


**SEMiX® 33c**

## Trench IGBT Modules

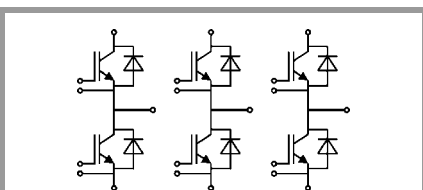
### SEMiX453GD176HDc

#### 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


**GD**

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
<b>IGBT</b>				
$V_{CES}$			1700	V
$I_C$	$T_j = 150\text{ °C}$	$T_c = 25\text{ °C}$	444	A
		$T_c = 80\text{ °C}$	315	A
$I_{Cnom}$			300	A
$I_{CRM}$	$I_{CRM} = 2 \times I_{Cnom}$		600	A
$V_{GES}$			-20 ... 20	V
$t_{psc}$	$V_{CC} = 1000\text{ V}$ $V_{GE} \leq 20\text{ V}$ $V_{CES} \leq 1700\text{ V}$	$T_j = 125\text{ °C}$	10	$\mu\text{s}$
$T_j$			-55 ... 150	$^{\circ}\text{C}$
<b>Inverse diode</b>				
$I_F$	$T_j = 150\text{ °C}$	$T_c = 25\text{ °C}$	545	A
		$T_c = 80\text{ °C}$	365	A
$I_{Fnom}$			300	A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$		600	A
$I_{FSM}$	$t_p = 10\text{ ms, sin } 180^{\circ}, T_j = 25\text{ °C}$		2900	A
$T_j$			-40 ... 150	$^{\circ}\text{C}$
<b>Module</b>				
$I_{t(RMS)}$			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
<b>IGBT</b>						
$V_{CE(sat)}$	$I_C = 300\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25\text{ °C}$	2	2.45		V
		$T_j = 125\text{ °C}$	2.45	2.9		V
$V_{CE0}$		$T_j = 25\text{ °C}$	1	1.2		V
		$T_j = 125\text{ °C}$	0.9	1.1		V
$r_{CE}$	$V_{GE} = 15\text{ V}$	$T_j = 25\text{ °C}$	3.3	4.2		$\text{m}\Omega$
		$T_j = 125\text{ °C}$	5.2	6.0		$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 12\text{ mA}$		5.2	5.8	6.4	V
$I_{CES}$	$V_{GE} = 0\text{ V}$ $V_{CE} = 1700\text{ V}$	$T_j = 25\text{ °C}$			3	$\text{mA}$
		$T_j = 125\text{ °C}$				$\text{mA}$
$C_{ies}$	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		26.4		nF
$C_{oes}$		$f = 1\text{ MHz}$		1.10		nF
$C_{res}$		$f = 1\text{ MHz}$		0.88		nF
$Q_G$	$V_{GE} = -8\text{ V...} + 15\text{ V}$			2799		nC
$R_{Gint}$	$T_j = 25\text{ °C}$			2.50		$\Omega$
$t_{d(on)}$	$V_{CC} = 1200\text{ V}$ $I_C = 300\text{ A}$	$T_j = 125\text{ °C}$		335		ns
$t_r$		$T_j = 125\text{ °C}$		70		ns
$E_{on}$	$R_{Gon} = 4.3\text{ }\Omega$			215		mJ
$t_{d(off)}$	$R_{Goff} = 4.3\text{ }\Omega$			990		ns
$t_f$				150		ns
$E_{off}$				125		mJ
$R_{th(j-c)}$	per IGBT				0.071	K/W



SEMiX® 33c

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## SEMiX453GD176HDc

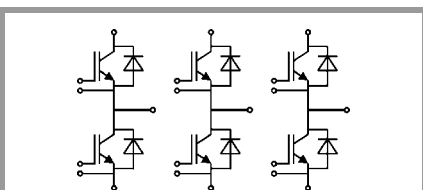
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## Typical Applications\*

