

5SNG 0300Q170300

62Pak phase leg IGBT Module

$V_{CE} = 1700 \text{ V}$
 $I_C = 300 \text{ A}$

Ultra low-loss, rugged SPT++ chip-set
 Smooth switching SPT++ chip-set for good EMC
 Cu base-plate for low thermal resistance
 Industry standard package
 2 switches in one package



Maximum rated values ¹⁾

Parameter	Symbol	Conditions	min	max	Unit
Collector-emitter voltage	V_{CES}	$V_{GE} = 0 \text{ V}$, $T_{vj} \geq 25 \text{ °C}$		1700	V
DC collector current	I_C	$T_C = 100 \text{ °C}$, $T_{vj} = 175 \text{ °C}$		300	A
Peak collector current	I_{CM}	$t_p = 1 \text{ ms}$		600	A
Gate-emitter voltage	V_{GES}		-20	20	V
Total power dissipation	P_{tot}	$T_C = 25 \text{ °C}$, $T_{vj} = 175 \text{ °C}$, per switch		1875	W
DC forward current	I_F			300	A
Peak forward current	I_{FRM}	$t_p = 1 \text{ ms}$		600	A
Surge current	I_{FSM}	$V_R = 0 \text{ V}$, $T_{vj} = 175 \text{ °C}$, $t_p = 10 \text{ ms}$, half-sinewave		1800	A
IGBT short circuit SOA	t_{psc}	$V_{CC} = 1300 \text{ V}$, $V_{CEM \text{ CHIP}} \leq 1700 \text{ V}$ $V_{GE} \leq 15 \text{ V}$, $T_{vj} \leq 175 \text{ °C}$		10	μs
Isolation voltage	V_{isol}	1 min, $f = 50 \text{ Hz}$		4000	V
Junction temperature	T_{vj}			175	°C
Junction operating temperature	$T_{vj(op)}$		-40	175	°C
Case temperature	T_C		-40	125 ²⁾ /150	°C
Storage temperature	T_{stg}		-40	125	°C
Mounting torques ³⁾	M_s	Base-heatsink, M6 screws	3	6	Nm
	M_{t1}	Main terminals, M6 screws	3	6	

¹⁾ Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747

²⁾ for UL1557 compliance T_{Cmax} must be limited to 125°C

³⁾ for detailed mounting instructions refer to ABB Document No. 5SYA 2106

IGBT characteristic values ⁴⁾

Parameter	Symbol	Conditions	min	typ	max	Unit	
Collector (-emitter) breakdown voltage	V _{(BR)CES}	V _{GE} = 0 V, I _C = 10 mA, T _{vj} = 25 °C	1700			V	
Collector-emitter ⁵⁾ saturation voltage	V _{CE sat}	I _C = 300 A, V _{GE} = 15 V	T _{vj} = 25 °C		2.25	2.6	V
			T _{vj} = 125 °C		2.55		V
			T _{vj} = 175 °C		2.75		V
Collector cut-off current	I _{CES}	V _{CE} = 1700 V, V _{GE} = 0 V	T _{vj} = 25 °C			1	mA
			T _{vj} = 125 °C		1.5		mA
			T _{vj} = 175 °C		30		mA
Gate leakage current	I _{GES}	V _{CE} = 0 V, V _{GE} = ± 20 V, T _{vj} = 175 °C	-1		1	µA	
Gate-emitter threshold voltage	V _{GE(th)}	I _C = 12 mA, V _{CE} = V _{GE} , T _{vj} = 25 °C	4.5		6.5	V	
Gate charge	Q _G	I _C = 300 A, V _{CE} = 900 V, V _{GE} = -15 V ..15 V		2.1		µC	
Input capacitance	C _{ies}	V _{CE} = 25 V, V _{GE} = 0 V, f = 1 MHz, T _{vj} = 25 °C		19.2		nF	
Output capacitance	C _{oes}			1.7		nF	
Reverse transfer capacitance	C _{res}			1.6		nF	
Internal gate resistance	R _{Gint}	per switch		2.5		Ω	
Turn-on delay time	t _{d(on)}	V _{CC} = 900 V, I _C = 300 A, R _G = 2.2 Ω, V _{GE} = ±15 V, L _σ = 60 nH, inductive load	T _{vj} = 25 °C		260		ns
			T _{vj} = 125 °C		275		ns
			T _{vj} = 175 °C		285		ns
Rise time	t _r		T _{vj} = 25 °C		95		ns
			T _{vj} = 125 °C		98		ns
			T _{vj} = 175 °C		102		ns
Turn-off delay time	t _{d(off)}		T _{vj} = 25 °C		365		ns
			T _{vj} = 125 °C		455		ns
			T _{vj} = 175 °C		550		ns
Fall time	t _f		T _{vj} = 25 °C		160		ns
			T _{vj} = 125 °C		165		ns
			T _{vj} = 175 °C		180		ns
Turn-on switching energy	E _{on}	V _{CC} = 900 V, I _C = 300 A, R _G = 2.2 Ω, V _{GE} = ±15 V, L _σ = 60 nH, inductive load	T _{vj} = 25 °C		75		mJ
		T _{vj} = 125 °C		95		mJ	
		T _{vj} = 175 °C		115		mJ	
Turn-off switching energy	E _{off}	V _{CC} = 900 V, I _C = 300 A, R _G = 2.2 Ω, V _{GE} = ±15 V, L _σ = 60 nH, inductive load	T _{vj} = 25 °C		50		mJ
		T _{vj} = 125 °C		75		mJ	
		T _{vj} = 175 °C		95		mJ	
Short circuit current	I _{SC}	t _{pSC} ≤ 10 µs, V _{GE} = 15 V, V _{CC} = 1300 V, V _{CEM CHIP} ≤ 1700 V	T _{vj} = 175 °C		950		A

