

**5SNG 0900R120590****LoPak phase leg IGBT module**

- $V_{CE} = 1200\text{ V}$
- $I_C = 900\text{ A} \times 2$
- Press-fit pins for reliable auxiliary contacts
- Ultra low-loss rugged Trench IGBT chipset
- NTC thermistor for temperature sensing
- Cu baseplate for low thermal resistance
- Pre-Applied Thermal Interface Material (TIM) to improve thermal conductivity between module and heat sink
- Industry standard package

**Maximum rated values**

Parameter	Symbol	Conditions	Min.	Max.	Unit
Collector-emitter voltage	$V_{ces}$	$V_{GE} = 0\text{ V}$ , $T_{vj} \geq 25\text{ °C}$		1200	V
DC collector current	$I_c$	$T_c = 125\text{ °C}$ , $T_{vj} = 175\text{ °C}$		900	A
Peak collector current	$I_{cm}$	$t_p = 1\text{ ms}$		1800	A
Gate-emitter voltage	$V_{ges}$		-20	20	V
DC forward current	$I_f$			900	A
Peak forward current	$I_{fpm}$	$t_p = 1\text{ ms}$		1800	A
Surge current	$I_{fsm}$			TBD	A
IGBT short circuit SOA	$t_{psc}$	$V_{GE} \leq 15\text{ V}$ , $V_{CC} = 900\text{ V}$ $V_{CE,max} \leq 1200\text{ V}$ , $T_{vj} = 175\text{ °C}$		8	us
Isolation voltage	$V_{isol}$	1 min, $f = 50\text{ Hz}$		4000	V
Max Junction temperature	$T_{vj}$		-40	175	C
Junction operating temperature	$T_{vj(op)}$		-40	175	C
Case temperature	$T_c$		-40	125/150	C
Storage temperature	$T_{stg}$		-40	125	C
Mounting torques	$M_s, M_{t1}$	Base-heatsink, M5 screws or Main terminals, M6 screws	3	6	Nm

