



# SML200HB12

**Attributes:**

- Aerospace build standard
- High reliability
- Lightweight
- Metal matrix base plate
- AlN isolation
- Trench gate igbts

**Maximum rated values/Electrical Properties**

Collector-emitter Voltage		$V_{ce}$	1200	V
DC Collector Current	$T_c=70C, T_{vj}=175C$ $T_c=25C, T_{vj}=175C$	$I_{c, nom}$ $I_c$	200 295	A
Repetitive peak Collector Current	$t_p=1msec, T_c=80C$	$I_{crm}$	400	A
Total Power Dissipation	$T_c=25C$	$P_{tot}$	2380	W
Gate-emitter peak voltage		$V_{ges}$	+/-20	V
DC Forward Diode Current		$I_f$	200	A
Repetitive Peak Forward Current	$t_p=1msec$	$I_{f, rm}$	400	A
$I^2t$ value per diode	$V_r=0V, t_p=10msec,$ $T_{vj}=125C$	$I_t^2$	7800	$A^2sec$
Isolation voltage	RMS, 50Hz, $t=1min$	$V_{isol}$	2500	V

Collector-emitter saturation voltage	$I_c=200A, V_{ge}=15V, T_c=25C$ $I_c=200A, V_{ge}=15V, T_c=125C$	$V_{ce(sat)}$		1.7 2.0	2.15	V
Gate Threshold voltage	$I_c=8mA, V_{ce}=V_{ge}, T_{vj}=25C$	$V_{ge(th)}$	5.0	5.8	6.5	V
Input capacitance	$f=1MHz, T_{vj}=25C, V_{ce}=25V,$ $V_{ge}=0V$	$C_{ies}$		14		nF
Reverse transfer Capacitance	$f=1MHz, T_{vj}=25C, V_{ce}=25V,$ $V_{ge}=0V$	$C_{res}$		0.5		nF
Collector emitter cut off current	$V_{ce}=1200V, V_{ge}=0V, T_{vj}=25C$	$I_{ces}$		1	5	mA
Gate emitter cut off current	$V_{ce}=0V, V_{ge}=20V, T_{vj}=25C$	$I_{ges}$			400	nA



Turn on delay time	Ic=200A, Vcc=600V Vge=+/15V,Rg=3.6Ω,Tvj=25C Vge=+/-15V,Rg=3.6Ω,Tvj=125C	t <sub>d,on</sub>	250 300	nsec nsec nsec
Rise time	Ic=200A, Vcc=600V Vge=+/-15V,Rg=3.6Ω,Tvj=25C Vge=+/-15V,Rg=3.6Ω,Tvj=125C	t <sub>r</sub>	90 100	nsec nsec nsec
Turn off delay time	Ic=200A, Vcc=600V Vge=+/-15V,Rg=3.6Ω,Tvj=25C Vge=+/-15V,Rg=3.6Ω,Tvj=125C	t <sub>d,off</sub>	550 650	nsec nsec nsec
Fall time	Ic=200A, Vcc=600V Vge=+/-15V,Rg=3.6Ω,Tvj=25C Vge=+/-15V,Rg=3.6Ω,Tvj=125C	t <sub>f</sub>	130 180	nsec nsec nsec
Turn on energy loss per pulse	Ic=200A, Vce=600V, Vge=+/-15V Rge=3.6Ω, L=30nH Tvj=25C di/dt=6000A/μsec Tvj=125C	E <sub>on</sub>	15	mJ mJ
Turn off energy loss per pulse	Ic=200A, Vce=600V, Vge=+/-15V Rge=3.6Ω, L=30nH Tvj=25C di/dt=4000A/μsec Tvj=125C	E <sub>off</sub>	35.0	mJ mJ
SC Data	t <sub>p</sub> ≤10μsec, Vge≤15V, Vce=900V, Vce(max)=Vces-L di/dt Tvj=125C	I <sub>sc</sub>	800	A
Stray Module inductance		L <sub>σce</sub>	20	nH
Terminal-chip resistance		R <sub>c</sub>	0.7	mΩ

