

# SEMiX302GB066HDs



SEMiX® 2s

## Trench IGBT Modules

### SEMiX302GB066HDs

#### Features

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

#### Typical Applications\*

- Matrix Converter
- Resonant Inverter
- Current Source Inverter

#### Remarks

- Case temperature limited to  $T_C=125^\circ\text{C}$  max.
- Product reliability results are valid for  $T_j=150^\circ\text{C}$
- For short circuit: Soft  $R_{Goff}$  recommended
- Take care of over-voltage caused by stray inductance



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Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
<b>IGBT</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$	600	V	
$I_C$	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	379	A
		$T_c = 80^\circ\text{C}$	286	A
$I_{Cnom}$		300	A	
$I_{CRM}$	$I_{CRM} = 2 \times I_{Cnom}$	600	A	
$V_{GES}$		-20 ... 20	V	
$t_{psc}$	$V_{CC} = 360\text{ V}$ $V_{GE} \leq 15\text{ V}$ $T_j = 150^\circ\text{C}$ $V_{CES} \leq 600\text{ V}$	6	$\mu\text{s}$	
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Inverse diode</b>				
$I_F$	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	419	A
		$T_c = 80^\circ\text{C}$	307	A
$I_{Fnom}$		300	A	
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	600	A	
$I_{FSM}$	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	1400	A	
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Module</b>				
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$	600	A	
$T_{stg}$		-40 ... 125	$^\circ\text{C}$	
$V_{isol}$	AC sinus 50Hz, $t = 1\text{ min}$	4000	V	

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
<b>IGBT</b>					
$V_{CE(sat)}$	$I_C = 300\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.45	1.85	V
		$T_j = 150^\circ\text{C}$	1.7	2.1	V
$V_{CE0}$		$T_j = 25^\circ\text{C}$	0.9	1	V
		$T_j = 150^\circ\text{C}$	0.85	0.9	V
$r_{CE}$	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	1.8	2.8	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	2.8	4.0	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C = 4.8\text{ mA}$	5	5.8	6.5	V
$I_{CES}$	$V_{GE} = 0\text{ V}$ $V_{CE} = 600\text{ V}$	$T_j = 25^\circ\text{C}$	0.15	0.45	$\text{mA}$
		$T_j = 150^\circ\text{C}$			$\text{mA}$
$C_{ies}$	$V_{CE} = 25\text{ V}$		18.5		nF
$C_{oes}$	$V_{GE} = 0\text{ V}$		1.15		nF
$C_{res}$			0.55		nF
$Q_G$	$V_{GE} = -8\text{ V...}+15\text{ V}$		2400		nC
$R_{Gint}$	$T_j = 25^\circ\text{C}$		1.00		$\Omega$
$t_{d(on)}$	$V_{CC} = 300\text{ V}$		110		ns
$t_r$	$I_C = 300\text{ A}$		85		ns
$E_{on}$	$T_j = 150^\circ\text{C}$		11.5		mJ
$t_{d(off)}$	$R_{Gon} = 5.1\ \Omega$ $R_{Goff} = 5.1\ \Omega$		820		ns
					ns
$t_f$			70		ns
$E_{off}$			15		mJ
$R_{th(j-c)}$	per IGBT			0.16	K/W

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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverse diode</b>						
$V_F = V_{EC}$	$I_F = 300\text{ A}$ $V_{GE} = 0\text{ V}$ chip	$T_j = 25^\circ\text{C}$		1.4	1.60	V
		$T_j = 150^\circ\text{C}$		1.4	1.6	V
$V_{F0}$		$T_j = 25^\circ\text{C}$	0.9	1	1.1	V
		$T_j = 150^\circ\text{C}$	0.75	0.85	0.95	V
$r_F$		$T_j = 25^\circ\text{C}$	1.0	1.3	1.7	m $\Omega$
		$T_j = 150^\circ\text{C}$	1.5	1.8	2.2	m $\Omega$
$I_{RRM}$	$I_F = 300\text{ A}$ $di/dt_{off} = 3600\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		240		A
$Q_{rr}$		$T_j = 150^\circ\text{C}$		35		$\mu\text{C}$
$E_{rr}$	$V_{GE} = -8\text{ V}$ $V_{CC} = 300\text{ V}$	$T_j = 150^\circ\text{C}$		7.5		mJ
$R_{th(j-c)}$	per diode				0.19	K/W
<b>Module</b>						
$L_{CE}$				18		nH
$R_{CC'+EE'}$	res., terminal-chip	$T_C = 25^\circ\text{C}$		0.7		m $\Omega$
		$T_C = 125^\circ\text{C}$		1		m $\Omega$
$R_{th(c-s)}$	per module			0.045		K/W
$M_s$	to heat sink (M5)		3		5	Nm
$M_t$	to terminals (M6)		2.5		5	Nm
w					250	g
<b>Temperature sensor</b>						
$R_{100}$	$T_c=100^\circ\text{C}$ ( $R_{25}=5\text{ k}\Omega$ )			$493 \pm 5\%$		$\Omega$
$B_{100/125}$	$R(T)=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$ ; T[K];			$3550 \pm 2\%$		K



