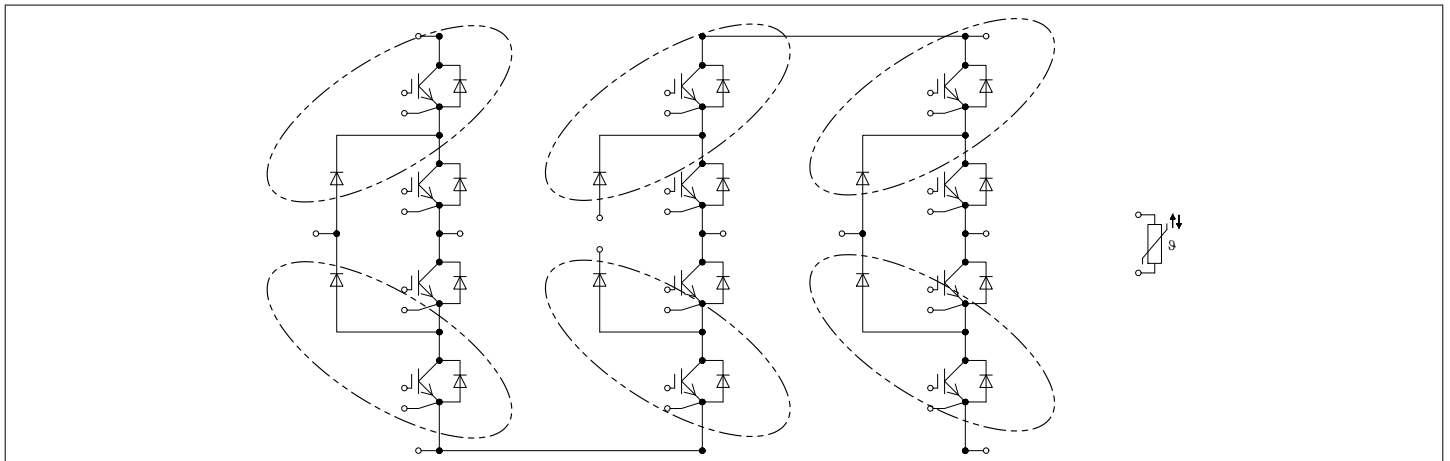


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1 Package

1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	3.0	kV
Internal Isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{Creep}	terminal to heatsink	9.6	mm
Creepage distance	d_{Creep}	terminal to terminal	6.8	mm
Clearance	d_{Clear}	terminal to heatsink	9.4	mm
Clearance	d_{Clear}	terminal to terminal	5.5	mm
Comparative tracking index	CTI		> 400	
RTI Elec.	RTI	housing	140	°C

Table 2 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Stray inductance module	L_{SCE}			28		nH
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_H = 25^\circ\text{C}$, per switch		1.6		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting torque for modul 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 25 A rms per connector pin.

2 IGBT,3-Level

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Collector-emitter voltage	V_{CES}	$T_{vj} = 25^\circ\text{C}$	650	V
Implemented collector current	I_{CN}		100	A
Continuous DC collector current	I_{CDC}	$T_{vj \max} = 175^\circ\text{C}$ $T_H = 65^\circ\text{C}$	70	A
Repetitive peak collector current	I_{CRM}	$t_p = 1 \text{ ms}$	200	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	$V_{CE\ sat}$	$I_C = 50\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$		1.17	1.38	V
			$T_{vj} = 125\ ^\circ C$		1.20		
			$T_{vj} = 150\ ^\circ C$		1.21		
Gate threshold voltage	V_{GEth}	$I_C = 1\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$		3.25	4	4.75	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CE} = 400\ V$			0.42		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$			0		Ω
Input capacitance	C_{ies}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			7.1		nF
Reverse transfer capacitance	C_{res}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.025		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 650\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$			0.007	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\ V, V_{GE} = 20\ V, T_{vj} = 25\ ^\circ C$				100	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 50\ A, V_{CE} = 300\ V, V_{GE} = \pm 15\ V, R_{Gon} = 8.2\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.026		μs
			$T_{vj} = 125\ ^\circ C$		0.028		
			$T_{vj} = 150\ ^\circ C$		0.028		
Rise time (inductive load)	t_r	$I_C = 50\ A, V_{CE} = 300\ V, V_{GE} = \pm 15\ V, R_{Gon} = 8.2\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.011		μs
			$T_{vj} = 125\ ^\circ C$		0.012		
			$T_{vj} = 150\ ^\circ C$		0.012		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 50\ A, V_{CE} = 300\ V, V_{GE} = \pm 15\ V, R_{Goff} = 8.2\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.140		μs
			$T_{vj} = 125\ ^\circ C$		0.170		
			$T_{vj} = 150\ ^\circ C$		0.180		
Fall time (inductive load)	t_f	$I_C = 50\ A, V_{CE} = 300\ V, V_{GE} = \pm 15\ V, R_{Goff} = 8.2\ \Omega$	$T_{vj} = 25\ ^\circ C$		0.020		μs
			$T_{vj} = 125\ ^\circ C$		0.050		
			$T_{vj} = 150\ ^\circ C$		0.050		
Turn-on energy loss per pulse	E_{on}	$I_C = 50\ A, V_{CE} = 300\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 8.2\ \Omega, di/dt = 2900\ A/\mu s (T_{vj} = 150\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		0.45		mJ
			$T_{vj} = 125\ ^\circ C$		0.66		
			$T_{vj} = 150\ ^\circ C$		0.72		
Turn-off energy loss per pulse	E_{off}	$I_C = 50\ A, V_{CE} = 300\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 8.2\ \Omega, dv/dt = 4500\ V/\mu s (T_{vj} = 150\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$		0.65		mJ
			$T_{vj} = 125\ ^\circ C$		0.92		
			$T_{vj} = 150\ ^\circ C$		1.02		
SC data	I_{SC}	$V_{GE} \leq 15\ V, V_{CC} = 360\ V, V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_P \leq 0\ \mu s, T_{vj} = 150\ ^\circ C$		800		A
Thermal resistance, junction to heatsink	R_{thJH}	per IGBT			0.886		K/W

Table 4 Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Temperature under switching conditions	$T_{vj\ op}$		-40		150	°C

3 IGBT, Inverter

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		$T_{vj} = 25\ ^\circ\text{C}$	650	V
Implemented collector current	I_{CN}			75	A
Continuous DC collector current	I_{CDC}	$T_{vj\ max} = 175\ ^\circ\text{C}$	$T_H = 65\ ^\circ\text{C}$	75	A
Repetitive peak collector current	I_{CRM}	$t_p = 1\ ms$		150	A
Gate-emitter peak voltage	V_{GES}			± 20	V

Table 6 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CE\ sat}$	$I_C = 50\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ\text{C}$		0.99	1.43	V
			$T_{vj} = 125\ ^\circ\text{C}$		0.94		
			$T_{vj} = 150\ ^\circ\text{C}$		0.91		
Gate threshold voltage	V_{GEth}	$I_C = 1\ mA, V_{CE} = 20\ V, T_{vj} = 25\ ^\circ\text{C}$		4.25	5	5.75	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CE} = 400\ V$			0.92		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ\text{C}$			0		Ω
Input capacitance	C_{ies}	$f = 100\ kHz, T_{vj} = 25\ ^\circ\text{C}, V_{CE} = 25\ V, V_{GE} = 0\ V$			11.8		nF
Reverse transfer capacitance	C_{res}	$f = 100\ kHz, T_{vj} = 25\ ^\circ\text{C}, V_{CE} = 25\ V, V_{GE} = 0\ V$			0.042		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 650\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ\text{C}$			0.007	mA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\ V, V_{GE} = 20\ V, T_{vj} = 25\ ^\circ\text{C}$				100	nA
Turn-on delay time (inductive load)	t_{don}	$I_C = 50\ A, V_{CE} = 300\ V, V_{GE} = \pm 15\ V, R_{Gon} = 8.2\ \Omega$	$T_{vj} = 25\ ^\circ\text{C}$		0.053		μs
			$T_{vj} = 125\ ^\circ\text{C}$		0.049		
			$T_{vj} = 150\ ^\circ\text{C}$		0.048		

Table 6 Characteristic values (continued)

