



SEMITRANS® 3

Fast IGBT4 Modules

SKM450GB12T4

Features

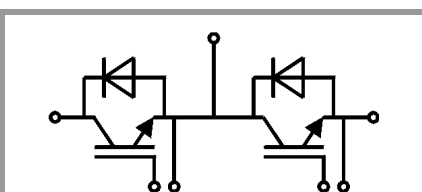
- IGBT4 = 4. generation fast trench IGBT (Infineon)
- CAL4 = Soft switching 4. generation CAL-diode
- Insulated copper baseplate using DBC technology (Direct Bonded Copper)
- Increased power cycling capability
- With integrated gate resistor
- For higher switching frequencies up to 20kHz
- UL recognized, file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic welders at fsw up to 20 kHz

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max.
- Recommended $T_{op} = -40 \dots +150^\circ\text{C}$
- Product reliability results valid for $T_j = 150^\circ\text{C}$



GB

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 175 °C	T _c = 25 °C	699	A
		T _c = 80 °C	538	A
I _{Cnom}			450	A
I _{CRM}	I _{CRM} = 3xI _{Cnom}		1350	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 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	461	A
		T _c = 80 °C	345	A
I _{Fnom}			400	A
I _{FRM}	I _{FRM} = 3xI _{Fnom}		1200	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		1980	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}			500	A
T _{stg}			-40 ... 125	°C
V _{isol}	AC sinus 50 Hz, t = 1 min		4000	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
V _{CE(sat)}	I _C = 450 A	T _j = 25 °C		1.84	2.07	V
	V _{GE} = 15 V chipelevel	T _j = 150 °C		2.23	2.42	V
V _{CE0}	chipelevel	T _j = 25 °C		0.80	0.90	V
		T _j = 150 °C		0.70	0.80	V
r _{CE}	V _{GE} = 15 V chipelevel	T _j = 25 °C		2.3	2.6	mΩ
		T _j = 150 °C		3.4	3.6	mΩ
V _{GE(th)}	V _{GE} =V _{CE} , I _C = 16.4 mA		5.3	5.8	6.3	V
I _{CES}	V _{GE} = 0 V	T _j = 25 °C			5	mA
	V _{CE} = 1200 V	T _j = 150 °C		-		mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		27.2		nF
C _{oes}		f = 1 MHz		1.76		nF
C _{res}		f = 1 MHz		1.50		nF
Q _G	V _{GE} = - 8 V...+ 15 V			2500		nC
R _{Gint}	T _j = 25 °C			1.9		Ω
t _{d(on)}	V _{CC} = 600 V	T _j = 150 °C		224		ns
t _r	I _C = 450 A		T _j = 150 °C		59	
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		32		mJ
t _{d(off)}	R _{G on} = 1 Ω	T _j = 150 °C		460		ns
t _f	R _{G off} = 1 Ω	T _j = 150 °C		91		ns
E _{off}	di/dt _{on} = 8300 A/μs	T _j = 150 °C				
	di/dt _{off} = 3800 A/μs					
	du/dt = 3700 V/μs			49		mJ
R _{th(j-c)}	per IGBT				0.062	K/W



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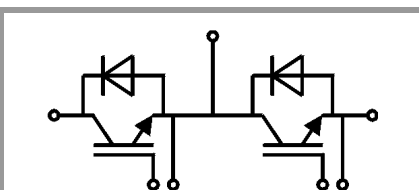
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Remarks

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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 450\text{ A}$	$T_j = 25\text{ }^{\circ}\text{C}$		2.31	2.65	V
	$V_{GE} = 0\text{ V}$	$T_j = 150\text{ }^{\circ}\text{C}$		2.31	2.64	V
	chiplevel					
V_{F0}		$T_j = 25\text{ }^{\circ}\text{C}$		1.30	1.50	V
	chiplevel	$T_j = 150\text{ }^{\circ}\text{C}$		0.90	1.10	V
r_F		$T_j = 25\text{ }^{\circ}\text{C}$		2.3	2.6	mΩ
	chiplevel	$T_j = 150\text{ }^{\circ}\text{C}$		3.1	3.4	mΩ
I_{RRM}	$I_F = 450\text{ A}$	$T_j = 150\text{ }^{\circ}\text{C}$		440		A
Q_{rr}	$di/dt_{off} = 8000\text{ A}/\mu\text{s}$	$T_j = 150\text{ }^{\circ}\text{C}$		65		μC
	$V_{GE} = 15\text{ V}$					
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 150\text{ }^{\circ}\text{C}$		28		mJ
$R_{th(j-c)}$	per diode				0.13	K/W
Module						
L_{CE}				15		nH
$R_{CC'+EE'}$	measured per	$T_C = 25\text{ }^{\circ}\text{C}$		0.55		mΩ
	switch	$T_C = 125\text{ }^{\circ}\text{C}$		0.85		mΩ
$R_{th(c-s)}$	per module			0.02	0.038	K/W
M_s	to heat sink M6		3		5	Nm
M_t		to terminals M6	2.5		5	Nm
						Nm
w					325	g