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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	$T_j = 25\text{ °C}$		1.5	1.70	V
		$T_j = 125\text{ °C}$		1.4	1.6	V
$V_{F0}$		$T_j = 25\text{ °C}$	0.9	1.1	1.3	V
		$T_j = 125\text{ °C}$	0.7	0.9	1.1	V
$r_F$		$T_j = 25\text{ °C}$	1.3	1.3	1.3	mΩ
		$T_j = 125\text{ °C}$	1.8	1.8	1.8	mΩ
$I_{RRM}$	$I_F = 300\text{ A}$ $di/dt_{off} = 4700\text{ A}/\mu\text{s}$	$T_j = 125\text{ °C}$		350		A
$Q_{rr}$	$V_{GE} = -15\text{ V}$	$T_j = 125\text{ °C}$		115		μC
$E_{rr}$	$V_{CC} = 1200\text{ V}$	$T_j = 125\text{ °C}$		65		mJ
$R_{th(j-c)}$	per diode				0.11	K/W
<b>Module</b>						
$L_{CE}$				20		nH
$R_{CC'+EE'}$	res., terminal-chip	$T_C = 25\text{ °C}$		0.7		mΩ
		$T_C = 125\text{ °C}$		1		mΩ
$R_{th(c-s)}$	per module			0.014		K/W
$M_s$	to heat sink (M5)		3		5	Nm
$M_t$		to terminals (M6)	2.5		5	Nm
$w$					900	g
<b>Temperatur Sensor</b>						
$R_{100}$	$T_c = 100\text{ °C}$ ( $R_{25} = 5\text{ k}\Omega$ )			$493 \pm 5\%$		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

