

SEMiX453GB17E7p



SEMiX® 3p

Trench IGBT Modules

SEMiX453GB17E7p

Features*

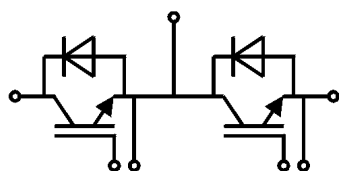
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- Press-fit pins as auxiliary contacts
- UL recognized, file no. E63532

Typical Applications

- AC inverter drives
- UPS
- Renewable energy systems

Remarks

- Product reliability results are valid for $T_j = 150^\circ\text{C}$
- 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		1700	V
I _C	T _j = 175 °C	T _c = 25 °C	654	A
		T _c = 80 °C	495	A
I _{Cnom}			450	A
I _{CRM}			900	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 1000 V V _{GE} ≤ 15 V V _{CES} ≤ 1700 V	T _j = 175 °C	6	μs
T _j			-40 ... 175	°C

Inverse diode

V _{RRM}	T _j = 25 °C		1700	V
I _F	T _j = 175 °C	T _c = 25 °C	517	A
		T _c = 80 °C	382	A
I _{FRM}			900	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		2565	A
T _j			-40 ... 175	°C

Module

$I_{t(RMS)}$	$T_{Terminal} \leq 90^\circ\text{C}, T_c = 90^\circ\text{C}$	600	A
T_{stg}	module without TIM	-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50Hz, $t = 1\text{ min}$	4000	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 450\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.70	2.00	V
		$T_j = 150^\circ\text{C}$	1.91	2.19	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	0.91	1.06	V
		$T_j = 150^\circ\text{C}$	0.78	0.93	V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.76	2.1	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	2.5	2.8	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 9.21\text{ mA}$	5.15	5.8	6.45	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1700\text{ V}, T_j = 25^\circ\text{C}$			0.3	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	45.9		nF
C_{oes}		$f = 1\text{ MHz}$	6.93		nF
C_{res}		$f = 1\text{ MHz}$	0.17		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		3231		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0.5		Ω
$t_{d(on)}$	$V_{CC} = 900\text{ V}$	$T_j = 150^\circ\text{C}$	140		ns
t_r	$I_C = 450\text{ A}$	$T_j = 150^\circ\text{C}$	40		ns
E_{on}	$V_{GE} = +15/-15\text{ V}$ $R_{G on} = 0.8\text{ }\Omega$	$T_j = 150^\circ\text{C}$	60		mJ
$t_{d(off)}$	$R_{G off} = 0.8\text{ }\Omega$	$T_j = 150^\circ\text{C}$	490		ns
t_f	$di/dt_{on} = 10600\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	150		ns
E_{off}	$di/dt_{off} = 2500\text{ A}/\mu\text{s}$ $dv/dt = 4050\text{ V}/\mu\text{s}$ $L_s = 25\text{ nH}$	$T_j = 150^\circ\text{C}$	132		mJ
$R_{th(j-c)}$	per IGBT			0.082	K/W
$R_{th(c-s)}$	per IGBT, P12 (reference)		0.040		K/W
$R_{th(c-s)}$	per IGBT, HP-PCM		0.018		K/W



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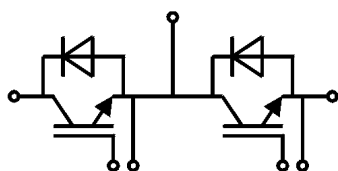
Typical Applications

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- UPS
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Remarks