GB

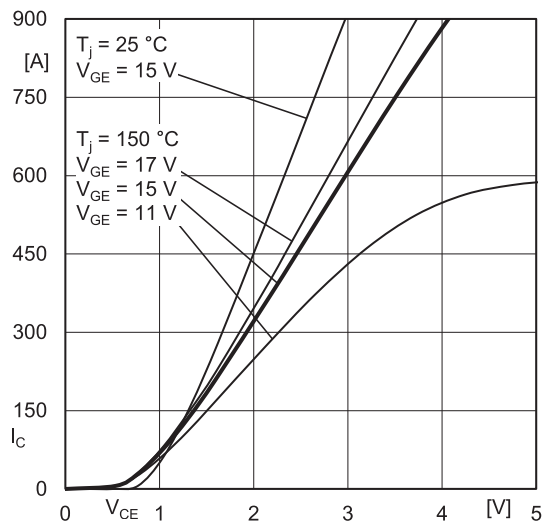


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

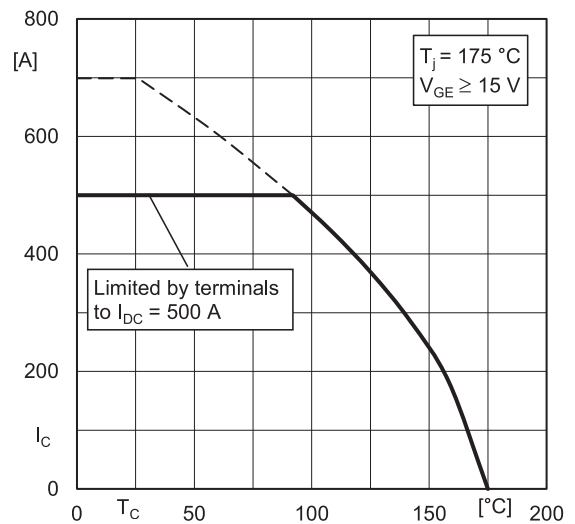


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

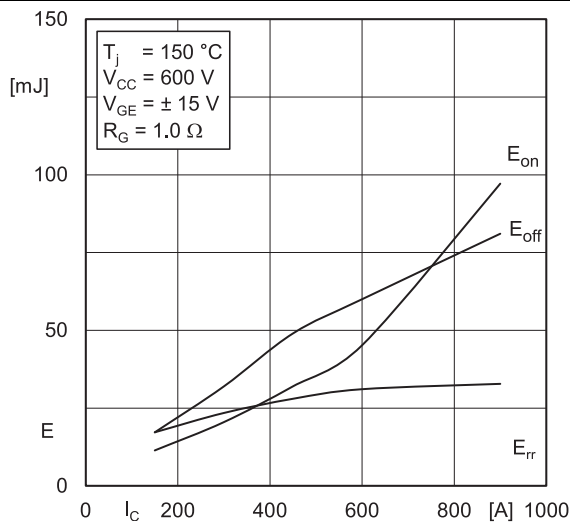


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

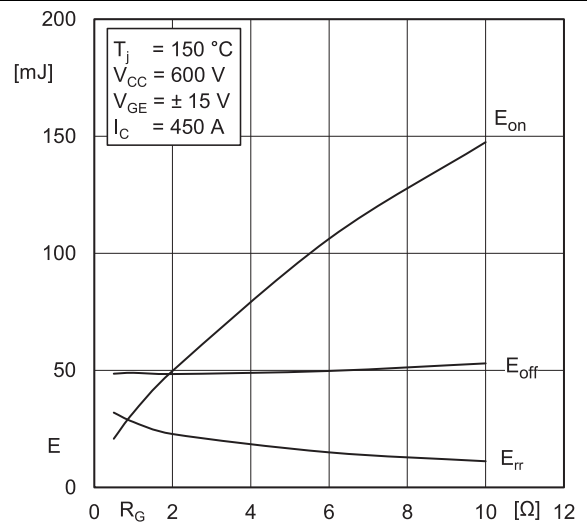