## IGBT characteristic values

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE} = 0 \text{ V}$ , $I_C = 5 \text{ mA}$	$T_{vj}=25 \text{ }^\circ\text{C}$	1200		V
Collector-emitter saturation voltage	$V_{CE \text{ sat}}$	$I_C = 900 \text{ A}$ , $V_{GE} = 15 \text{ V}$	$T_{vj}=25 \text{ }^\circ\text{C}$		1.55	V
			$T_{vj}=125 \text{ }^\circ\text{C}$		1.7	V
			$T_{vj}=175 \text{ }^\circ\text{C}$		1.8	V
Collector cut-off current	$I_{CES}$	$V_{CE} = 1200 \text{ V}$ , $V_{GE} = -15 \text{ V}$	$T_{vj}=25 \text{ }^\circ\text{C}$		0.1	mA
			$T_{vj}=125 \text{ }^\circ\text{C}$		2.5	mA
			$T_{vj}=175 \text{ }^\circ\text{C}$		13	mA
Gate leakage current	$I_{GES}$	$V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$		-150	150	nA
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C = 36 \text{ mA}$ , $V_{CE} = V_{GE}$	$T_{vj}=25 \text{ }^\circ\text{C}$	5.5		V
Gate charge	$Q_G$				TBD	$\mu\text{C}$
Input capacitance	$C_{ies}$				TBD	nF
Internal gate resistance	$R_{g,int}$				1.3	$\Omega$
Turn-on delay time	$t_{d(on)}$	$I_C = 900 \text{ A}$ , $V_{CE} = 600 \text{ V}$ , $V_{GE} = \pm 15 \text{ V}$ , $R_{G,on} = 0.51 \text{ } \Omega$	$T_{vj}=25 \text{ }^\circ\text{C}$		475	ns
			$T_{vj}=125 \text{ }^\circ\text{C}$		500	ns
			$T_{vj}=175 \text{ }^\circ\text{C}$		550	ns
Rise time	$t_r$		$T_{vj}=25 \text{ }^\circ\text{C}$		140	ns
			$T_{vj}=125 \text{ }^\circ\text{C}$		175	ns
			$T_{vj}=175 \text{ }^\circ\text{C}$		200	ns
Turn-off delay time	$t_{d(off)}$	$T_{vj}=25 \text{ }^\circ\text{C}$		525	ns	
		$T_{vj}=125 \text{ }^\circ\text{C}$		615	ns	
		$T_{vj}=175 \text{ }^\circ\text{C}$		650	ns	
Fall time	$t_f$	$T_{vj}=25 \text{ }^\circ\text{C}$		140	ns	
		$T_{vj}=125 \text{ }^\circ\text{C}$		170	ns	
		$T_{vj}=175 \text{ }^\circ\text{C}$		180	ns	
Turn-on switching energy	$E_{on}$	$I_C = 900 \text{ A}$ , $V_{CE} = 600 \text{ V}$ , $V_{GE} = \pm 15 \text{ V}$ , $L_s = 25 \text{ nH}$ , $R_{g,on} = 0.51 \text{ } \Omega$	$T_{vj}=25 \text{ }^\circ\text{C}$		152	mJ
			$T_{vj}=125 \text{ }^\circ\text{C}$		235	mJ
			$T_{vj}=175 \text{ }^\circ\text{C}$		273	mJ
Turn-off switching energy	$E_{off}$	$I_C = 900 \text{ A}$ , $V_{CE} = 600 \text{ V}$ , $V_{GE} = \pm 15 \text{ V}$ , $L_s = 25 \text{ nH}$	$T_{vj}=25 \text{ }^\circ\text{C}$		132	mJ
			$T_{vj}=125 \text{ }^\circ\text{C}$		165	mJ
			$T_{vj}=175 \text{ }^\circ\text{C}$		186	mJ
Short circuit current	$I_{SC}$	$V_{GE} = 15 \text{ V}$ , $V_{CC} = 900 \text{ V}$ , $V_{CEM \text{ CHIP}} \leq 1200 \text{ V}$	$T_{vj}=175 \text{ }^\circ\text{C}$		3500	A

## Diode characteristic values

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward voltage	$V_F$	$I_F = 900 \text{ A}$	$T_{vj} = 25 \text{ }^\circ\text{C}$		1.65	V
			$T_{vj} = 125 \text{ }^\circ\text{C}$		1.7	V
			$T_{vj} = 175 \text{ }^\circ\text{C}$		1.8	V
Peak reverse recovery current	$I_{rm}$		$T_{vj} = 25 \text{ }^\circ\text{C}$		493	A
			$T_{vj} = 125 \text{ }^\circ\text{C}$		535	A
			$T_{vj} = 175 \text{ }^\circ\text{C}$		550	A
Recovered charge	$Q_{rr}$	$I_F = 900 \text{ A}$ $V_{CE} = 600 \text{ V}$ $V_{GE} = \pm 15 \text{ V}$ $L_S = 25 \text{ nH}$ $R_{g,on} = 0.51 \text{ } \Omega$ $dI/dt = 3.9 \text{ kA}/\mu\text{s}$	$T_{vj} = 25 \text{ }^\circ\text{C}$		76	$\mu\text{C}$
			$T_{vj} = 125 \text{ }^\circ\text{C}$		135	$\mu\text{C}$
			$T_{vj} = 175 \text{ }^\circ\text{C}$		190	$\mu\text{C}$
Reverse recovery time	$t_{rr}$		$T_{vj} = 25 \text{ }^\circ\text{C}$		297	ns
			$T_{vj} = 125 \text{ }^\circ\text{C}$		553	ns
			$T_{vj} = 175 \text{ }^\circ\text{C}$		680	ns
Reverse recovery energy	$E_{rec}$		$T_{vj} = 25 \text{ }^\circ\text{C}$		21	mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$		47	mJ
			$T_{vj} = 175 \text{ }^\circ\text{C}$		55	mJ