⁴⁾ Characteristic values according to IEC 60747 - 9

⁵⁾ Collector-emitter saturation voltage is given at chip level

Diode characteristic values ⁶⁾

Parameter	Symbol	Conditions	min	typ	max	Unit
Forward voltage ⁷⁾	V _F	I _F = 300 A	T _{Vj} = 25 °C	1.6	2.2	V
			T _{Vj} = 125 °C	1.75		V
			T _{Vj} = 175 °C	1.7		V
Peak reverse recovery current	I _{RM}	V _{CC} = 900 V, I _F = 300 A, V _{GE} = ±15 V, R _G = 2.2 Ω, di/dt = 3.4 kA/μs L _σ = 60 nH, inductive load	T _{Vj} = 25 °C	330		A
			T _{Vj} = 125 °C	390		A
			T _{Vj} = 175 °C	450		A
Recovered charge	Q _r		T _{Vj} = 25 °C	86		μC
			T _{Vj} = 125 °C	131		μC
			T _{Vj} = 175 °C	178		μC
Reverse recovery time	t _{rr}		T _{Vj} = 25 °C	600		ns
			T _{Vj} = 125 °C	720		ns
			T _{Vj} = 175 °C	840		ns
Reverse recovery energy	E _{rec}		T _{Vj} = 25 °C	50		mJ
			T _{Vj} = 125 °C	75		mJ
			T _{Vj} = 175 °C	110		mJ

⁶⁾ Characteristic values according to IEC 60747 - 2

⁷⁾ Forward voltage is given at chip level

Package properties ⁸⁾

Parameter	Symbol	Conditions	min	typ	max	Unit
IGBT thermal resistance junction to case	$R_{th(j-c)IGBT}$	per switch			0.080	K/W
Diode thermal resistance junction to case	$R_{th(j-c)DIODE}$				0.120	K/W
IGBT thermal resistance ³⁾ case to heatsink	$R_{th(c-s)IGBT}$	IGBT per switch, λ grease = $1\text{W}/\text{m} \times \text{K}$		0.033		K/W
Diode thermal resistance ³⁾ case to heatsink	$R_{th(c-s)DIODE}$	Diode per switch, λ grease = $1\text{W}/\text{m} \times \text{K}$		0.050		K/W
Comparative tracking index	CTI		200			
Module stray inductance	$L_{\sigma CE}$	per switch		20		nH
Resistance, terminal-chip	$R_{CC' \rightarrow EE'}$	per switch	$T_C = 25 \text{ }^{\circ}\text{C}$	0.7		m Ω
			$T_C = 125 \text{ }^{\circ}\text{C}$	0.98		
			$T_C = 175 \text{ }^{\circ}\text{C}$	1.12		

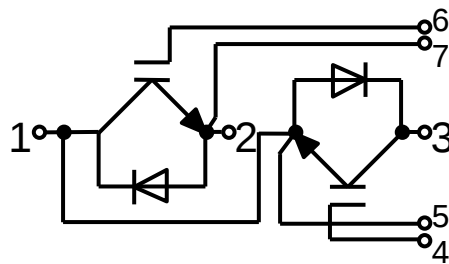
³⁾ For detailed mounting instructions refer to ABB Document No. 5SYA 2106

Mechanical properties ⁸⁾

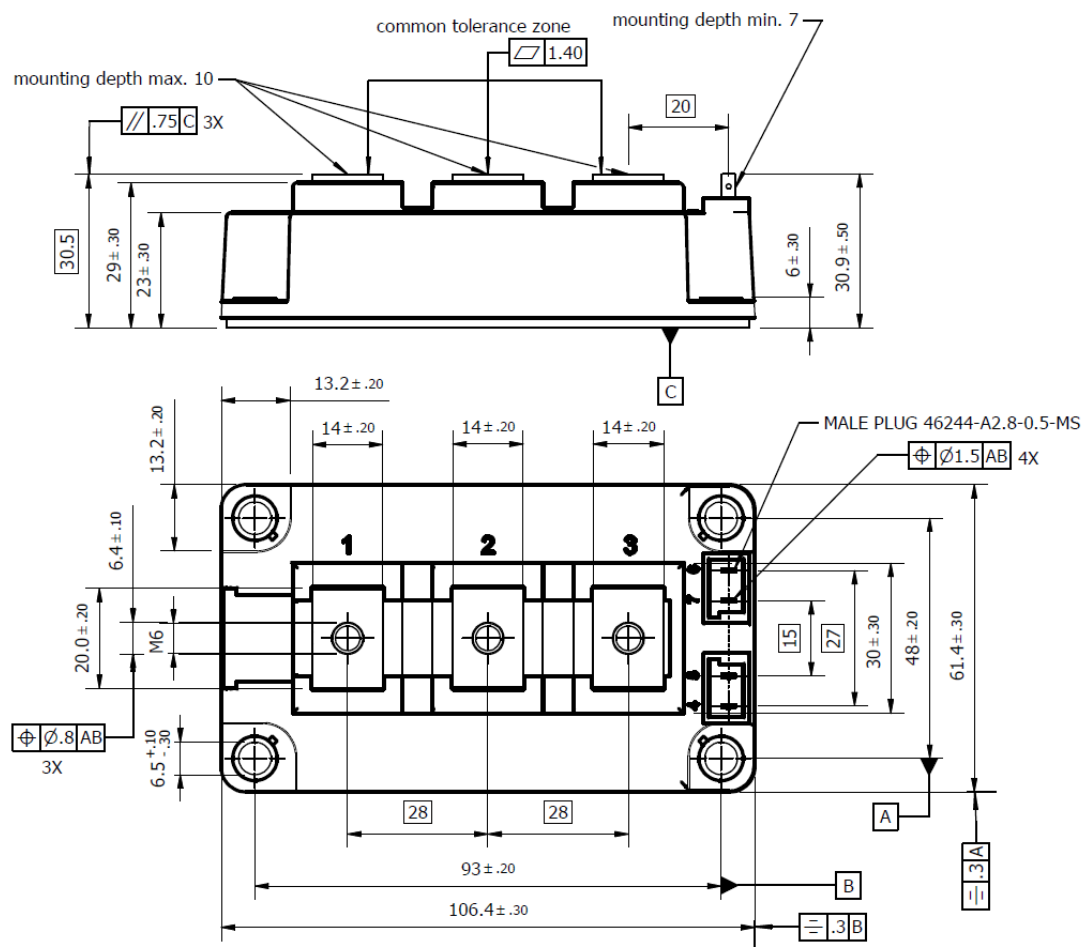
Parameter	Symbol	Conditions	min	typ	max	Unit
Dimensions	L x W x H	Typical	106.4 x 61.4 x 30.9			mm
Clearance distance in air	d_a	according to IEC 60664-1 and EN 50124-1	Term. to base:	23		mm
			Term. to term:	11		
Surface creepage distance	d_s	according to IEC 60664-1 and EN 50124-1	Term. to base:	29		mm
			Term. to term:	23		
Mass	m			330		g