**Diode characteristics**

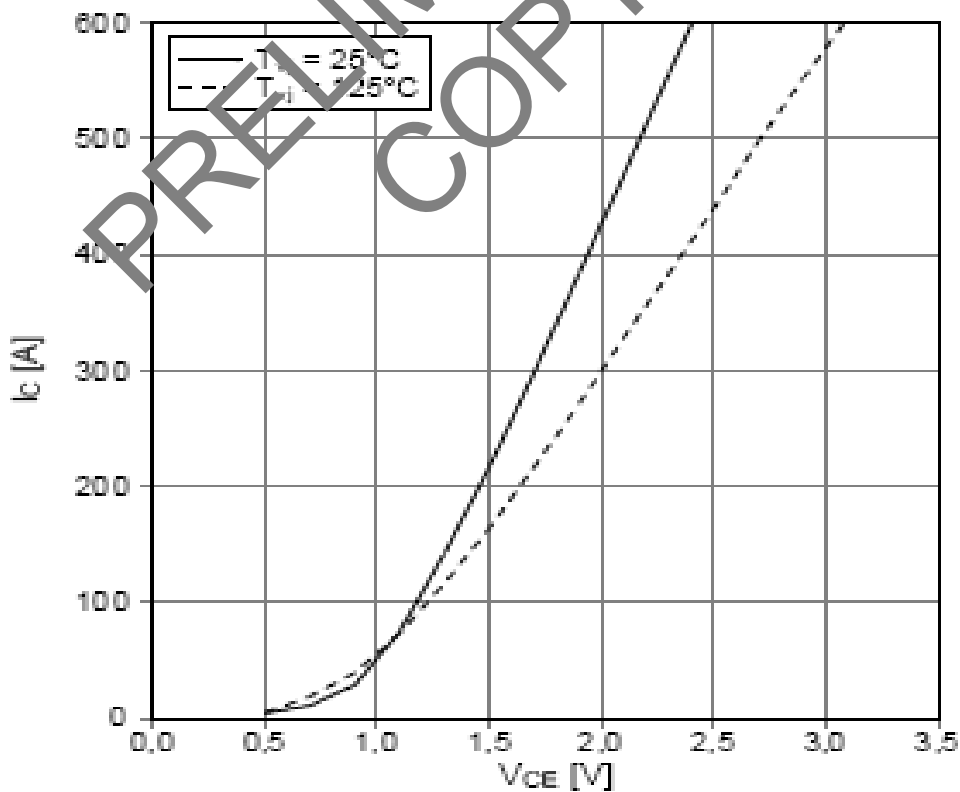
Forward voltage	Ic=200A, Vge=0V, Tc=25C Ic=200A, Vge=0V, Tc=125C	V <sub>f</sub>	1.65 1.65	2.15	V V
Peak reverse recovery current	If=200A, -di/dt=2000A/μsec Vce=600V, Vge=-15V, Tvj=25C Vce=600V, Vge=-15V, Tvj=125C	I <sub>rm</sub>	150 190	A A	
Recovered charge	If=200A, -di/dt=2000A/μsec Vce=600V, Vge=-15V, Tvj=25C Vce=600V, Vge=-15V, Tvj=125C	Q <sub>r</sub>	20 36	μC μC	
Reverse recovery energy	If=200A, -di/dt=2000A/μsec Vce=600V, Vge=-15V, Tvj=25C Vce=600V, Vge=-15V, Tvj=125C	E <sub>rec</sub>	9 17	mJ mJ	



### Thermal Properties

			Min	Typ	Max	
Thermal resistance junction to case	Igibt Diode	$R_{\theta J-C}$			0.063 0.11	K/W
Thermal resistance case to heatsink		$R_{\theta C-HS}$		0.03		K/W
Maximum junction temperature		$T_{vj}$			175	C
Maximum operating temperature		$T_{op}$	-55		175	C
Storage Temperature		$T_{stg}$	-55		175	C

