

Final datasheet

EconoPACK™3 module with TRENCHSTOP™ IGBT7 and emitter controlled 7 diode and NTC

Features

- Electrical features
 - $V_{CES} = 950 \text{ V}$
 - $I_{C \text{ nom}} = 600 \text{ A} / I_{CRM} = 600 \text{ A}$
 - Low switching losses
 - TRENCHSTOP™ IGBT7
 - Suitable Infineon gate drivers can be found under <https://www.infineon.com/gdfinder>
- Mechanical features
 - Compact design
 - Copper base plate
 - Integrated NTC temperature sensor
 - High power density



Typical appearance

Potential applications

- Solar applications
- Three-level applications

Product validation

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

Description

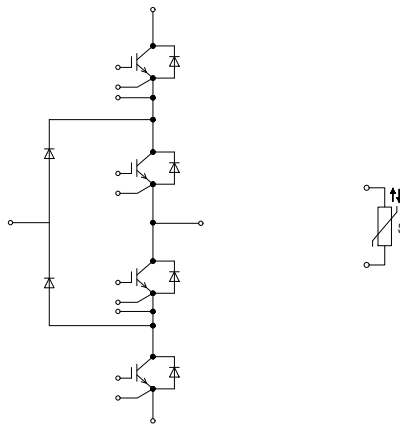


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1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	3.2	kV
Isolation test voltage NTC	$V_{ISOL(NTC)}$	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$	3.2	kV
Material of module baseplate			Cu	
Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
Creepage distance	$d_{Creep \text{ nom}}$	terminal to baseplate, nom.	10.0	mm
Creepage distance	$d_{Creep \text{ min}}$	terminal to baseplate, min.	7.5	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}			20		nH
Module lead resistance, terminals - chip	$R_{AA'+CC'}$	$T_C = 25 \text{ °C}$, per switch		2		mΩ
Module lead resistance, terminals - chip	$R_{CC'+EE'}$	$T_C = 25 \text{ °C}$, per switch		1.5		mΩ
Storage temperature	T_{stg}		-40		125	°C
Mounting torque for module mounting	M	- Mounting according to valid application note	3		6	Nm
Weight	G			300		g

Note: The current under continuous operation is limited to 50A rms per connector pin

2 IGBT, T1 / T4

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		$T_{vj} = 25 \text{ °C}$	950	V
Implemented collector current	I_{CN}			600	A
Continuous DC collector current	I_{CDC}	$T_{vj \text{ max}} = 175 \text{ °C}$	$T_C = 115 \text{ °C}$	290	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 $T_{vj\ op}$	600	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	$V_{CE\ sat}$	$I_C = 250\ A, V_{GE} = 15\ V$	$T_{vj} = 25\ ^\circ C$	1.43	1.64	V
			$T_{vj} = 125\ ^\circ C$	1.53		
			$T_{vj} = 150\ ^\circ C$	1.55		
Gate threshold voltage	V_{GETh}	$I_C = 9.75\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$	4.35	5.1	5.85	V
Gate charge	Q_G	$V_{GE} = \pm 15\ V, V_{CC} = 600\ V, T_{vj} = 25\ ^\circ C$		1.35		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25\ ^\circ C$		0.5		Ω
Input capacitance	C_{ies}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		37.9		nF
Reverse transfer capacitance	C_{res}	$f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$		0.117		nF
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 950\ V, V_{GE} = 0\ V$	$T_{vj} = 25\ ^\circ C$		0.11	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}	$I_C = 250\ A, V_{CC} = 500\ V, V_{GE} = \pm 15\ V, R_{Gon} = 1.8\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.059		μs
			$T_{vj} = 125\ ^\circ C$	0.070		
			$T_{vj} = 150\ ^\circ C$	0.070		
Rise time (inductive load)	t_r	$I_C = 250\ A, V_{CC} = 500\ V, V_{GE} = \pm 15\ V, R_{Gon} = 1.8\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.020		μs
			$T_{vj} = 125\ ^\circ C$	0.022		
			$T_{vj} = 150\ ^\circ C$	0.023		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 250\ A, V_{CC} = 500\ V, V_{GE} = \pm 15\ V, R_{Goff} = 0.75\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.190		μs
			$T_{vj} = 125\ ^\circ C$	0.240		
			$T_{vj} = 150\ ^\circ C$	0.250		
Fall time (inductive load)	t_f	$I_C = 250\ A, V_{CC} = 500\ V, V_{GE} = \pm 15\ V, R_{Goff} = 0.75\ \Omega$	$T_{vj} = 25\ ^\circ C$	0.040		μs
			$T_{vj} = 125\ ^\circ C$	0.080		
			$T_{vj} = 150\ ^\circ C$	0.090		
Turn-on energy loss per pulse	E_{on}	$I_C = 250\ A, V_{CC} = 500\ V, L_\sigma = 15\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 1.8\ \Omega, di/dt = 8.8\ kA/\mu s (T_{vj} = 150\ ^\circ C)$	$T_{vj} = 25\ ^\circ C$	3.1		mJ
			$T_{vj} = 125\ ^\circ C$	3.88		
			$T_{vj} = 150\ ^\circ C$	3.88		

(table continues...)

Table 4 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off energy loss per pulse	E_{off}	$I_C = 250 \text{ A}$, $V_{CC} = 500 \text{ V}$, $L_\sigma = 15 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 0.75 \Omega$, $dv/dt = 4910 \text{ V}/\mu\text{s}$ ($T_{vj} = 150 \text{ }^\circ\text{C}$)	$T_{vj} = 25 \text{ }^\circ\text{C}$	6.1		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$	10.2		
			$T_{vj} = 150 \text{ }^\circ\text{C}$	11.5		
Thermal resistance, junction to case	R_{thJC}	per IGBT			0.108	K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 5 \text{ W}/(\text{m}\cdot\text{K})$		0.0240		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	$^\circ\text{C}$

3 IGBT, T2 / T3

Table 5 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		$T_{vj} = 25 \text{ }^\circ\text{C}$	1200	V
Implemented collector current	I_{CN}			450	A
Continuous DC collector current	I_{CDC}	$T_{vj\text{ max}} = 175 \text{ }^\circ\text{C}$	$T_C = 115 \text{ }^\circ\text{C}$	335	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_{vj\text{ op}}$		600	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	$V_{CE\text{ sat}}$	$I_C = 250 \text{ A}$, $V_{GE} = 15 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	1.33	1.50	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1.34		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	1.35		
Gate threshold voltage	V_{GEth}	$I_C = 10.5 \text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25 \text{ }^\circ\text{C}$	5.15	5.8	6.45	V
Gate charge	Q_G	$V_{GE} = \pm 15 \text{ V}$, $V_{CC} = 600 \text{ V}$, $T_{vj} = 25 \text{ }^\circ\text{C}$		7.5		μC
Internal gate resistor	R_{Gint}	$T_{vj} = 25 \text{ }^\circ\text{C}$		0.33		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}$, $T_{vj} = 25 \text{ }^\circ\text{C}$, $V_{CE} = 25 \text{ V}$, $V_{GE} = 0 \text{ V}$		90.4		nF
Reverse transfer capacitance	C_{res}	$f = 100 \text{ kHz}$, $T_{vj} = 25 \text{ }^\circ\text{C}$, $V_{CE} = 25 \text{ V}$, $V_{GE} = 0 \text{ V}$		0.315		nF

(table continues...)

Table 6 (continued) **Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter cut-off current	I_{CES}	$V_{CE} = 1200 \text{ V}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$			0.024	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}	$I_C = 250 \text{ A}$, $V_{CC} = 500 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 0.47 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.120		μs
			$T_{vj} = 125 \text{ °C}$		0.130		
			$T_{vj} = 175 \text{ °C}$		0.138		
Rise time (inductive load)	t_r	$I_C = 250 \text{ A}$, $V_{CC} = 500 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 0.47 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.030		μs
			$T_{vj} = 125 \text{ °C}$		0.034		
			$T_{vj} = 175 \text{ °C}$		0.035		
Turn-off delay time (inductive load)	t_{doff}	$I_C = 250 \text{ A}$, $V_{CC} = 500 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 0.47 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.360		μs
			$T_{vj} = 125 \text{ °C}$		0.490		
			$T_{vj} = 175 \text{ °C}$		0.560		
Fall time (inductive load)	t_f	$I_C = 250 \text{ A}$, $V_{CC} = 500 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 0.47 \text{ } \Omega$	$T_{vj} = 25 \text{ °C}$		0.065		μs
			$T_{vj} = 125 \text{ °C}$		0.150		
			$T_{vj} = 175 \text{ °C}$		0.210		
Turn-on energy loss per pulse	E_{on}	$I_C = 250 \text{ A}$, $V_{CC} = 500 \text{ V}$, $L_\sigma = 15 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 0.47 \text{ } \Omega$, $di/dt = 7.68 \text{ kA}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$		4.45		mJ
			$T_{vj} = 125 \text{ °C}$		6.96		
			$T_{vj} = 150 \text{ °C}$		8.6		
Turn-off energy loss per pulse	E_{off}	$I_C = 250 \text{ A}$, $V_{CC} = 500 \text{ V}$, $L_\sigma = 15 \text{ nH}$, $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 0.47 \text{ } \Omega$, $dv/dt = 2200 \text{ V}/\mu\text{s}$ ($T_{vj} = 175 \text{ °C}$)	$T_{vj} = 25 \text{ °C}$		16.5		mJ
			$T_{vj} = 125 \text{ °C}$		28		
			$T_{vj} = 150 \text{ °C}$		35.7		
Thermal resistance, junction to case	R_{thJC}	per IGBT				0.0930	K/W
Thermal resistance, case to heat sink	R_{thCH}	per IGBT, $\lambda_{grease} = 5 \text{ W}/(\text{m} \cdot \text{K})$			0.0220		K/W
Temperature under switching conditions	$T_{vj op}$			-40		175	°C

