

SEMiX® 33c

Trench IGBT Modules

SEMiX303GD12E4c

Features

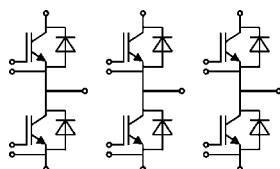
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- UL recognised file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic Welding

Remarks

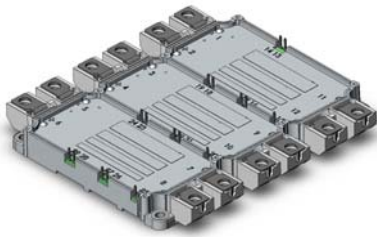
- Case temperature limited to $T_C=125^{\circ}\text{C}$ max.
- Product reliability results are valid for $T_J=150^{\circ}\text{C}$



GD

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V _{CES}			1200	V
I _C	T _j = 175 °C	T _c = 25 °C	466	A
		T _c = 80 °C	359	A
I _{Cnom}			300	A
I _{CRM}	I _{CRM} = 3xI _{Cnom}		900	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				
I _F	T _j = 175 °C	T _c = 25 °C	338	A
		T _c = 80 °C	252	A
I _{Fnom}			300	A
I _{FRM}	I _{FRM} = 3xI _{Fnom}		900	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		1485	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}			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 = 100 A V _{GE} = 15 V chipelevel	T _J = 25 °C		1.8	2.05	V
		T _J = 150 °C		2.2	2.4	V
V _{CE0}		T _J = 25 °C		0.8	0.9	V
		T _J = 150 °C		0.7	0.8	V
r _{CE}	V _{GE} = 15 V	T _J = 25 °C		3.3	3.8	mΩ
		T _J = 150 °C		5.0	5.3	mΩ
V _{GE(th)}	V _{GE} =V _{CE} , I _C = 11.4 mA		5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V	T _J = 25 °C		0.1	0.3	mA
	V _{CE} = 1200 V	T _J = 150 °C				mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		18.5		nF
C _{oes}		f = 1 MHz		1.22		nF
C _{res}		f = 1 MHz		1.03		nF
Q _G	V _{GE} = - 8 V...+ 15 V			1695		nC
R _{Gint}	T _J = 25 °C			2.50		Ω
t _{d(on)}	V _{CC} = 600 V	T _J = 150 °C		213		ns
t _r	I _C = 300 A	T _J = 150 °C		60		ns
E _{on}	R _{G on} = 1.8 Ω R _{G off} = 1.8 Ω	T _J = 150 °C		29.4		mJ
t _{d(off)}		T _J = 150 °C		535		ns
t _f		T _J = 150 °C		113		ns
E _{off}		T _J = 150 °C		41.8		mJ
R _{th(j-c)}	per IGBT				0.095	K/W



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Typical Applications*

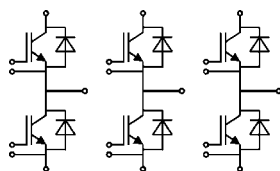
- AC inverter drives
- UPS
- Electronic Welding

Remarks

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

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverse diode					
$V_F = V_{EC}$	$I_F = 300\text{ A}$ $V_{GE} = 0\text{ V}$ chip				
	$T_J = 25^\circ\text{C}$		2.2	2.52	V
	$T_J = 150^\circ\text{C}$		2.2	2.5	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					
	$T_J = 25^\circ\text{C}$	2.7	3.0	3.4	m Ω
	$T_J = 150^\circ\text{C}$	3.5	4.2	4.6	m Ω
I_{RRM}	$I_F = 300\text{ A}$ $di/dt_{off} = 5200\text{ A}/\mu\text{s}$				
	$T_J = 150^\circ\text{C}$		300		A
Q_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$				
	$T_J = 150^\circ\text{C}$		50		μC
E_{rr}					
	$T_J = 150^\circ\text{C}$		22.9		mJ
$R_{th(j-c)}$	per diode			0.18	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

