

SEMiX453GB12M7p



SEMiX® 3p

Trench IGBT Modules

SEMiX453GB12M7p

Features*

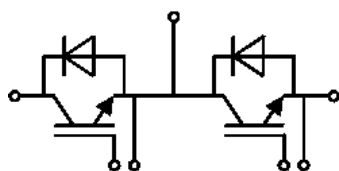
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High overload capability
- Low loss high density IGBTs
- Press-fit pins as auxiliary contacts
- UL recognized, file no. E63532

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"



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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	601	A
		T _c = 80 °C	457	A
I _{Cnom}			450	A
I _{CRM}			900	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	554	A
		T _c = 80 °C	415	A
I _{FRM}			900	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		2430	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 = 450 A	T _j = 25 °C		1.55	1.88	V
	V _{GE} = 15 V chipelevel	T _j = 150 °C		1.80		V
V _{CE0}		T _j = 25 °C		0.87	0.95	V
	chipelevel	T _j = 150 °C		0.76		V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C		1.51	2.1	mΩ
	chipelevel	T _j = 150 °C		2.3		mΩ
V _{GE(th)}	V _{CE} = 10 V, I _C = 45 mA		5.4	6	6.6	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V, T _j = 25 °C				4.5	mA
C _{ies}	V _{CE} = 10 V V _{GE} = 0 V	f = 1 MHz		90.0		nF
C _{oes}		f = 1 MHz		2.74		nF
C _{res}		f = 1 MHz		0.96		nF
Q _G	V _{GE} = -8V ... + 15V			4020		nC
R _{Gint}	T _j = 25 °C			1.0		Ω
t _{d(on)}	V _{CC} = 600 V	T _j = 150 °C		280		ns
t _r	I _C = 450 A	T _j = 150 °C		75		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		39		mJ
t _{d(off)}	R _{G on} = 1.1 Ω	T _j = 150 °C		410		ns
t _f	R _{G off} = 1.1 Ω	T _j = 150 °C		100		ns
	di/dt _{on} = 6300 A/μs	T _j = 150 °C				
	di/dt _{off} = 3800 A/μs					
E _{off}	dv/dt = 5250 V/μs L _s = 25 nH	T _j = 150 °C		49		mJ
R _{th(j-c)}	per IGBT				0.083	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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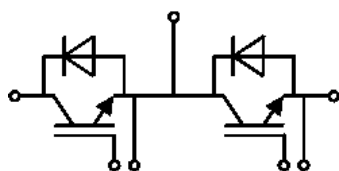
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 450 A	T _j = 25 °C		2.14	2.46	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		2.07	2.38	V
V _{F0}	chiplevel	T _j = 25 °C		1.30	1.50	V
		T _j = 150 °C		0.90	1.10	V
r _F	chiplevel	T _j = 25 °C		1.87	2.1	mΩ
		T _j = 150 °C		2.6	2.8	mΩ
I _{RRM}	I _F = 450 A	T _j = 150 °C		430		A
Q _{rr}	di/dt _{off} = 6400 A/μs	T _j = 150 °C		76		μC
E _{rr}	V _{GE} = -15 V	T _j = 150 °C		35		mJ
	V _{CC} = 600 V					
R _{th(j-c)}	per diode				0.107	K/W
R _{th(c-s)}	per diode (λ _{grease} =0.81 W/(m*K))			0.045		K/W
R _{th(c-s)}	per diode, pre-applied phase change material			0.036		K/W
Module						
L _{CE}				20		nH
R _{CC'+EE'}	measured per switch	T _C = 25 °C		0.95		mΩ
		T _C = 125 °C		1.25		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



