



SEMiX® 5

Trench IGBT Modules

Engineering Sample SEMiX305GD07E4

Target Data

Features

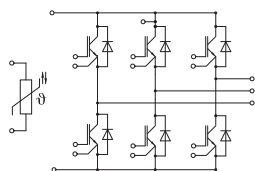
- Solderless assembly solution with PressFIT signal pins and screw power terminals
- IGBT 4 Trench Gate Technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Reliable mechanical design with injection moulded terminals and robust internal connections
- UL recognized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

Typical Applications*

- Three phase inverters for AC motor speed control
- UPS

Remarks

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



GD

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	347	A
		T _c = 80 °C	260	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	$^{\circ}\text{C}$
V_{isol}	AC sinus 50Hz, $t = 1\text{ min}$	4000	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 300\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^{\circ}\text{C}$	1.55	1.95	V
		$T_j = 150^{\circ}\text{C}$	1.75	2.15	V
V_{CE0}	chiplevel	$T_j = 25^{\circ}\text{C}$	0.9	1	V
		$T_j = 150^{\circ}\text{C}$	0.82	0.9	V
r_{CE}	$V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^{\circ}\text{C}$	2.2	3.2	$\text{m}\Omega$
		$T_j = 150^{\circ}\text{C}$	3.1	4.2	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C = 8\text{ mA}$	5.1	5.8	6.4	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 650\text{ V}, T_j = 25^{\circ}\text{C}$			0.2	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	18.5		nF
C_{oes}		$f = 1\text{ MHz}$	1.16		nF
C_{res}		$f = 1\text{ MHz}$	0.55		nF
Q_G	$V_{GE} = -8\text{ V}...+15\text{ V}$		2400		nC
R_{Gint}	$T_j = 25^{\circ}\text{C}$		1.0		Ω
$t_{d(on)}$	$V_{CC} = 300\text{ V}$	$T_j = 150^{\circ}\text{C}$			ns
t_r	$I_C = 300\text{ A}$	$T_j = 150^{\circ}\text{C}$			ns
E_{on}	$V_{GE} = +15/-15\text{ V}$ $R_{G on} = 3\text{ }\Omega$	$T_j = 150^{\circ}\text{C}$	5.54		mJ
$t_{d(off)}$	$R_{G off} = 3\text{ }\Omega$	$T_j = 150^{\circ}\text{C}$			ns
t_f	$di/dt_{on} = 4760\text{ A}/\mu\text{s}$ $di/dt_{off} = 3478\text{ A}/\mu\text{s}$	$T_j = 150^{\circ}\text{C}$			ns
E_{off}		$T_j = 150^{\circ}\text{C}$	20.52		mJ
$R_{th(j-c)}$	per IGBT			0.18	K/W
$R_{th(c-s)}$	per IGBT ($\lambda_{grease}=0.81\text{ W/mK}$, thickness 50-100 μm)		0.051		K/W
$R_{th(c-s)}$	per IGBT ($\lambda=3.4\text{ W/mK}$)		0.031		K/W



