

SEMiX 653GB176HDs

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SEMiX® 3s

Trench IGBT Modules

SEMiX 653GB176HDs

SEMiX 653GAL176HDs

SEMiX 653GAR176HDs

Preliminary Data

Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- Released for Sn-Pb and Ni-Au PCB surfaces

Typical Applications

- AC inverter drives
- UPS
- Electronic welders

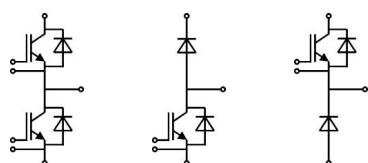
Remarks

- short circuit capability is tested @ $V_{CC}=1000V$ (all other static parameters are tested @ $V_{CC}=1200V$)

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Absolute Maximum Ratings		$T_c = 25\text{ }^\circ\text{C}$, unless otherwise specified	
Symbol	Conditions	Values	Units
IGBT			
V_{CES}	$T_j = 25\text{ }^\circ\text{C}$	1700	V
I_C	$T_j = 150\text{ }^\circ\text{C}$	$T_c = 25\text{ }^\circ\text{C}$ $T_c = 80\text{ }^\circ\text{C}$	A A
I_{CRM}	$I_{CRM}=2\times I_{Cnom}$	900	A
V_{GES}		± 20	V
t_{psc}	$V_{CC} = 1200\text{ V}$; $V_{GE} \leq 20\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$ $V_{CES} < 1700\text{ V}$	10	μs
Inverse Diode			
I_F	$T_j = 150\text{ }^\circ\text{C}$	$T_c = 25\text{ }^\circ\text{C}$ $T_c = 80\text{ }^\circ\text{C}$	A A
I_{FRM}	$I_{FRM}=2\times I_{Fnom}$	900	A
I_{FSM}	$t_p = 10\text{ ms}$; sin. $T_j = 25\text{ }^\circ\text{C}$	2900	A
Module			
$I_{t(RMS)}$		600	A
T_{vj}		- 40 ... + 150	$^\circ\text{C}$
T_{stg}		- 40 ... + 125	$^\circ\text{C}$
V_{isol}	AC, 1 min.	4000	V

Characteristics			T _c = 25 °C, unless otherwise specified			
Symbol	Conditions		min.	typ.	max.	Units
IGBT						
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 18 mA		5,2	5,8	6,4	V
I _{CES}	V _{GE} = 0 V, V _{CE} = V _{CES} T _j = 25 °C				0,45	mA
V _{CE0}	T _j = 25 °C T _j = 125 °C			1	1,2	V
				0,9	1,1	V
r _{CE}	V _{GE} = 0 V T _j = 25°C T _j = 125°C			2,2	2,8	mΩ
				3,4	4	mΩ
V _{CE(sat)}	I _{Cnom} = 450 A, V _{GE} = 15 V T _j = 25°C _{chiplev.} T _j = 125°C _{chiplev.}			2	2,45	V
				2,45	2,9	V
C _{ies}	V _{CE} = 25, V _{GE} = 0 V f = 1 MHz			39,6		nF
C _{oes}				1,6		nF
C _{res}				1,3		nF
Q _G	V _{GE} = -8 V ... +15 V			4200		nC
t _{d(on)}	R _{Gon} = 3,6 Ω	V _{CC} = 1200V I _{Cnom} = 450A T _j = 125 °C		290		ns
t _r				90		ns
E _{on}			300		mJ	
t _{d(off)}	R _{Goff} = 3,6 Ω			975		ns
t _f				190		ns
E _{off}			180		mJ	
R _{th(j-c)}	per IGBT				0,054	K/W



GB

GAL

GAR

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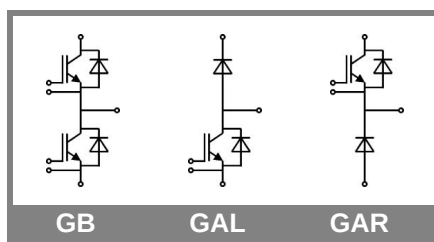
Remarks

- short circuit capability is tested @ $V_{CC}=1000V$ (all other static parameters are tested @ $V_{CC}=1200V$)