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rise time (inductive load)	t_r	$I_C = 50 \text{ A}$, $V_{CE} = 300 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 8.2 \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.017		μs
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.018		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	0.019		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 50 \text{ A}$, $V_{CE} = 300 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 8.2 \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.330		μs
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.370		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	0.380		
Fall time (inductive load)	t_f	$I_C = 50 \text{ A}$, $V_{CE} = 300 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 8.2 \Omega$	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.130		μs
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.210		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	0.240		
Turn-on energy loss per pulse	E_{on}	$I_C = 50 \text{ A}$, $V_{CE} = 300 \text{ V}$, $L_\sigma = 35 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 8.2 \Omega$, $di/dt = 2400 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.29		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	0.34		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	0.36		
Turn-off energy loss per pulse	E_{off}	$I_C = 50 \text{ A}$, $V_{CE} = 300 \text{ V}$, $L_\sigma = 35 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 8.2 \Omega$, $dv/dt = 1600 \text{ V}/\mu\text{s}$ ($T_{vj} = 150 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	2.48		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	3.45		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	3.69		
SC data	I_{SC}	$V_{GE} \leq 15 \text{ V}$, $V_{CC} = 360 \text{ V}$, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_P \leq 0 \text{ } \mu\text{s}$, $T_{vj} \leq 150 \text{ }^\circ\text{C}$	900		A
Thermal resistance, junction to heatsink	R_{thJH}	per IGBT		0.902		K/W
Temperature under switching conditions	$T_{vj op}$		-40		150	$^\circ\text{C}$

4 Diode, 3-Level

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} = 25 \text{ }^\circ\text{C}$	650	V
Implemented forward current	I_{FN}		75	A
Continuous DC forward current	I_F		40	A
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$	150	A

Table 7 Maximum rated values (continued)

Parameter	Symbol	Note or test condition	Values	Unit
I^2t - value	I^2t	$V_R = 0 \text{ V}$, $t_P = 10 \text{ ms}$	$T_{vj} = 125 \text{ °C}$	A^2s
			$T_{vj} = 150 \text{ °C}$	

Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 40 \text{ A}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$	1.30	1.64	V
			$T_{vj} = 125 \text{ °C}$	1.20		
			$T_{vj} = 150 \text{ °C}$	1.15		
Peak reverse recovery current	I_{RM}	$I_F = 40 \text{ A}$, $V_R = 300 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2900 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	47		A
			$T_{vj} = 125 \text{ °C}$	60		
			$T_{vj} = 150 \text{ °C}$	66		
Recovered charge	Q_r	$I_F = 40 \text{ A}$, $V_R = 300 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2900 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	2.13		μC
			$T_{vj} = 125 \text{ °C}$	4.18		
			$T_{vj} = 150 \text{ °C}$	4.9		
Reverse recovery energy	E_{rec}	$I_F = 40 \text{ A}$, $V_R = 300 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2900 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	0.55		mJ
			$T_{vj} = 125 \text{ °C}$	1.04		
			$T_{vj} = 150 \text{ °C}$	1.23		
Thermal resistance, junction to heatsink	R_{thJH}	per diode		1.21		K/W
Temperature under switching conditions	$T_{vj \text{ op}}$		-40		150	°C

5 Diode, Inverter

Table 9 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}		75	A
Continuous DC forward current	I_F		40	A
Repetitive peak forward current	I_{FRM}	$t_P = 1 \text{ ms}$	150	A

Table 9 Maximum rated values (continued)

Parameter	Symbol	Note or test condition	Values	Unit
I^2t - value	I^2t	$V_R = 0 \text{ V}$, $t_P = 10 \text{ ms}$	$T_{vj} = 125 \text{ °C}$	A^2s
			$T_{vj} = 150 \text{ °C}$	
			370	
			360	

Table 10 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 40 \text{ A}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$		1.30	V
			$T_{vj} = 125 \text{ °C}$		1.20	
			$T_{vj} = 150 \text{ °C}$		1.15	
Peak reverse recovery current	I_{RM}	$I_F = 40 \text{ A}$, $V_R = 300 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2400 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	42		A
			$T_{vj} = 125 \text{ °C}$	55		
			$T_{vj} = 150 \text{ °C}$	59		
Recovered charge	Q_r	$I_F = 40 \text{ A}$, $V_R = 300 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2400 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	1.73		μC
			$T_{vj} = 125 \text{ °C}$	4.11		
			$T_{vj} = 150 \text{ °C}$	4.47		
Reverse recovery energy	E_{rec}	$I_F = 40 \text{ A}$, $V_R = 300 \text{ V}$, $V_{GE} = -15 \text{ V}$, $-di_F/dt = 2400 \text{ A}/\mu\text{s}$ ($T_{vj} = 150 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$	0.21		mJ
			$T_{vj} = 125 \text{ °C}$	1.03		
			$T_{vj} = 150 \text{ °C}$	1.18		
Thermal resistance, junction to heatsink	R_{thJH}	per diode		1.04		K/W
Temperature under switching conditions	$T_{vj \text{ op}}$		-40		150	°C

6 NTC-Thermistor

Table 11 Characteristic values

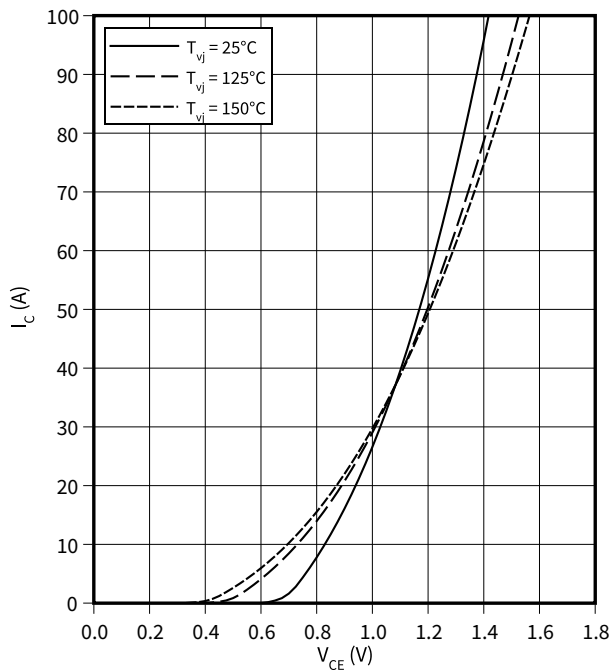
Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25 \text{ °C}$		5		kΩ
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100 \text{ °C}$, $R_{100} = 493 \text{ Ω}$	-5		5	%
Power dissipation	P_{25}	$T_{NTC} = 25 \text{ °C}$			20	mW
B-value	$B_{25/50}$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

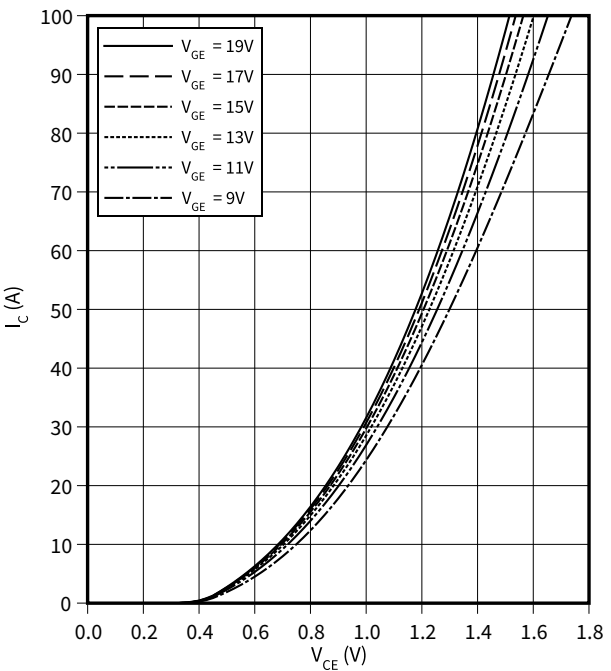
output characteristic (typical), IGBT,3-Level