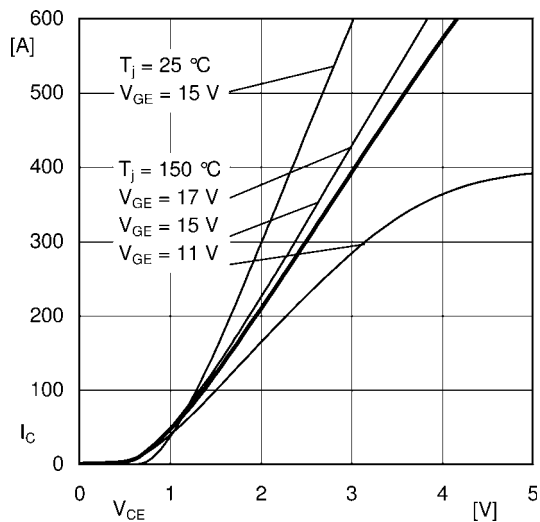


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_E$

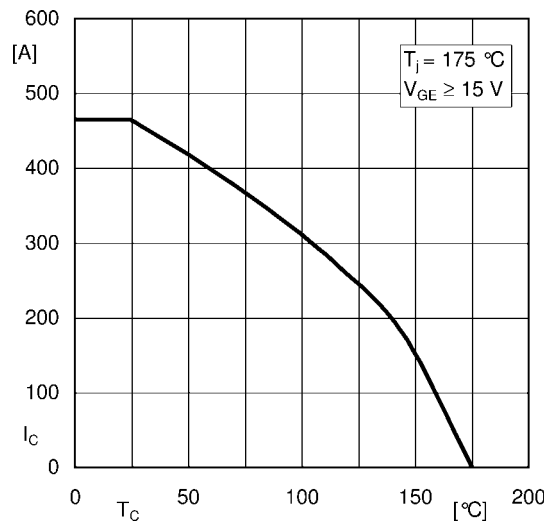


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

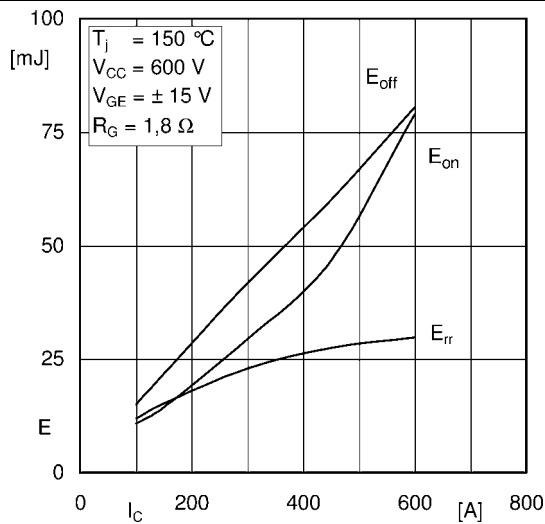


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

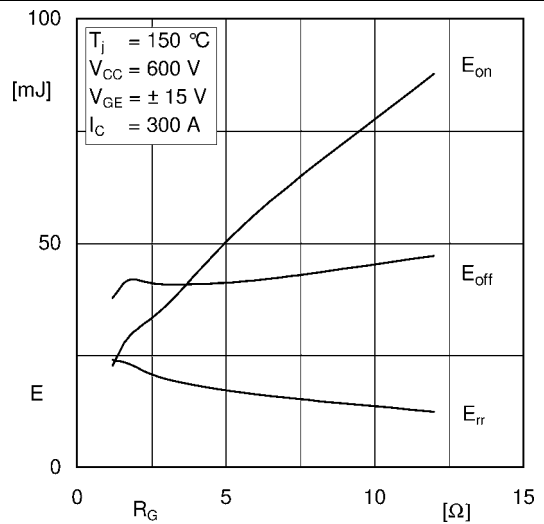


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