Note: $T_{vj op} > 150 \text{ °C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

4 Diode, D1 / D4

Table 7 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25\text{ °C}$	950	V
Implemented forward current	I_{FN}			300	A
Continuous DC forward current	I_F			250	A
Repetitive peak forward current	I_{FRM}	$t_P = 1\text{ ms}$		600	A
I^2t - value	I^2t	$t_P = 10\text{ ms}, V_R = 0\text{ V}$	$T_{vj} = 125\text{ °C}$	3100	A^2s
			$T_{vj} = 150\text{ °C}$	2900	

Table 8 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 250\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$	2.42	2.67	V
			$T_{vj} = 125\text{ °C}$	2.22		
			$T_{vj} = 150\text{ °C}$	2.16		
Peak reverse recovery current	I_{RM}	$V_{CC} = 500\text{ V}, I_F = 250\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 7.8\text{ kA}/\mu s (T_{vj} = 150\text{ °C})$	$T_{vj} = 25\text{ °C}$	208		A
			$T_{vj} = 125\text{ °C}$	290		
			$T_{vj} = 150\text{ °C}$	312		
Recovered charge	Q_r	$V_{CC} = 500\text{ V}, I_F = 250\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 7.8\text{ kA}/\mu s (T_{vj} = 150\text{ °C})$	$T_{vj} = 25\text{ °C}$	8.6		μC
			$T_{vj} = 125\text{ °C}$	18		
			$T_{vj} = 150\text{ °C}$	22		
Reverse recovery energy	E_{rec}	$V_{CC} = 500\text{ V}, I_F = 250\text{ A}, V_{GE} = -15\text{ V}, -di_F/dt = 7.8\text{ kA}/\mu s (T_{vj} = 150\text{ °C})$	$T_{vj} = 25\text{ °C}$	3		mJ
			$T_{vj} = 125\text{ °C}$	6.6		
			$T_{vj} = 150\text{ °C}$	8		
Thermal resistance, junction to case	R_{thJC}	per diode			0.257	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 5\text{ W}/(m \cdot K)$		0.0300		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		150	°C

5 Diode, D2 / D3

Table 9 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25\text{ °C}$	1200	V
Implemented forward current	I_{FN}			300	A
Continuous DC forward current	I_F			250	A
Repetitive peak forward current	I_{FRM}	$t_P = 1\text{ ms}$		600	A
I^2t - value	I^2t	$t_P = 10\text{ ms}, V_R = 0\text{ V}$	$T_{vj} = 125\text{ °C}$	4150	A^2s
			$T_{vj} = 175\text{ °C}$	3600	

Table 10 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 250\text{ A}, V_{GE} = 0\text{ V}$		$T_{vj} = 25\text{ °C}$	1.62	V
				$T_{vj} = 125\text{ °C}$	1.49	
				$T_{vj} = 175\text{ °C}$	1.42	
Thermal resistance, junction to case	R_{thJC}	per diode			0.204	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 5\text{ W/(m·K)}$		0.0290		K/W
Temperature under switching conditions	$T_{vj\text{ op}}$		-40		175	°C

Note: $T_{vj\text{ op}} > 150\text{ °C}$ is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

6 Diode, D5 / D6

Table 11 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}		$T_{vj} = 25\text{ °C}$	1200	V
Continuous DC forward current	I_F			200	A
Repetitive peak forward current	I_{FRM}	$t_P = 1\text{ ms}$		400	A

(table continues...)

Table 11 (continued) Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
I^2t - value	I^2t	$t_p = 10 \text{ ms}, V_R = 0 \text{ V}$	$T_{vj} = 125 \text{ °C}$	A^2s
			$T_{vj} = 150 \text{ °C}$	
			1800	
			1460	

Table 12 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 200 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$	1.45	1.75	V
			$T_{vj} = 125 \text{ °C}$	1.75		
			$T_{vj} = 150 \text{ °C}$	1.85		
Peak reverse recovery current	I_{RM}	$V_{CC} = 500 \text{ V}, I_F = 200 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 9.2 \text{ kA}/\mu\text{s} (T_{vj} = 150 \text{ °C})$	$T_{vj} = 25 \text{ °C}$	76		A
			$T_{vj} = 125 \text{ °C}$	76		
			$T_{vj} = 150 \text{ °C}$	76		
Recovered charge	Q_r	$V_{CC} = 500 \text{ V}, I_F = 200 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 9.2 \text{ kA}/\mu\text{s} (T_{vj} = 150 \text{ °C})$	$T_{vj} = 25 \text{ °C}$	1.28		μC
			$T_{vj} = 125 \text{ °C}$	1.28		
			$T_{vj} = 150 \text{ °C}$	1.28		
Reverse recovery energy	E_{rec}	$V_{CC} = 500 \text{ V}, I_F = 200 \text{ A}, V_{GE} = -15 \text{ V}, -di_F/dt = 9.2 \text{ kA}/\mu\text{s} (T_{vj} = 150 \text{ °C})$	$T_{vj} = 25 \text{ °C}$	0.32		mJ
			$T_{vj} = 125 \text{ °C}$	0.32		
			$T_{vj} = 150 \text{ °C}$	0.32		
Thermal resistance, junction to case	R_{thJC}	per diode			0.231	K/W
Thermal resistance, case to heat sink	R_{thCH}	per diode, $\lambda_{grease} = 5 \text{ W}/(\text{m}\cdot\text{K})$		0.0290		K/W
Temperature under switching conditions	$T_{vj op}$		-40		150	°C

7 NTC-Thermistor

Table 13 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	R_{25}	$T_{NTC} = 25 \text{ °C}$		5		k Ω
Deviation of R_{100}	$\Delta R/R$	$T_{NTC} = 100 \text{ °C}, R_{100} = 493 \text{ }\Omega$	-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

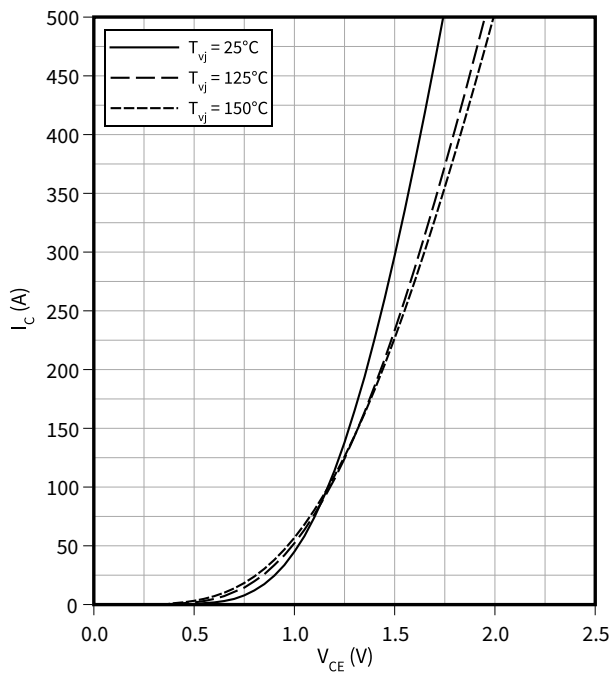
Note: *For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.*