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



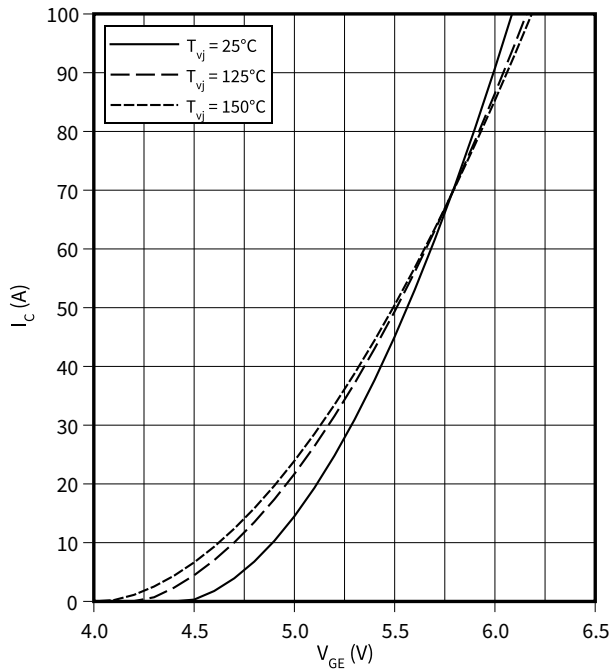
output characteristic (typical), IGBT,3-Level

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



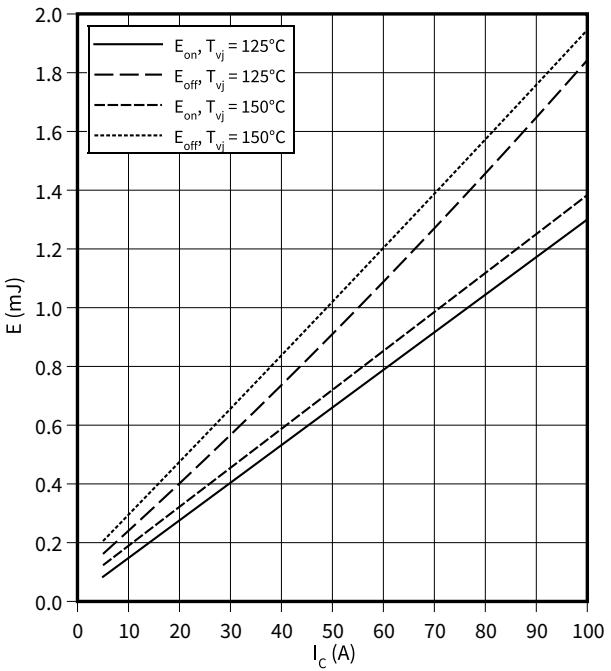
transfer characteristic (typical), IGBT,3-Level

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



switching losses (typical), IGBT,3-Level

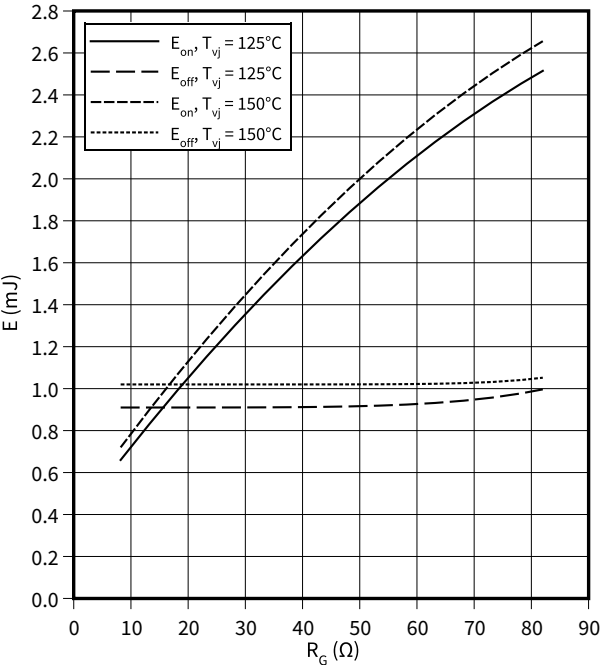
$E = f(I_C)$
 $R_{Goff} = 8.2\text{ }\Omega$, $R_{Gon} = 8.2\text{ }\Omega$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$



7 Characteristics diagrams

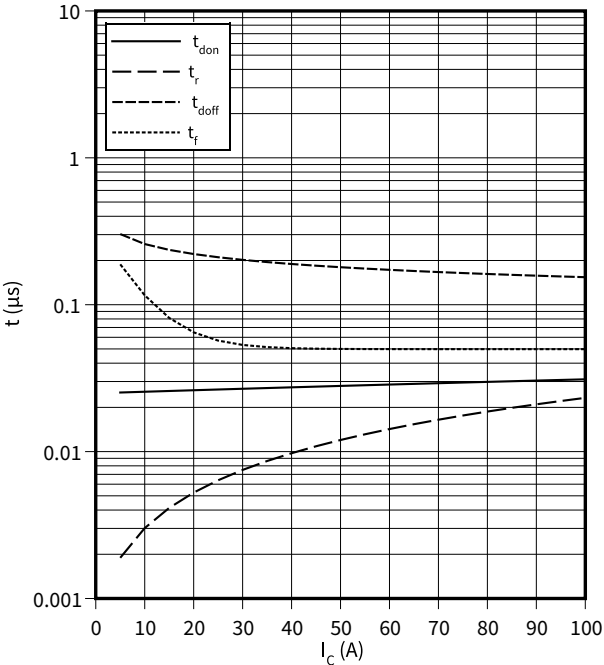
switching losses (typical), IGBT,3-Level

$E = f(R_G)$
 $I_C = 50\text{ A}$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$



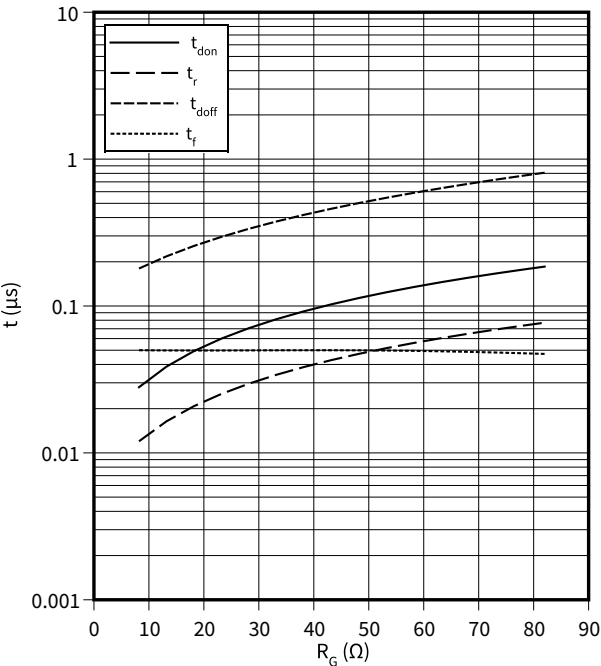
switching times (typical), IGBT,3-Level

$t = f(I_C)$
 $R_{Goff} = 8.2\text{ }\Omega$, $R_{Gon} = 8.2\text{ }\Omega$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $T_{vj} = 150\text{ }^\circ\text{C}$