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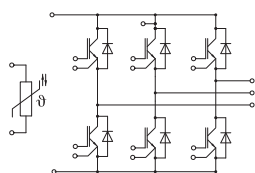
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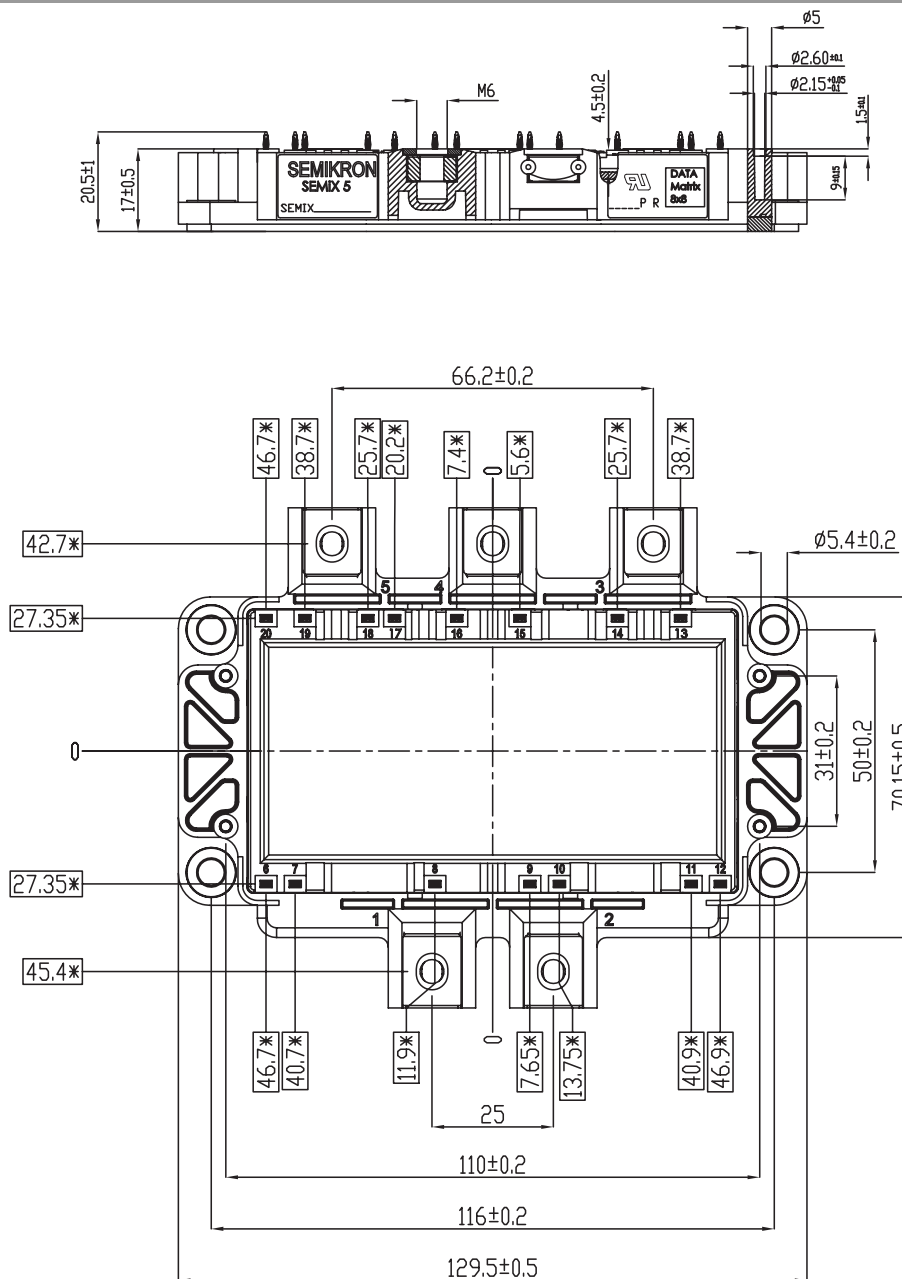
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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 300 A	T _j = 25 °C		1.40	1.76	V
	V _{GE} = 0 V chiplevel	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	T _j = 150 °C		-		A
Q _{rr}	di/dt _{off} = 3900 A/μs	T _j = 150 °C				μC
E _{rr}	V _{GE} = -15 V	T _j = 150 °C		4.96		mJ
	V _{CC} = 300 V					
R _{th(j-c)}	per diode				0.25	K/W
R _{th(c-s)}	per diode (λ _{grease} =0.81 W/mK, thickness 50-100μm)			0.061		K/W
R _{th(c-s)}	per diode (λ=3.4 W/mK)			0.041		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			0.005		K/W
R _{th(c-s)2}	including thermal coupling, Ts underneath module (λ _{grease} =0.81 W/(m*K))			0.0072		K/W
R _{th(c-s)2}	including thermal coupling, Ts underneath module, pre-applied phase change material			0.0045		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



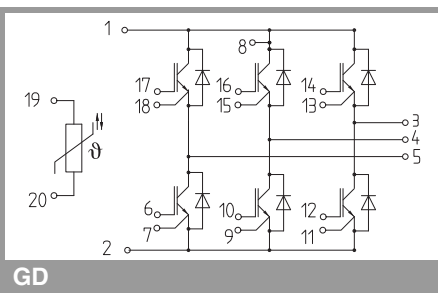
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* = All dimension with tolerance of ± 0.4

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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