

SEMiX223GD12E4c



SEMiX[®] 33c

Trench IGBT Modules

SEMiX223GD12E4c

Features

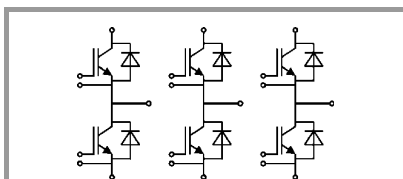
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- UL recognized, file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic Welding

Remarks

- Case temperature limited to $T_C=125^\circ\text{C}$ max.
- Product reliability results are valid for $T_J=150^\circ\text{C}$



GD

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V_{CES}			1200	V
I_C	$T_J = 175^\circ\text{C}$	$T_C = 25^\circ\text{C}$	333	A
		$T_C = 80^\circ\text{C}$	256	A
I_{Cnom}			225	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$		675	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 20\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_J = 150^\circ\text{C}$	10	μs
T_J			-40 ... 175	$^\circ\text{C}$
Inverse diode				
I_F	$T_J = 175^\circ\text{C}$	$T_C = 25^\circ\text{C}$	270	A
		$T_C = 80^\circ\text{C}$	202	A
I_{Fnom}			225	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$		675	A
I_{FSM}	$t_p = 10\text{ ms}$, $\sin 180^\circ$, $T_J = 25^\circ\text{C}$		1161	A
T_J			-40 ... 175	$^\circ\text{C}$
Module				
$I_{t(RMS)}$			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
IGBT						
$V_{CE(sat)}$	$I_C = 225\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_J = 25^\circ\text{C}$	1.85	2.1		V
		$T_J = 150^\circ\text{C}$	2.25	2.45		V
V_{CE0}			$T_J = 25^\circ\text{C}$	0.8	0.9	V
			$T_J = 150^\circ\text{C}$	0.7	0.8	V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_J = 25^\circ\text{C}$	4.7	5.3		$\text{m}\Omega$
		$T_J = 150^\circ\text{C}$	6.9	7.3		$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 9\text{ mA}$		5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_J = 25^\circ\text{C}$	0.1	0.3		mA
		$T_J = 150^\circ\text{C}$				mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$		$f = 1\text{ MHz}$		13.2	nF
C_{oes}			$f = 1\text{ MHz}$		0.87	nF
C_{res}			$f = 1\text{ MHz}$		0.71	nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$			1275		nC
R_{Gint}	$T_J = 25^\circ\text{C}$			3.33		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 225\text{ A}$	$T_J = 150^\circ\text{C}$			213	ns
t_r		$T_J = 150^\circ\text{C}$			60	ns
E_{on}	$R_{G\ on} = 1.5\ \Omega$		$T_J = 150^\circ\text{C}$		22	mJ
$t_{d(off)}$	$R_{G\ off} = 1.5\ \Omega$		$T_J = 150^\circ\text{C}$		535	ns
t_f	$di/dt_{on} = 3630\text{ A}/\mu\text{s}$ $di/dt_{off} = 2235\text{ A}/\mu\text{s}$		$T_J = 150^\circ\text{C}$		113	ns
E_{off}			$T_J = 150^\circ\text{C}$		31.4	mJ
$R_{th(j-c)}$	per IGBT				0.135	K/W

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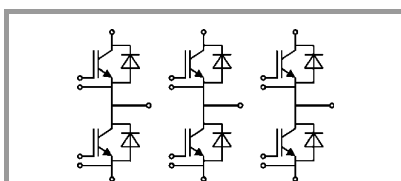
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 225\text{ A}$ $V_{GE} = 0\text{ V}$ chip	$T_j = 25^\circ\text{C}$		2.2	2.49	V
		$T_j = 150^\circ\text{C}$		2.1	2.4	V
V_{F0}		$T_j = 25^\circ\text{C}$	1.1	1.3	1.5	V
		$T_j = 150^\circ\text{C}$	0.7	0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$	3.6	3.9	4.4	m Ω
		$T_j = 150^\circ\text{C}$	4.7	5.4	5.9	m Ω
I_{RRM}	$I_F = 225\text{ A}$	$T_j = 150^\circ\text{C}$		210		A
Q_{rr}	$di/dt_{off} = 3900\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		37		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		17.2		mJ
$R_{th(j-c)}$	per diode				0.22	K/W
Module						
L_{CE}				20		nH
R_{CC+EE}	res., terminal-chip	$T_C = 25^\circ\text{C}$		0.7		m Ω
		$T_C = 125^\circ\text{C}$		1		m Ω
$R_{th(c-s)}$	per module			0.014		K/W
M_s	to heat sink (M5)		3		5	Nm
M_t	to terminals (M6)		2.5		5	Nm
						Nm
w					900	g
Temperatur Sensor						
R_{100}	$T_C=100^\circ\text{C}$ ($R_{25}=5\text{ k}\Omega$)			$493 \pm 5\%$		Ω
$B_{100/125}$	$R_{(T)}=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; $T[\text{K}]$;			3550 $\pm 2\%$		K



