



SEMiX® 3p

Trench IGBT Modules

SEMiX303GB12M7p

Features*

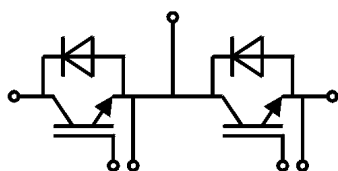
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High overload capability
- Low loss high density IGBTs
- Press-fit pins as auxiliary contacts
- UL recognized, file no. E63532

Typical Applications

- AC inverter drives
- UPS
- Renewable energy systems

Remarks

- Product reliability results are valid for $T_j=150^\circ\text{C}$ (recommended $T_{j,op}=-40\dots+150^\circ\text{C}$)
- V_{isol} between temperature sensor and power section is only 2500V
- For storage and case temperature with TIM see document "TP(*) SEMiX 3p"



GB

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 175 °C	T _c = 25 °C	436	A
		T _c = 80 °C	334	A
I _{Cnom}			300	A
I _{CRM}			600	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 150 °C	8	μs
T _j			-40 ... 175	°C
Inverse diode				
V _{RRM}	T _j = 25 °C		1200	V
I _F	T _j = 175 °C	T _c = 25 °C	361	A
		T _c = 80 °C	270	A
I _{FRM}			600	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		1485	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}			600	A
T _{stg}	module without TIM		-40 ... 125	°C
V _{isol}	AC sinus 50Hz, t = 1 min		4000	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
V _{CE(sat)}	I _C = 300 A	T _j = 25 °C		1.55	1.95	V
	V _{GE} = 15 V chipelevel	T _j = 150 °C		1.80	2.28	V
V _{CE0}	chipelevel	T _j = 25 °C		0.84	0.90	V
		T _j = 150 °C		0.72	0.83	V
r _{CE}	V _{GE} = 15 V chipelevel	T _j = 25 °C		2.4	3.5	mΩ
		T _j = 150 °C		3.6	4.8	mΩ
V _{GE(th)}	V _{CE} = 10 V, I _C = 30 mA		5.4	6	6.6	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V, T _j = 25 °C				3.0	mA
C _{ies}	V _{CE} = 10 V V _{GE} = 0 V	f = 1 MHz		63.0		nF
C _{oes}		f = 1 MHz		1.96		nF
C _{res}		f = 1 MHz		0.84		nF
Q _G	V _{GE} = -8V ... + 15V			3000		nC
R _{Gint}	T _j = 25 °C			0.3		Ω
t _{d(on)}	V _{CC} = 600 V	T _j = 150 °C		200		ns
t _r	I _C = 300 A	T _j = 150 °C		38		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		15		mJ
t _{d(off)}	R _{G on} = 1.3 Ω	T _j = 150 °C		330		ns
	R _{G off} = 1.3 Ω	T _j = 150 °C		95		ns
t _f	di/dt _{on} = 8800 A/μs	T _j = 150 °C				
E _{off}	di/dt _{off} = 2700 A/μs	T _j = 150 °C				
	dv/dt = 5100 V/μs					
E _{off}	L _s = 25 nH			32		mJ
R _{th(j-c)}	per IGBT				0.113	K/W
R _{th(c-s)}	per IGBT (λ _{grease} =0.81 W/(m*K))			0.03		K/W
R _{th(c-s)}	per IGBT, pre-applied phase change material			0.021		K/W



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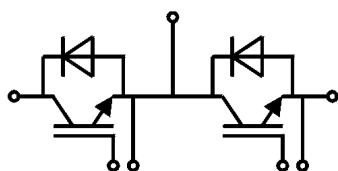
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 300 A	T _j = 25 °C		2.20	2.52	V
	V _{GE} = 0 V chipelevel	T _j = 150 °C		2.16	2.47	V
V _{F0}	chipelevel	T _j = 25 °C		1.30	1.50	V
		T _j = 150 °C		0.90	1.10	V
r _F	chipelevel	T _j = 25 °C		3.0	3.4	mΩ
		T _j = 150 °C		4.2	4.6	mΩ
I _{RRM}	I _F = 300 A	T _j = 150 °C		450		A
Q _{rr}	di/dt _{off} = 8700 A/μs	T _j = 150 °C		53		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	T _j = 150 °C		27		mJ
R _{th(j-c)}	per diode				0.162	K/W
R _{th(c-s)}	per diode (λ _{grease} =0.81 W/(m*K))			0.046		K/W
R _{th(c-s)}	per diode, pre-applied phase change material			0.037		K/W
Module						
L _{CE}				20		nH
R _{CC'+EE'}	measured per switch	T _C = 25 °C		1.2		mΩ
		T _C = 125 °C		1.65		mΩ
R _{th(c-s)1}	calculated without thermal coupling			0.009		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module (λ _{grease} =0.81 W/(m*K))			0.014		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module, pre-applied phase change material			0.010		K/W
M _s	to heat sink (M5)		3		6	Nm
M _t		to terminals (M6)	3		6	Nm
						Nm
w					350	g
Temperature Sensor						
R ₁₀₀	T _C =100°C (R ₂₅ =5 kΩ)			493 ± 5%		Ω
B _{100/125}	R _(T) =R ₁₀₀ exp[B _{100/125} (1/T-1/T ₁₀₀)]; T[K];			3550 ±2%		K