⁸⁾ Package and mechanical properties according to IEC 60747 - 15

Electrical configuration



Outline drawing ³⁾



Note: all dimensions are shown in millimeters

³⁾ For detailed mounting instructions refer to ABB Document No. 5SYA 2106

This is an electrostatic sensitive device, please observe the international standard IEC 60747-1, chap. VIII.
This product has been designed and qualified for Industrial Level.

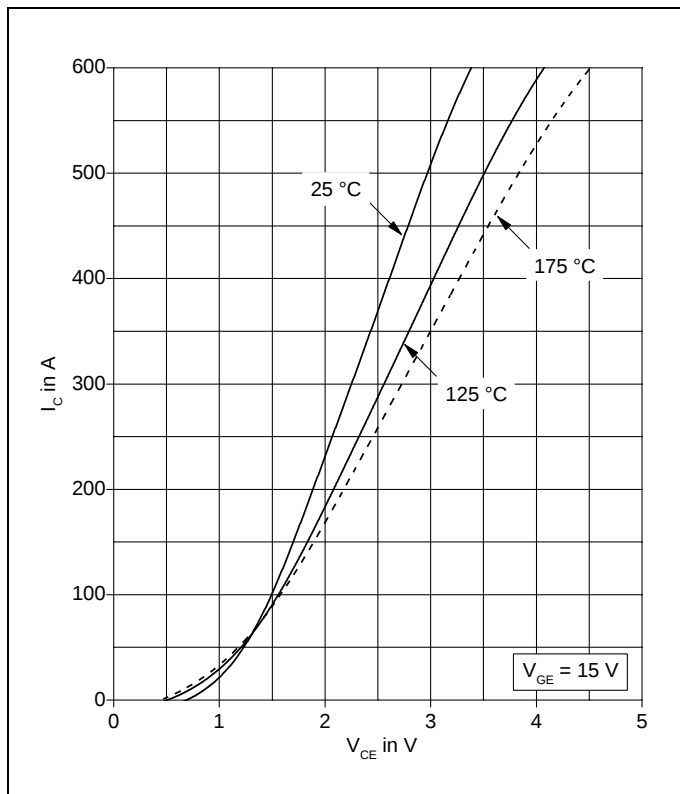


Fig. 1 Typical on-state characteristics, chip level

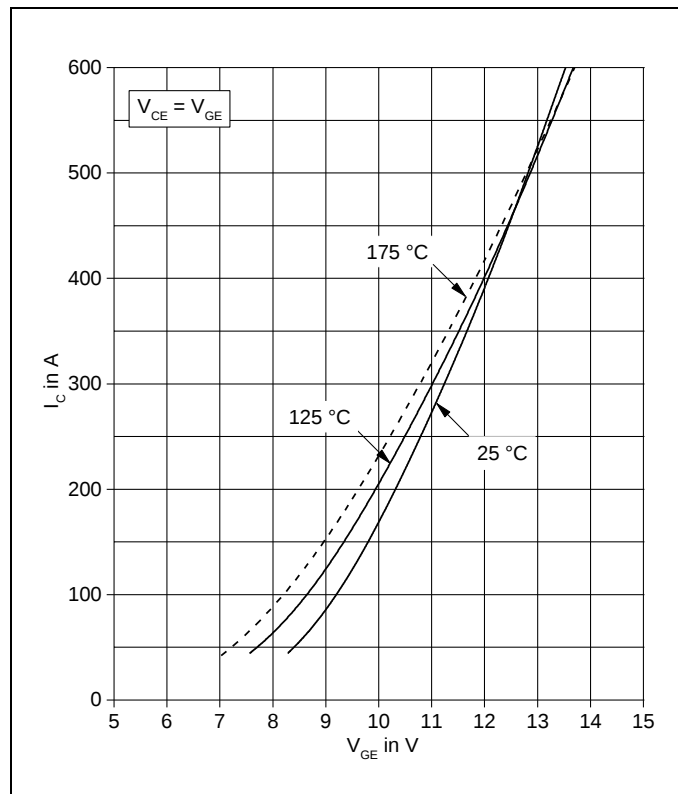


Fig. 2 Typical transfer characteristics, chip level

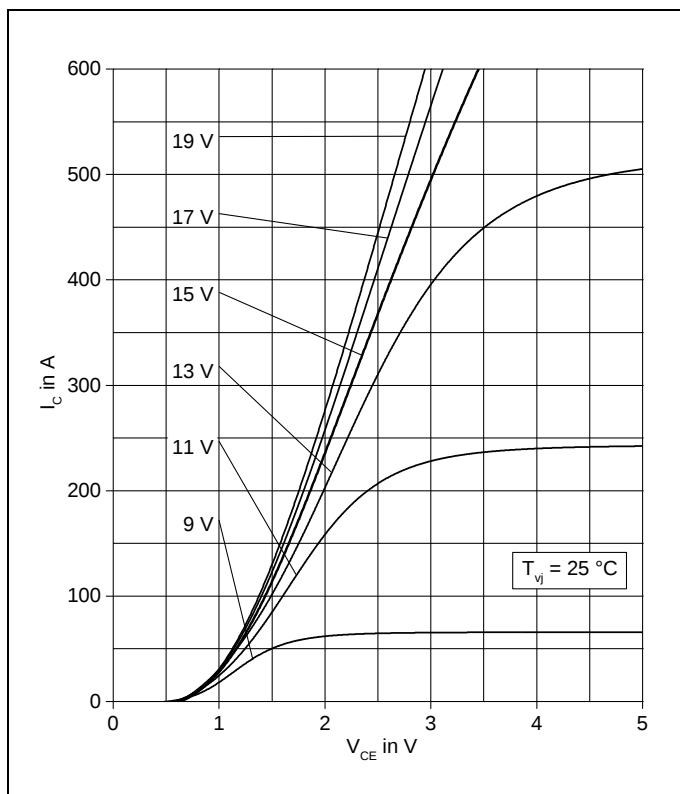


Fig. 3 Typical output characteristics, chip level

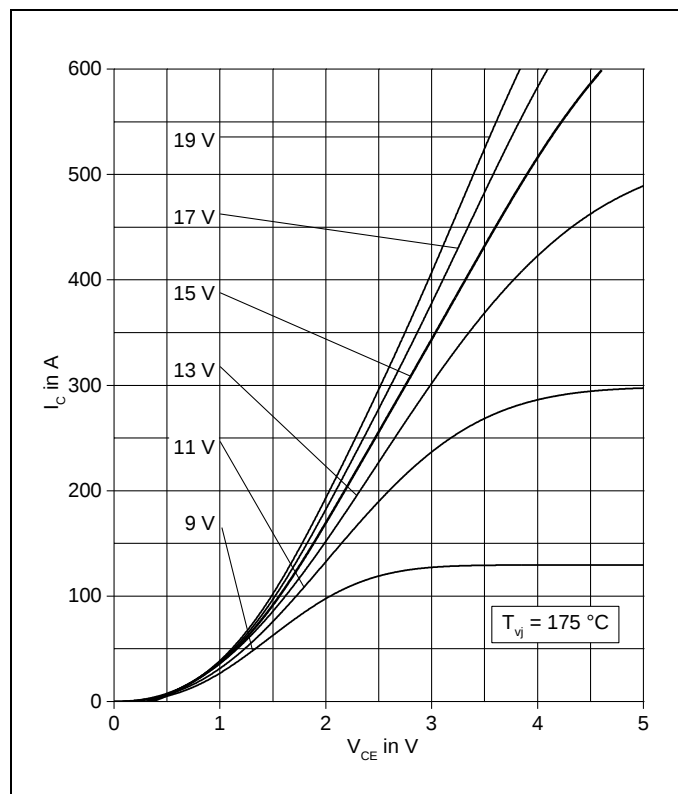