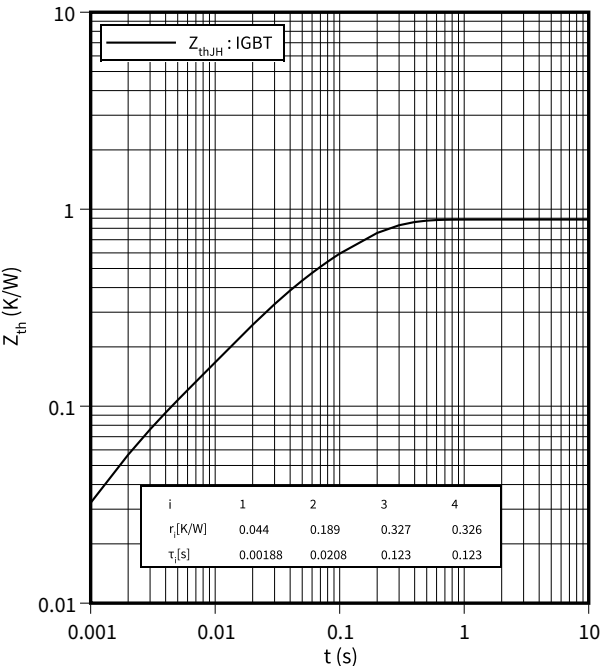
switching times (typical), IGBT,3-Level

$t = f(R_G)$
 $I_C = 50\text{ A}$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $T_{vj} = 150\text{ }^\circ\text{C}$



transient thermal impedance , IGBT,3-Level

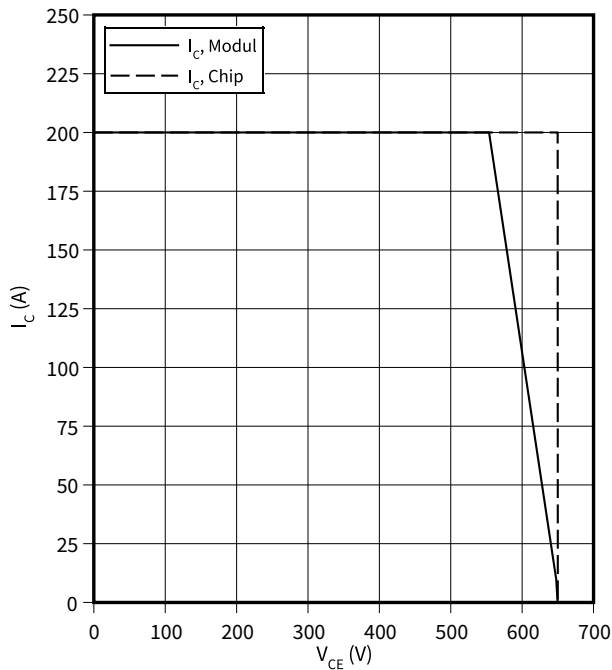
$Z_{th} = f(t)$



7 Characteristics diagrams

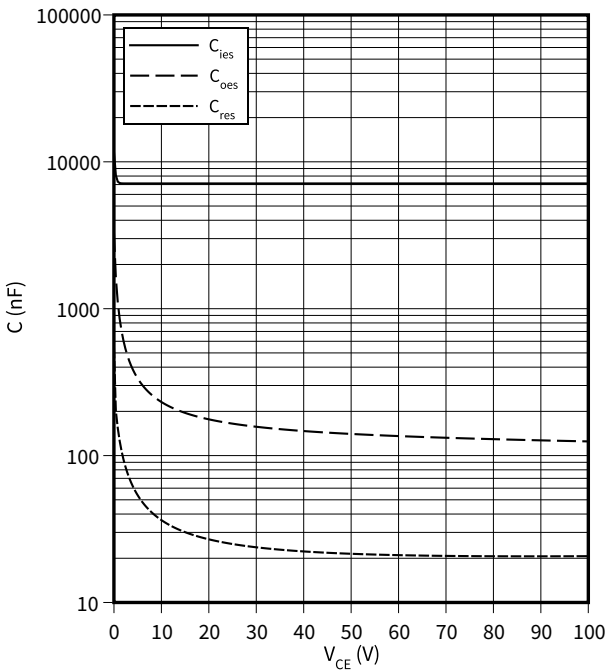
reverse bias safe operating area (RBSOA), IGBT,3-Level

$I_C = f(V_{CE})$
 $R_{Goff} = 8.2 \, \Omega$, $V_{GE} = \pm 15 \, V$, $T_{vj} = 150 \, ^\circ C$



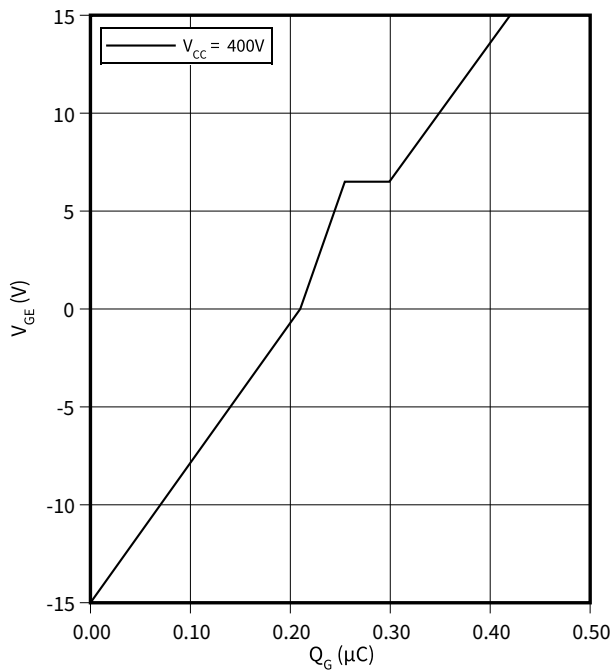
capacity characteristic (typical), IGBT,3-Level

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



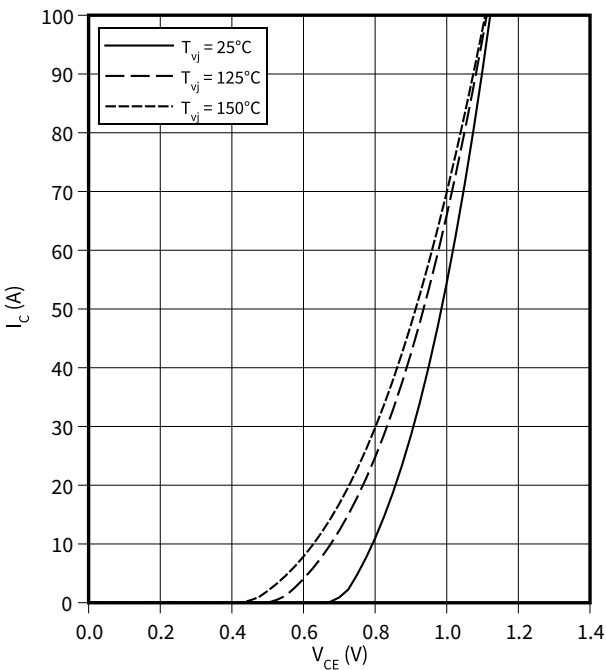
gate charge characteristic (typical), IGBT,3-Level

$V_{GE} = f(Q_G)$
 $I_C = 50 \, A$, $T_{vj} = 25 \, ^\circ C$



output characteristic (typical), IGBT, Inverter

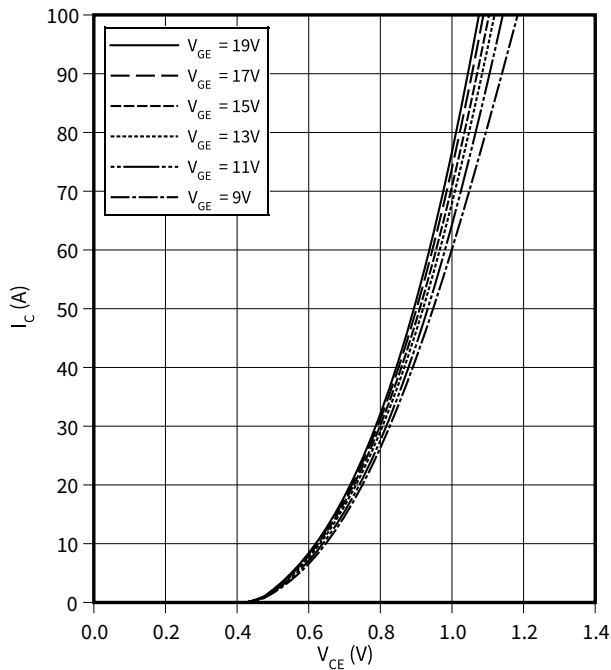
$I_C = f(V_{CE})$
 $V_{GE} = 15 \, V$



7 Characteristics diagrams

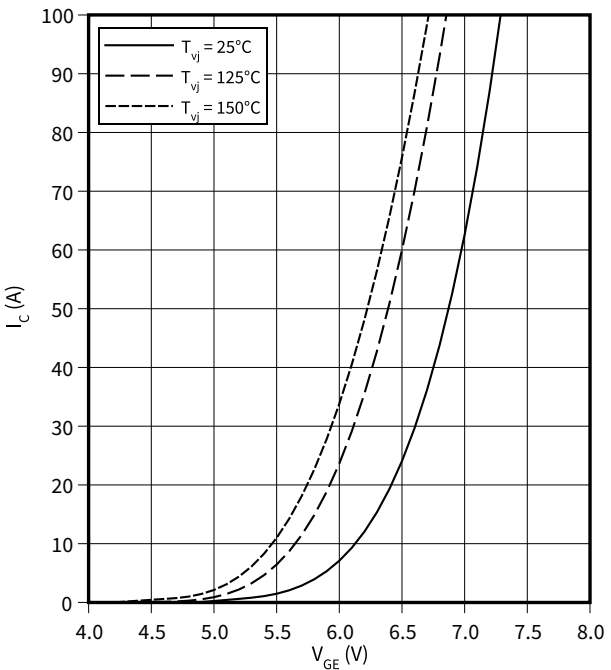
output characteristic (typical), IGBT, Inverter

