SEMiX305GD07E4

SEMiX® 5

Trench IGBT Modules

Engineering Sample

SEMiX305GD07E4

Target Data

Features

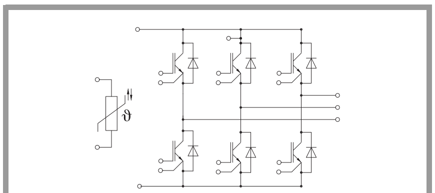
- Solderless assembly solution with PressFIT signal pins and screw power terminals
- IGBT 4 Trench Gate Technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Reliable mechanical design with injection moulded terminals and robust internal connections
- UL recognized file no. E63532
- NTC temperature sensor inside

Typical Applications*

- Three phase inverters for AC motor speed control
- UPS

Remarks

- Case temperature limited to T_C=125°C max.
- Product reliability results are valid for T_{jop}=150°C
- Dynamic data are estimated
- For storage and case temperature with TIM see document “TP(HALA P8) SEMiX 5p”



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Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
IGBT				
V_{CES}	T_j = 25 °C		650	V
I_C	T_j = 175 °C	T_c = 25 °C	372	A
		T_c = 80 °C	281	A
I_{Cnom}			300	A
I_{CRM}	I_{CRM} = 3xI_{Cnom}		900	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 360 V V_{GE} ≤ 15 V V_{CES} ≤ 650 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Inverse diode				
V_{RRM}	T_j = 25 °C		650	V
I_F	T_j = 175 °C	T_c = 25 °C	335	A
		T_c = 80 °C	244	A
I_{Fnom}			300	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}		600	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		2160	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$			400	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 V_{GE} = 15 V chiplevel	T_j = 25 °C		1.55	1.95	V
		T_j = 150 °C		1.75	2.15	V
V_{CE0}	chiplevel	T_j = 25 °C		0.9	1	V
		T_j = 150 °C		0.82	0.9	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		2.2	3.2	mΩ
		T_j = 150 °C		3.1	4.2	mΩ
$V_{GE(th)}$	V_{GE}=V_{CE}, I_C = 8 mA		5.1	5.8	6.4	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 650 V, T_j = 25 °C				0.2	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		18.5		nF
C_{oes}		f = 1 MHz		1.16		nF
C_{res}		f = 1 MHz		0.55		nF
Q_G	V_{GE} = - 15 V...+ 15 V			3023		nC
R_{Gint}	T_j = 25 °C			1.0		Ω
$t_{d(on)}$	V_{CC} = 300 V I_C = 300 A V_{GE} = +15/-15 V $R_{G\ on}$ = 2 Ω $R_{G\ off}$ = 2 Ω di/dt$_{on}$ = 4760 A/µs di/dt$_{off}$ = 3478 A/µs	T_j = 150 °C				ns
t_r		T_j = 150 °C				ns
E_{on}		T_j = 150 °C		5.5		mJ
$t_{d(off)}$		T_j = 150 °C				ns
t_f		T_j = 150 °C				ns
E_{off}		T_j = 150 °C		15.6		mJ
$R_{th(j-c)}$	per IGBT				0.16	K/W
$R_{th(c-s)}$	per IGBT (λgrease=0.81 W/mK, thickness 50-100µm)			0.051		K/W
$R_{th(c-s)}$	per IGBT (λ=3.4 W/mK)			0.031		K/W

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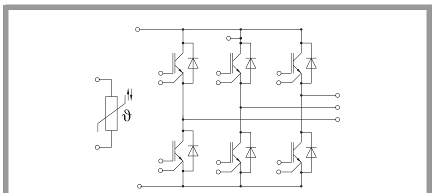