8 Characteristics diagrams

Output characteristic (typical), IGBT, T1 / T4

$I_C = f(V_{CE})$

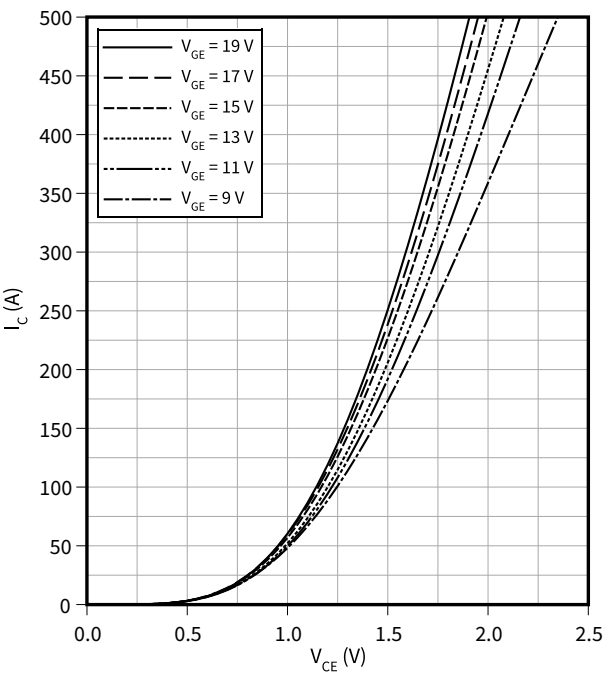
$V_{GE} = 15\text{ V}$



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

$I_C = f(V_{CE})$

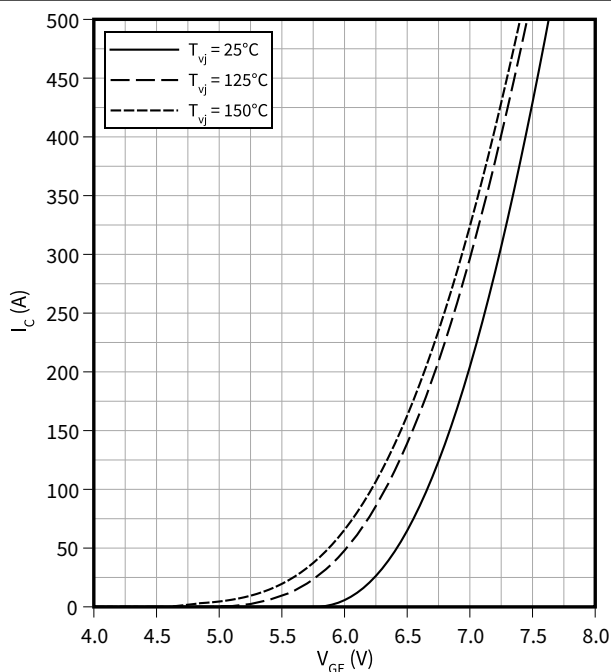
$T_{vj} = 150^\circ\text{C}$



Transfer characteristic (typical), IGBT, T1 / T4

$I_C = f(V_{GE})$

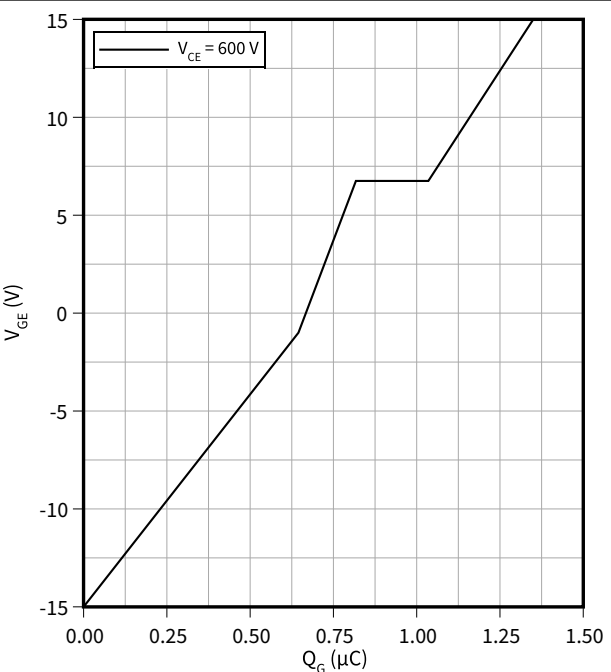
$V_{CE} = 20\text{ V}$



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

$V_{GE} = f(Q_G)$

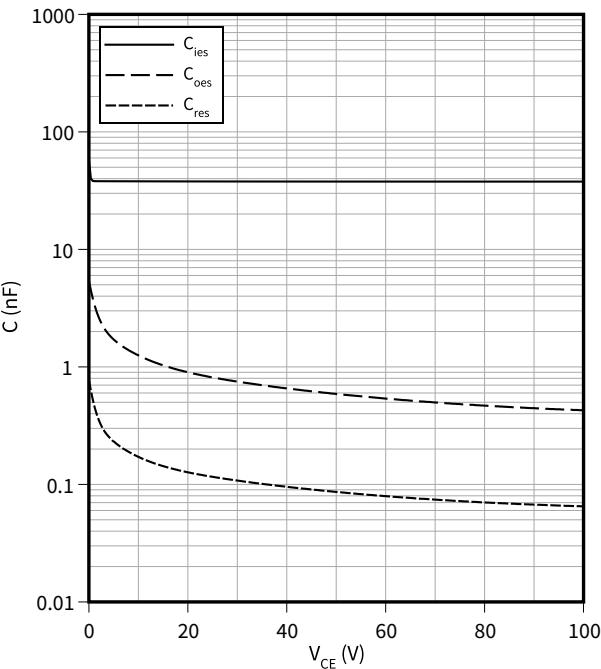
$I_C = 600\text{ A}, T_{vj} = 25^\circ\text{C}$



8 Characteristics diagrams

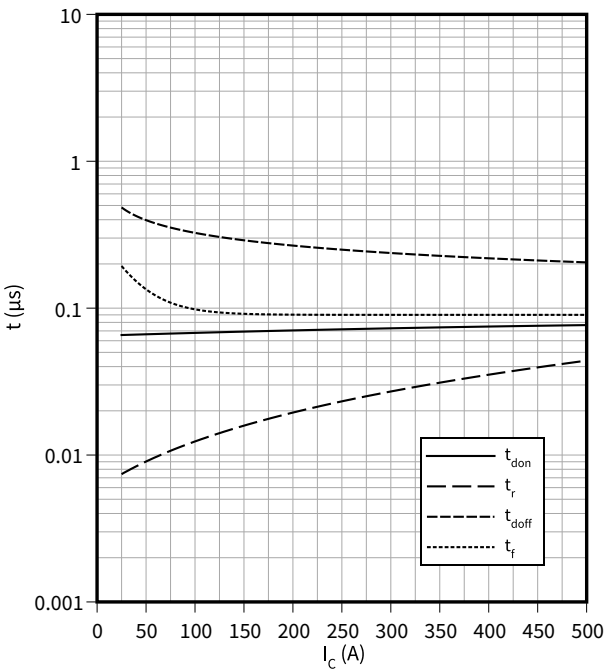
Capacity characteristic (typical), IGBT, T1 / T4

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



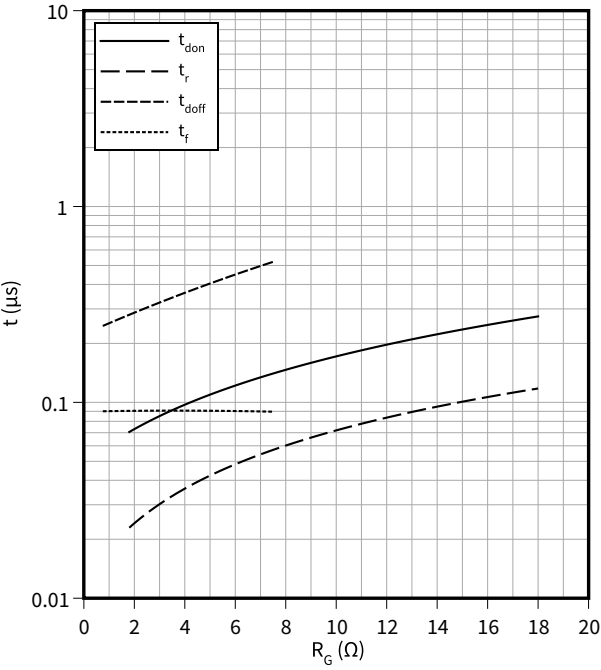
Switching times (typical), IGBT, T1 / T4

$t = f(I_C)$
 $V_{CC} = 500\text{ V}$, $T_{vj} = 150\text{ °C}$, $R_{Goff} = 0.75\text{ }\Omega$, $R_{Gon} = 1.8\text{ }\Omega$, $V_{GE} = \pm 15\text{ V}$



