



SEMiX® 5

Trench IGBT Modules

Evaluation Sample SEMiX155GD12T4

Target Data

Features

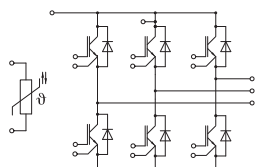
- Solderless assembling solution with PressFIT signal pins and screw power terminals
- IGBT 4 Trench Gate Technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Reliable mechanical design with injection moulded terminals and reliable internal connections
- UL recognized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

Typical Applications*

- AC inverter drives
- UPS
- Electronic Welding

Remarks

- 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		1200	V
I _C	T _j = 175 °C	T _c = 25 °C	219	A
		T _c = 80 °C	169	A
I _{Cnom}			150	A
I _{CRM}	I _{CRM} = 3xI _{Cnom}		450	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 20 V V _{CES} ≤ 1200 V	T _j = 150 °C	10	μs
T _j			-40 ... 175	°C

Inverse diode

V_{RRM}	$T_j = 25\text{ }^{\circ}\text{C}$		1200	V
I_F	$T_j = 175\text{ }^{\circ}\text{C}$	$T_c = 25\text{ }^{\circ}\text{C}$	175	A
		$T_c = 80\text{ }^{\circ}\text{C}$	131	A
I_{Fnom}			150	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$		300	A
I_{FSM}	$t_p = 10\text{ ms}$, $\sin 180^{\circ}$, $T_j = 25\text{ }^{\circ}\text{C}$		900	A
T_j			-40 ... 175	$^{\circ}\text{C}$

Module

$I_{t(RMS)}$		280	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					
$V_{CE(sat)}$	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^{\circ}\text{C}$	1.80	2.05	V
		$T_j = 150^{\circ}\text{C}$	2.20	2.40	V
V_{CE0}	chipelevel	$T_j = 25^{\circ}\text{C}$	0.80	0.90	V
		$T_j = 150^{\circ}\text{C}$	0.70	0.80	V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^{\circ}\text{C}$	6.7	7.7	m Ω
		$T_j = 150^{\circ}\text{C}$	10.0	11	m Ω
$V_{GE(th)}$	$V_{GE}=V_{CE}$, $I_C = 6\text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$, $V_{CE} = 1200\text{ V}$, $T_j = 25^{\circ}\text{C}$			2.0	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	9.3		nF
C_{oes}		$f = 1\text{ MHz}$	0.58		nF
C_{res}		$f = 1\text{ MHz}$	0.51		nF
Q_G	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		850		nC
R_{Gint}	$T_j = 25^{\circ}\text{C}$		5.0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^{\circ}\text{C}$	t.b.d.		ns
t_r	$I_C = 150\text{ A}$	$T_j = 150^{\circ}\text{C}$	t.b.d.		ns
E_{on}	$V_{GE} = +15/-15\text{ V}$ $R_{G on} = 1\text{ }\Omega$	$T_j = 150^{\circ}\text{C}$	13		mJ
$t_{d(off)}$	$R_{G off} = 1\text{ }\Omega$	$T_j = 150^{\circ}\text{C}$	t.b.d.		ns
t_f	$di/dt_{on} = 3300\text{ A}/\mu\text{s}$ $di/dt_{off} = 1000\text{ A}/\mu\text{s}$	$T_j = 150^{\circ}\text{C}$	t.b.d.		ns
E_{off}		$T_j = 150^{\circ}\text{C}$	21		mJ
$R_{th(j-c)}$	per IGBT			0.21	K/W
$R_{th(c-s)}$	per IGBT ($\lambda_{grease}=0.81\text{ W/mK}$, thickness 50-100 μm)		t.b.d.		K/W
$R_{th(c-s)}$	per IGBT ($\lambda=3.4\text{ W/mK}$)		t.b.d.		K/W