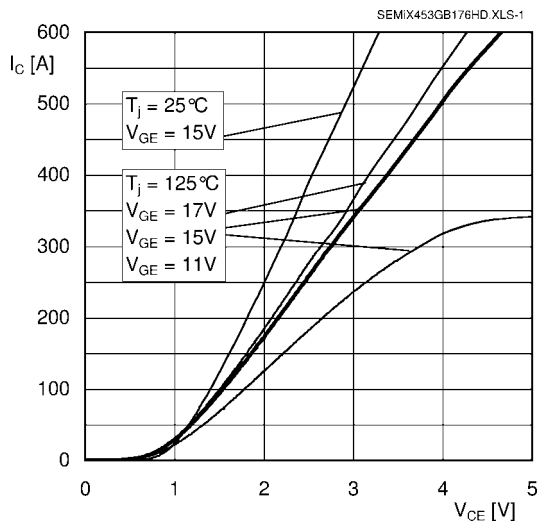


Fig. 1: Typ. output characteristic, inclusive  $R_{CC'+EE'}$

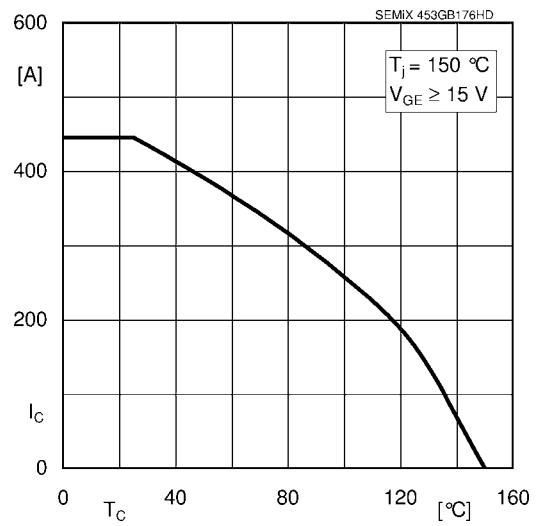


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

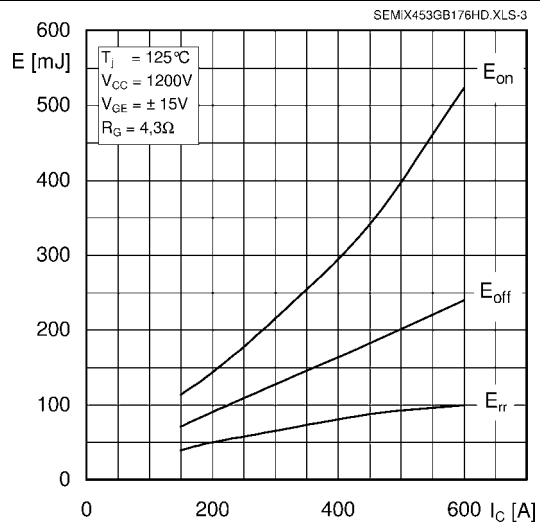