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- V_{isol} between temperature sensor and power section is only 2500V
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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		2.00	2.40	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		2.16	2.56	V
V _{F0}	chiplevel	T _j = 25 °C		1.32	1.56	V
		T _j = 150 °C		1.08	1.22	V
r _F	chiplevel	T _j = 25 °C		1.51	1.86	mΩ
		T _j = 150 °C		2.4	3.0	mΩ
I _{RRM}	I _F = 450 A	T _j = 150 °C		623		A
Q _{rr}	di/dt _{off} = 10600 A/ μs	T _j = 150 °C		139		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 900 V	T _j = 150 °C		103		mJ
R _{th(j-c)}	per diode				0.11	K/W
R _{th(c-s)}	per diode, P12 (reference)			0.048		K/W
R _{th(c-s)}	per diode, HP-PCM			0.019		K/W
Module						
L _{CE}				20		nH
R _{CC'+EE'}	measured per switch	T _C = 25 °C		1.2		mΩ
		T _C = 150 °C		1.7		mΩ
R _{th(c-s)1}	calculated without thermal coupling			0.011		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module, P12 (reference)			0.017		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module, HP-PCM			0.007		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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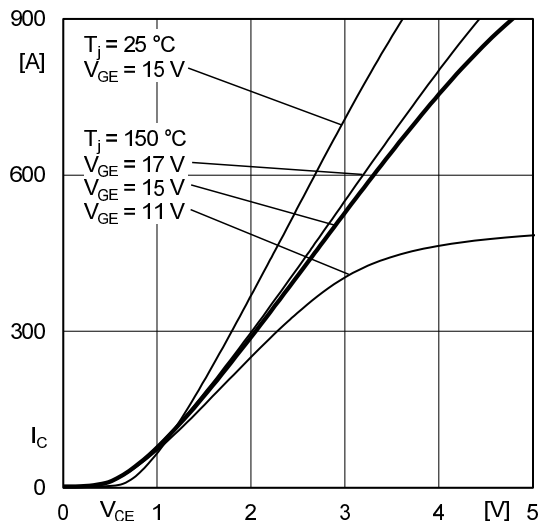