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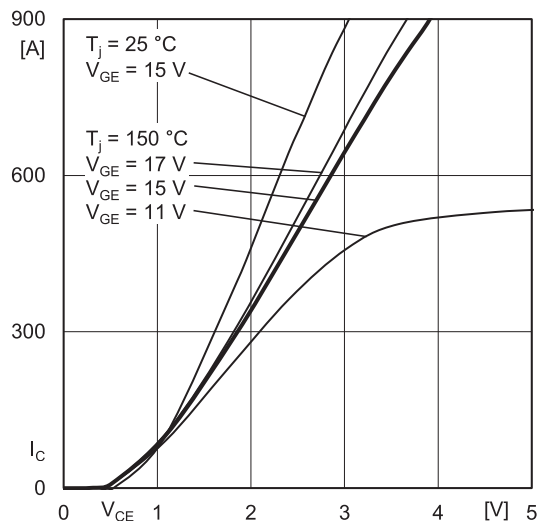
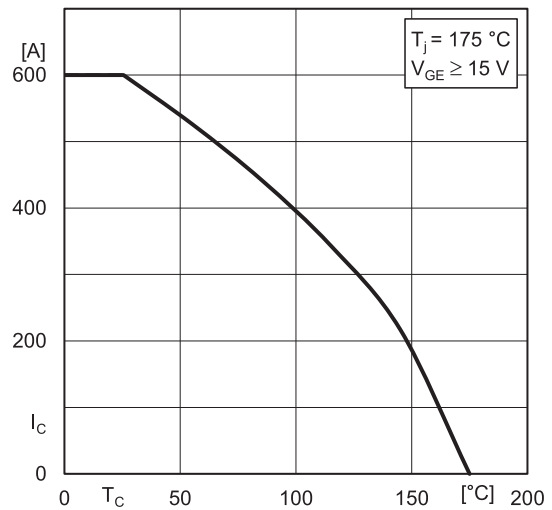
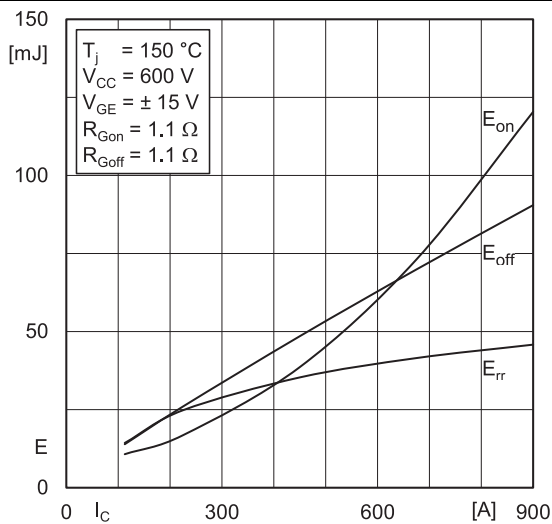
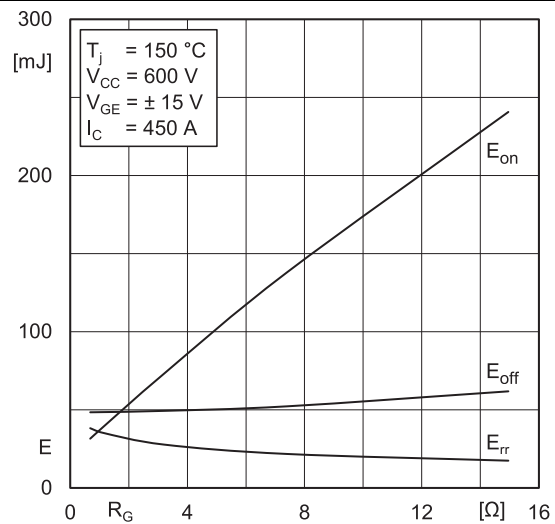
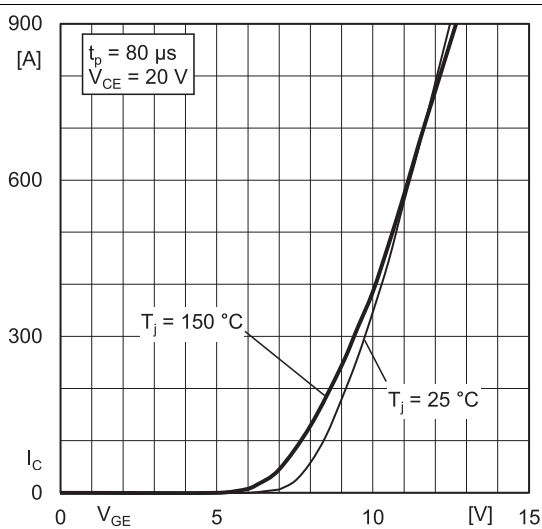
Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$ Fig. 2: Rated current vs. temperature $I_C = f(T_C)$ Fig. 3: Typ. turn-on /-off energy = $f(I_C)$ Fig. 4: Typ. turn-on /-off energy = $f(R_G)$ 