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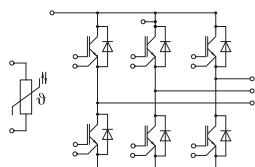
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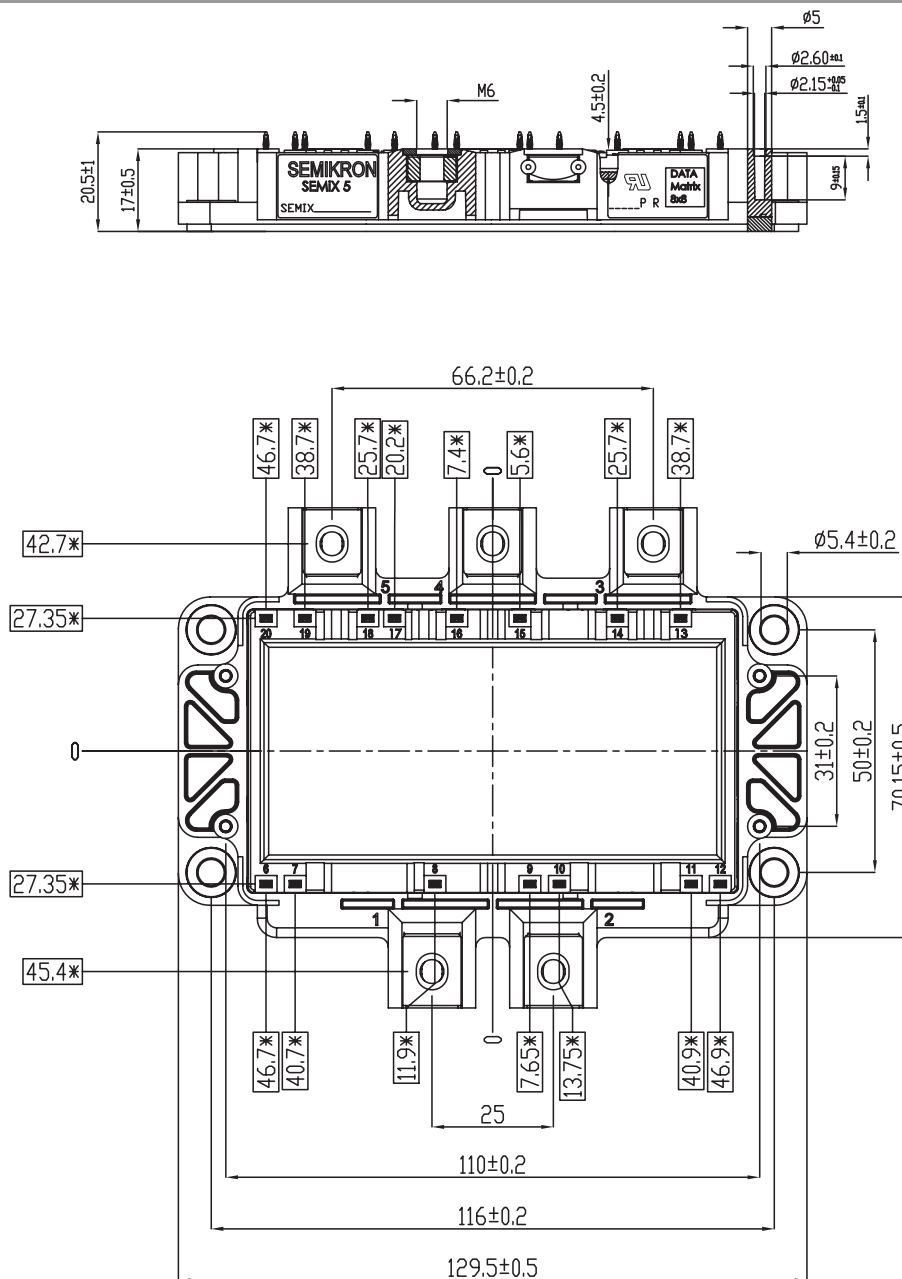
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 150 A	T _j = 25 °C		2.14	2.46	V
	V _{GE} = 0 V chipelevel	T _j = 150 °C		2.07	2.38	V
V _{F0}	chipelevel	T _j = 25 °C		1.30	1.50	V
		T _j = 150 °C		0.90	1.10	V
r _F	chipelevel	T _j = 25 °C		5.6	6.4	mΩ
		T _j = 150 °C		7.8	8.5	mΩ
I _{RRM}	I _F = 150 A	T _j = 150 °C		-		A
Q _{rr}	di/dt _{off} = 3300 A/μs	T _j = 150 °C		-		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	T _j = 150 °C		14		mJ
R _{th(j-c)}	per diode				0.35	K/W
R _{th(c-s)}	per diode (λgrease=0.81 W/mK, thickness 50-100μm)			t.b.d.		K/W
R _{th(c-s)}	per diode (λ=3.4 W/mK)			t.b.d.		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			t.b.d.		K/W
R _{th(c-s)2}	including thermal coupling, Ts underneath module (λgrease=0.81 W/ (m*K))			t.b.d.		K/W
R _{th(c-s)2}	including thermal coupling, Ts underneath module, pre-applied phase change material			t.b.d.		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



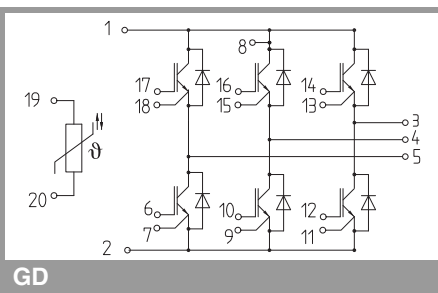
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* = All dimension with tolerance of ± 0.4

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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