GB

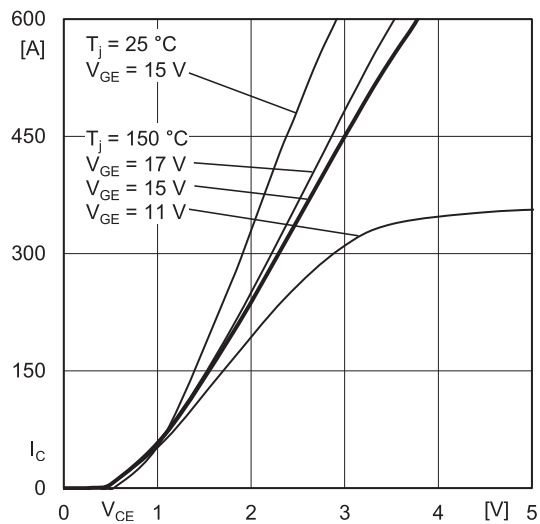


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

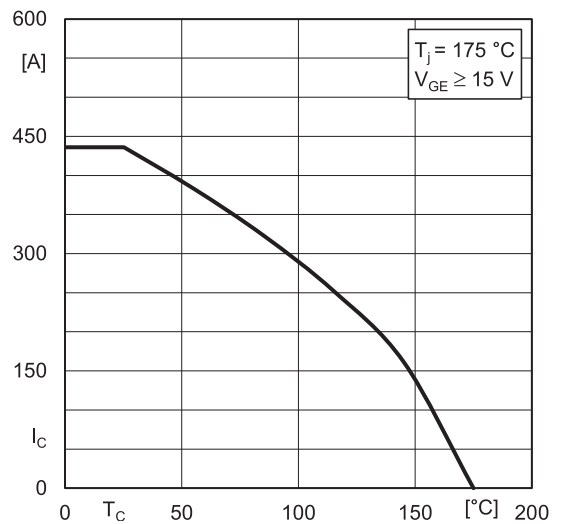


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

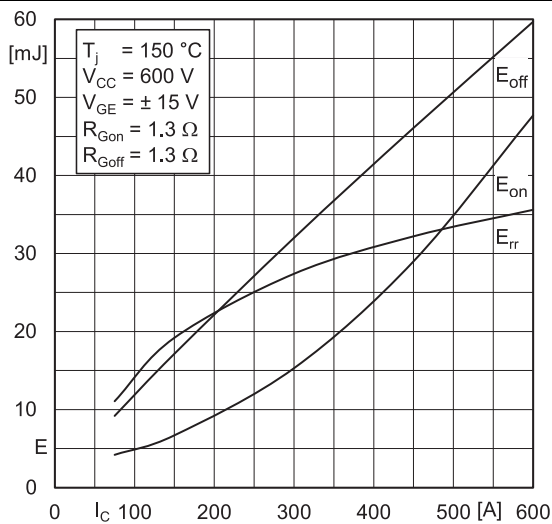


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

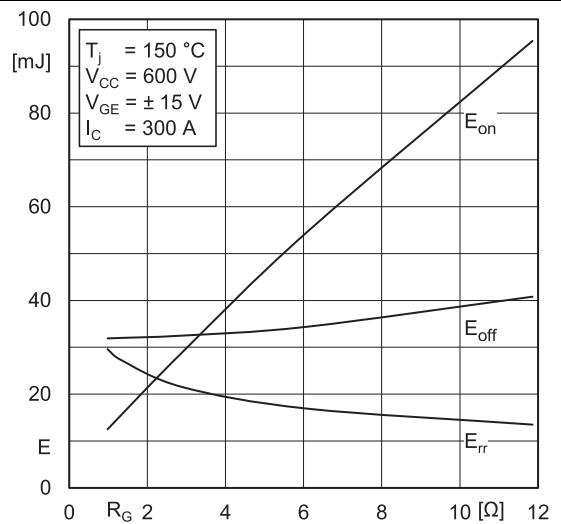


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