Characteristics					
Symbol	Conditions	min.	typ.	max.	Units
Inverse Diode					
$V_F = V_{EC}$	$I_{Fnom} = 450 A$; $V_{GE} = 0 V$				
	$T_j = 25 ^\circ C_{chiplev.}$		1,7	1,9	V
	$T_j = 125 ^\circ C_{chiplev.}$		1,7	1,9	V
V_{F0}	$T_j = 25 ^\circ C$		1,1	1,3	V
	$T_j = 125 ^\circ C$		0,9	1,1	V
r_F	$T_j = 25 ^\circ C$		1,3		mΩ
	$T_j = 125 ^\circ C$		1,8		mΩ
I_{RRM}	$I_{Fnom} = 450 A$		380		A
Q_{rr}	$di/dt = 4200 A/\mu s$		130		μC
E_{rr}	$V_{GE} = -15 V$; $V_{CC} = 1200 V$		73		mJ
$R_{th(j-c)D}$	per diode			0,11	K/W
Module					
L_{CE}			20		nH
$R_{CC'+EE'}$	res., terminal-chip	$T_{case} = 25 ^\circ C$	0,7		mΩ
		$T_{case} = 125 ^\circ C$	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
w				300	g
Temperature sensor					
R_{100}	$T_c = 100 ^\circ C$ ($R_{25} = 5 k\Omega$)		0,493±5%		kΩ
$B_{100/125}$	$R(T) = R_{100} \exp[B_{100/125} (1/T - 1/T_{100})]$; $T[K]$; B		3550±2%		K

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

This technical information specifies semiconductor devices but promises no characteristics. No warranty or guarantee expressed or implied is made regarding delivery, performance or suitability.



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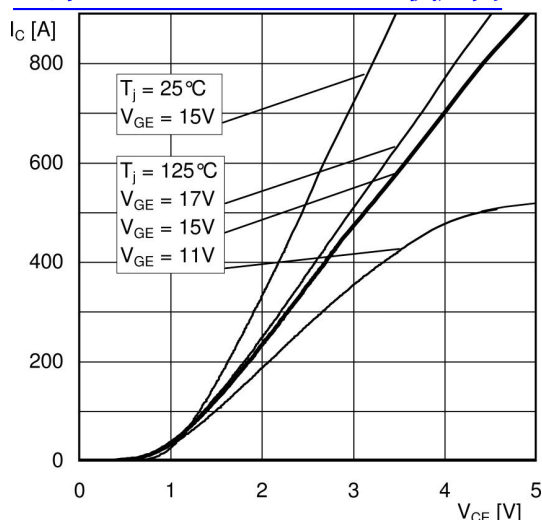