## NTC Thermistor

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Rated resistance	$R_{25}$	$T_c = 25 \text{ }^\circ\text{C}$		5		K-ohms
R100	$R_{100}$	$T_c = 100 \text{ }^\circ\text{C}$	468		517	ohms
B-value	$B_{25/50}$	$R_{25} = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$		3375		K
B-value	$B_{25/100}$	$R_{25} = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298.15\text{K}))]$		3433		K

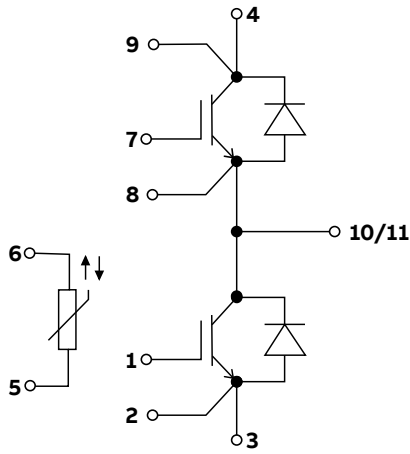
## Package properties

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
IGBT thermal resistance junction to case	$R_{th(j-c)} \text{ IGBT}$	per switch			0.043	K/W
Diode thermal resistance junction to case	$R_{th(j-c)} \text{ DIODE}$	per switch			0.095	K/W
IGBT thermal resistance case to heatsink	$R_{th(c-s)} \text{ IGBT}$	IGBT per switch, $I_{TIM} = 5 \text{ W}/\text{m} \times \text{K}$		0.03		K/W
Diode thermal resistance case to heatsink	$R_{th(c-s)} \text{ DIODE}$	Diode per switch, $I_{TIM} = 5 \text{ W}/\text{m} \times \text{K}$		0.04		K/W
Comparative tracking index	CTI					
Module stray inductance	$L \sigma \text{ CE}$	per switch		20		nH
Resistance, terminal-chip	RCC'+EE'	per switch	$T_{vj} = 25 \text{ }^\circ\text{C}$	0.95		m-ohms
			$T_{vj} = 125 \text{ }^\circ\text{C}$	1.35		
			$T_{vj} = 175 \text{ }^\circ\text{C}$	1.55		K/W