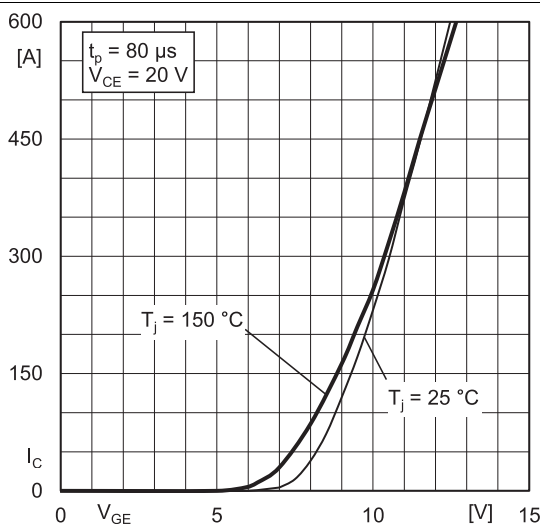


Fig. 5: Typ. transfer characteristic

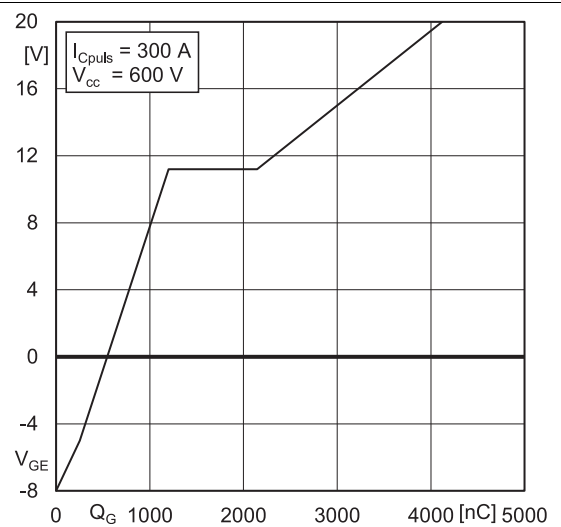


Fig. 6: Typ. gate charge characteristic

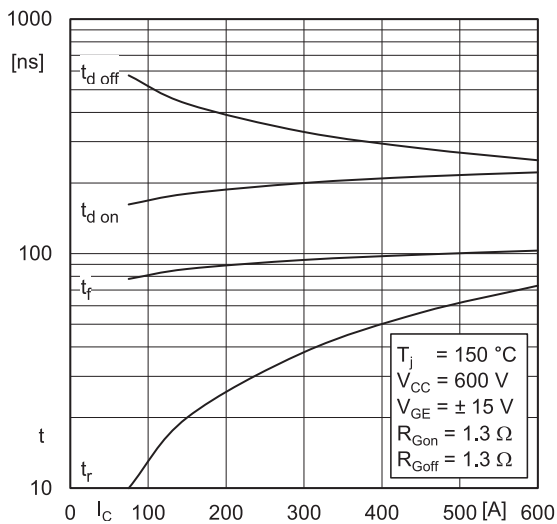


Fig. 7: Typ. switching times vs. I_C

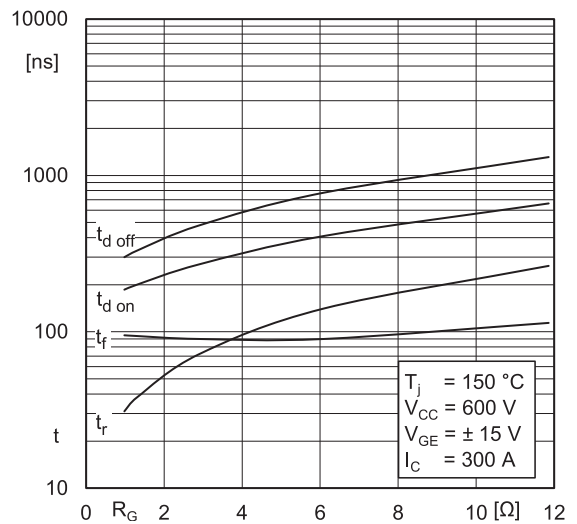


Fig. 8: Typ. switching times vs. gate resistor R_G

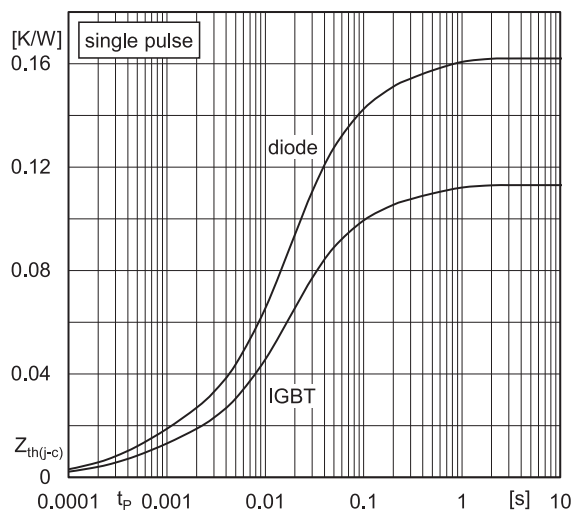