Fig. 4 Typical output characteristics, chip level

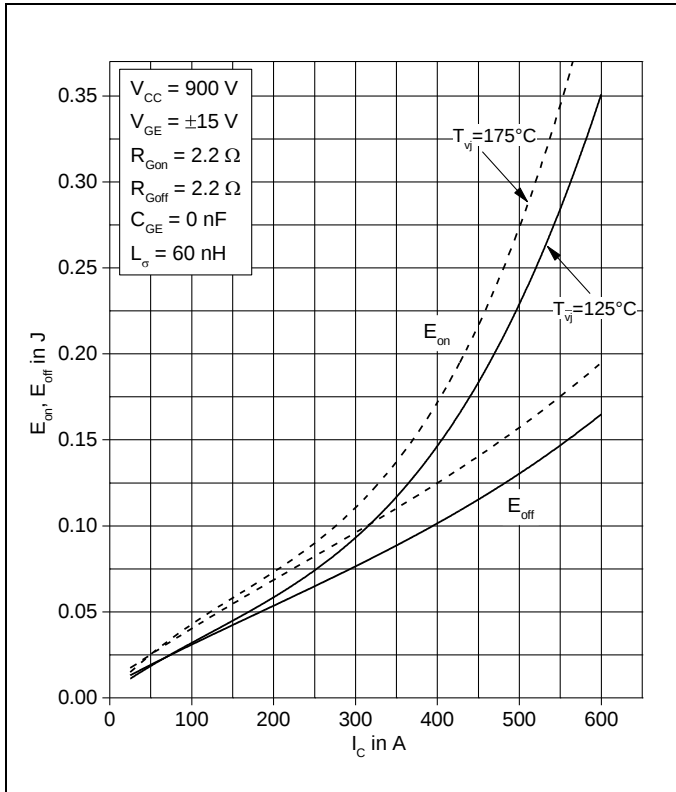


Fig. 5 Typical switching energies per pulse vs. collector current

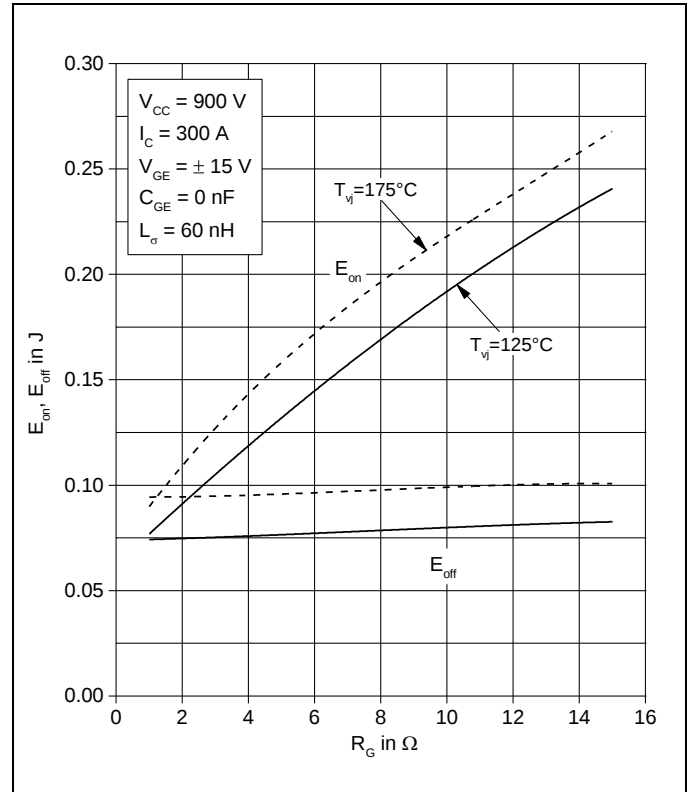


Fig. 6 Typical switching energies per pulse vs. gate resistor

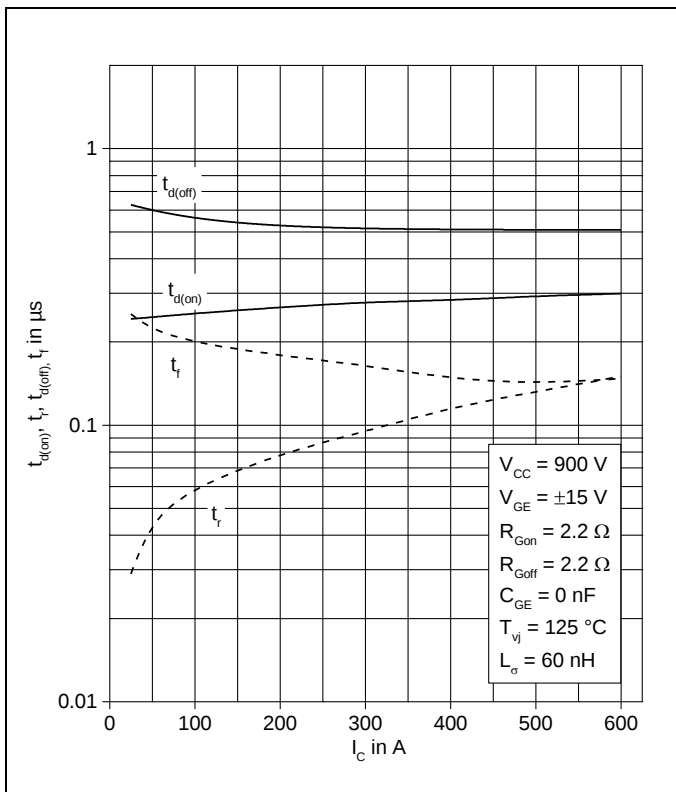


Fig. 7 Typical switching times vs. collector current