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + EE'$

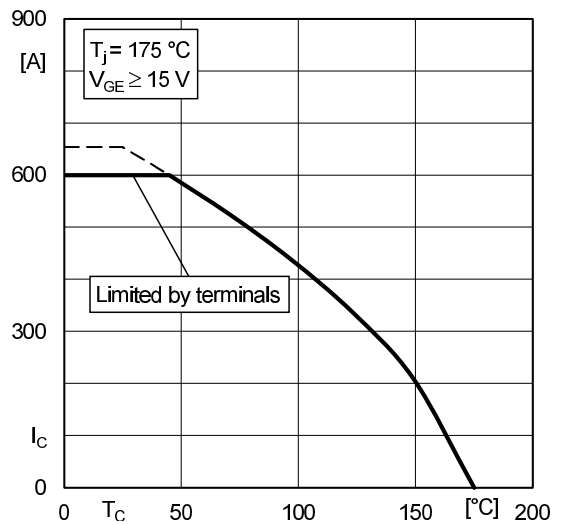


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

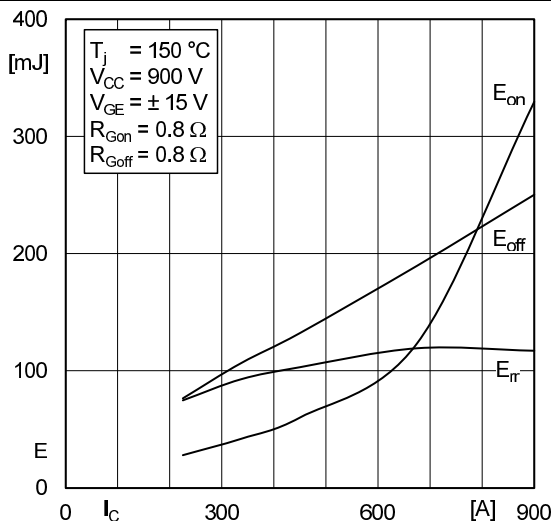


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

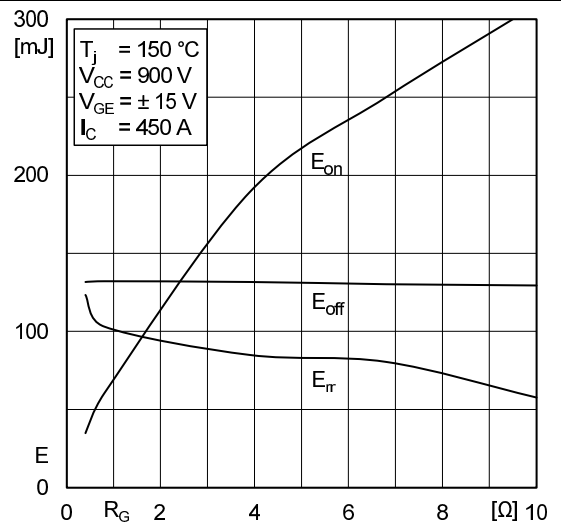


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

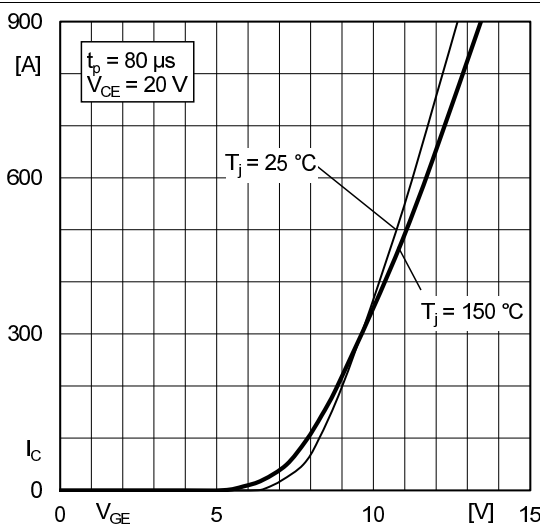


Fig. 5: Typ. transfer characteristic

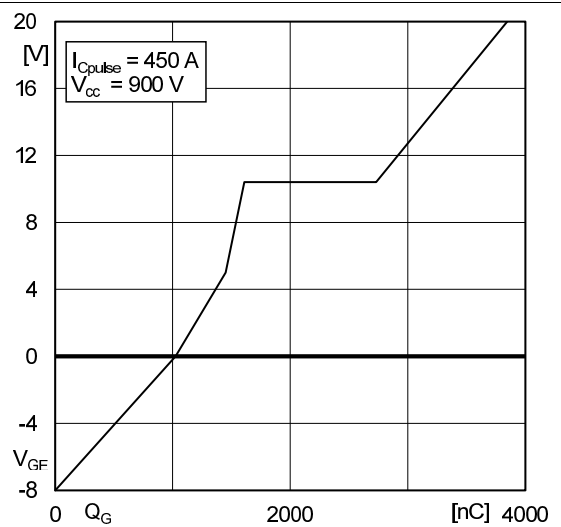


Fig. 6: Typ. gate charge characteristic