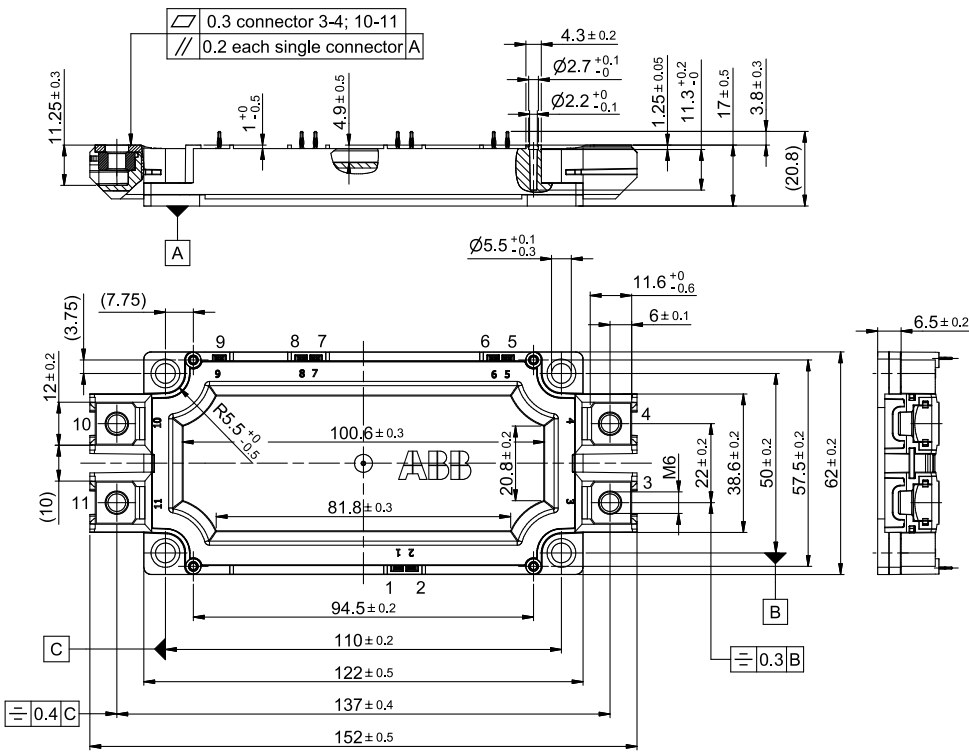
## Mechanical properties

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dimensions	L x W x H	Typical	152 x 62 x 17			
Clearancedistance in air	$d_a$	According to IEC 60664-1 and EN 50124-1	Term. to base:	12.5		mm
			Term. to base:	10		
Surface creepage distance	$d_s$		Term. to base:	14.5		
			Term. to base:	13		
Mass	m			350		g

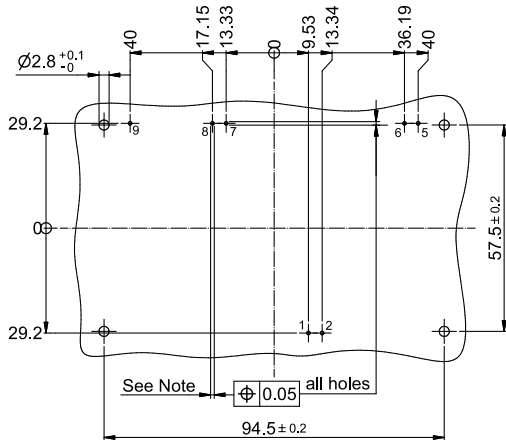
Electrical configuration



Outline drawing (mm)



PCB drill hole pattern for press-fit



Note:

Ø1<sup>+0.09</sup><sub>-0.06</sub> Diameter of finished plated through-hole

Ø1.15 Diameter of drilled hole

Note: For detailed mounting instructions refer to ABB Document No. 5SYA 2113.