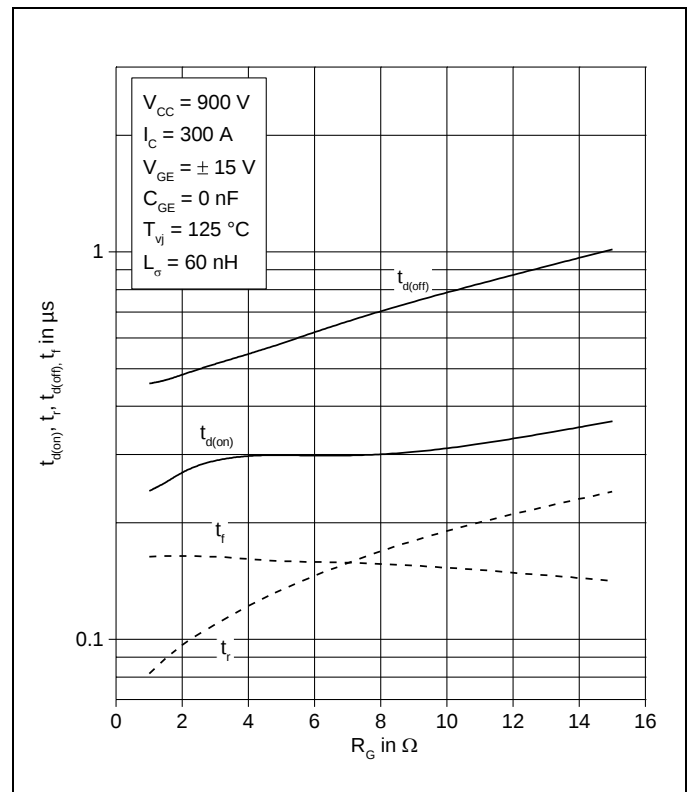


Fig. 8 Typical switching times vs. gate resistor

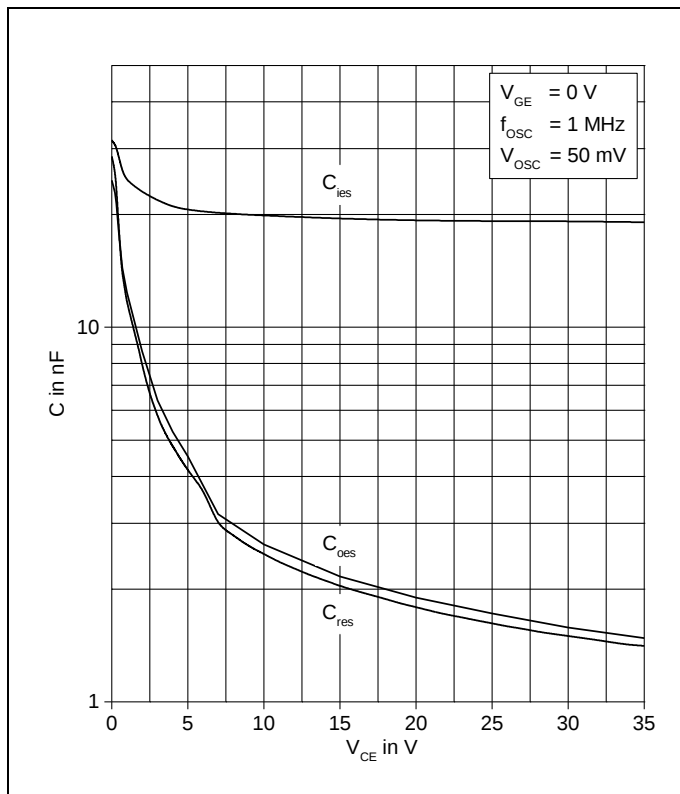


Fig. 9 Typical capacitances vs. collector-emitter voltage

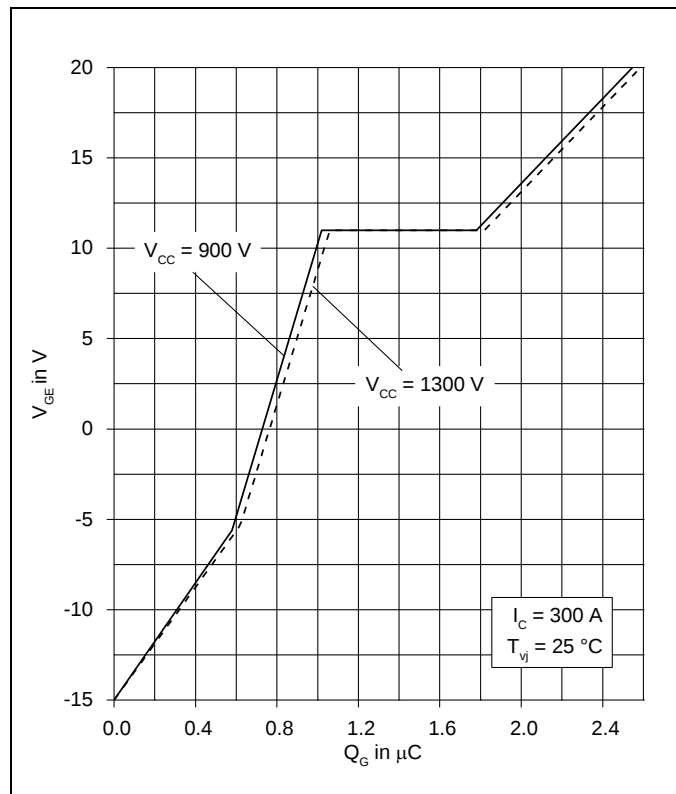


Fig. 10 Typical gate charge characteristics

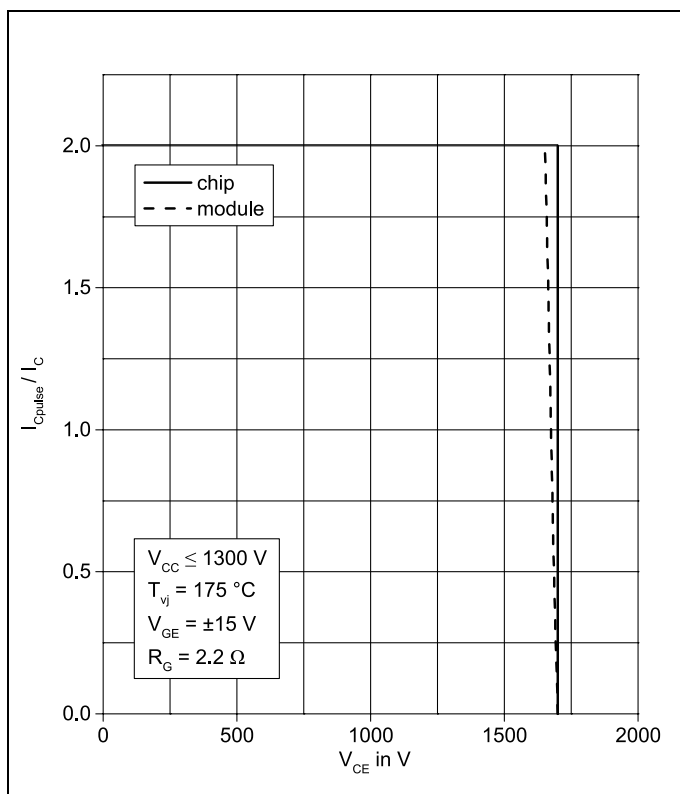


Fig. 11 Turn-off safe operating area (RBSOA)