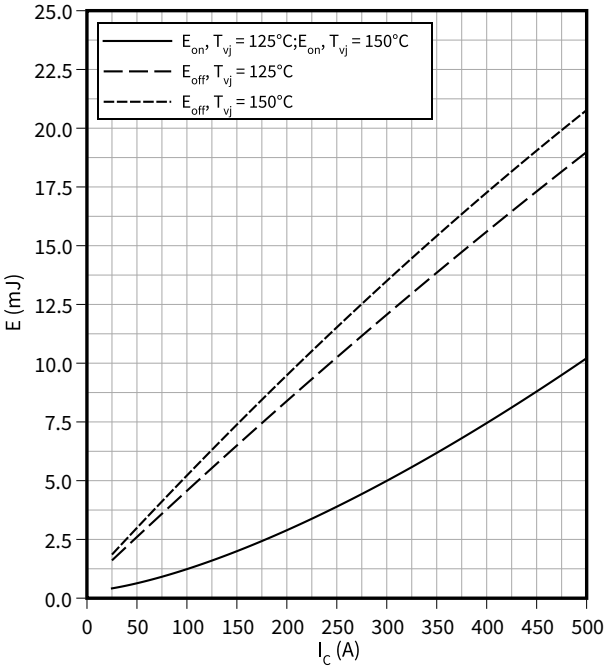
Switching times (typical), IGBT, T1 / T4

$t = f(R_G)$
 $I_C = 250\text{ A}$, $V_{CC} = 500\text{ V}$, $-15 / 15\text{ V}$, $T_{vj} = 150\text{ °C}$



Switching losses (typical), IGBT, T1 / T4

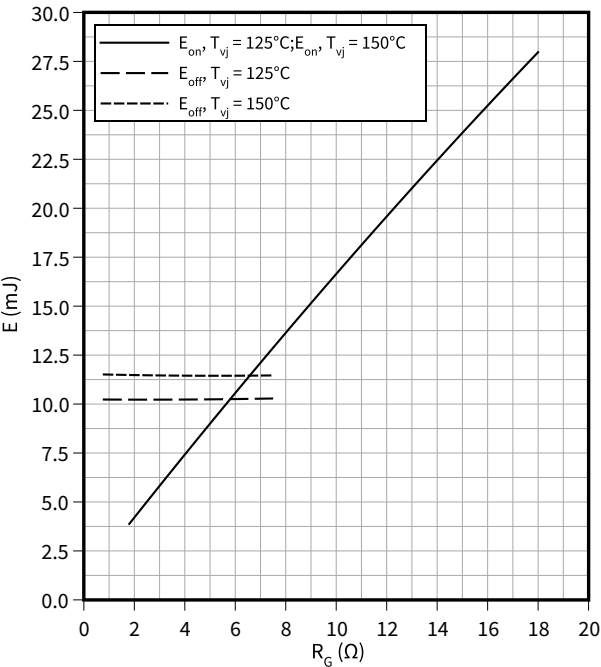
$E = f(I_C)$
 $R_{Goff} = 0.75\text{ }\Omega$, $R_{Gon} = 1.8\text{ }\Omega$, $V_{CC} = 500\text{ V}$, $-15 / 15\text{ V}$



8 Characteristics diagrams

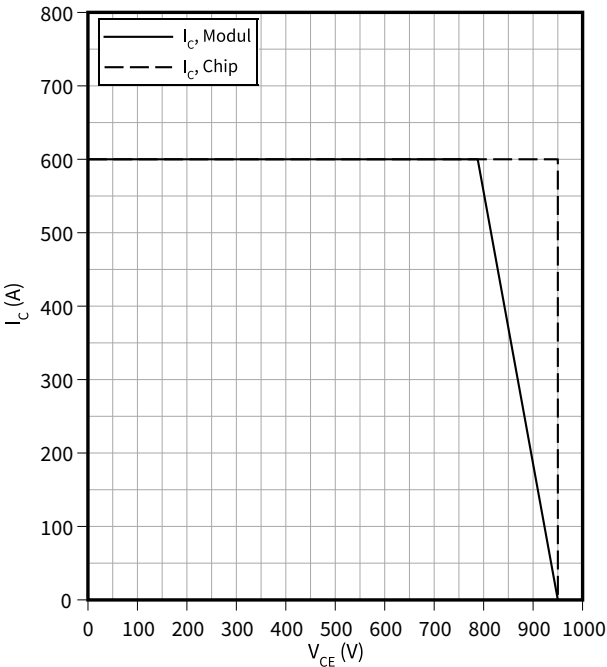
Switching losses (typical), IGBT, T1 / T4

$E = f(R_G)$
 $I_C = 250\text{ A}$, $V_{CC} = 500\text{ V}$, $-15 / 15\text{ V}$



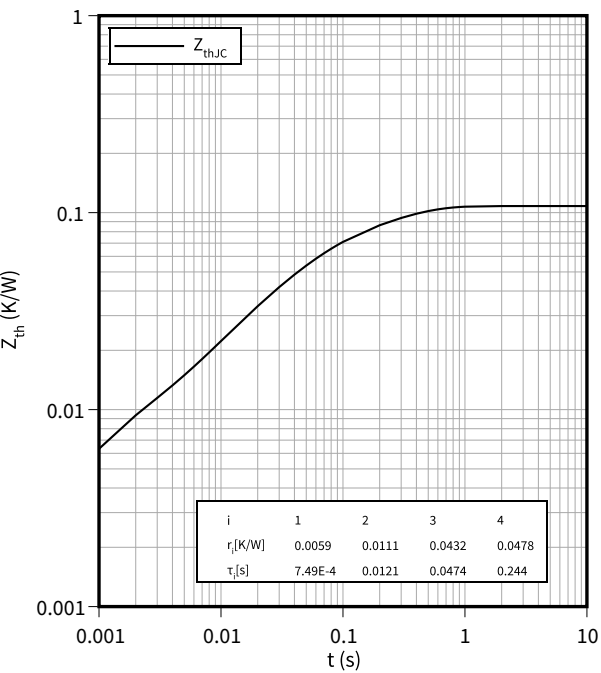
Reverse bias safe operating area (RBSOA), IGBT, T1 / T4

$I_C = f(V_{CE})$
 $R_{Goff} = 0.75\text{ }\Omega$, $V_{GE} = \pm 15\text{ V}$, $T_{vj} = 150\text{ }^\circ\text{C}$



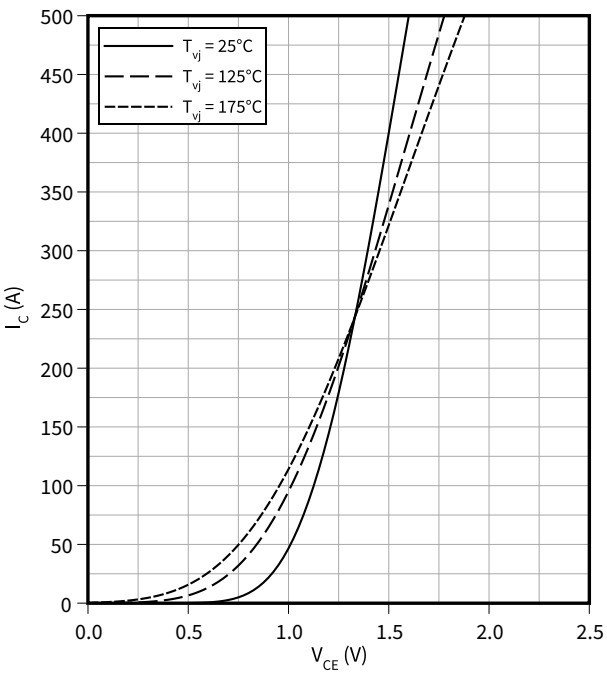
Transient thermal impedance, IGBT, T1 / T4

$Z_{th} = f(t)$



Output characteristic (typical), IGBT, T2 / T3

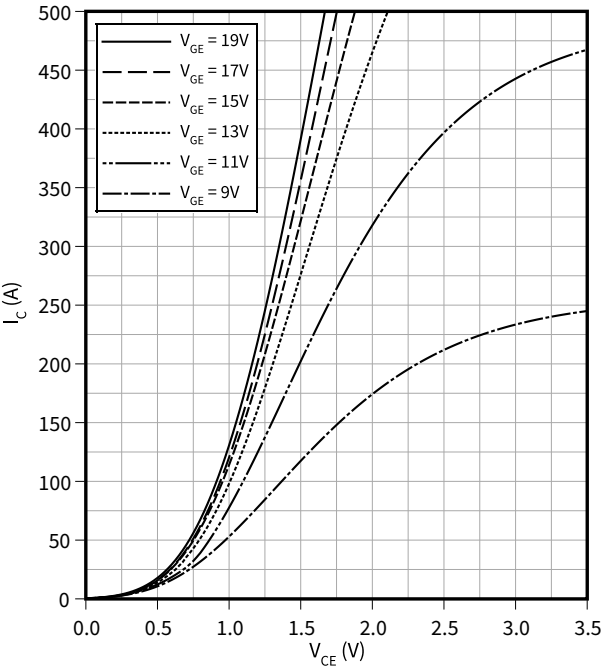
$I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