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



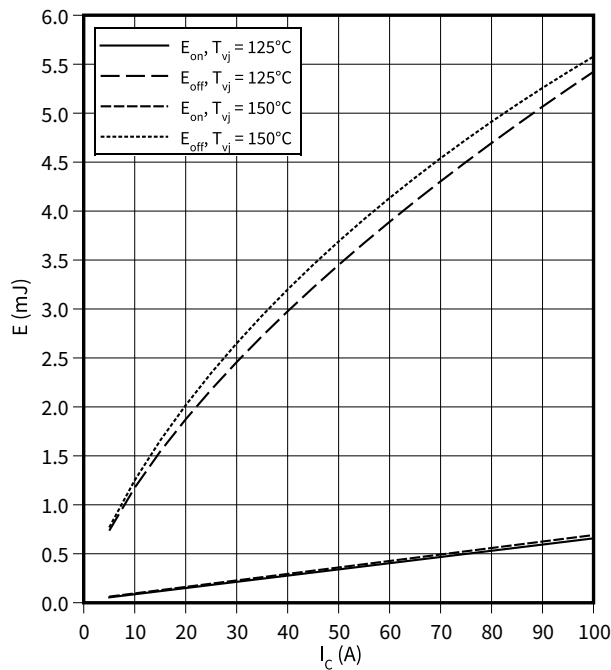
transfer characteristic (typical), IGBT, Inverter

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



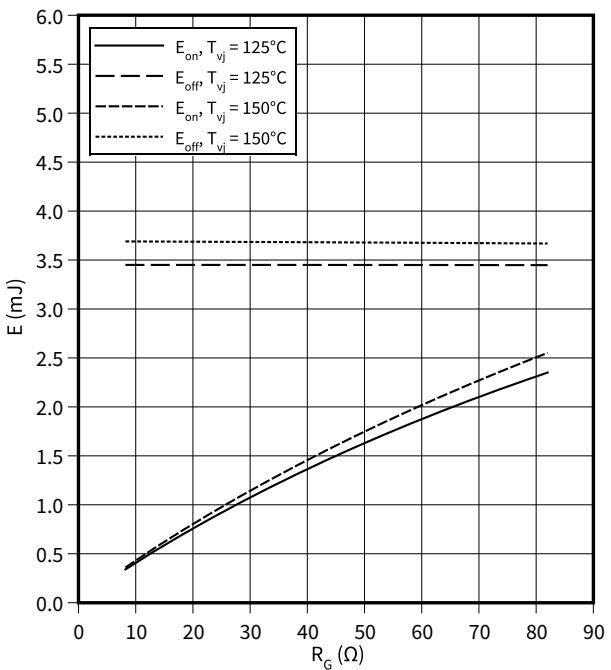
switching losses (typical), IGBT, Inverter

$E = f(I_C)$
 $R_{Goff} = 8.2\text{ }\Omega$, $R_{Gon} = 8.2\text{ }\Omega$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$



switching losses (typical), IGBT, Inverter

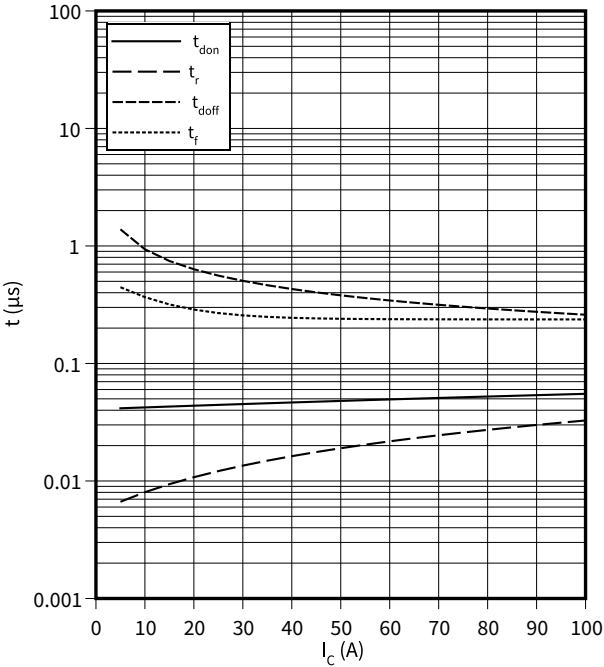
$E = f(R_G)$
 $I_C = 50\text{ A}$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$



7 Characteristics diagrams

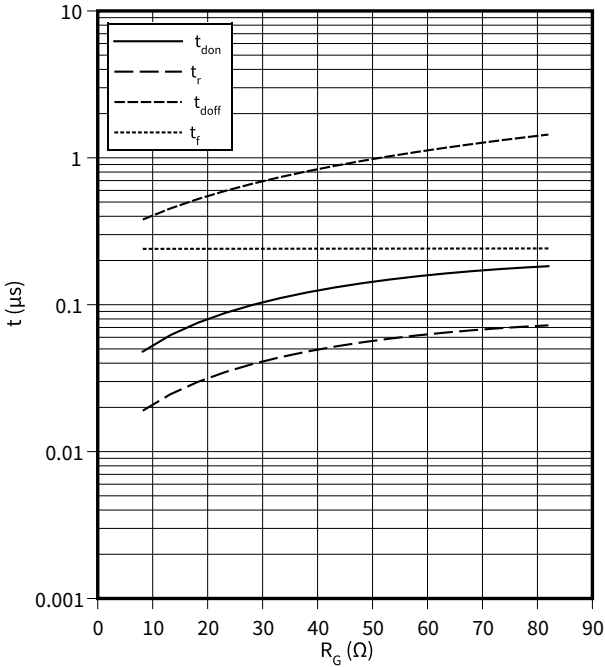
switching times (typical), IGBT, Inverter

$t = f(I_C)$
 $R_{Goff} = 8.2 \, \Omega$, $R_{Gon} = 8.2 \, \Omega$, $V_{CE} = 300 \, V$, $V_{GE} = \pm 15 \, V$, $T_{vj} = 150 \, ^\circ C$



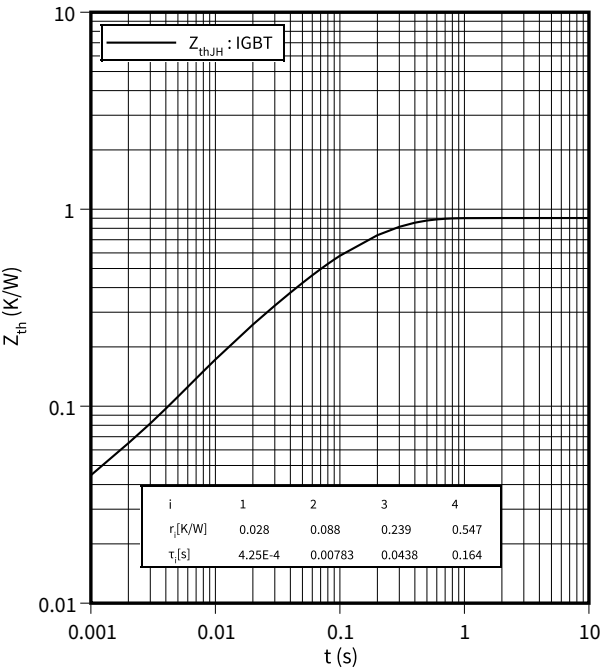
switching times (typical), IGBT, Inverter

