

SEMiX653GAL176HDs



SEMiX® 3s

Trench IGBT Modules

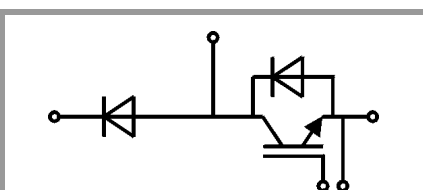
SEMiX653GAL176HDs

Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- UL recognised file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic welders



GAL

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V _{CES}	T _j = 25 °C		1700	V
I _C	T _j = 150 °C	T _c = 25 °C	619	A
		T _c = 80 °C	438	A
I _{Cnom}			450	A
I _{CRM}	I _{CRM} = 2xI _{Cnom}		900	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 1000 V V _{GE} ≤ 20 V V _{CES} ≤ 1700 V	T _j = 125 °C	10	µs
T _j			-55 ... 150	°C
Inverse diode				
I _F	T _j = 150 °C	T _c = 25 °C	545	A
		T _c = 80 °C	365	A
I _{Fnom}			450	A
I _{FRM}	I _{FRM} = 2xI _{Fnom}		900	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		2900	A
T _j			-40 ... 150	°C
Freewheeling diode				
I _F	T _j = 150 °C	T _c = 25 °C	545	A
		T _c = 80 °C	365	A
I _{Fnom}			450	A
I _{FRM}	I _{FRM} = 2xI _{Fnom}		900	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		2900	A
T _j			-40 ... 150	°C
Module				
I _{t(RMS)}	T _{terminal} = 80 °C		600	A
T _{stg}			-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		2	2.45	V
	V _{GE} = 15 V chipelevel	T _j = 125 °C		2.5	2.9	V
V _{CE0}		T _j = 25 °C		1	1.2	V
		T _j = 125 °C		0.9	1.1	V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C		2.2	2.8	mΩ
		T _j = 125 °C		3.4	4.0	mΩ
V _{GE(th)}	V _{GE} =V _{CE} , I _C = 18 mA		5.2	5.8	6.4	V
I _{CES}	V _{GE} = 0 V	T _j = 25 °C			3	mA
	V _{CE} = 1700 V	T _j = 125 °C				mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		39.6		nF
C _{oes}		f = 1 MHz		1.65		nF
C _{res}		f = 1 MHz		1.31		nF
Q _G	V _{GE} = - 8 V...+ 15 V			4200		nC
R _{Gint}	T _j = 25 °C			1.67		Ω

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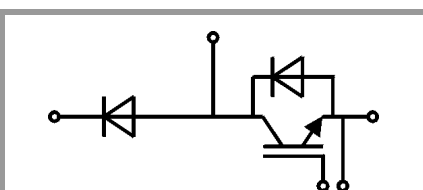
Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
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Typical Applications*