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Inverse diode						
$V_F = V_{EC}$	I_F = 300 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.40	1.76	V
		T_j = 150 °C		1.39	1.77	V
V_{F0}	chiplevel	T_j = 25 °C		1.04	1.24	V
		T_j = 150 °C		0.85	0.99	V
r_F	chiplevel	T_j = 25 °C		1.19	1.76	mΩ
		T_j = 150 °C		1.79	2.6	mΩ
I_{RRM}	I_F = 300 A di/dt$_{off}$ = 4760 A/µs V_{GE} = -15 V V_{CC} = 300 V	T_j = 150 °C		212		A
Q_{rr}		T_j = 150 °C		21.6		µC
E_{rr}		T_j = 150 °C		5.2		mJ
$R_{th(j-c)}$	per diode				0.25	K/W
$R_{th(c-s)}$	per diode (λgrease=0.81 W/mK, thickness 50-100µm)			0.047		K/W
$R_{th(c-s)}$	per diode (λ=3.4 W/mK)			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
$Rth_{(c-s)1}$	calculated without thermal coupling			0.004		K/W
$Rth_{(c-s)2}$	including thermal coupling, Ts underneath module (λ_{grease}=0.81 W/(m*K))			0.0069		K/W
$Rth_{(c-s)2}$	including thermal coupling, Ts underneath module, pre-applied phase change material			0.0048		K/W
M_s	to heat sink (M5)		3		6	Nm
M_t		to terminals (M6)	3		6	Nm
						Nm
w				398		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

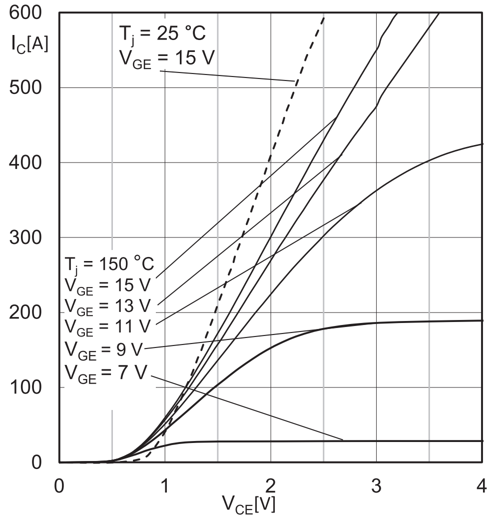


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+ EE'}$

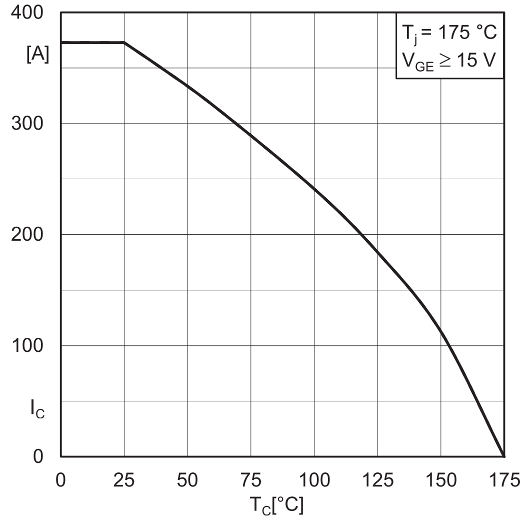


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

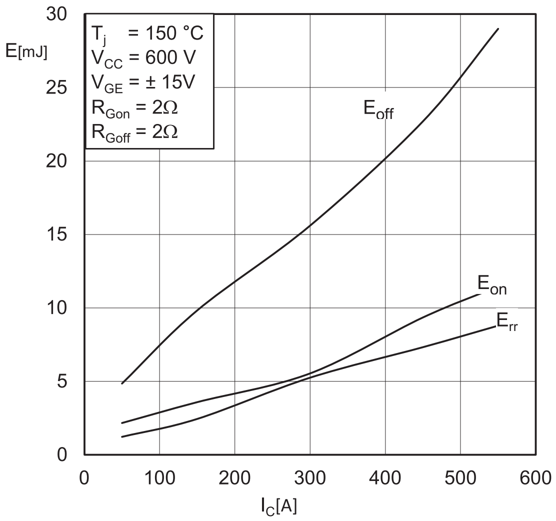


Fig. 3: Typ. turn-on /-off energy = f (I_C)

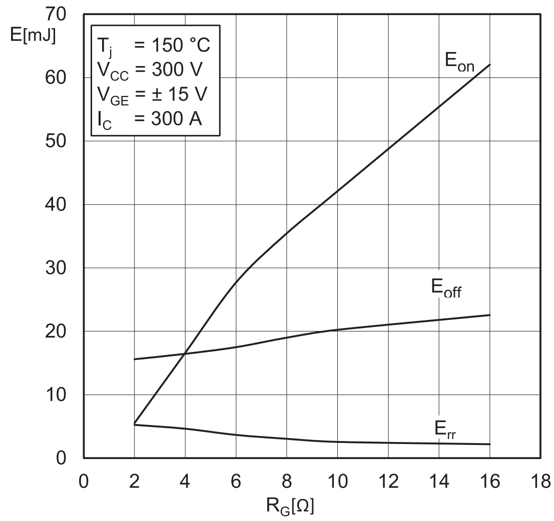


Fig. 4: Typ. turn-on /-off energy = f (R_G)