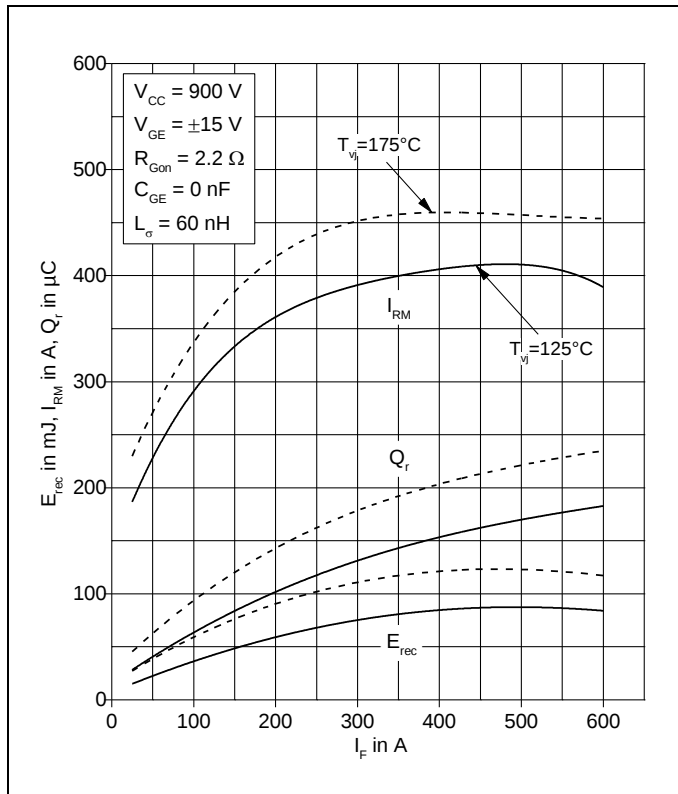


Fig. 12 Typical reverse recovery characteristics vs. forward current

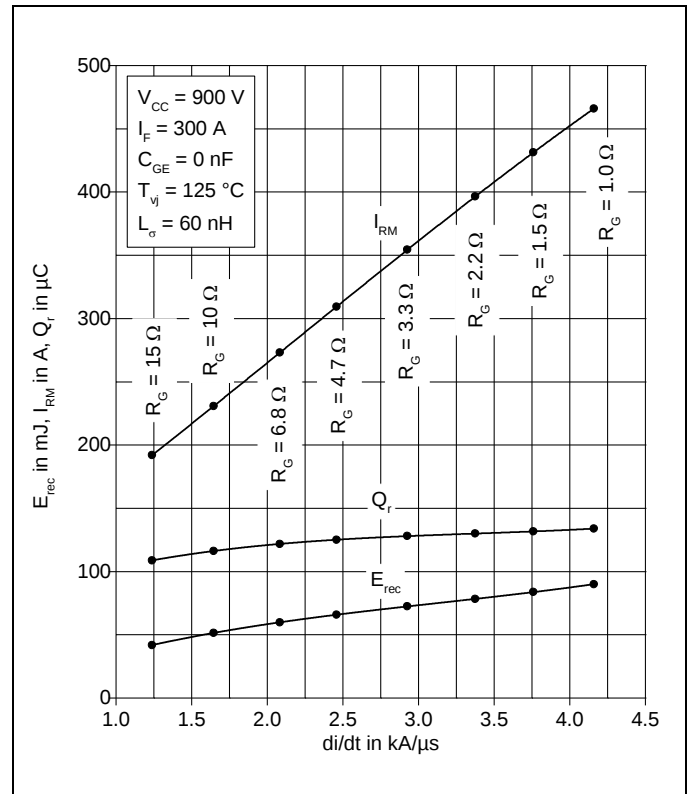


Fig. 13 Typical reverse recovery characteristics vs. di/dt

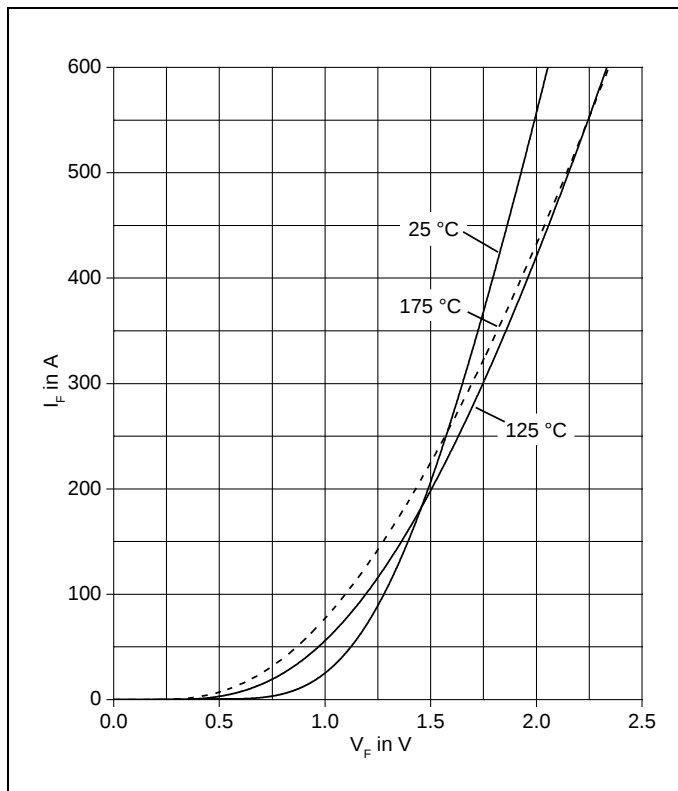


Fig. 14 Typical diode forward characteristics, chip level

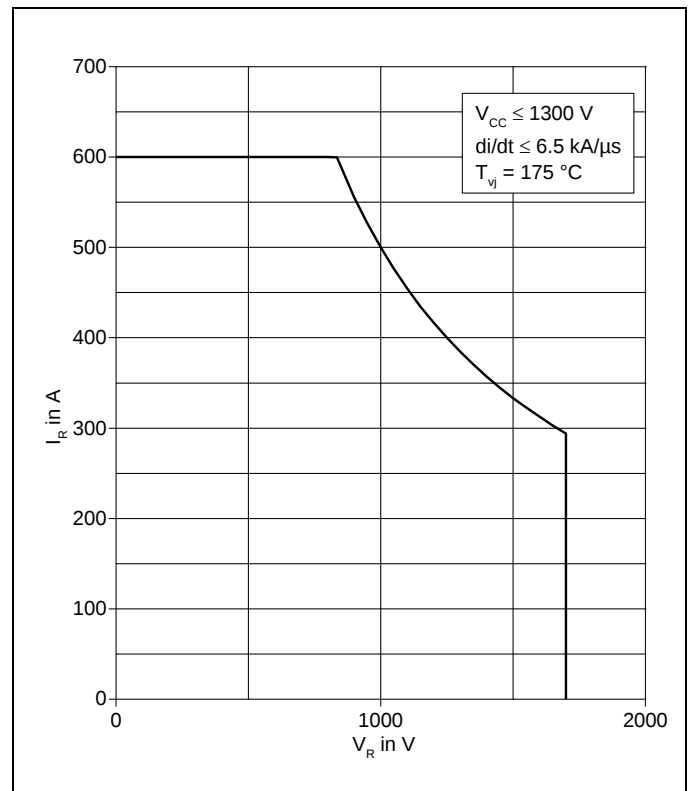


Fig. 15 Safe operating area diode (SOA)

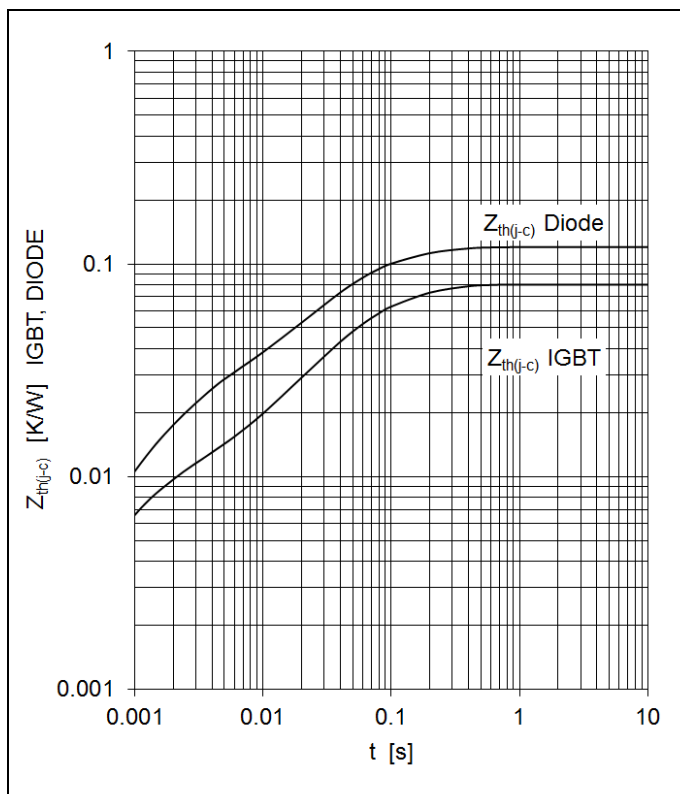


Fig. 16 Thermal impedance vs. time

Analytical function for transient thermal impedance:

$$Z_{th(j-c)}(t) = \sum_{i=1}^n R_i (1 - e^{-t/\tau_i})$$

	i	1	2	3	4	5
IGBT	$R_i(K/kW)$	8.1	44.2	27.7		
	$\tau_i(ms)$	0.9	40.2	136		
DIODE	$R_i(K/kW)$	20.2	30.9	68.9		
	$\tau_i(ms)$	1.8	137	37.2		

Related documents:

5SYA 2042 Failure rates of IGBT modules due to cosmic rays
 5SYA 2045 Thermal runaway during blocking
 5SYA 2053 Applying IGBT
 5SYA 2058 Surge currents for IGBT diodes
 5SYA 2093 Thermal design and temperature ratings of IGBT modules
 5SYA 2098 Paralleling of IGBT modules

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