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

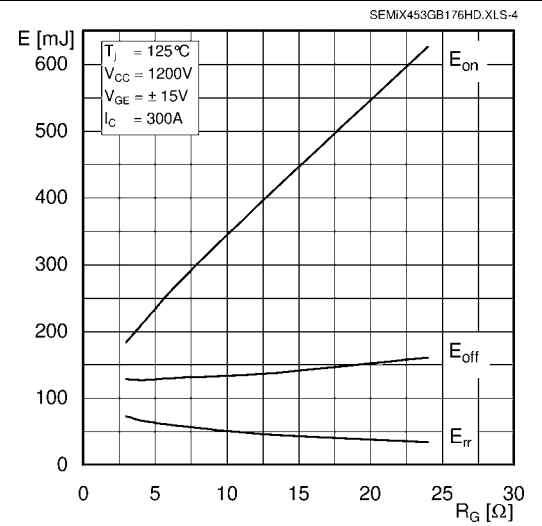


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

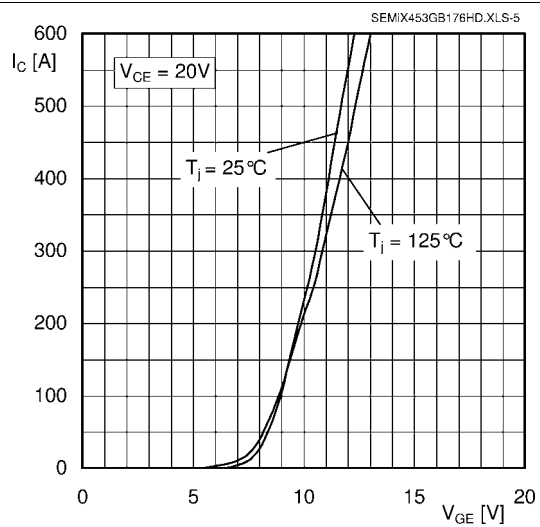


Fig. 5: Typ. transfer characteristic

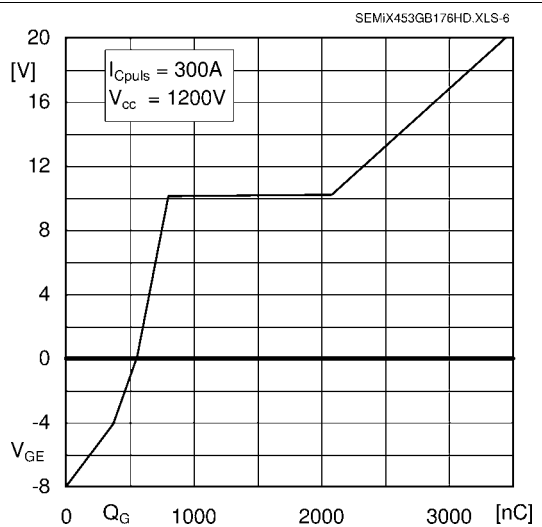