- AC inverter drives
- UPS
- Electronic welders

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
t _{d(on)}	V _{CC} = 1200 V	T _j = 125 °C		290		ns
t _r	I _C = 450 A	T _j = 125 °C		90		ns
E _{on}	V _{GE} = ±15 V	T _j = 125 °C		300		mJ
t _{d(off)}	R _{G on} = 3.6 Ω	T _j = 125 °C		975		ns
t _f	R _{G off} = 3.6 Ω	T _j = 125 °C		190		ns
E _{off}		T _j = 125 °C		180		mJ
R _{th(j-c)}	per IGBT				0.054	K/W
Inverse diode						
V _F = V _{EC}	I _F = 450 A	T _j = 25 °C		1.7	1.90	V
	V _{GE} = 0 V	T _j = 125 °C		1.7	1.9	V
	chip					
V _{F0}		T _j = 25 °C	0.9	1.1	1.3	V
		T _j = 125 °C	0.7	0.9	1.1	V
r _F		T _j = 25 °C	1.3	1.3	1.3	mΩ
		T _j = 125 °C	1.8	1.8	1.8	mΩ
I _{RRM}	I _F = 450 A	T _j = 125 °C		380		A
Q _{rr}	di/dt _{off} = 4200 A/μs	T _j = 125 °C		130		μC
E _{rr}	V _{GE} = -15 V	T _j = 125 °C		73		mJ
	V _{CC} = 1200 V					
R _{th(j-c)}	per diode				0.11	K/W
Freewheeling diode						
V _F = V _{EC}	I _F = 450 A	T _j = 25 °C		1.7	1.90	V
	V _{GE} = 0 V	T _j = 125 °C		1.7	1.9	V
	chip					
V _{F0}		T _j = 25 °C	0.9	1.1	1.3	V
		T _j = 125 °C	0.7	0.9	1.1	V
r _F		T _j = 25 °C	1.3	1.3	1.3	mΩ
		T _j = 125 °C	1.8	1.8	1.8	mΩ
I _{RRM}	I _F = 450 A	T _j = 125 °C		380		A
Q _{rr}	di/dt _{off} = 4200 A/μs	T _j = 125 °C		130		μC
E _{rr}	V _{GE} = -15 V	T _j = 125 °C		73		mJ
	V _{CC} = 1200 V					
R _{th(j-c)}	per diode				0.11	K/W
Module						
L _{CE}				20		nH
R _{CC'+EE'}	res., terminal-chip	T _C = 25 °C		0.7		mΩ
		T _C = 125 °C		1		mΩ
R _{th(c-s)}	per module			0.04		K/W
M _s	to heat sink (M5)		3		5	Nm
M _t		to terminals (M6)	2.5		5	Nm
						Nm
w					300	g
Temperatur 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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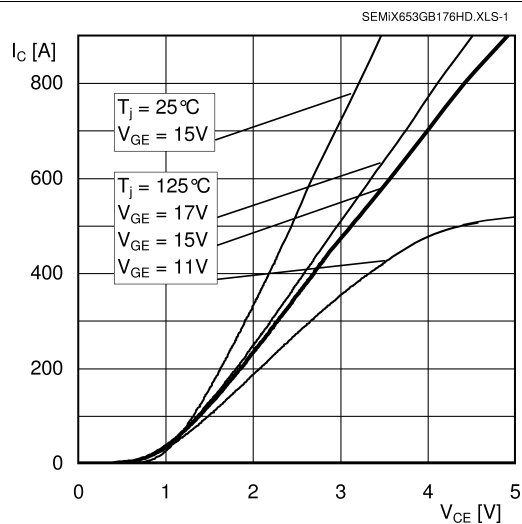