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+EE'}$

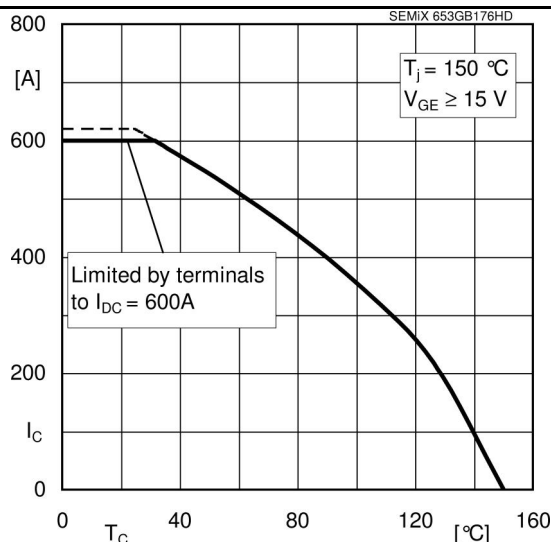


Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

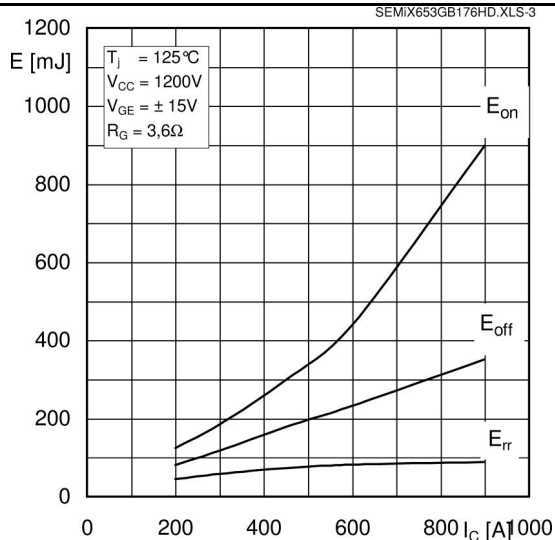


Fig. 3 Typ. turn-on /off energy = $f(I_C)$

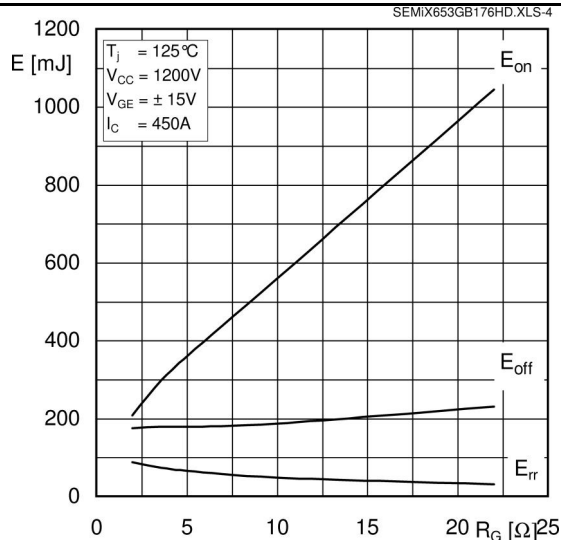


Fig. 4 Typ. turn-on /off energy = $f(R_G)$

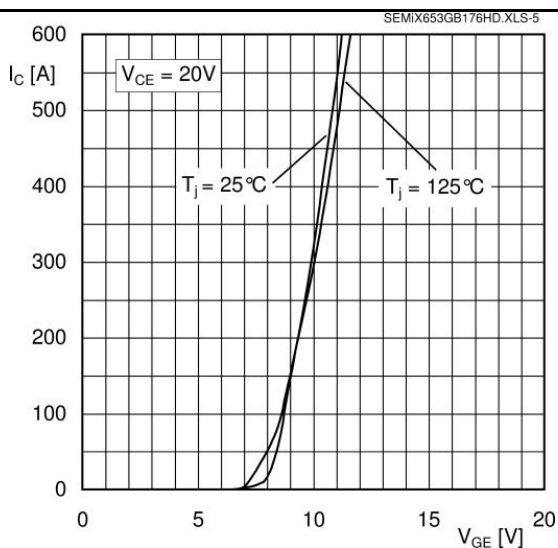


Fig. 5 Typ. transfer characteristic

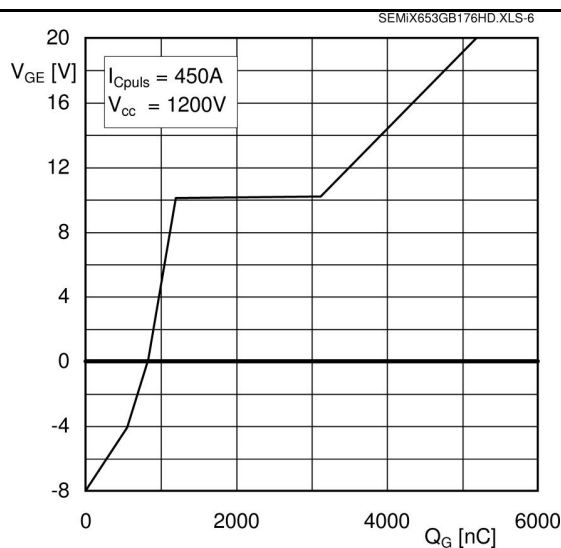


Fig. 6 Typ. gate charge characteristic

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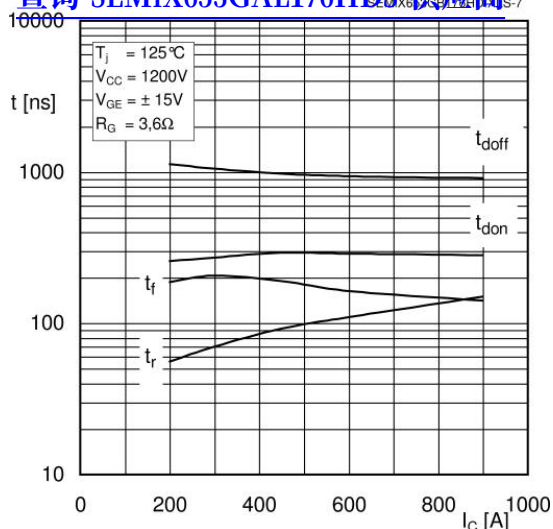