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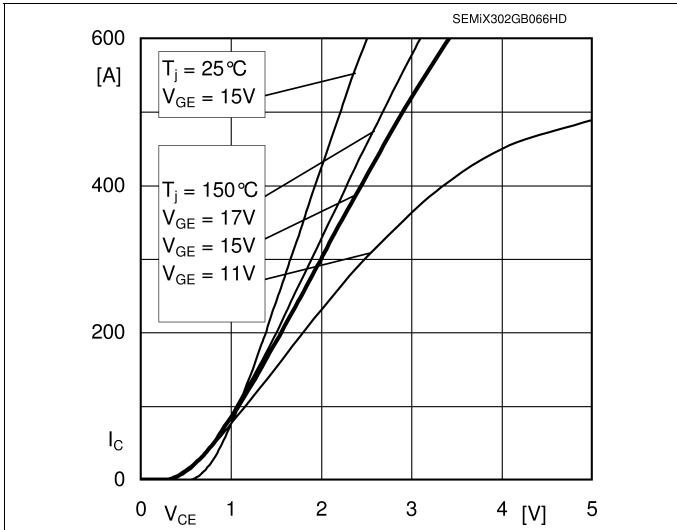


Fig. 1: Typ. output characteristic, inclusive  $R_{CC+EE}$

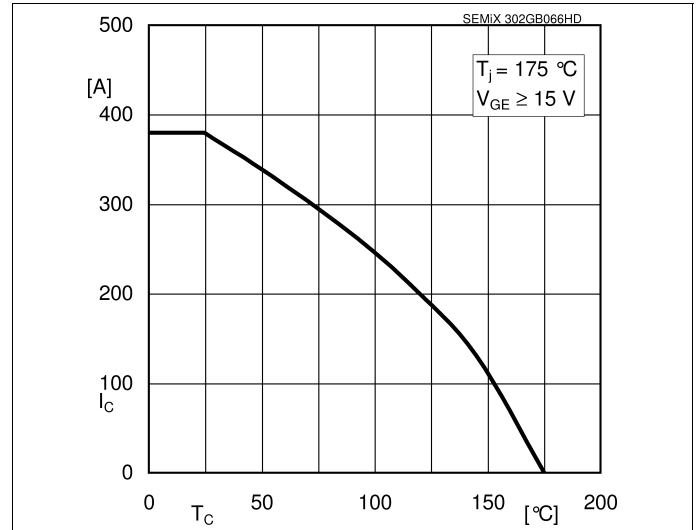


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

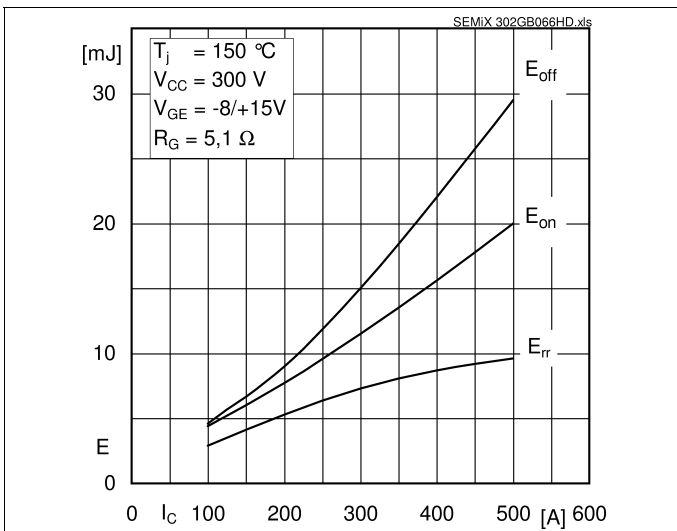