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

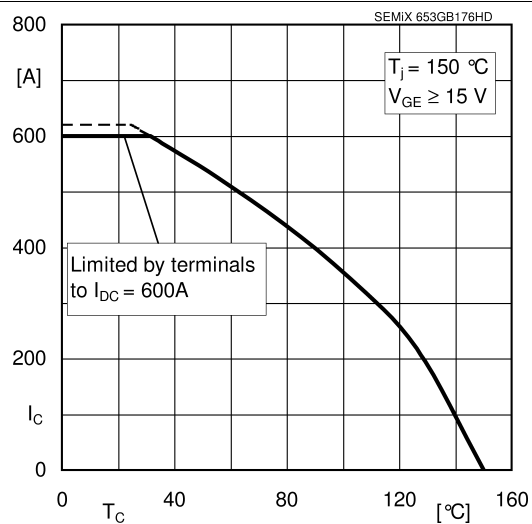


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

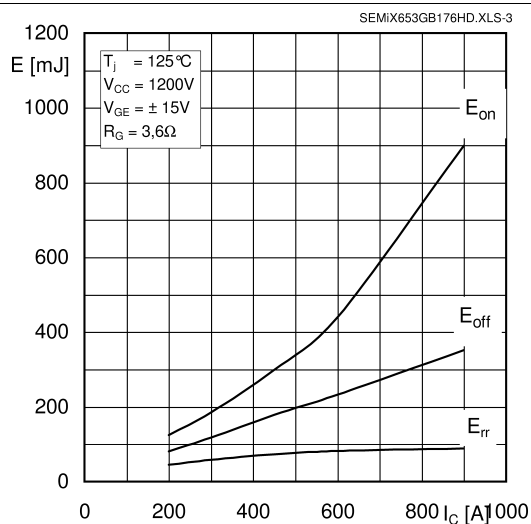


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

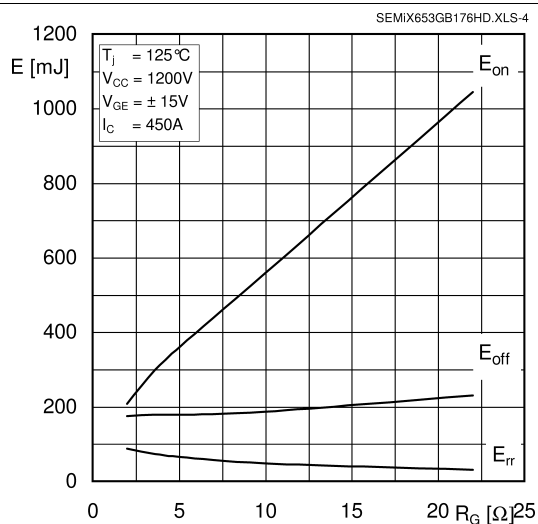


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

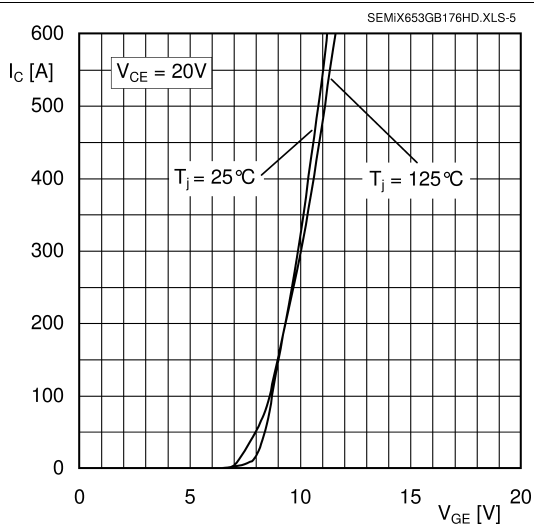


Fig. 5: Typ. transfer characteristic