GD

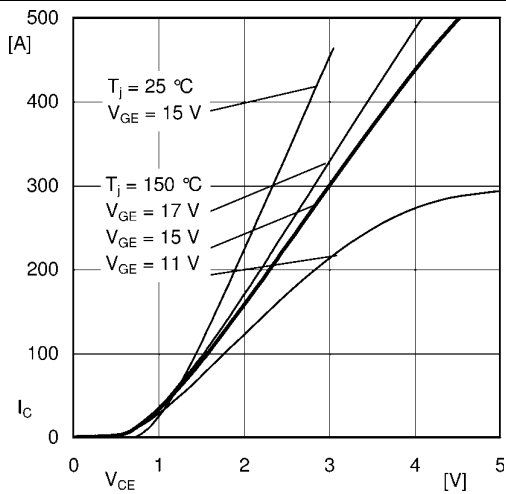


Fig. 1: Typ. output characteristic, inclusive $R_{CC+EE'}$

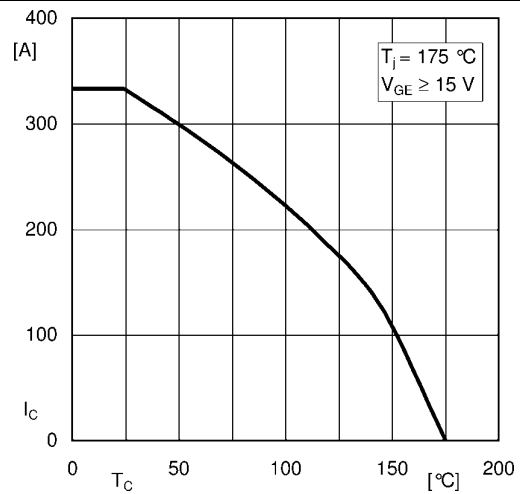


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

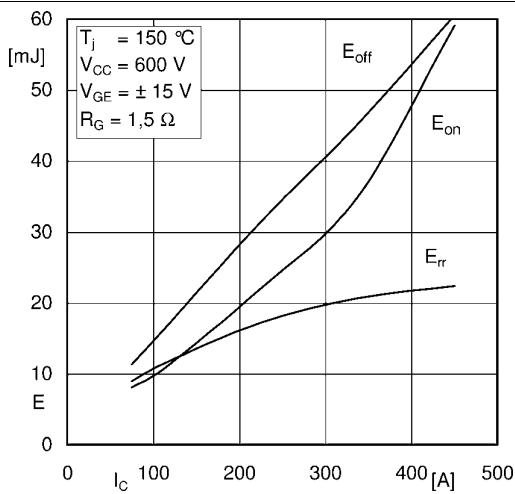


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

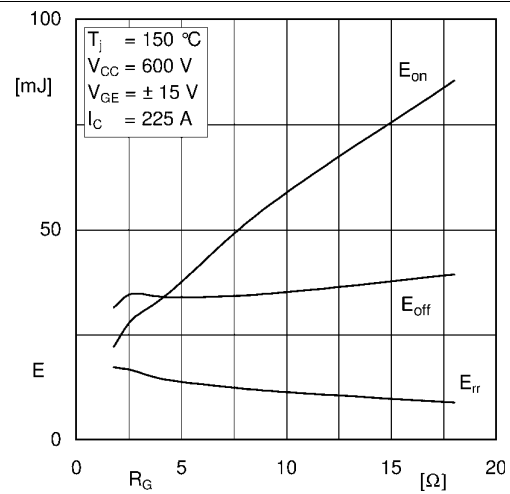