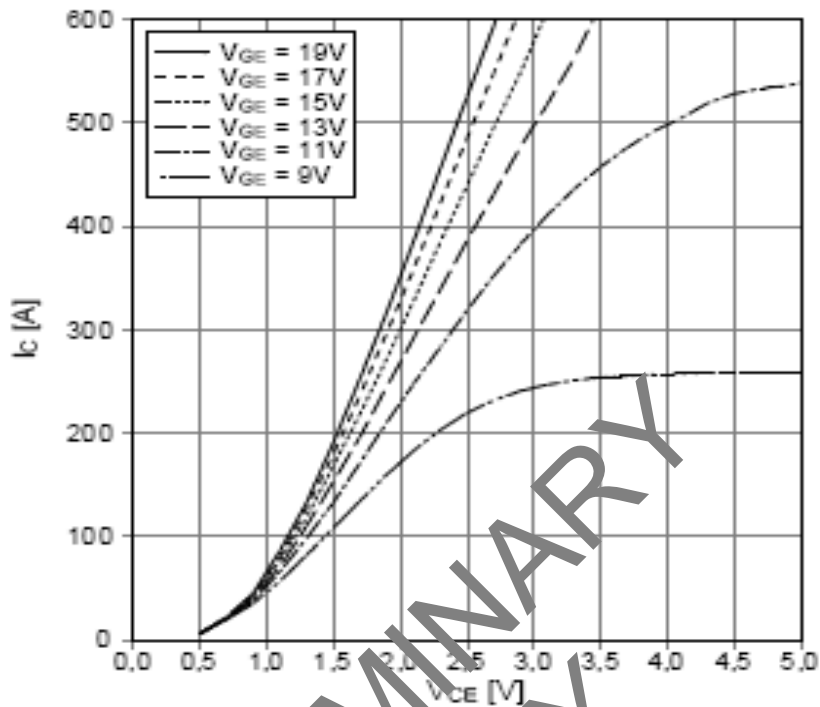
output characteristic IGBT inverter (typical)  
 $I_C = f(V_{CE})$   
 $V_{GE} = 15\text{ V}$





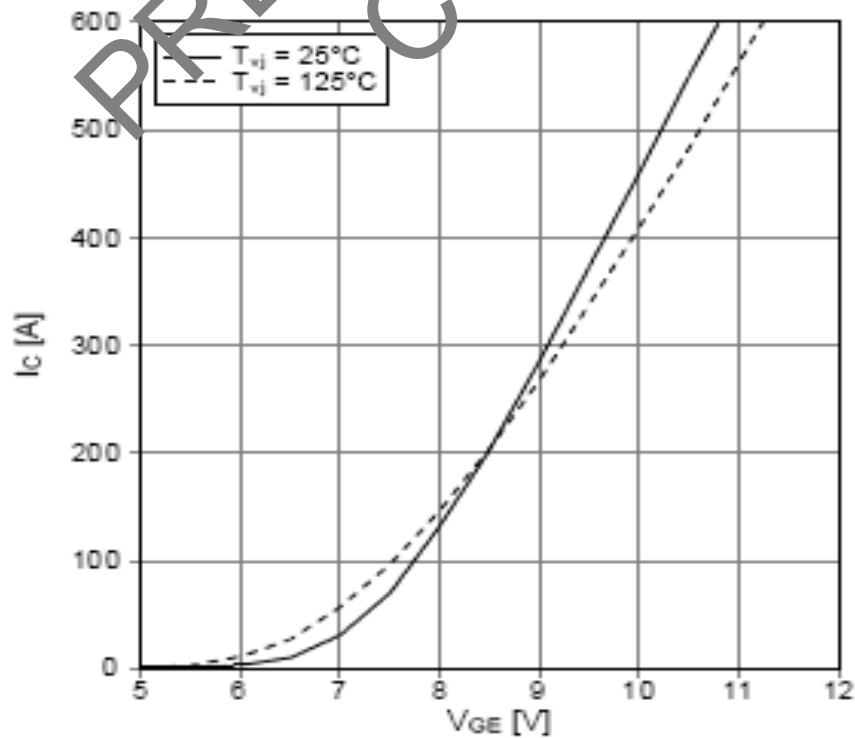
### output characteristic IGBT-Inverter (typical)