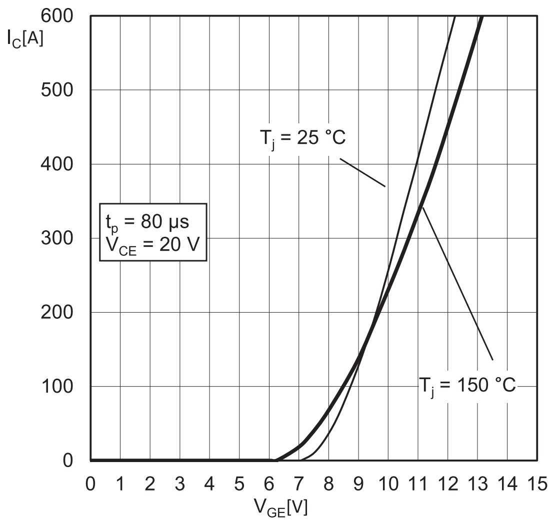


Fig. 5: Typ. transfer characteristic

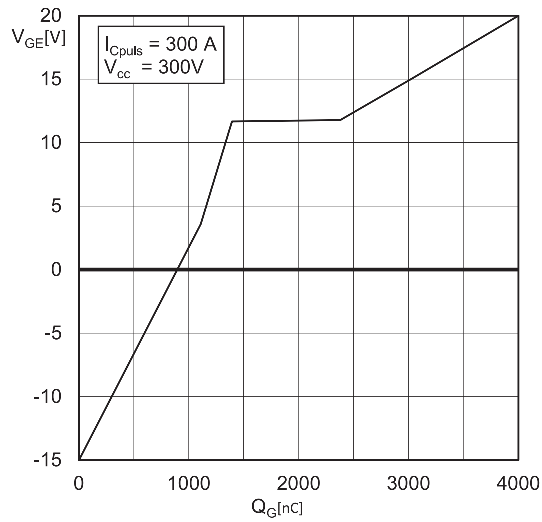


Fig. 6: Typ. gate charge characteristic

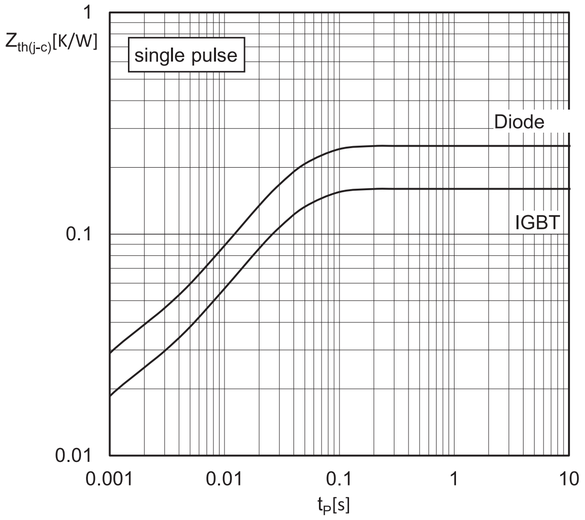


Fig. 9: Transient thermal impedance

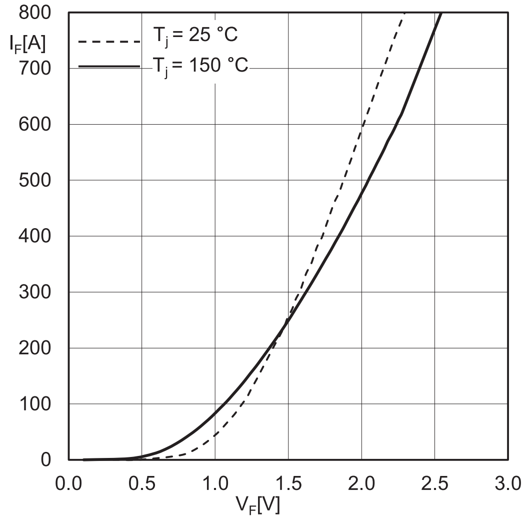
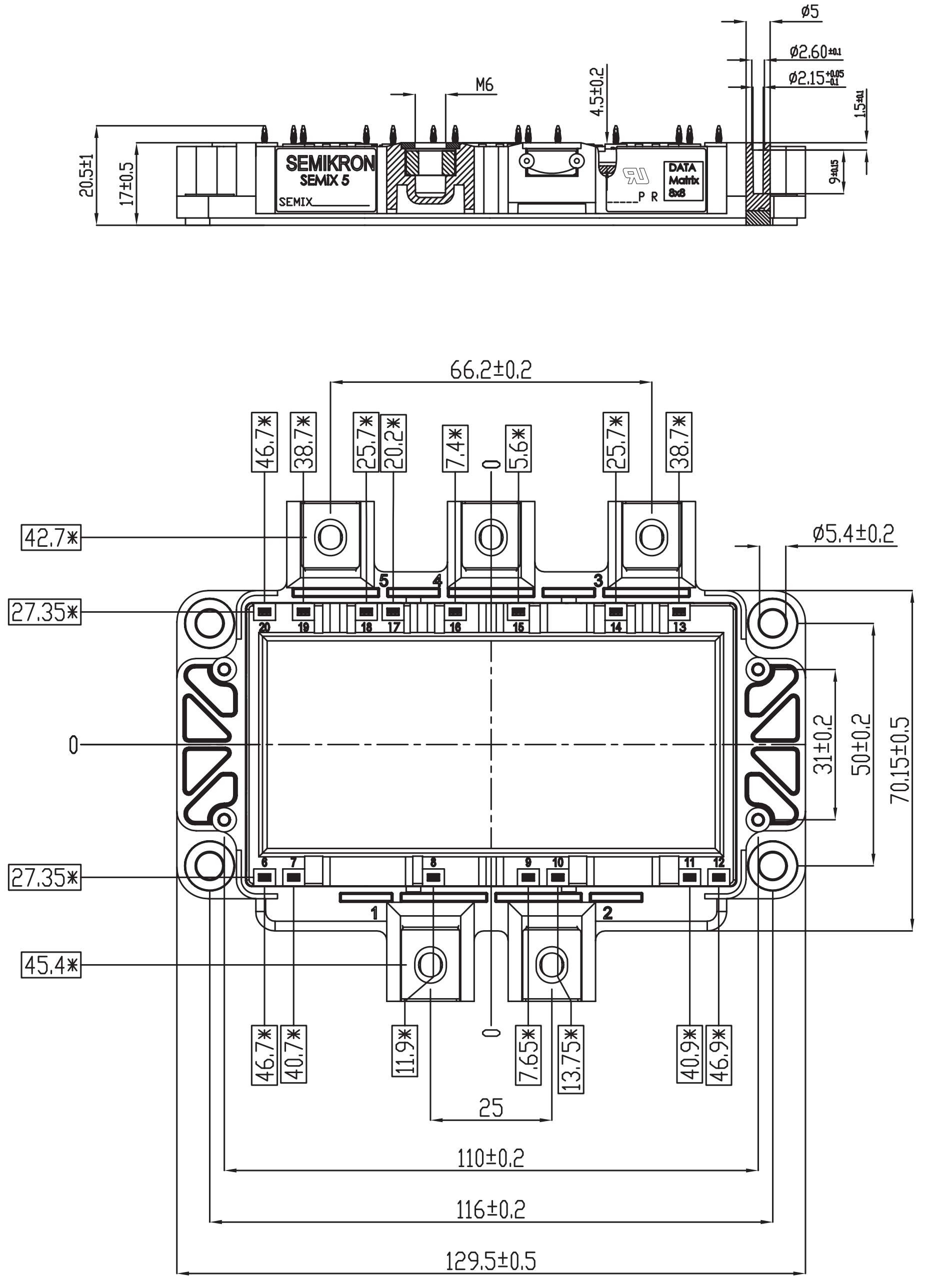


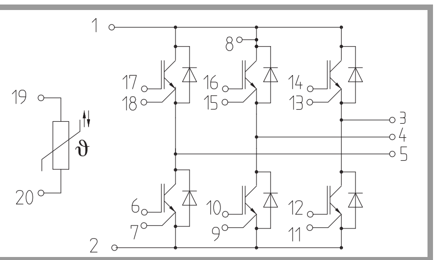
Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$



* = All dimension with tolerance of ⌖ Ø 0.4

For technical details please refer
to SEMiX(R)5 Mounting Instruction

SEMiX5p



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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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