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

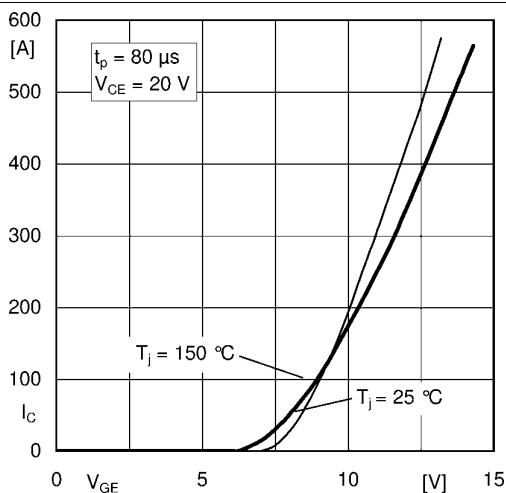


Fig. 5: Typ. transfer characteristic

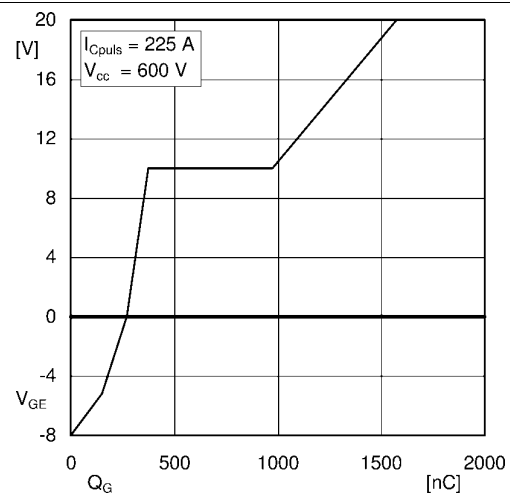


Fig. 6: Typ. gate charge characteristic

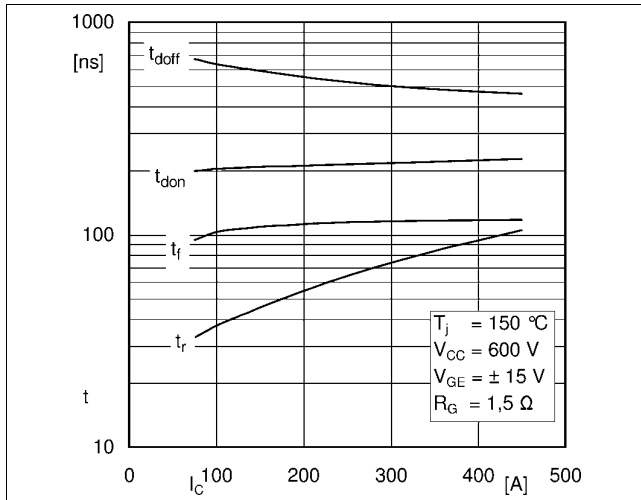


Fig. 7: Typ. switching times vs. I_C

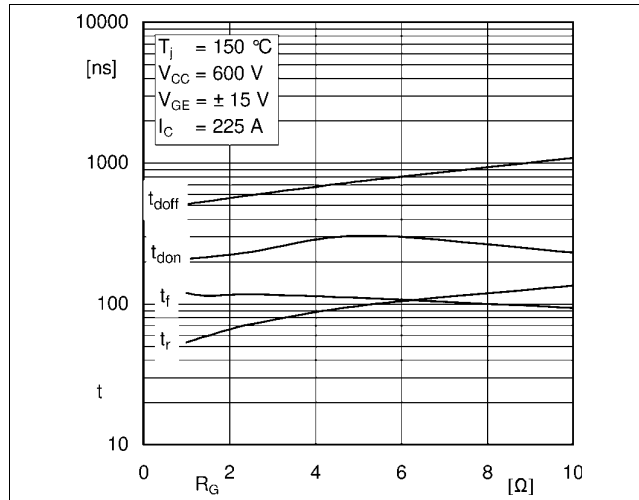


Fig. 8: Typ. switching times vs. gate resistor R_G