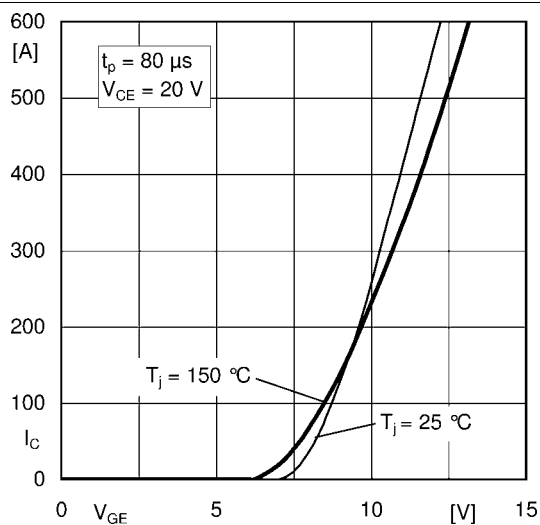


Fig. 5: Typ. transfer characteristic

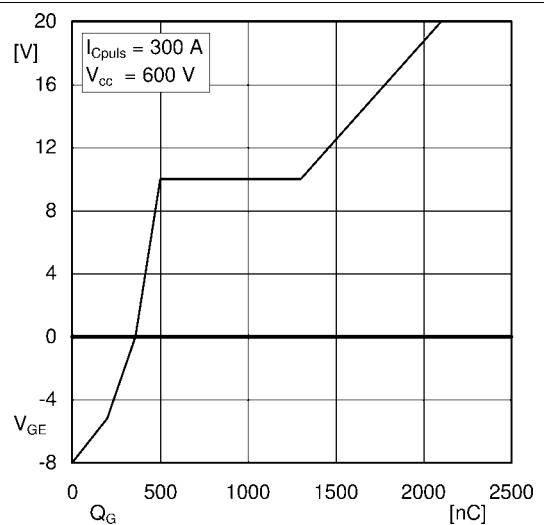


Fig. 6: Typ. gate charge characteristic

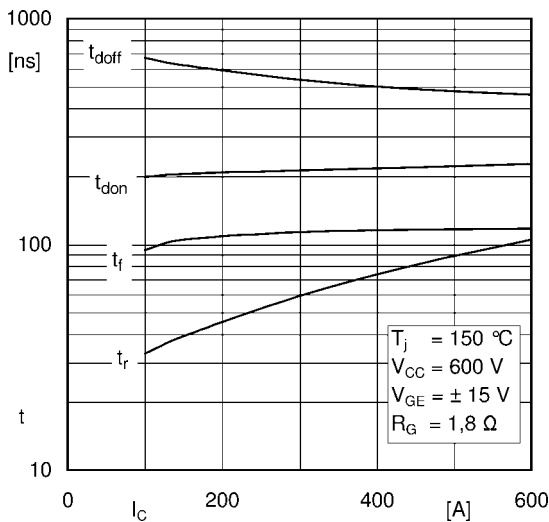


Fig. 7: Typ. switching times vs. I_C

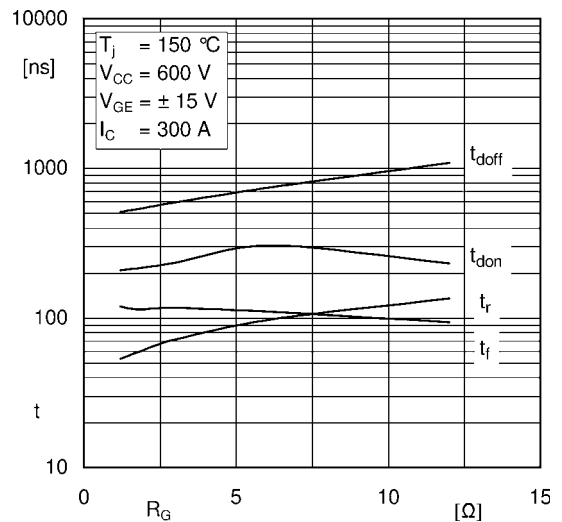


Fig. 8: Typ. switching times vs. gate resistor R_G

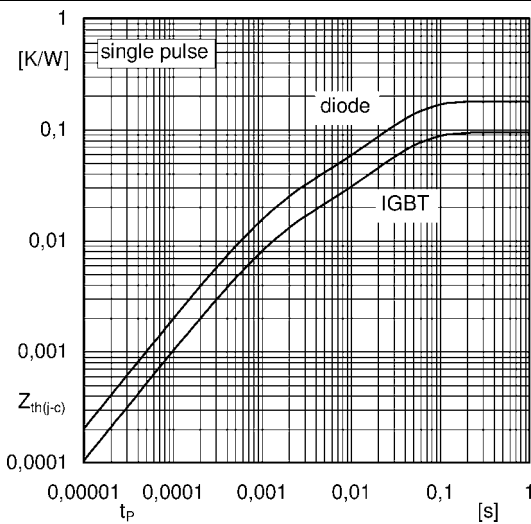