8 Characteristics diagrams

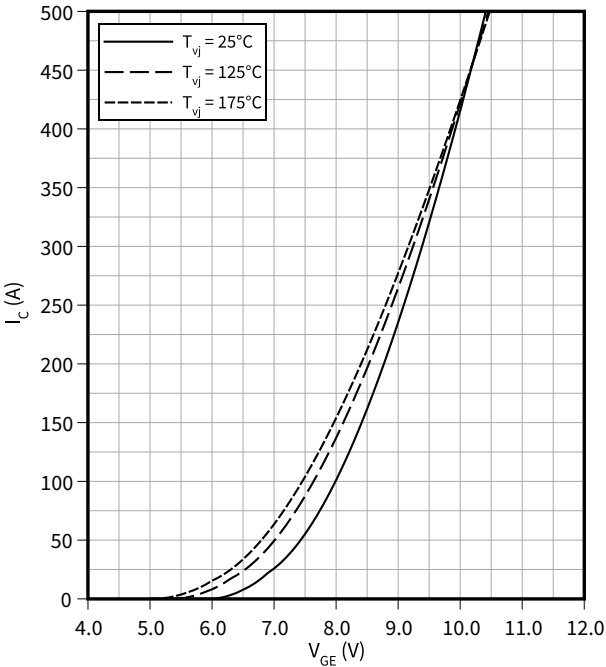
Output characteristic field (typical), IGBT, T2 / T3

$I_C = f(V_{CE})$
 $T_{vj} = 175\text{ °C}$



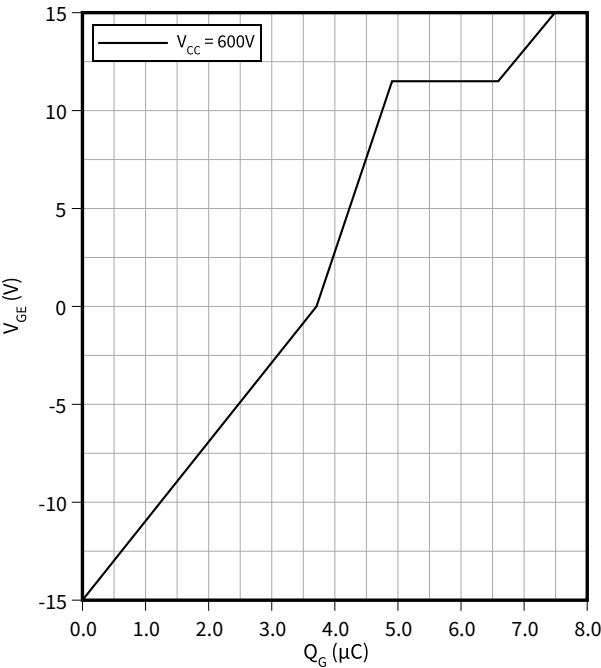
Transfer characteristic (typical), IGBT, T2 / T3

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



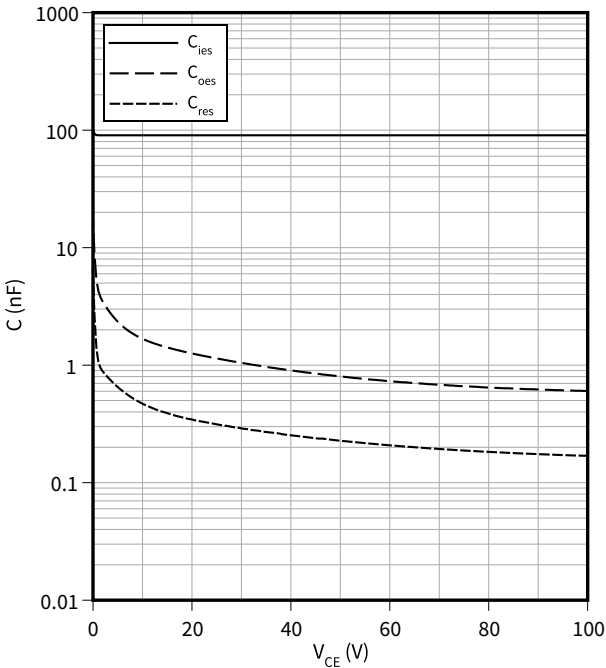
Gate charge characteristic (typical), IGBT, T2 / T3

$V_{GE} = f(Q_G)$
 $I_C = 450\text{ A}$, $T_{vj} = 25\text{ °C}$



Capacity characteristic (typical), IGBT, T2 / T3

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

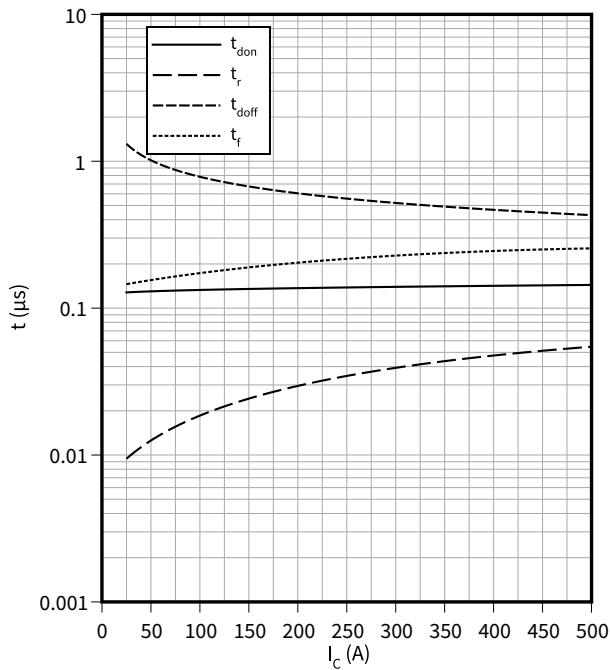


8 Characteristics diagrams

Switching times (typical), IGBT, T2 / T3

$t = f(I_C)$

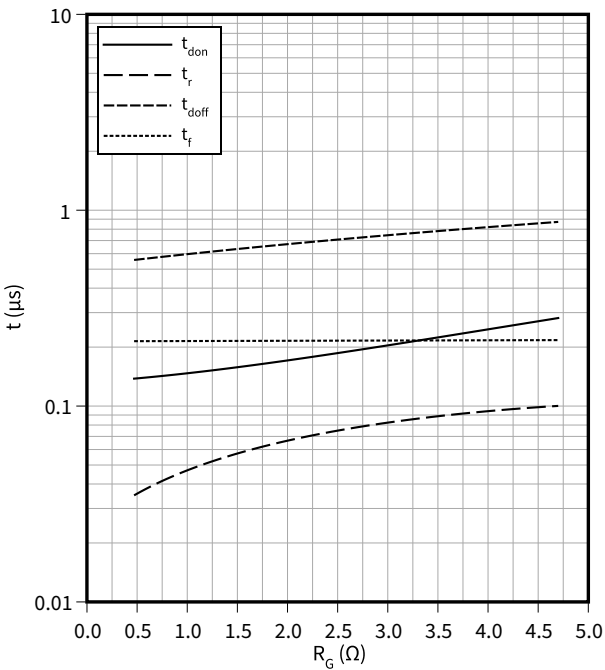
$R_{Goff} = 0.47 \, \Omega$, $R_{Gon} = 0.47 \, \Omega$, $V_{CC} = 500 \, V$, $\pm 15 \, V$, $T_{vj} = 175 \, ^\circ C$



Switching times (typical), IGBT, T2 / T3

$t = f(R_G)$

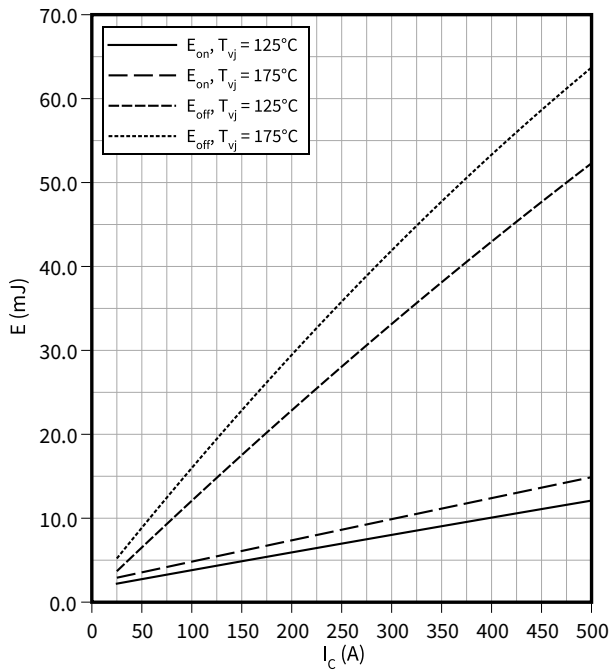
$I_C = 250 \, A$, $V_{CC} = 500 \, V$, $\pm 15 \, V$, $T_{vj} = 175 \, ^\circ C$