Fig. 9: Transient thermal impedance

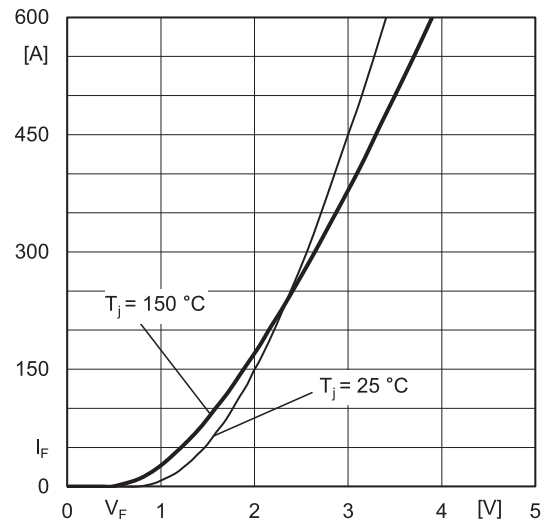


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'} + EE'$

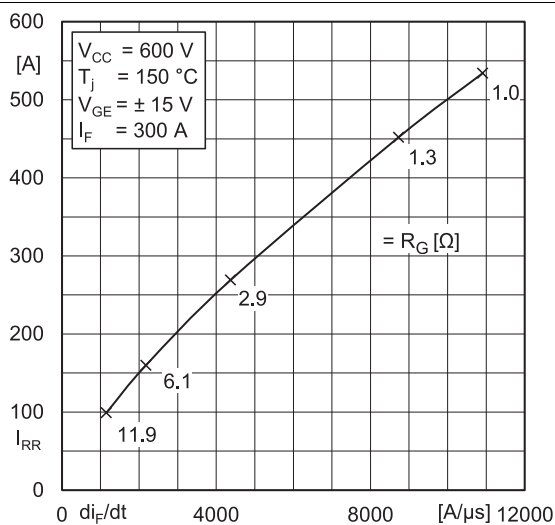


Fig. 11: Typ. CAL diode peak reverse recovery current

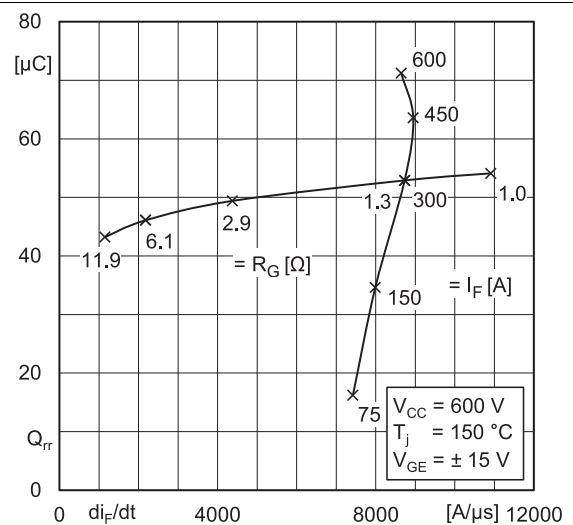


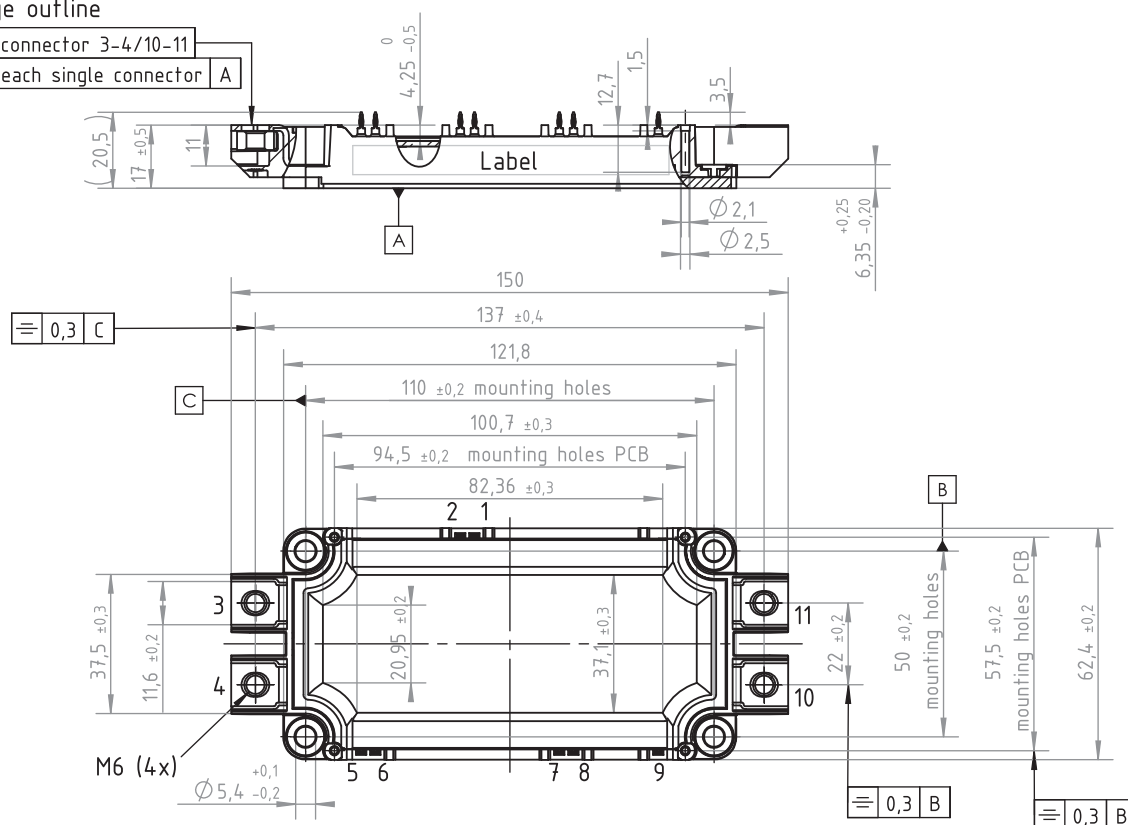


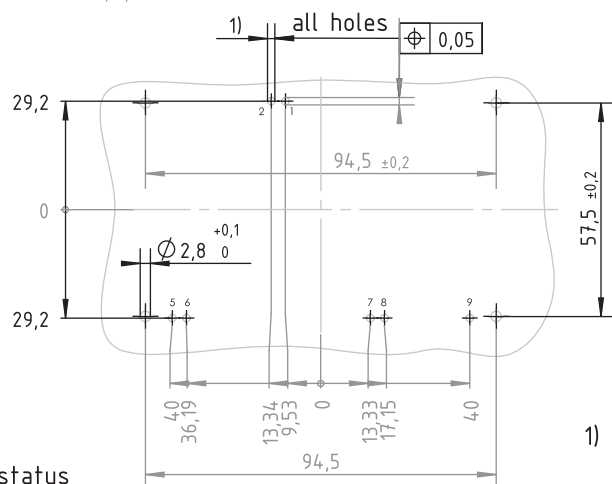
Fig. 12: Typ. CAL diode recovery charge

Package outline

	0,3 connector 3-4/10-11	
	0,2 each single connector	A



PCB drillhole pattern

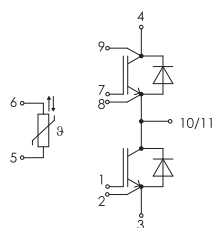


Dimensions in mm

Dimensions valid in mounted status

1) PCB hole specification see
Mounting Instructions SEMiX press-fit

SEMIX 3p



pinout

This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

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