Fig. 5: Typ. transfer characteristic

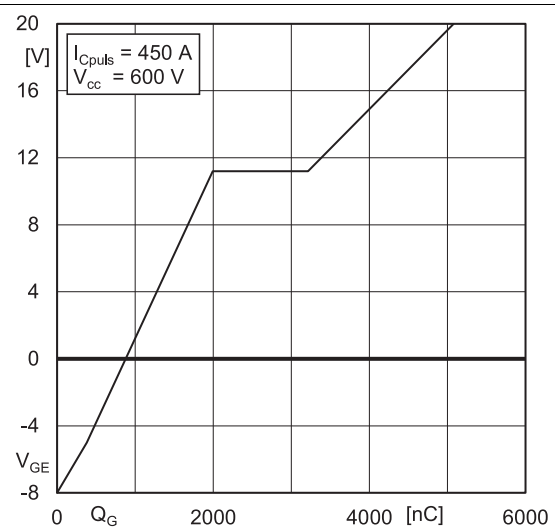


Fig. 6: Typ. gate charge characteristic

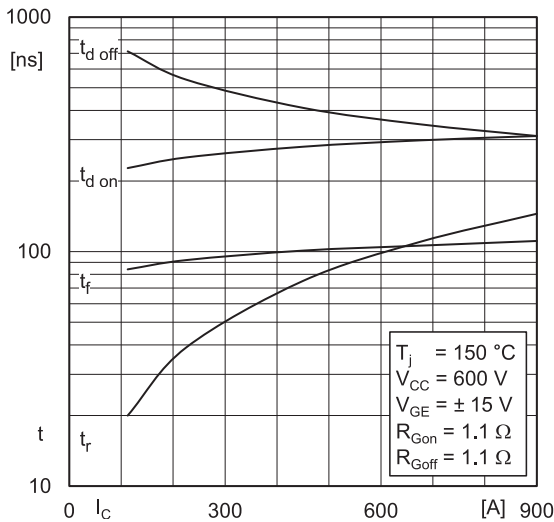


Fig. 7: Typ. switching times vs. I_C

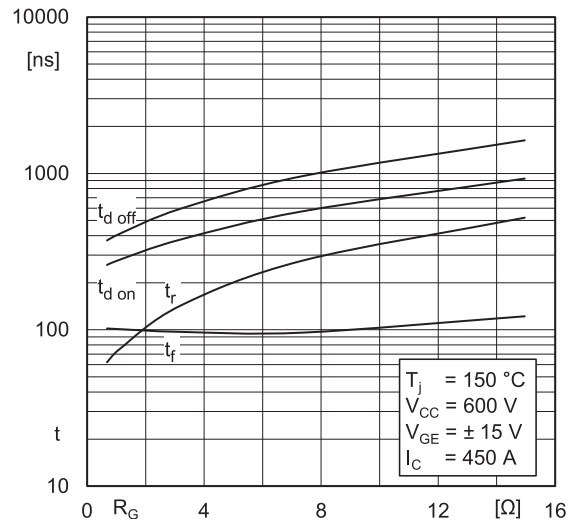


Fig. 8: Typ. switching times vs. gate resistor R_G

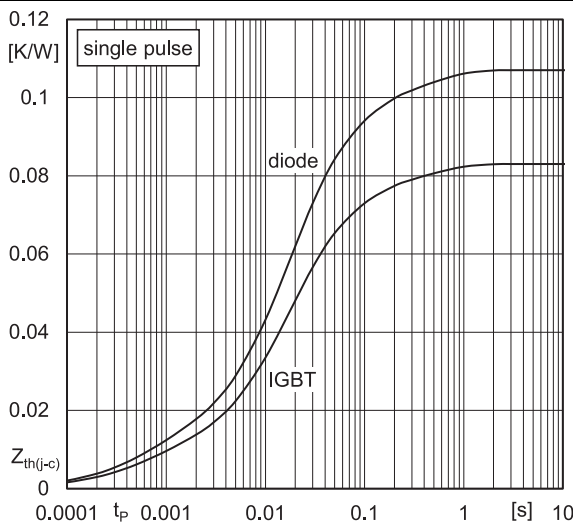


Fig. 9: Transient thermal impedance

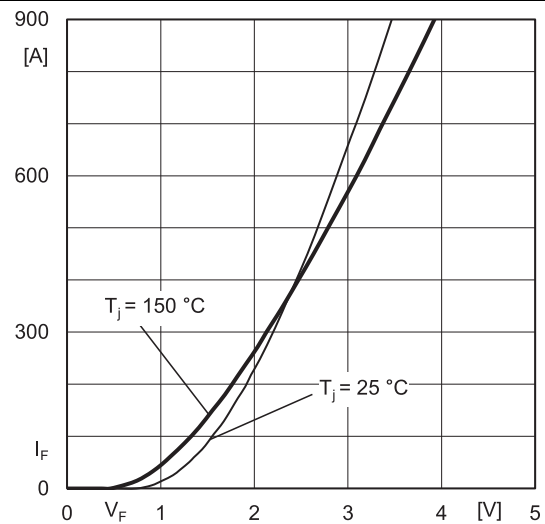


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'}+EE'$