Fig. 7 Typ. switching times vs. I_C

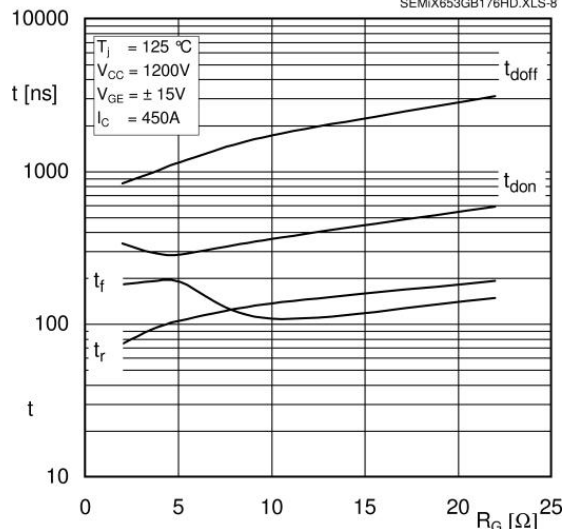


Fig. 8 Typ. switching times vs. gate resistor R_G

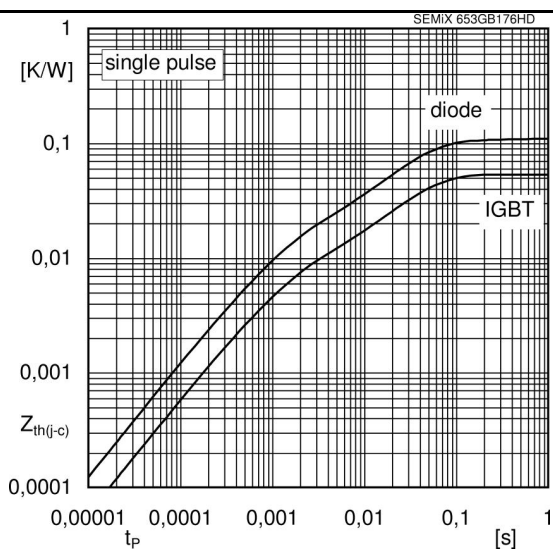


Fig. 9 Typ. transient thermal impedance

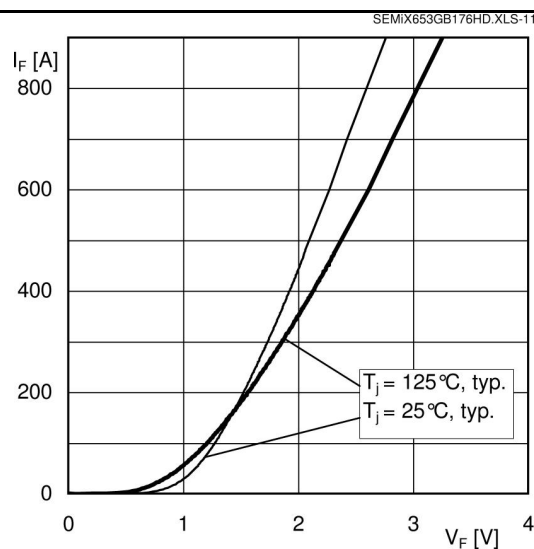


Fig. 10 Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