Switching losses (typical), IGBT, T2 / T3

$E = f(I_C)$

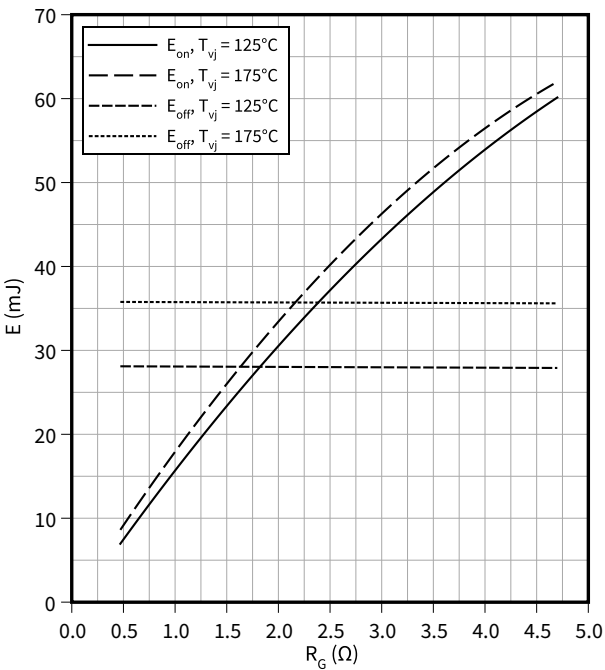
$R_{Goff} = 0.47 \, \Omega$, $R_{Gon} = 0.47 \, \Omega$, $V_{CC} = 500 \, V$, $\pm 15 \, V$



Switching losses (typical), IGBT, T2 / T3

$E = f(R_G)$

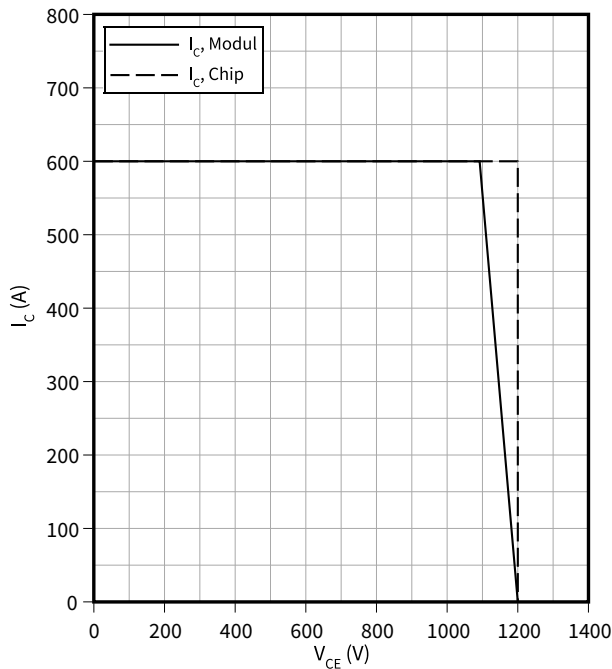
$I_C = 250 \, A$, $V_{CC} = 500 \, V$, $\pm 15 \, V$



8 Characteristics diagrams

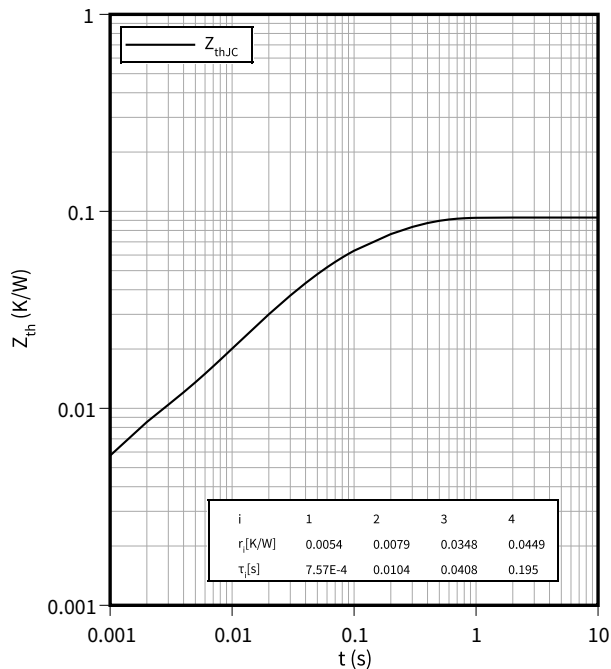
Reverse bias safe operating area (RBSOA), IGBT, T2 / T3

$I_C = f(V_{CE})$
 $R_{Goff} = 0.47 \Omega$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 175 \text{ }^\circ\text{C}$



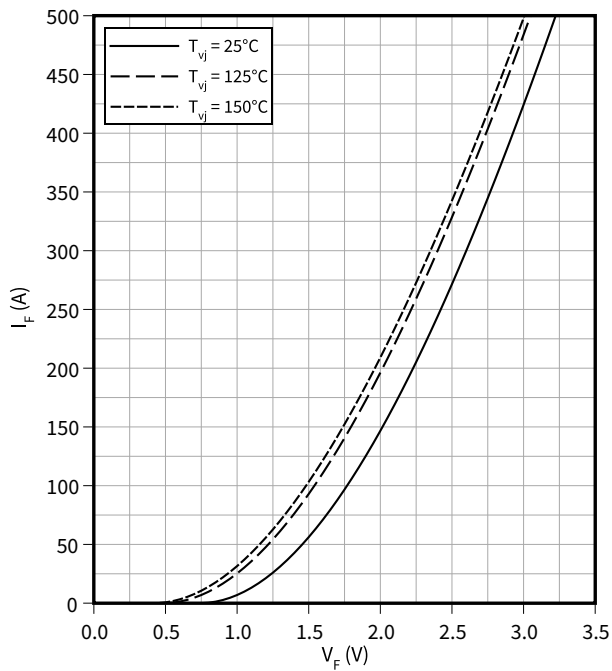
Transient thermal impedance, IGBT, T2 / T3

$Z_{th} = f(t)$



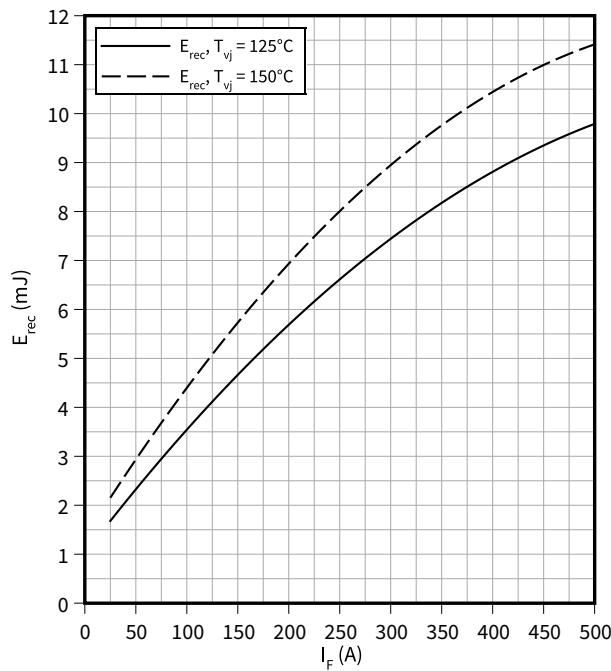
Forward characteristic (typical), Diode, D1 / D4

$I_F = f(V_F)$



Switching losses (typical), Diode, D1 / D4

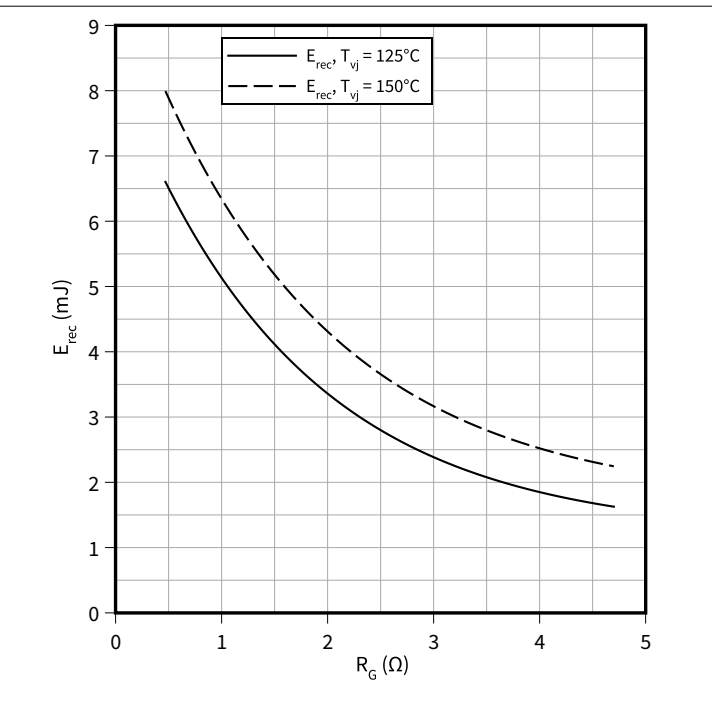
$E_{rec} = f(I_F)$
 $R_G = 0.47 \Omega$, $V_{CC} = 500 \text{ V}$