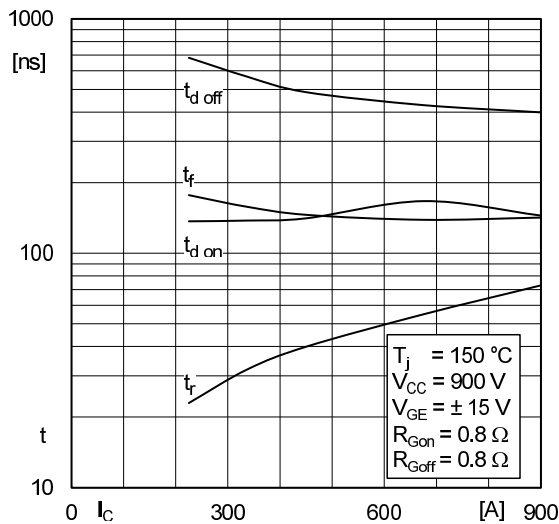


Fig. 7: Typ. switching times vs. I_C

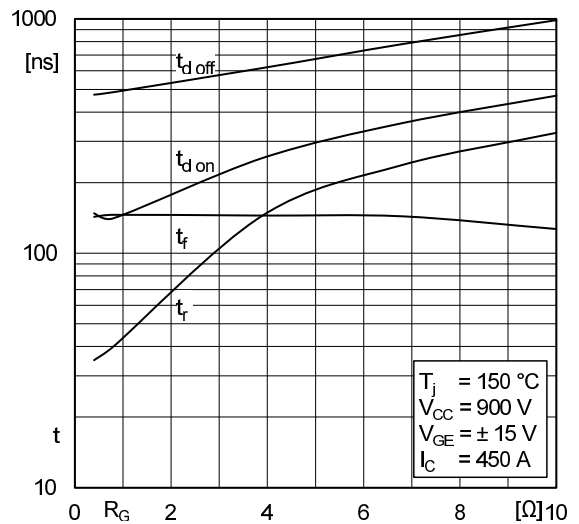


Fig. 8: Typ. switching times vs. gate resistor R_G

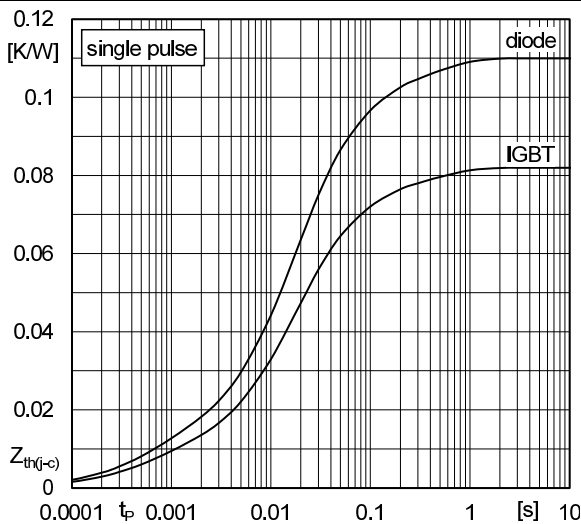


Fig. 9: Transient thermal impedance

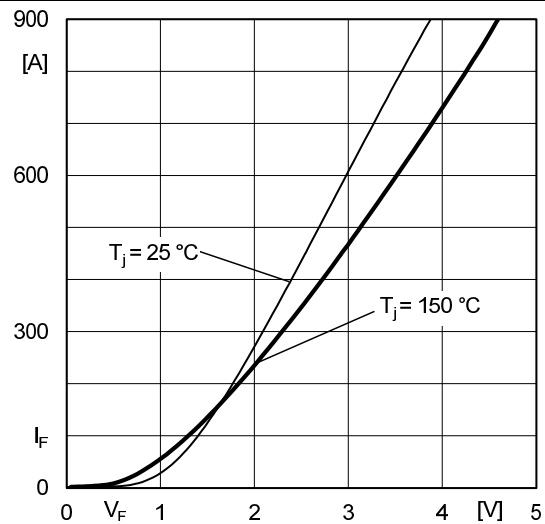


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

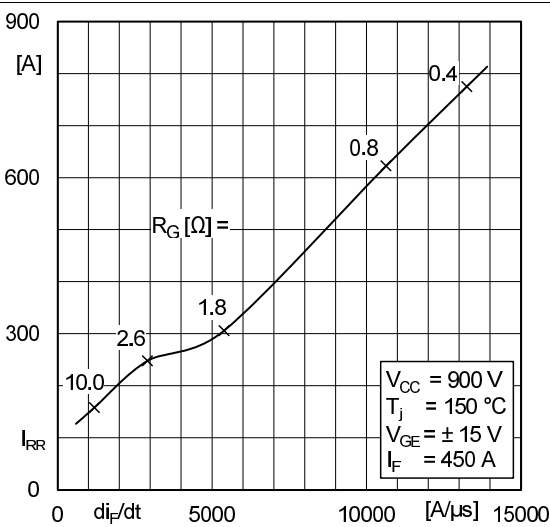


Fig. 11: Typ. CAL diode peak reverse recovery current

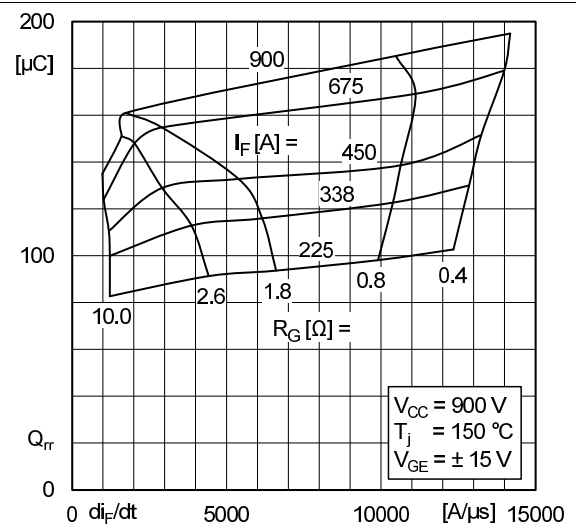