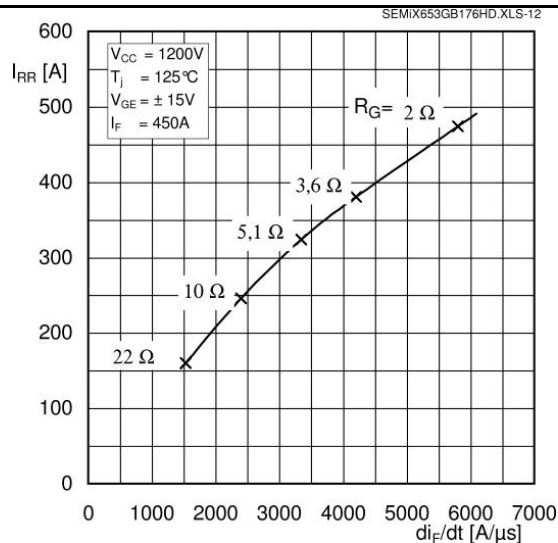


Fig. 11 Typ. CAL diode peak reverse recovery current

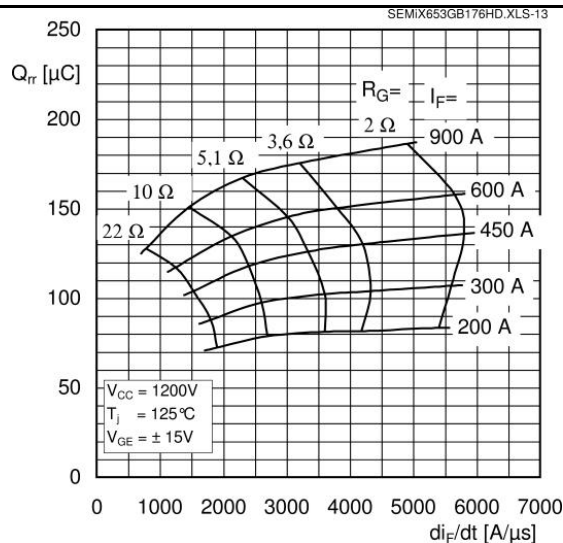
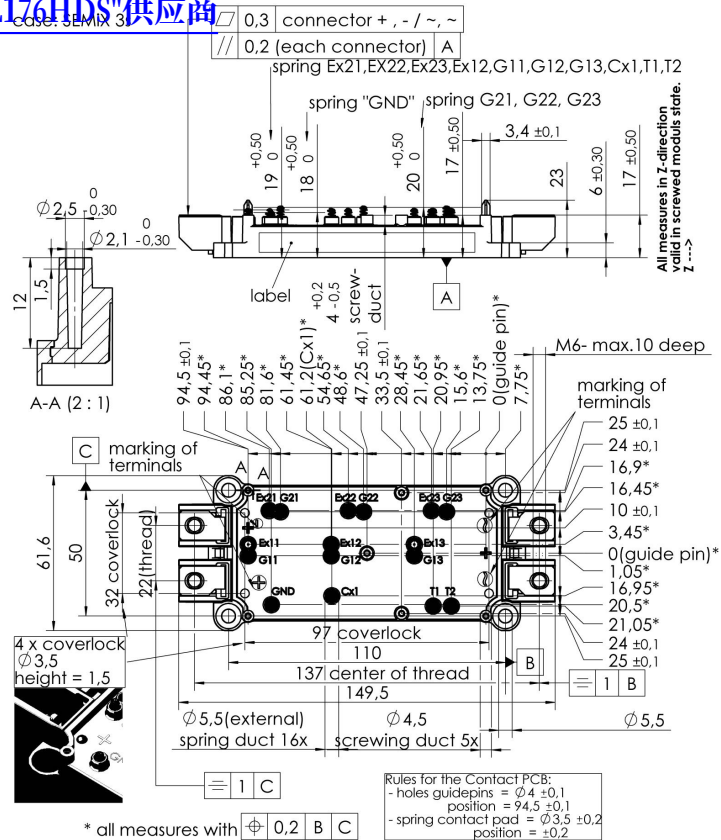


Fig. 12 Typ. CAL diode recovery charge

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Case SEMiX 3s