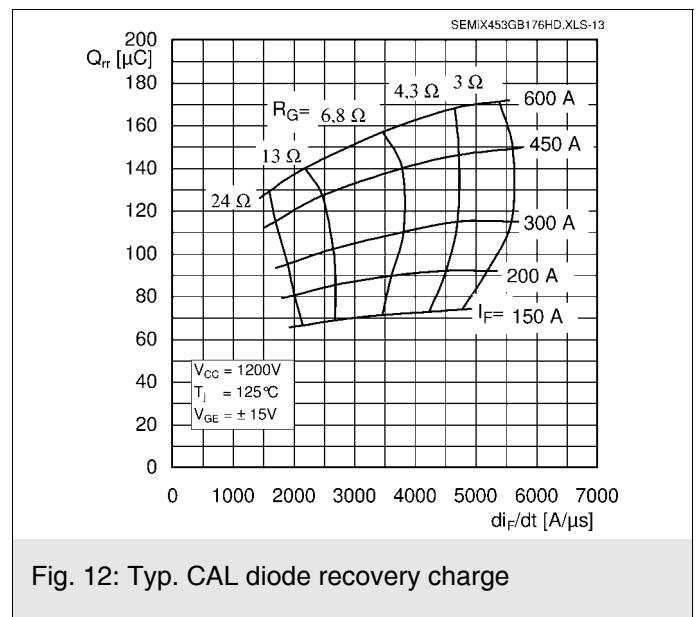
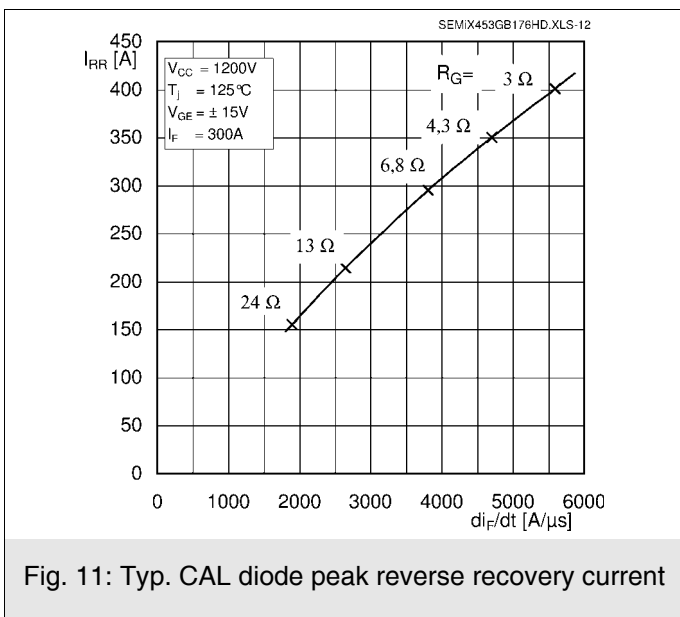
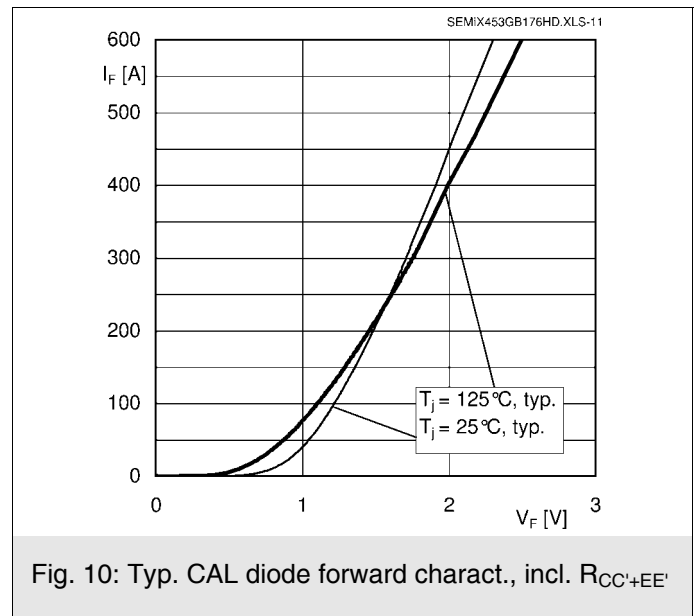
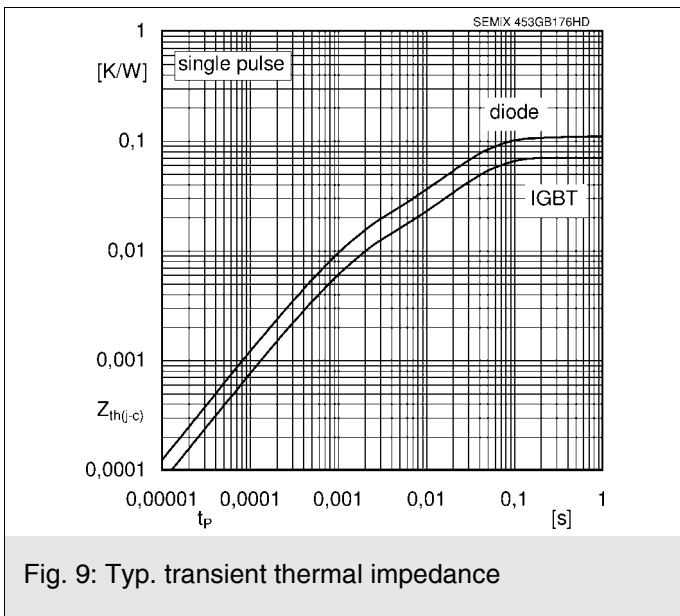
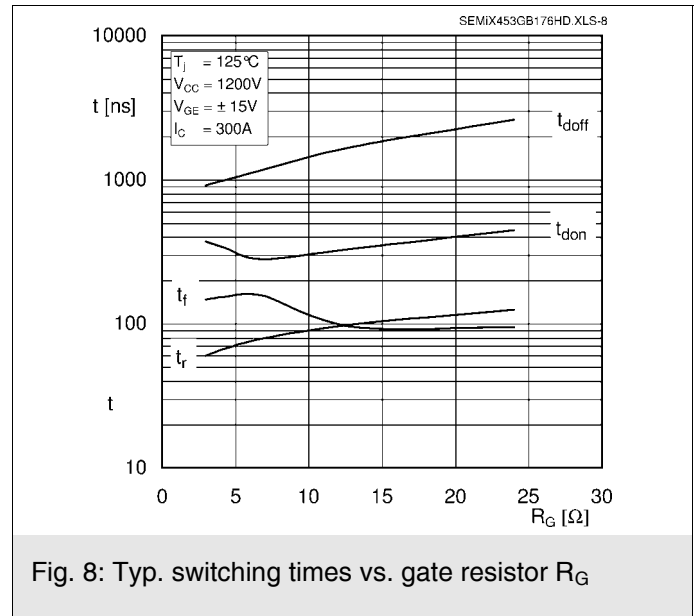
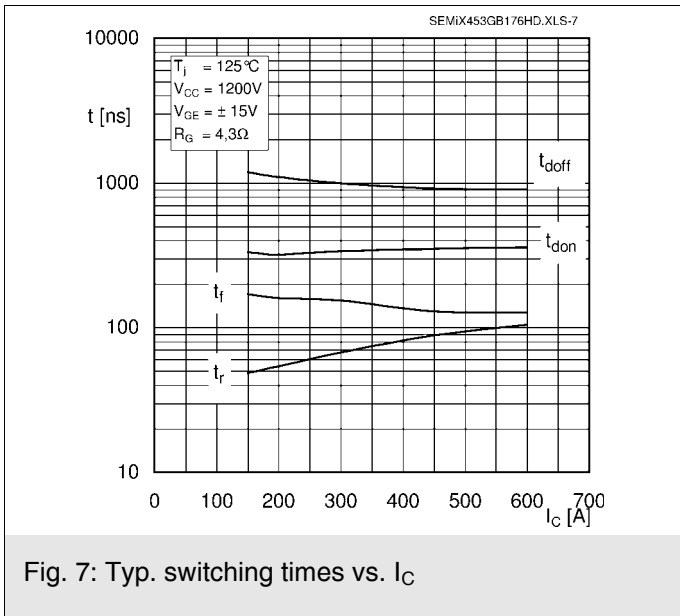