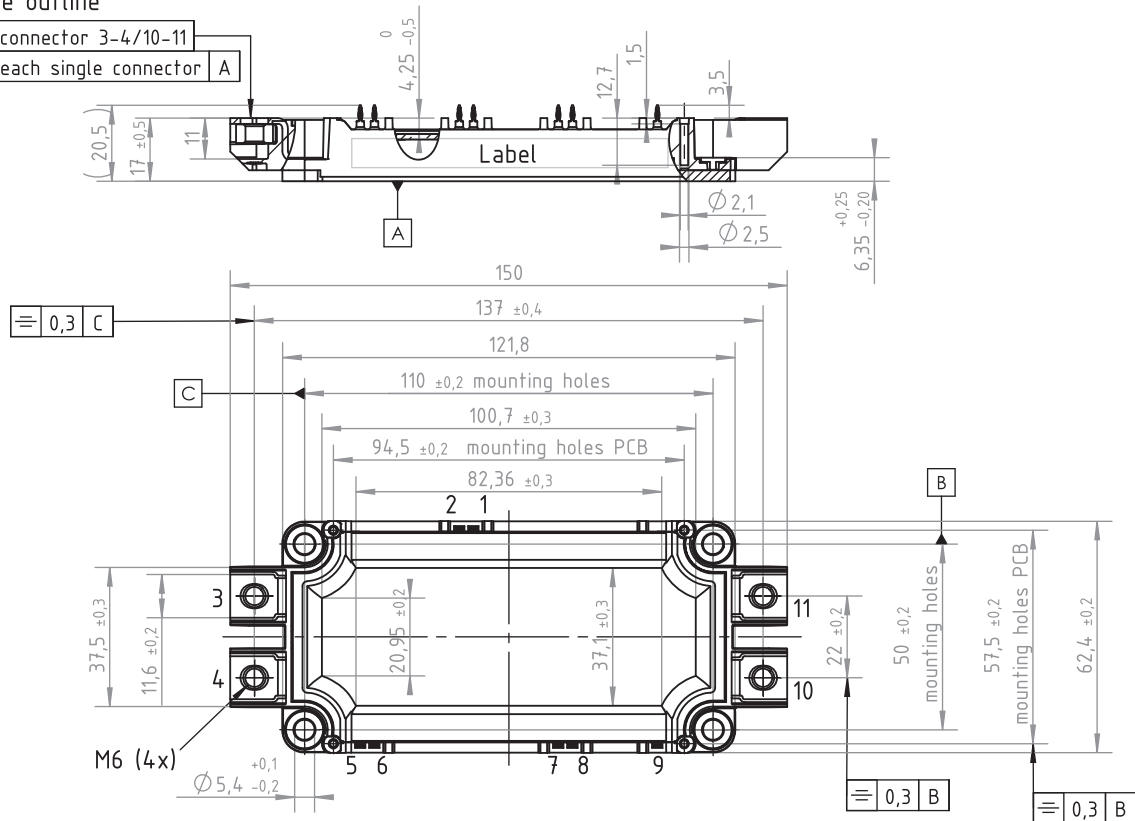


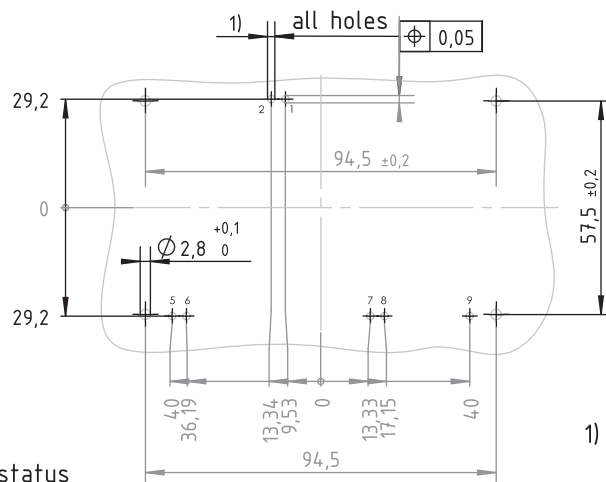
Fig. 12: Typ. CAL diode recovery charge

Package outline

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



PCB drillhole pattern

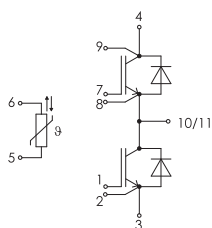


Dimensions in mm

Dimensions valid in mounted status

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

SEMiX 3p



pinout

IMPORTANT INFORMATION AND WARNINGS

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

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