$t = f(R_G)$
 $I_C = 50 \, A$, $V_{CE} = 300 \, V$, $V_{GE} = \pm 15 \, V$, $T_{vj} = 150 \, ^\circ C$



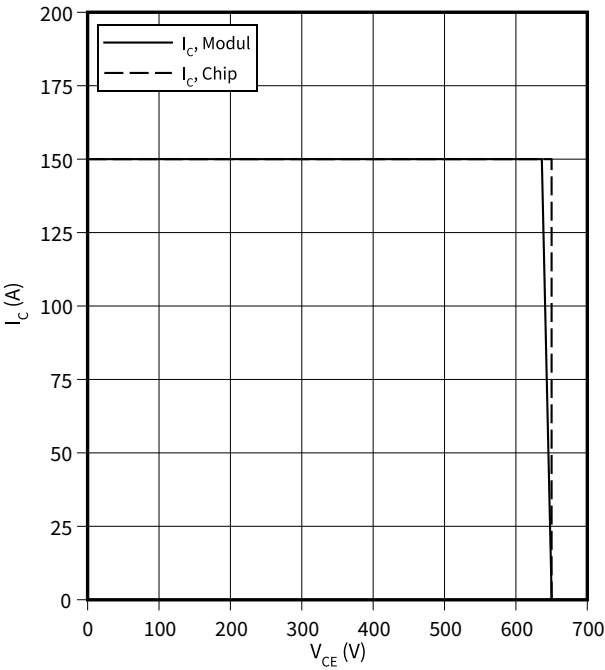
transient thermal impedance , IGBT, Inverter

$Z_{th} = f(t)$



reverse bias safe operating area (RBSOA), IGBT, Inverter

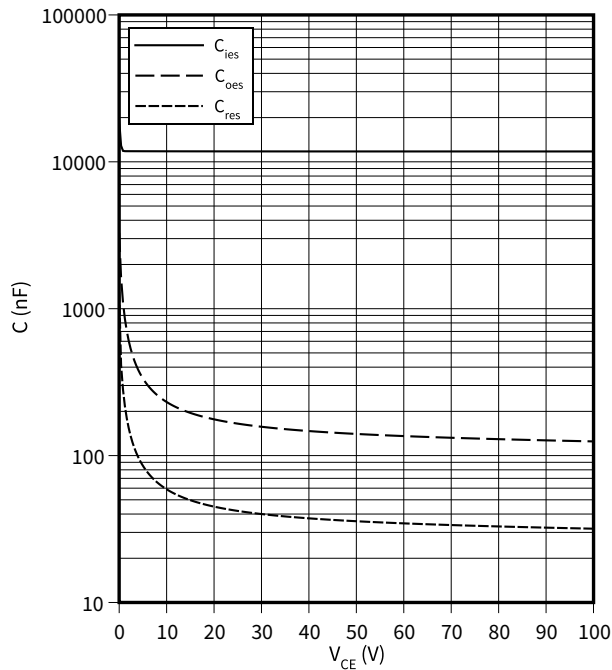
$I_C = f(V_{CE})$
 $R_{Goff} = 8.2 \, \Omega$, $V_{GE} = \pm 15 \, V$, $T_{vj} = 150 \, ^\circ C$



7 Characteristics diagrams

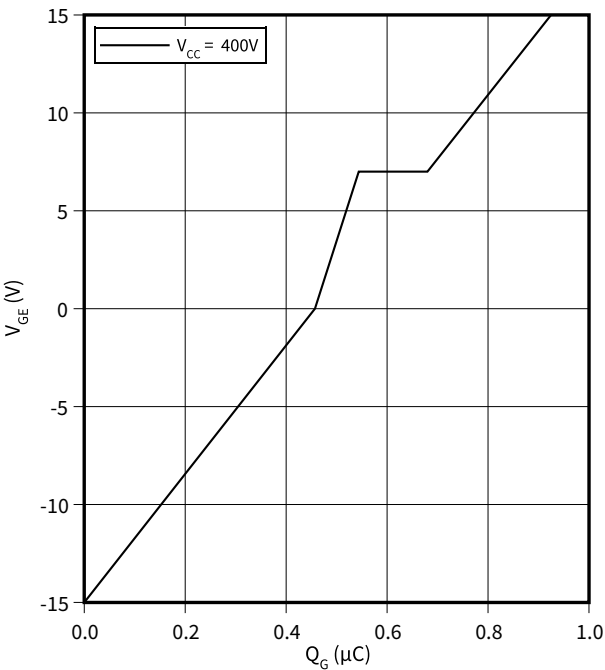
capacity characteristic (typical), IGBT, Inverter

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



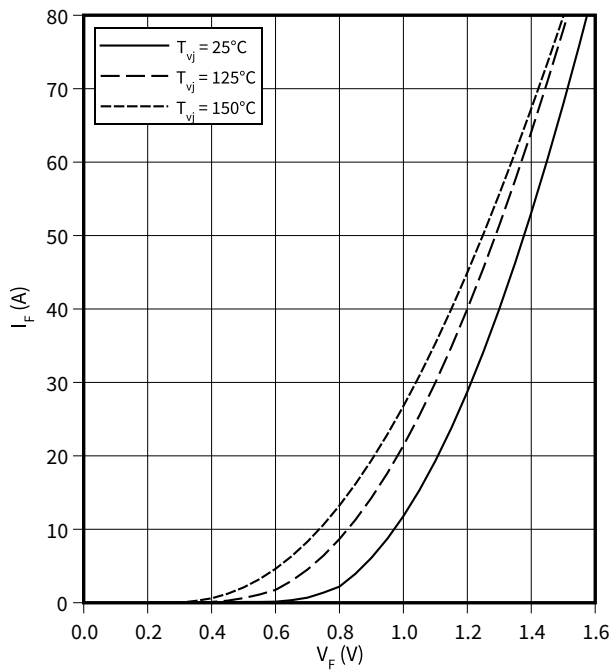
gate charge characteristic (typical), IGBT, Inverter

$V_{GE} = f(Q_G)$
 $I_C = 50 \text{ A}$, $T_{vj} = 25^\circ\text{C}$



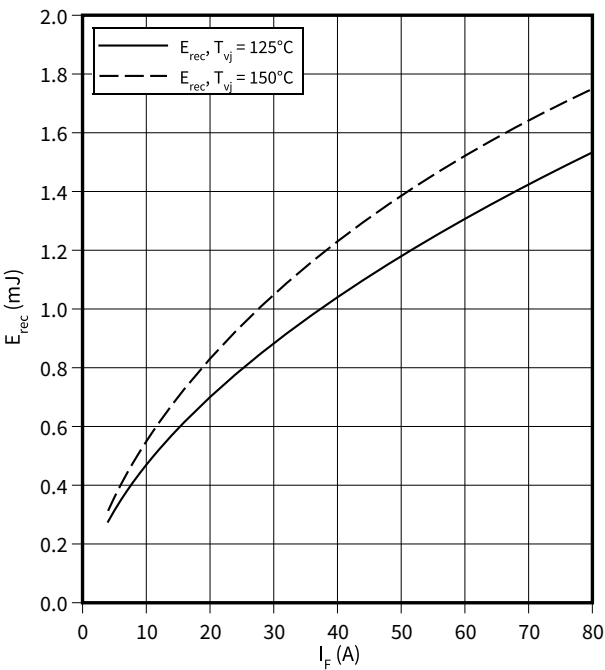
forward characteristic of (typical), Diode, 3-Level

$I_F = f(V_F)$



switching losses (typical), Diode, 3-Level

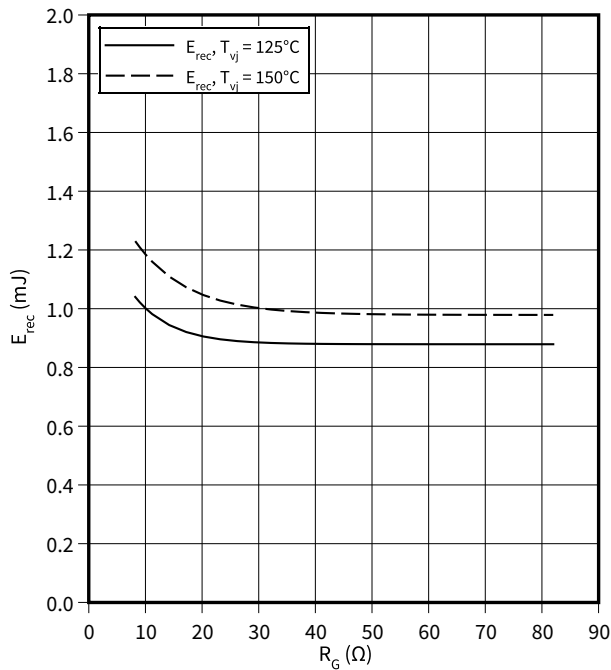
$E_{rec} = f(I_F)$
 $R_{Gon} = 8.2 \Omega$, $V_{CE} = 300 \text{ V}$