8 Characteristics diagrams

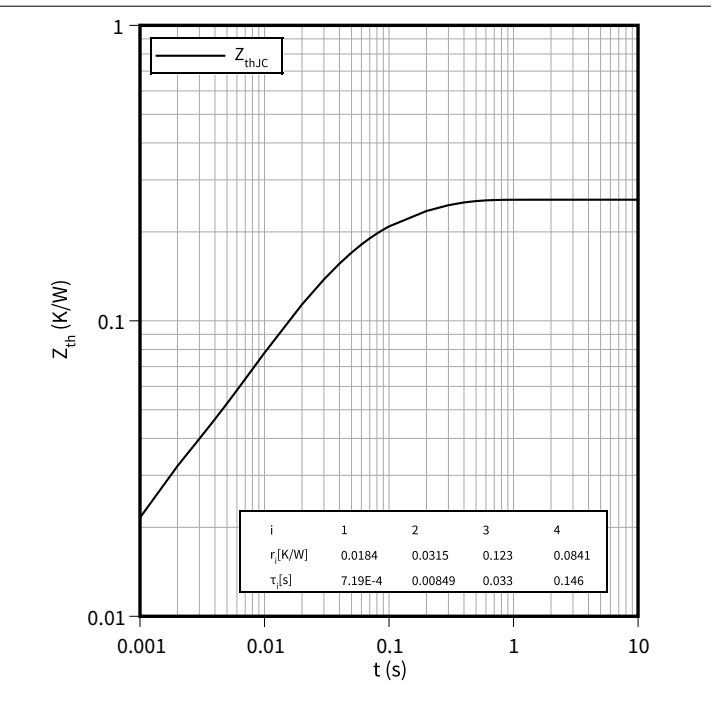
Switching losses (typical), Diode, D1 / D4

$E_{rec} = f(R_G)$
 $I_F = 250\text{ A}$, $V_{CC} = 500\text{ V}$



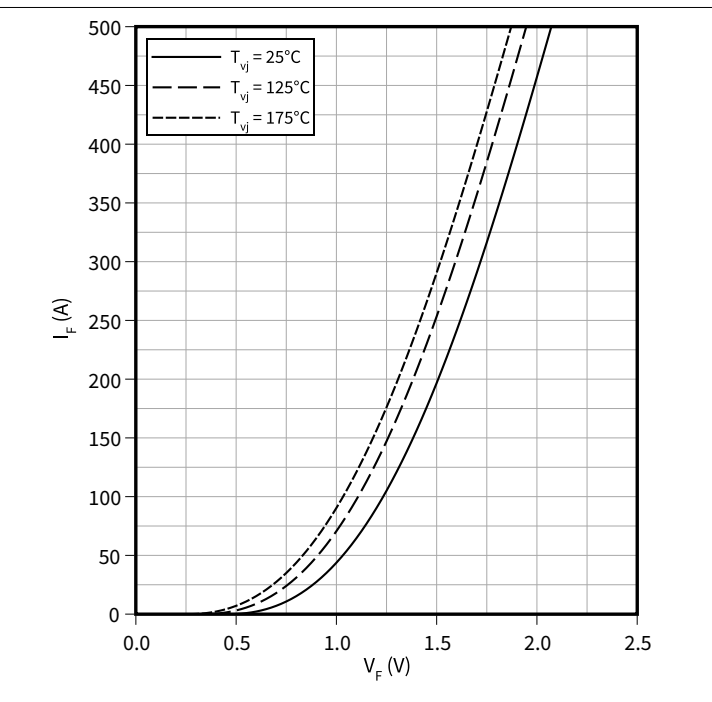
Transient thermal impedance, Diode, D1 / D4

$Z_{th} = f(t)$



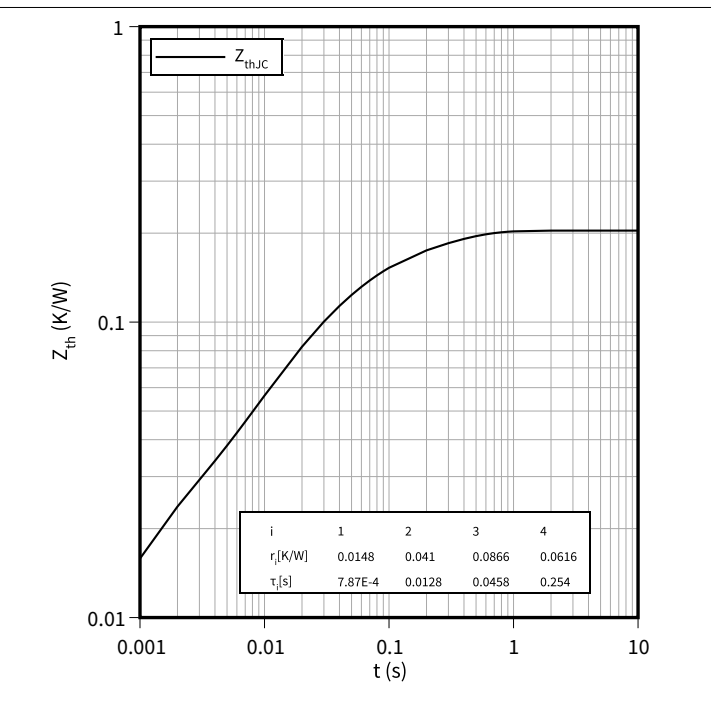
Forward characteristic (typical), Diode, D2 / D3

$I_F = f(V_F)$



Transient thermal impedance, Diode, D2 / D3

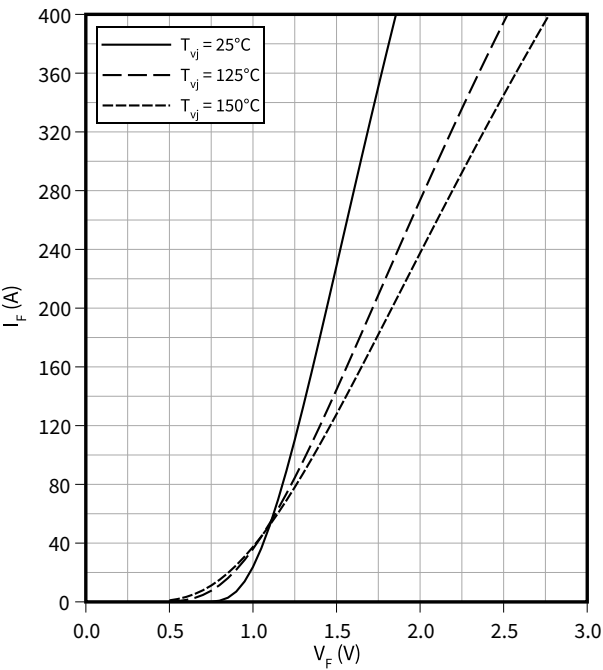
$Z_{th} = f(t)$



8 Characteristics diagrams

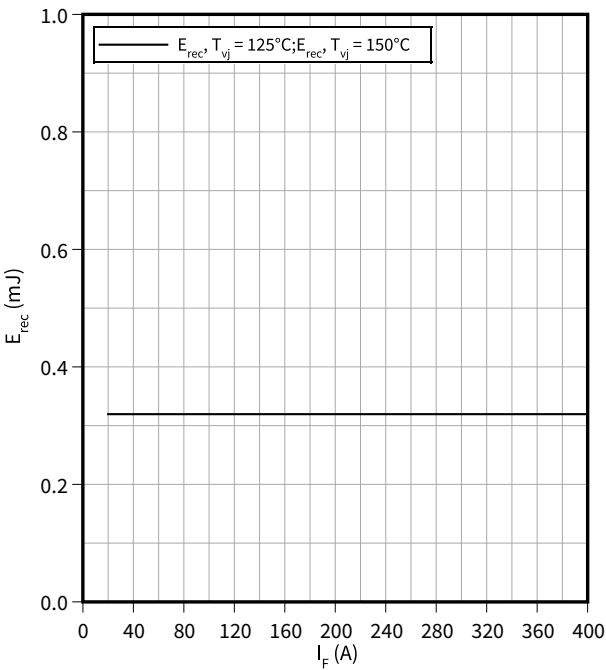
Forward characteristic (typical), Diode, D5 / D6