Fig. 9: Typ. transient thermal impedance

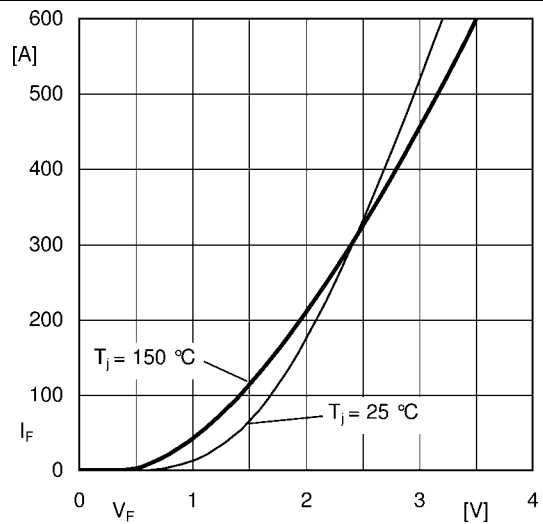


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC+EE'}$

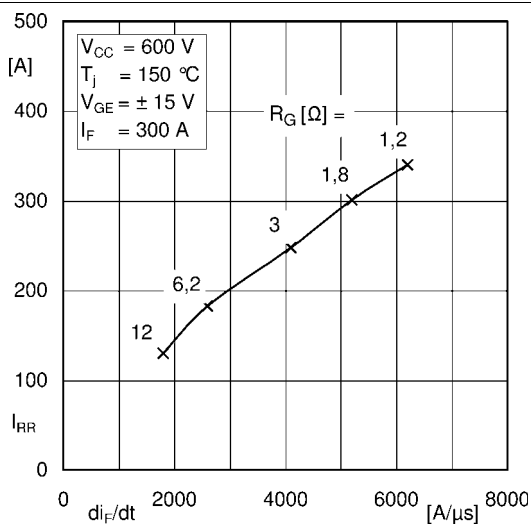


Fig. 11: Typ. CAL diode peak reverse recovery current

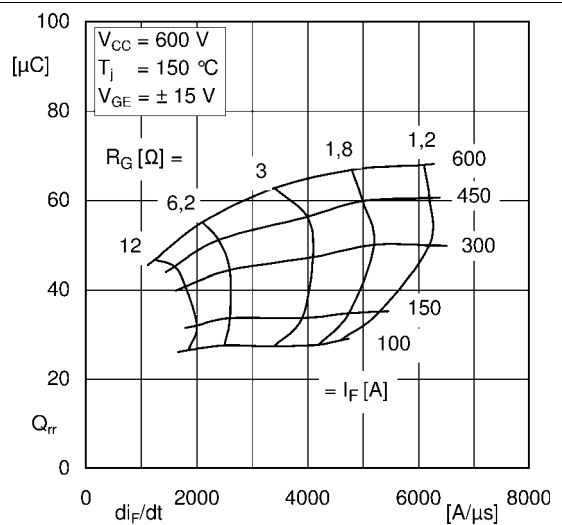
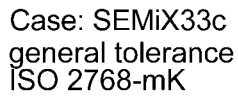
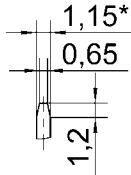