$I_C = f(V_{CE})$   
 $T_{vj} = 125^\circ\text{C}$



### transfer characteristic IGBT-inverter (typical)

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

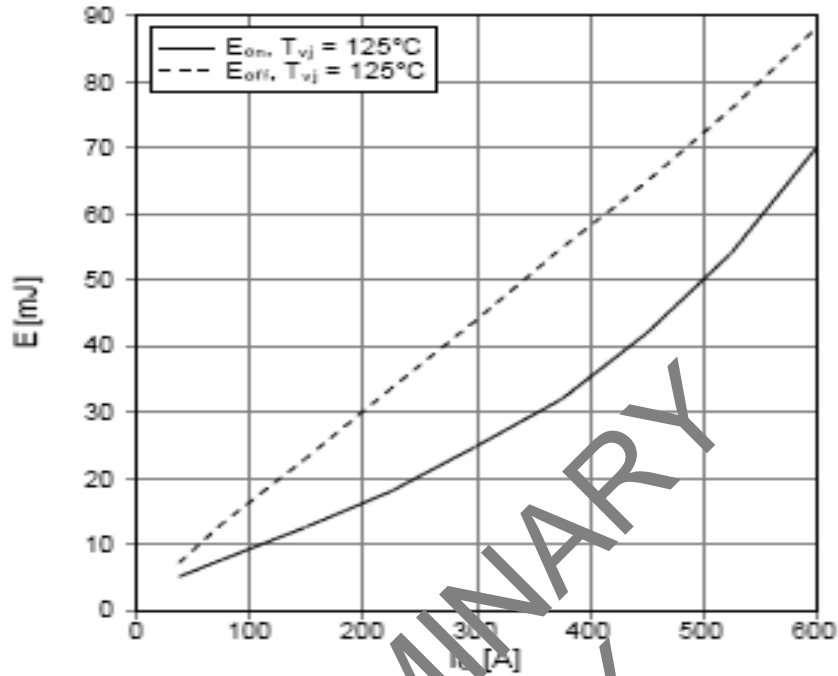




### switching losses IGBT-inverter (typical)

$$E_{on} = f(I_c), E_{off} = f(I_c)$$

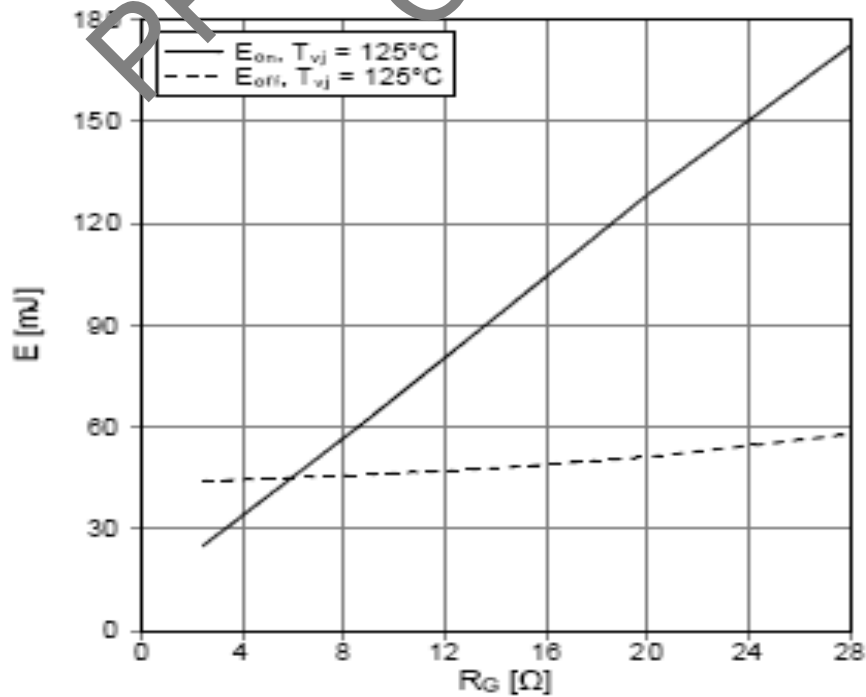
$$V_{GE} = \pm 15 \text{ V}, R_{Gon} = 2.4 \Omega, R_{Goff} = 2.4 \Omega, V_{CE} = 600 \text{ V}$$