Fig. 1 Typical on-state characteristics, chip level

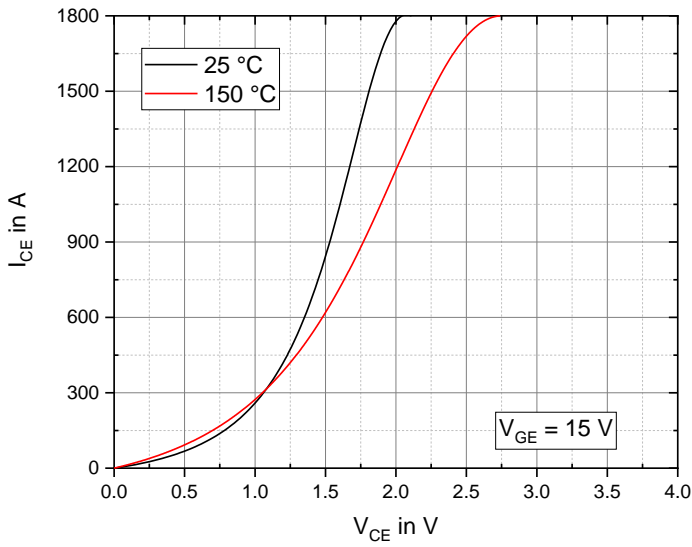


Fig. 2 Typical transfer characteristics, chip level

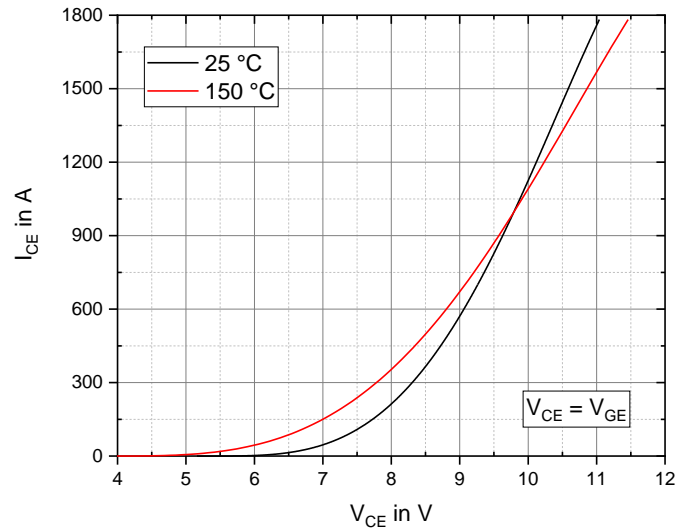


Fig. 3 Typical switching energies per pulse, vs. switched current

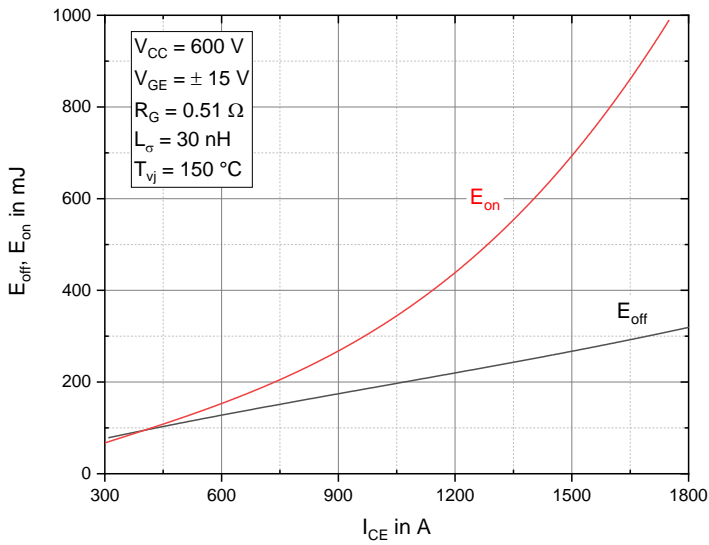


Fig. 4 Typical switching energies per pulse vs. gate resistor

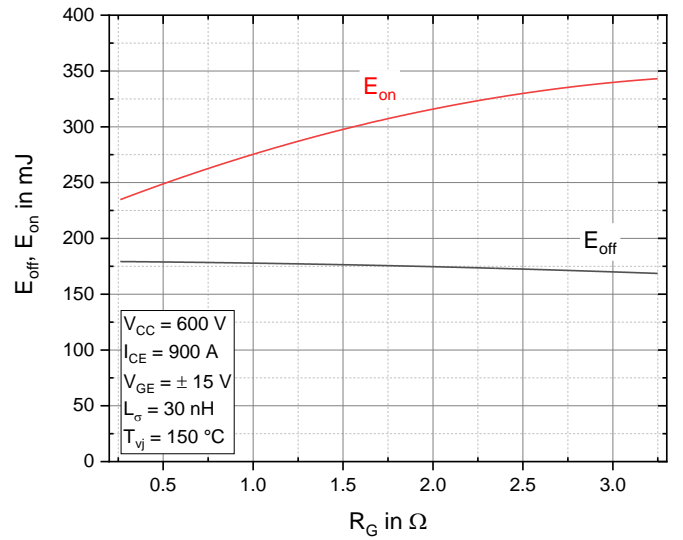


Fig. 5 Turn-off safe operating area (RBSOA)