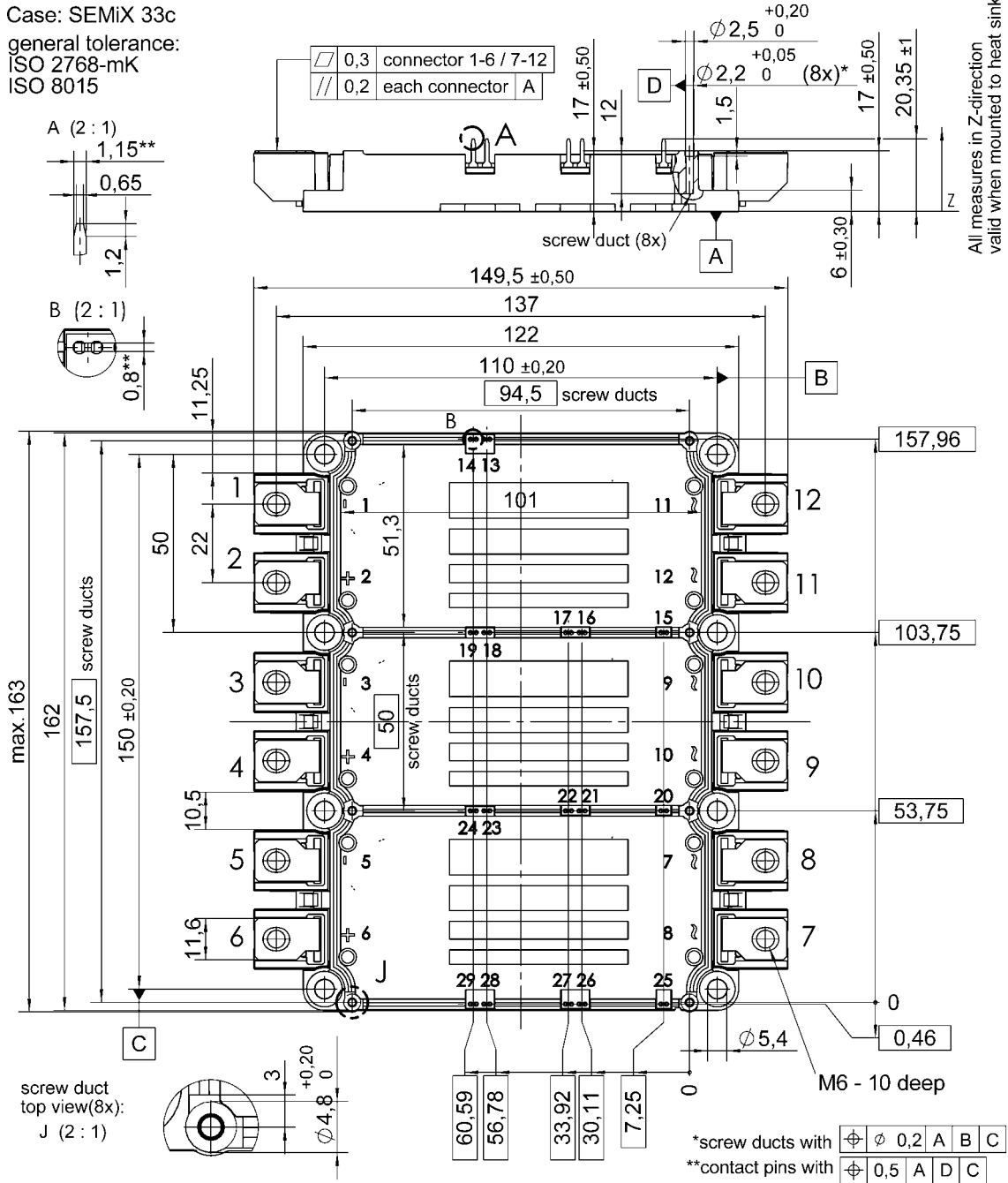


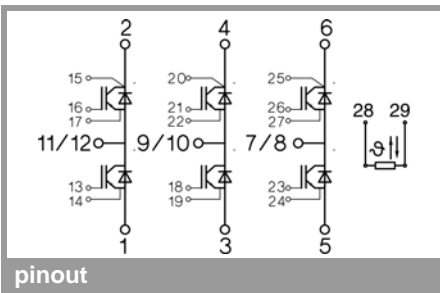
Fig. 6: Typ. gate charge characteristic



Case: SEMiX 33c  
 general tolerance:  
 ISO 2768-mk  
 ISO 8015



SEMiX 33c



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 personal.