7 Characteristics diagrams

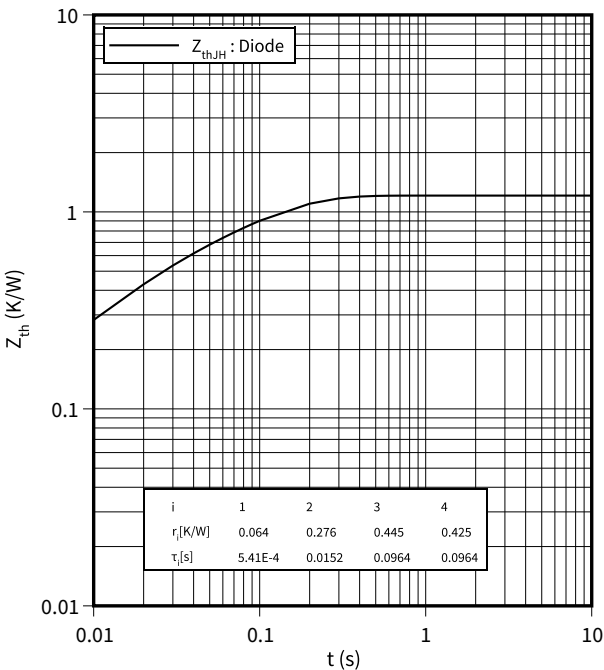
switching losses (typical), Diode, 3-Level

$E_{rec} = f(R_G)$
 $V_{CE} = 300\text{ V}, I_F = 40\text{ A}$



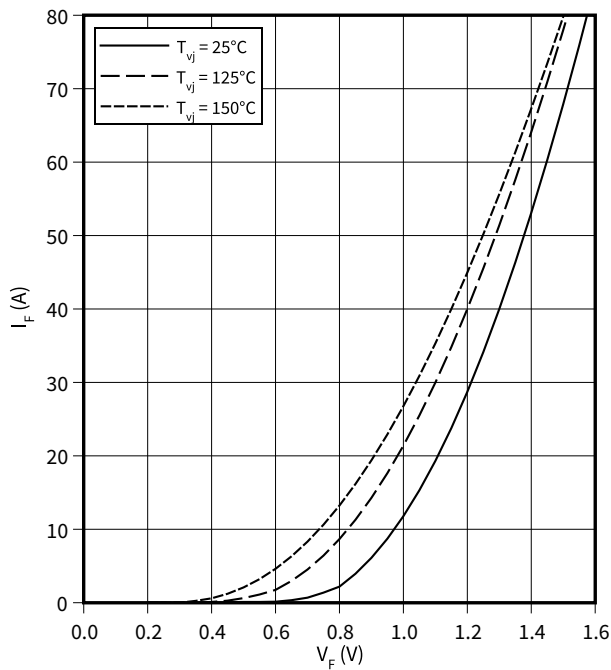
transient thermal impedance , Diode, 3-Level

$Z_{th} = f(t)$



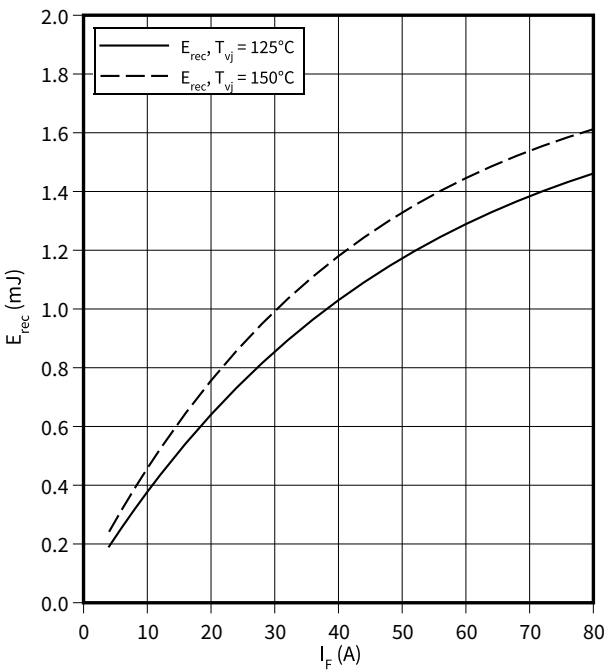
forward characteristic of (typical), Diode, Inverter

$I_F = f(V_F)$



switching losses (typical), Diode, Inverter

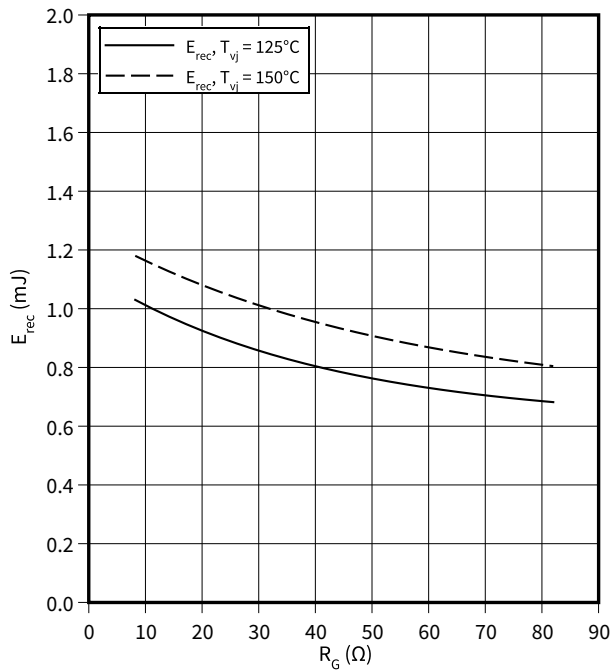
$E_{rec} = f(I_F)$
 $R_{Gon} = 8.2\ \Omega, V_{CE} = 300\text{ V}$



7 Characteristics diagrams

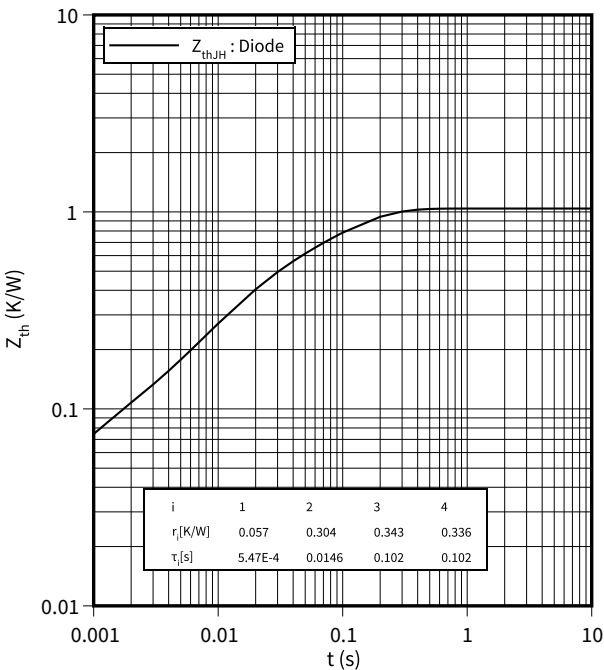
switching losses (typical), Diode, Inverter