$I_F = f(V_F)$



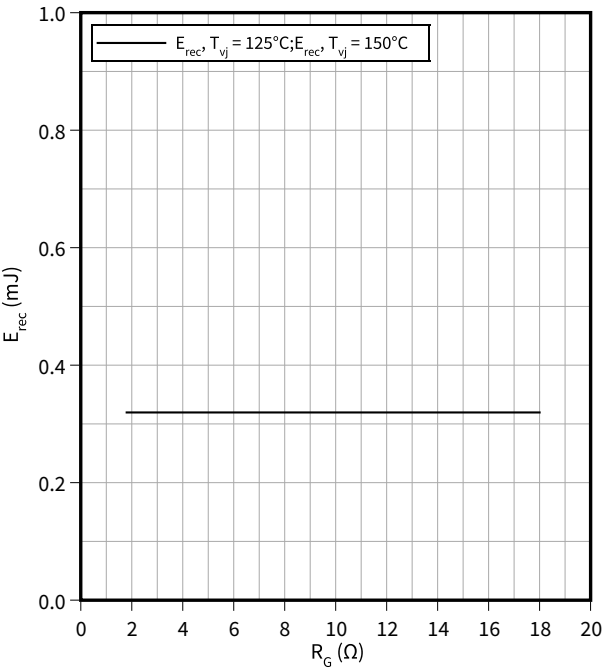
Switching losses (typical), Diode, D5 / D6

$E_{rec} = f(I_F)$
 $R_{Gon} = 1.8\ \Omega, V_{CE} = 500\ \text{V}$



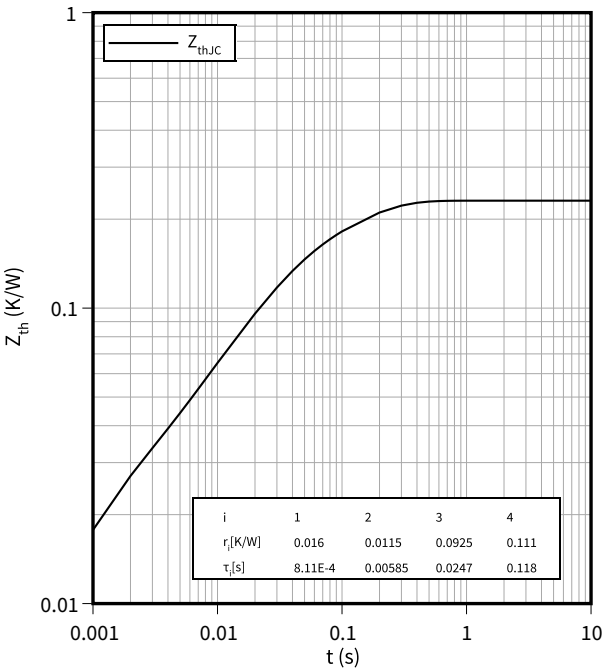
Switching losses (typical), Diode, D5 / D6

$E_{rec} = f(R_G)$
 $V_{CE} = 500\ \text{V}, I_F = 200\ \text{A}$



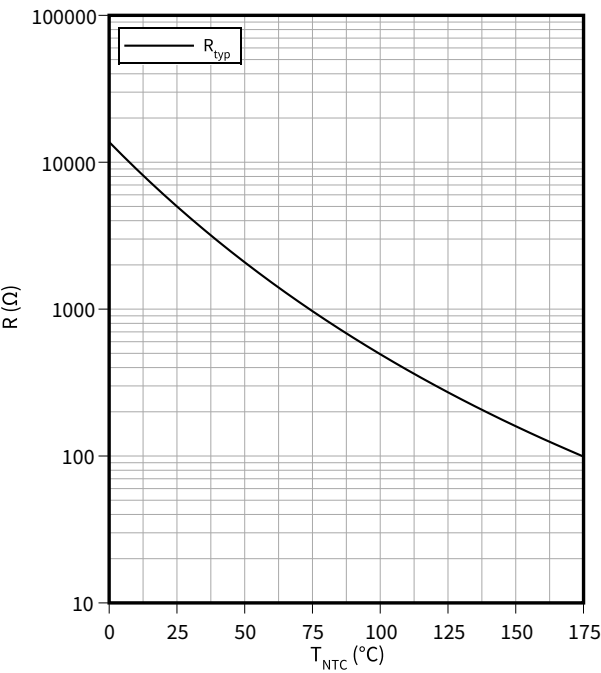
Transient thermal impedance, Diode, D5 / D6

$Z_{th} = f(t)$



Temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



9 Circuit diagram

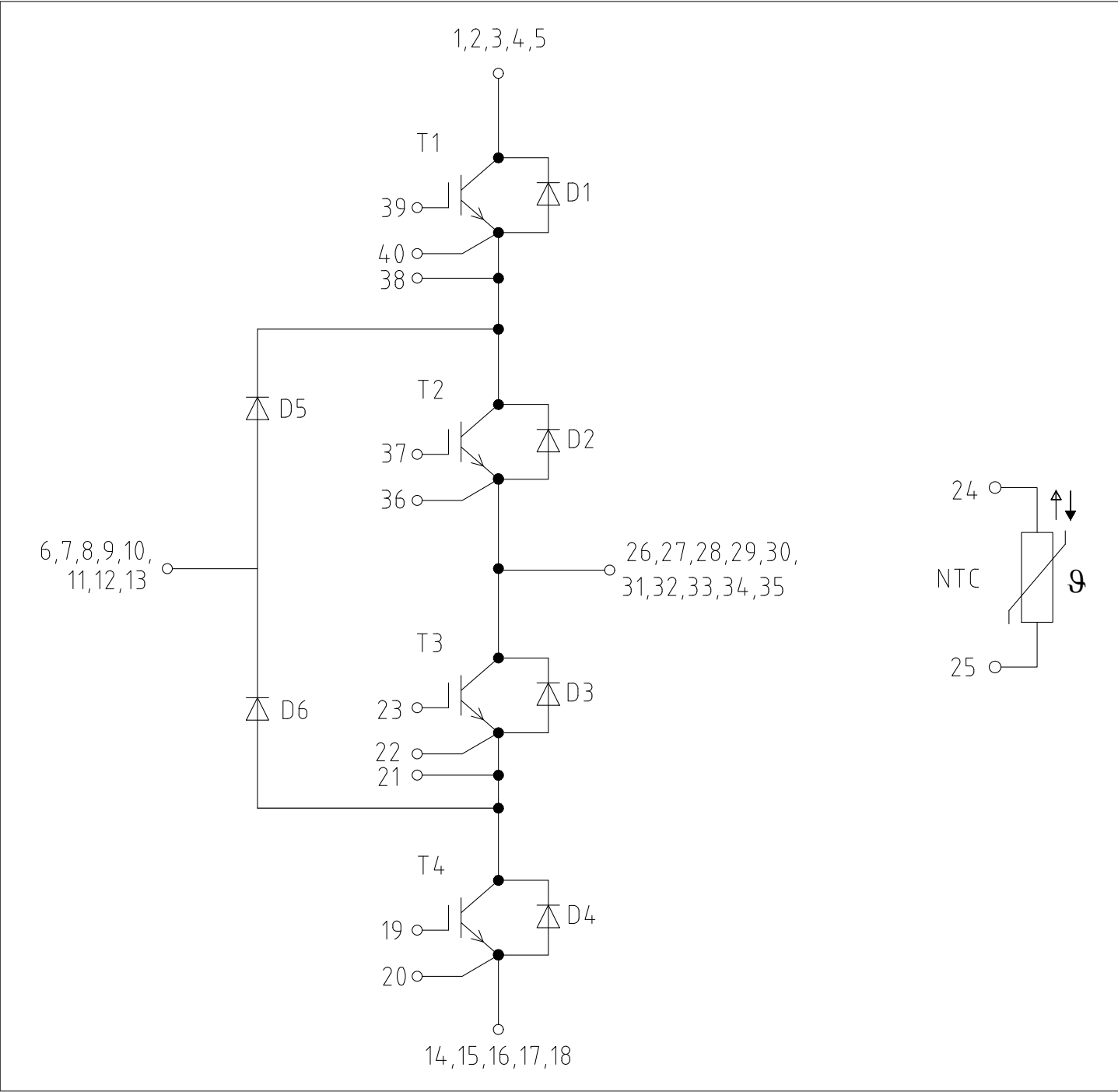


Figure 1

10 Package outlines

Figure 2

11 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	 7154914284655054991153071549142846550549911530		

Figure 3



Revision history

Revision history

Document revision	Date of release	Description of changes
0.10	2024-11-05	Initial version
1.00	2024-12-18	Final datasheet

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