### switching losses IGBT-Inverter (typical)

$$E_{on} = f(R_G), E_{off} = f(R_G)$$

$$V_{GE} = \pm 15 \text{ V}, I_c = 300 \text{ A}, V_{CE} = 600 \text{ V}$$

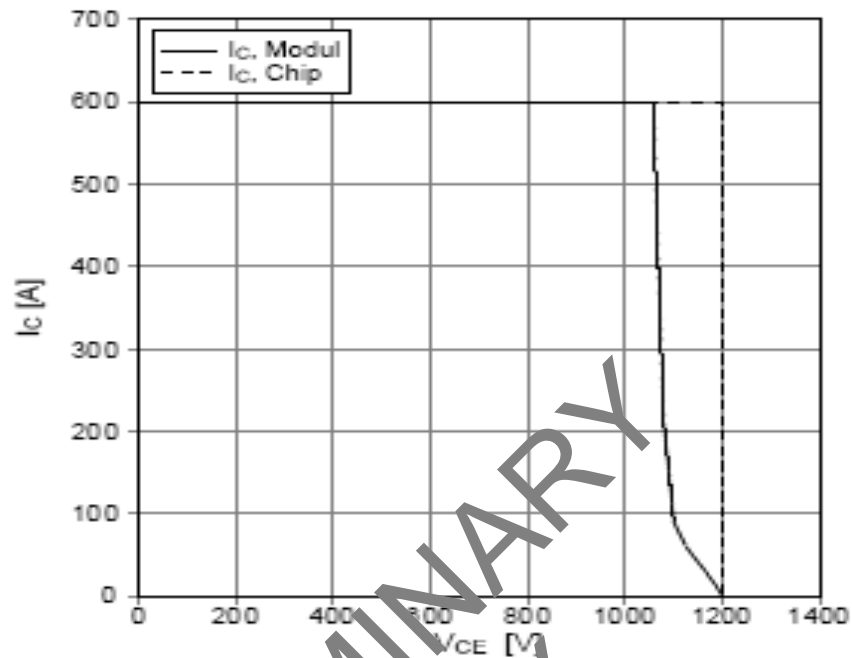




#### reverse bias safe operating area IGBT-inv. (RBSOA)

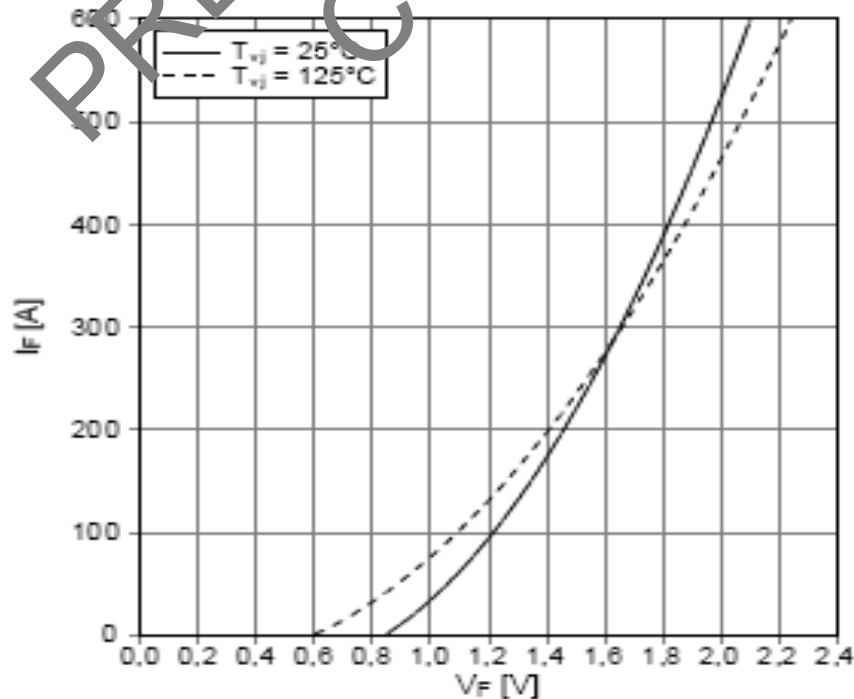