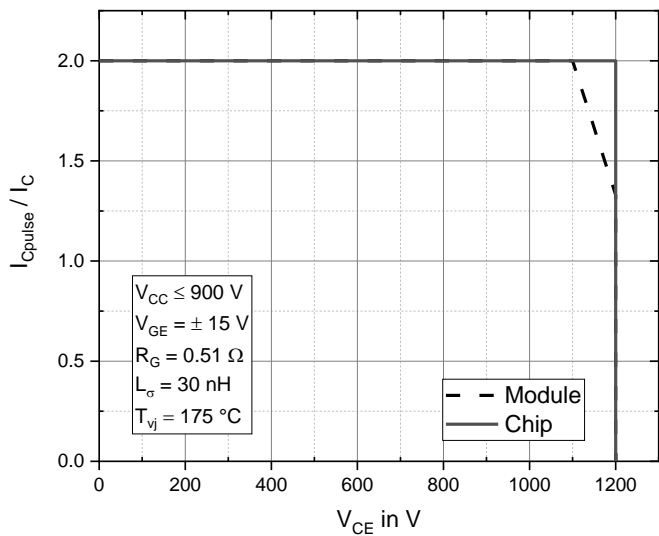


Fig. 6 Typical diode forward characteristics, chip level

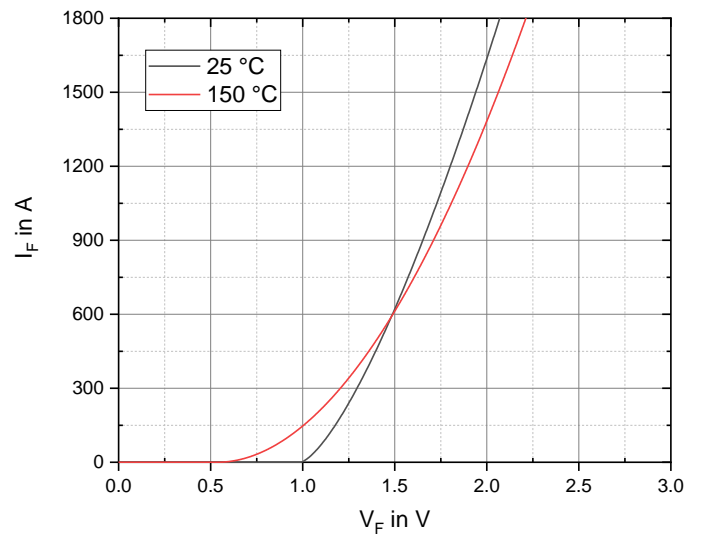


Fig. 7 Typical recovery characteristics, vs. switched current

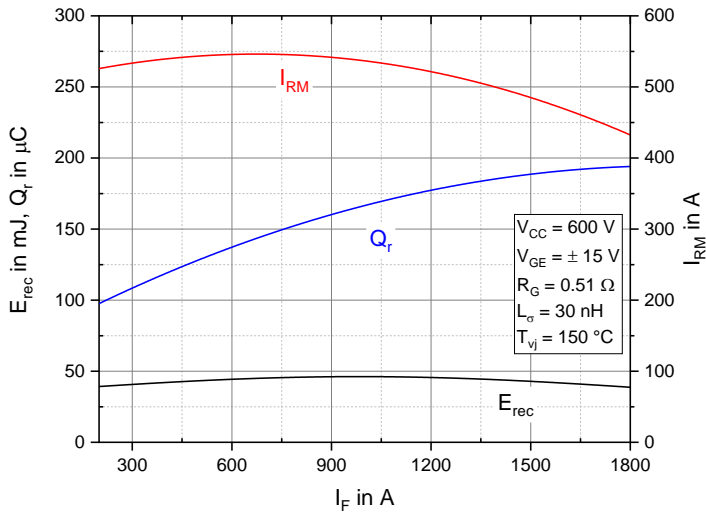


Fig. 8 Typical recovery characteristics vs. di/dt