$E_{rec} = f(R_G)$
 $V_{CE} = 300\text{ V}, I_F = 40\text{ A}$



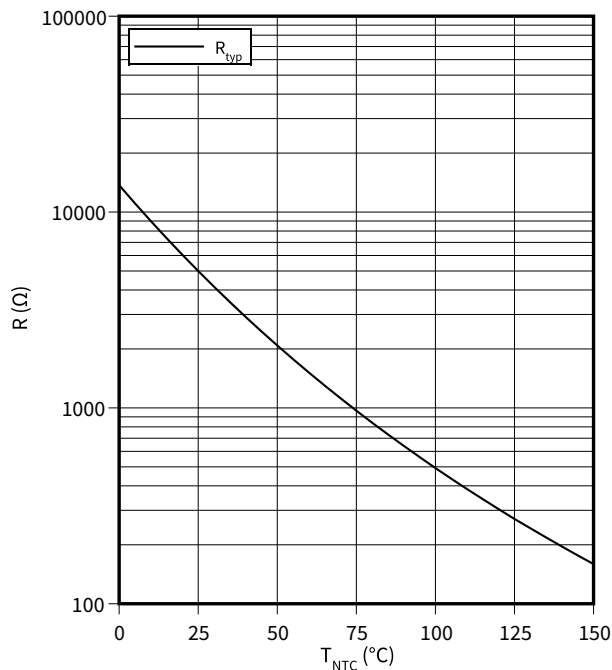
transient thermal impedance , Diode, Inverter

$Z_{th} = f(t)$



temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



8 Circuit diagram

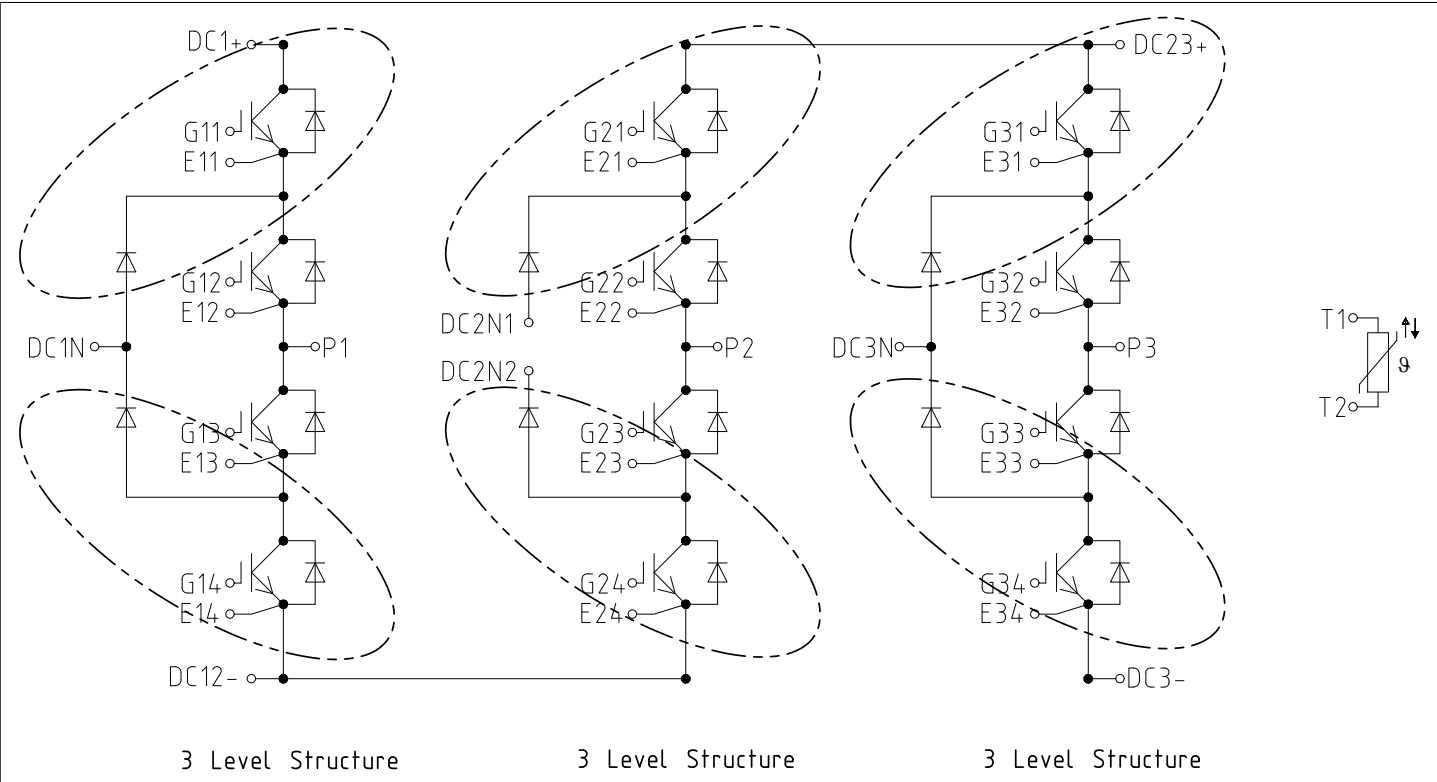


Figure 2

9 Package outlines

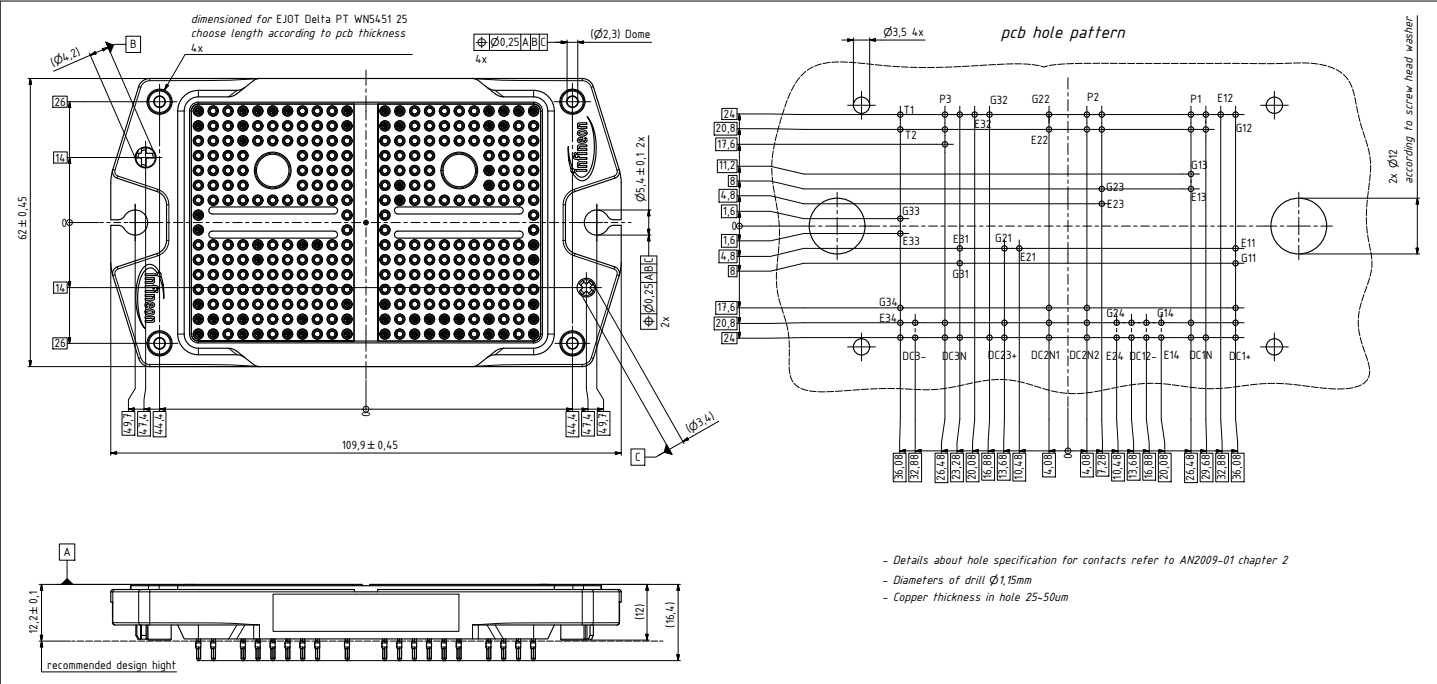


Figure 3

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 4

Revision history

Revision history

Document revision	Date of release	Description of changes
V1.0	2020-04-03	
1.00	2021-04-22	Final

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