$$I_C = f(V_{CE})$$

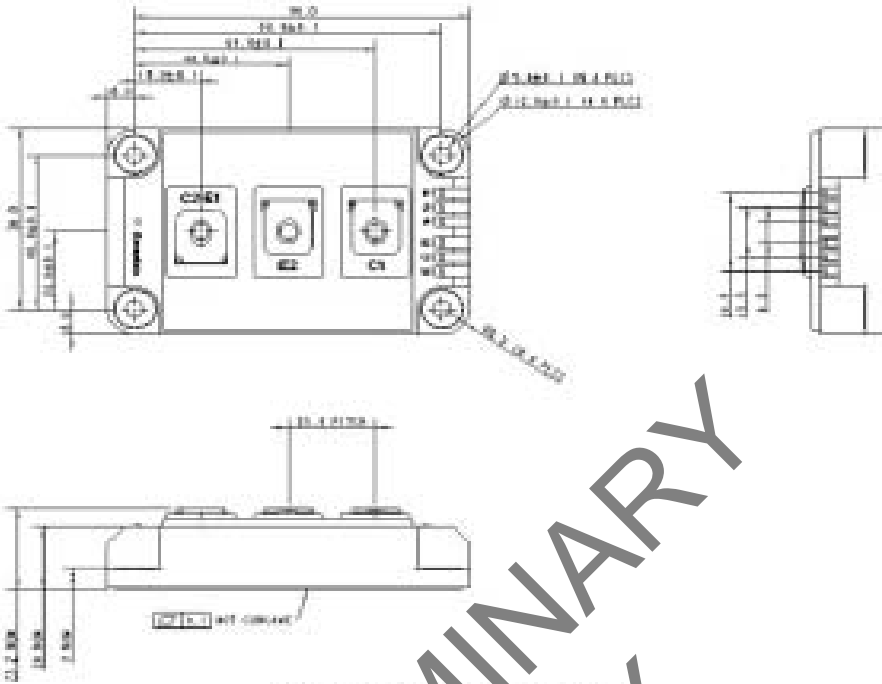
$$V_{GE} = \pm 15 \text{ V}, R_{Goff} = 2.4 \Omega, T_{vj} = 125^\circ\text{C}$$



#### forward characteristic of diode inverter (typical)

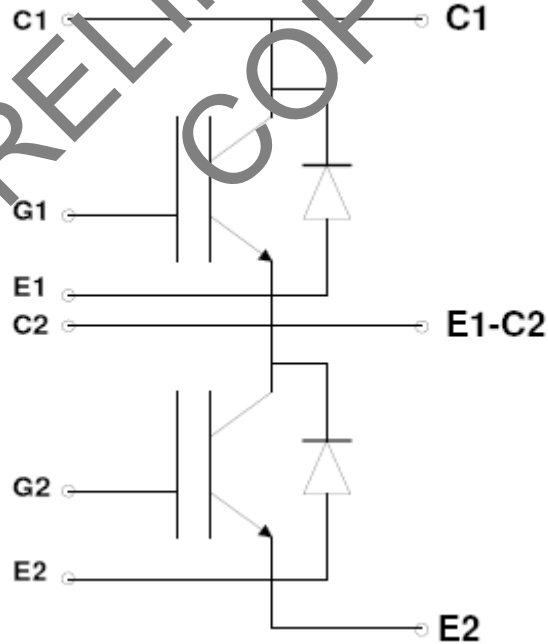
$$I_F = f(V_F)$$





All dimensions in mm

PRELIMINARY COPY



CIRCUIT DIAGRAM