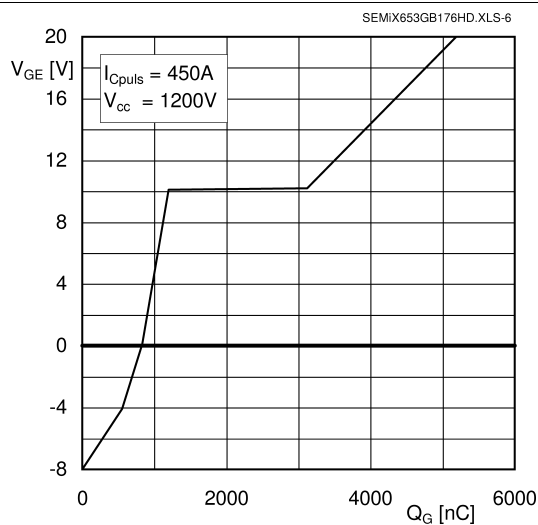


Fig. 6: Typ. gate charge characteristic

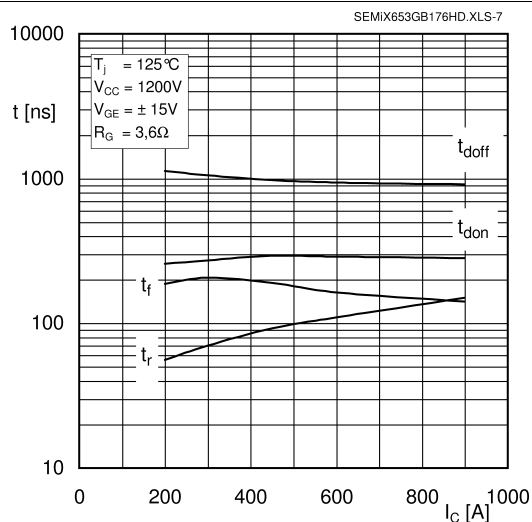


Fig. 7: Typ. switching times vs. I_C

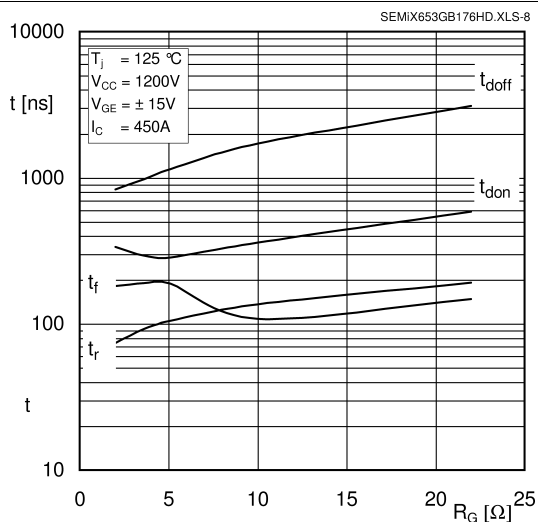


Fig. 8: Typ. switching times vs. gate resistor R_G

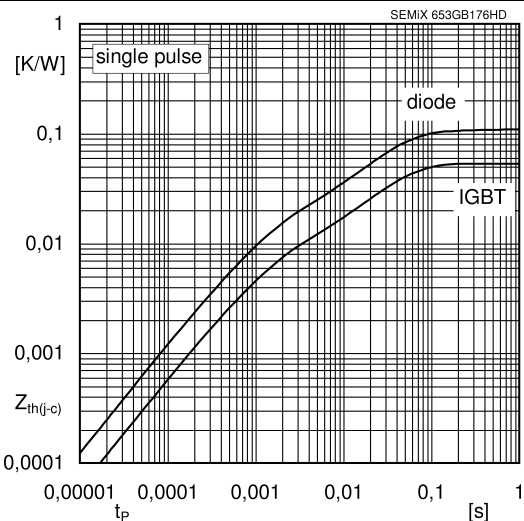


Fig. 9: Typ. transient thermal impedance

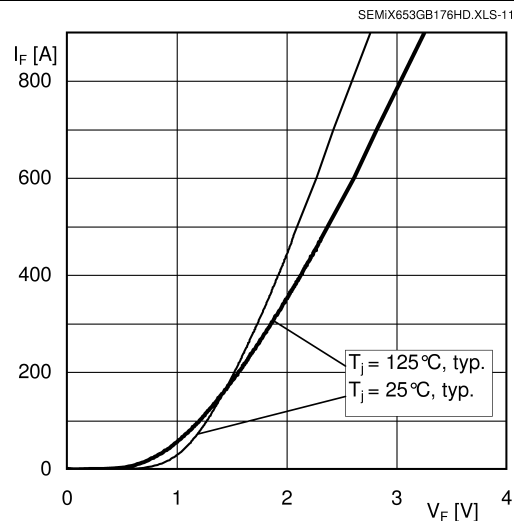