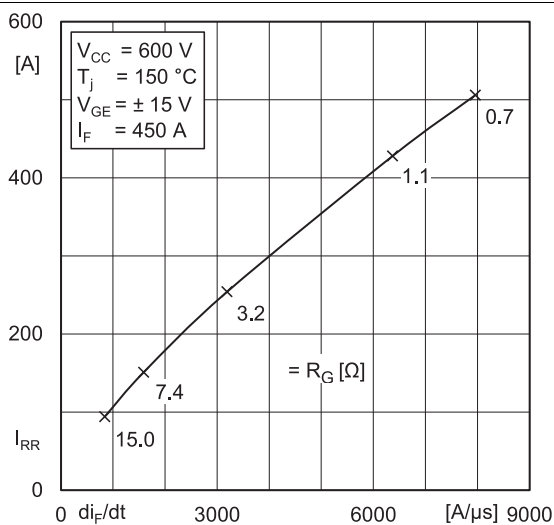


Fig. 11: Typ. CAL diode peak reverse recovery current

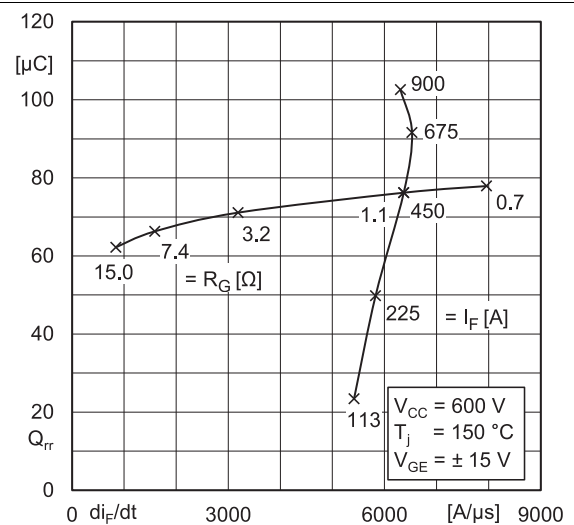
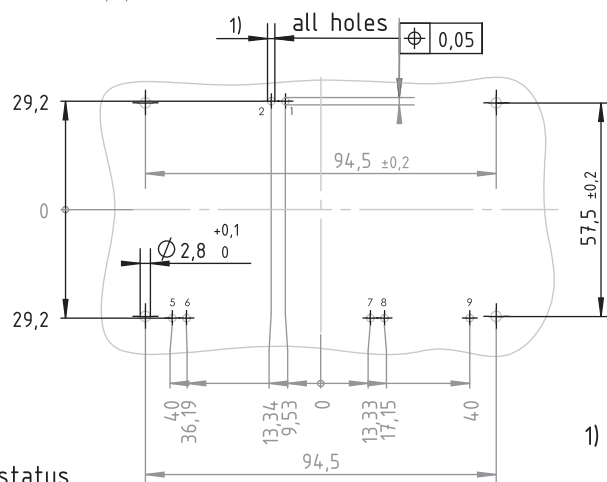


Fig. 12: Typ. CAL diode recovery charge

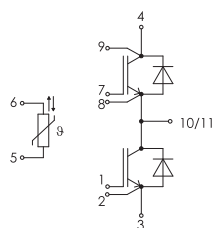
	0,3 connector 3-4/10-11	
	0,2 each single connector	A



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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