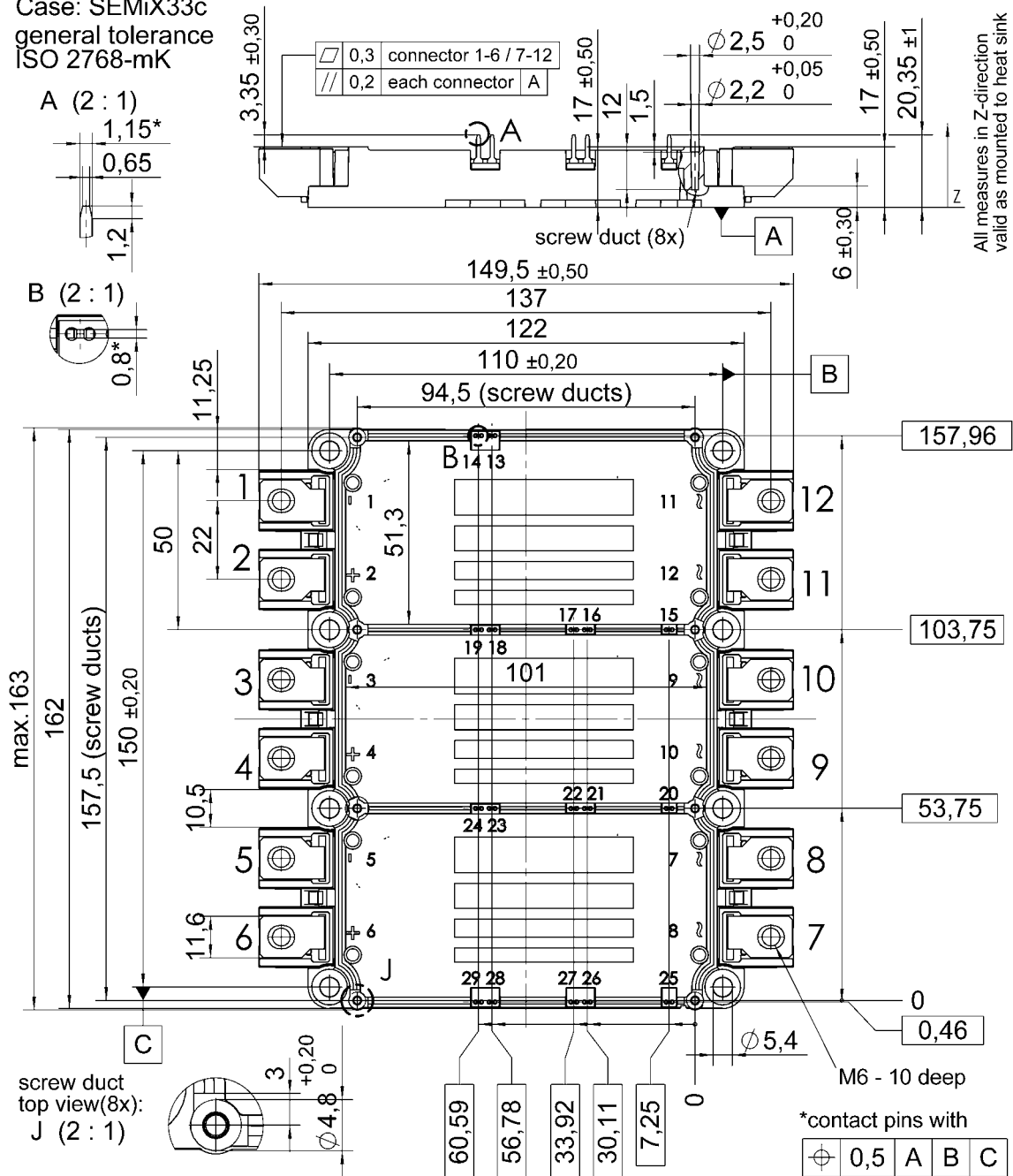
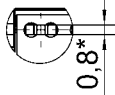
Fig. 12: Typ. CAL diode recovery charge



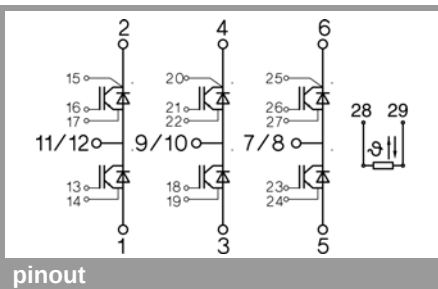
A (2 : 1)



B (2 : 1)



SEMIX 33c



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

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