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

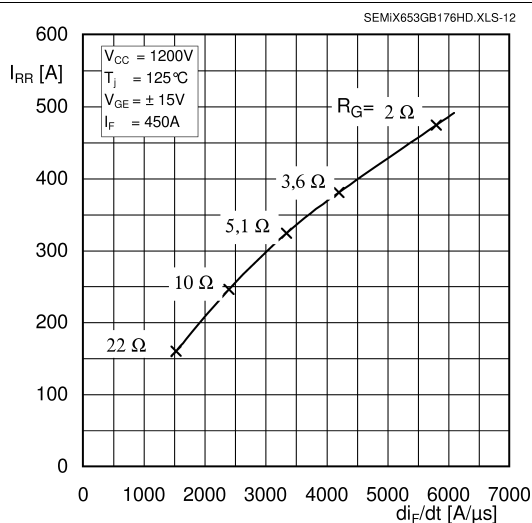


Fig. 11: Typ. CAL diode peak reverse recovery current

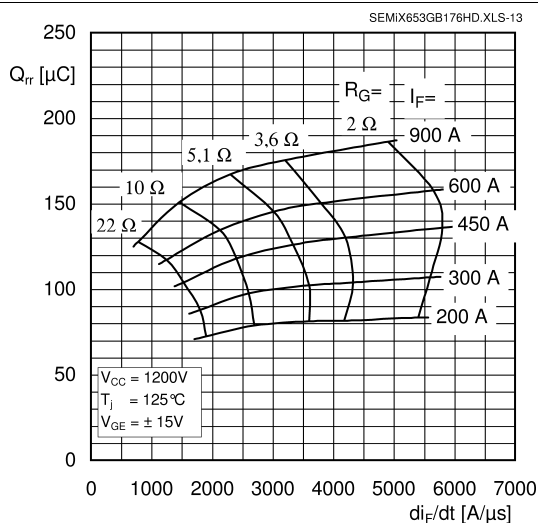
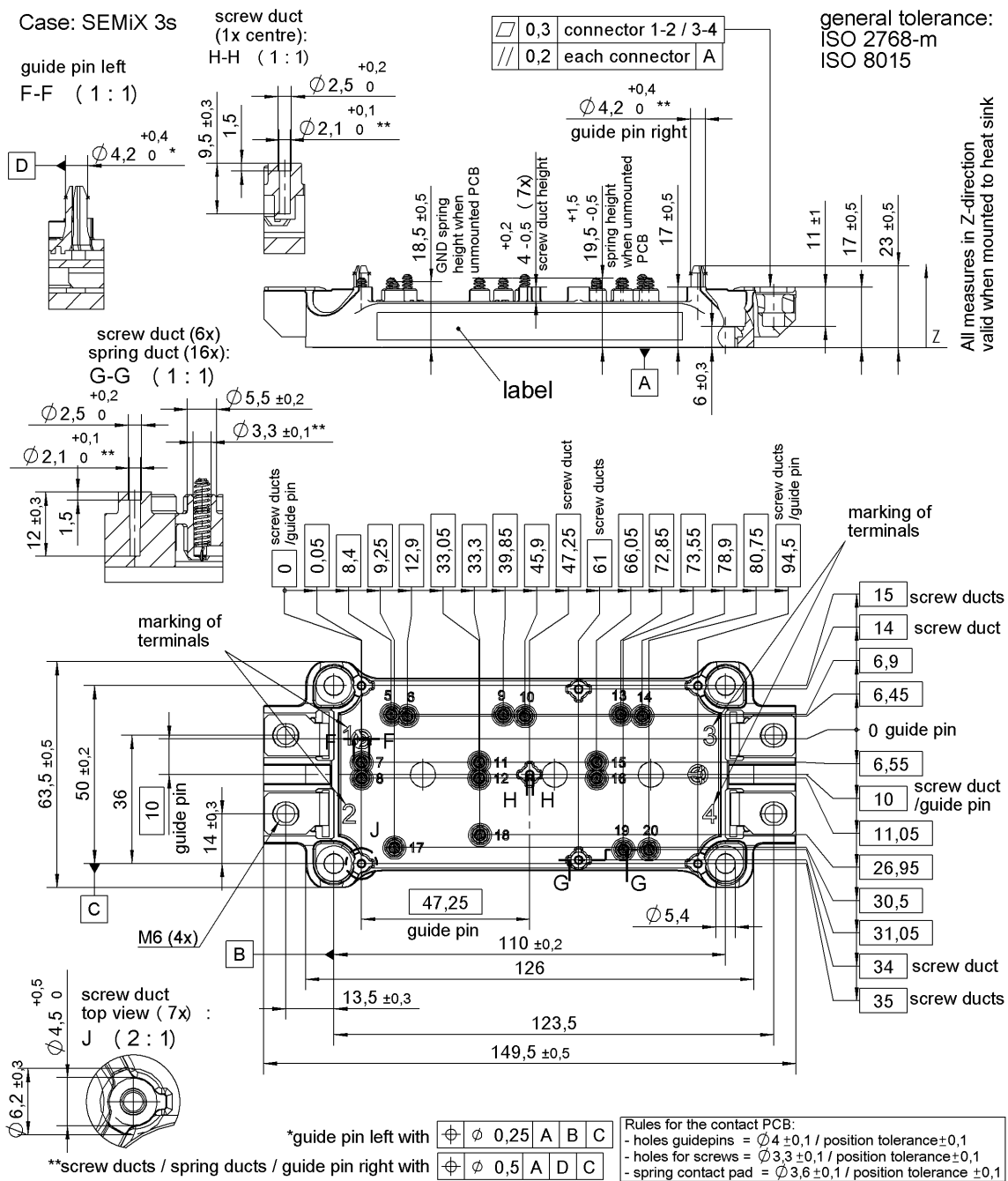
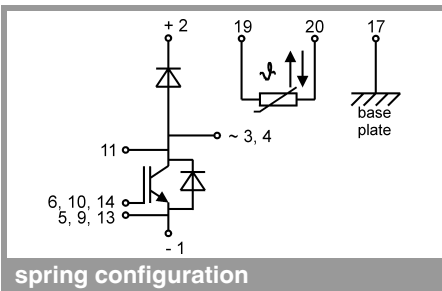


Fig. 12: Typ. CAL diode recovery charge

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

* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.