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

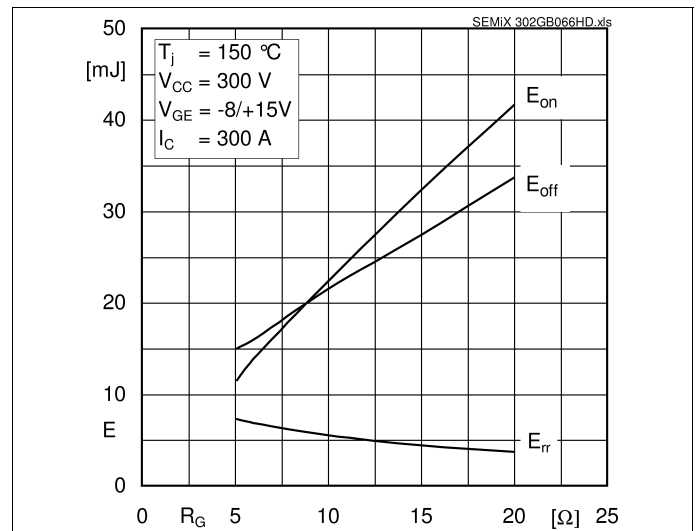


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

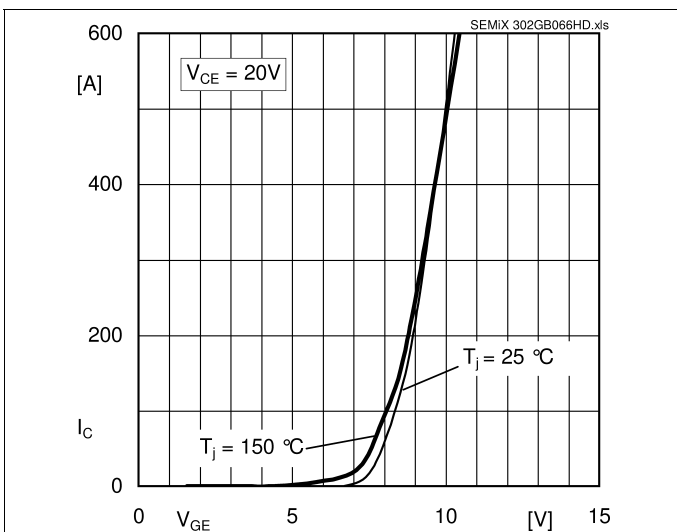


Fig. 5: Typ. transfer characteristic

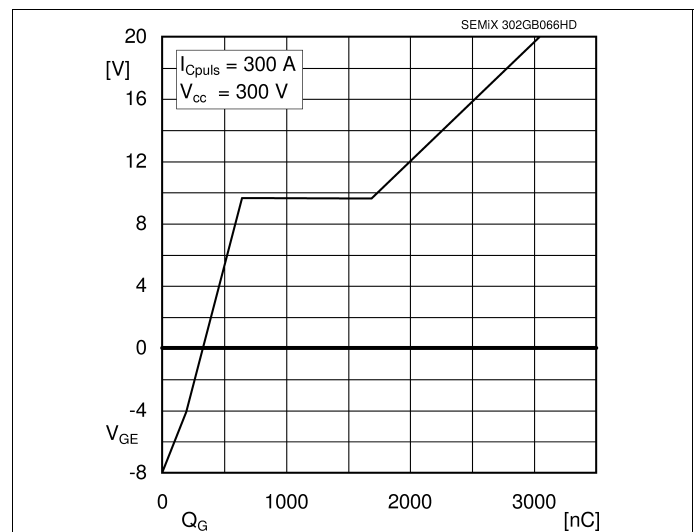


Fig. 6: Typ. gate charge characteristic