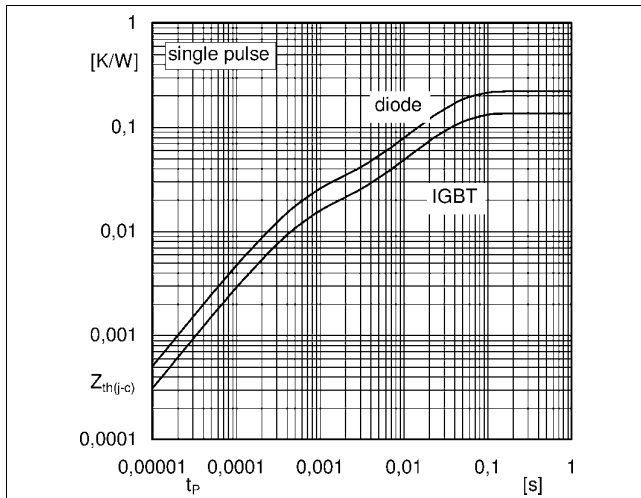


Fig. 9: Typ. transient thermal impedance

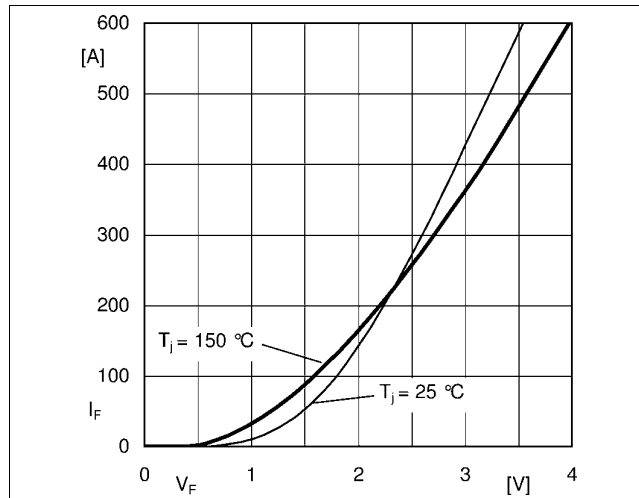


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

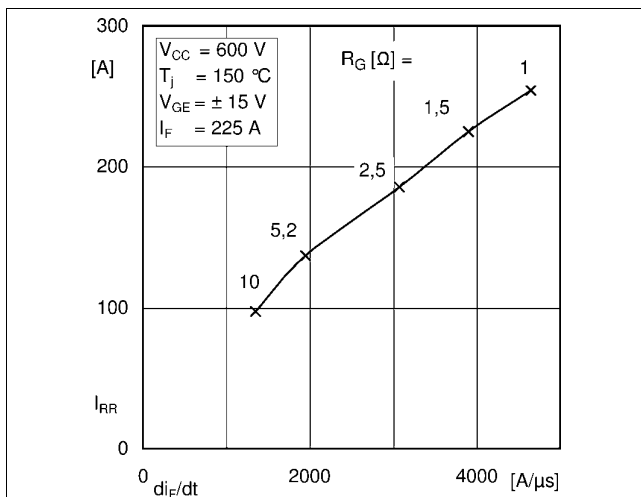


Fig. 11: Typ. CAL diode peak reverse recovery current

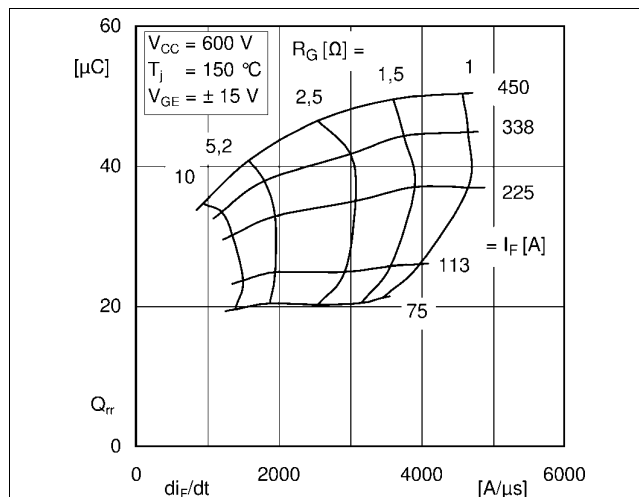


Fig. 12: Typ. CAL diode recovery charge