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

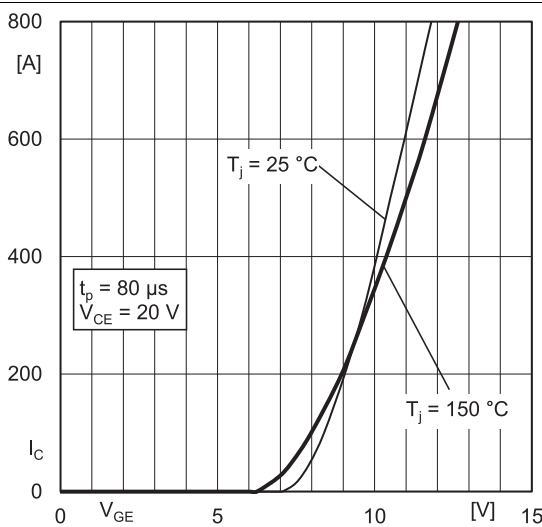


Fig. 5: Typ. transfer characteristic

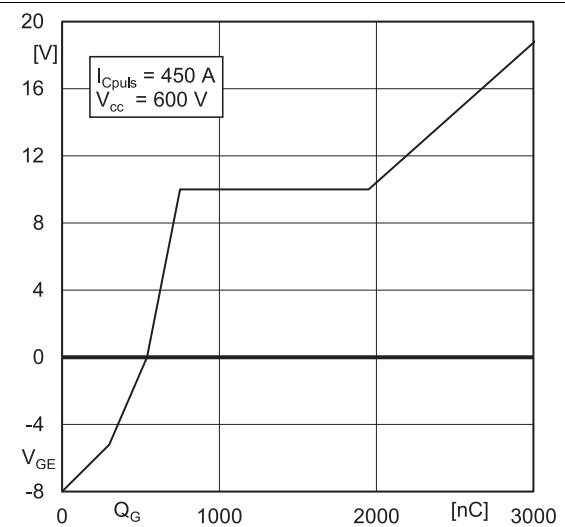


Fig. 6: Typ. gate charge characteristic

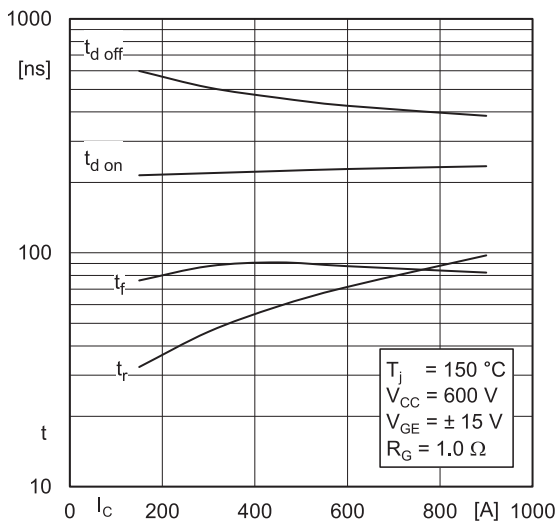


Fig. 7: Typ. switching times vs. I_C

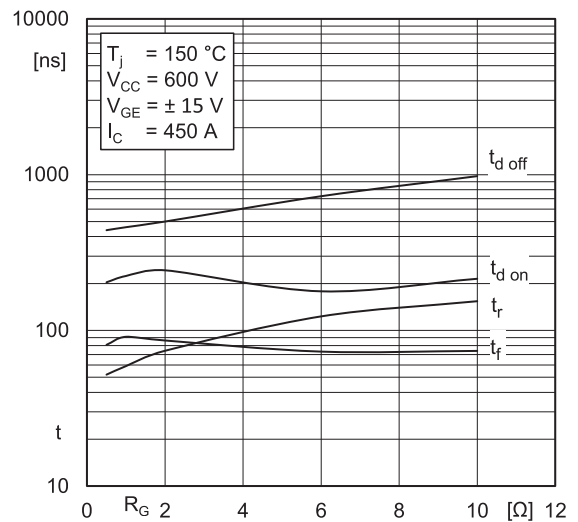


Fig. 8: Typ. switching times vs. gate resistor R_G

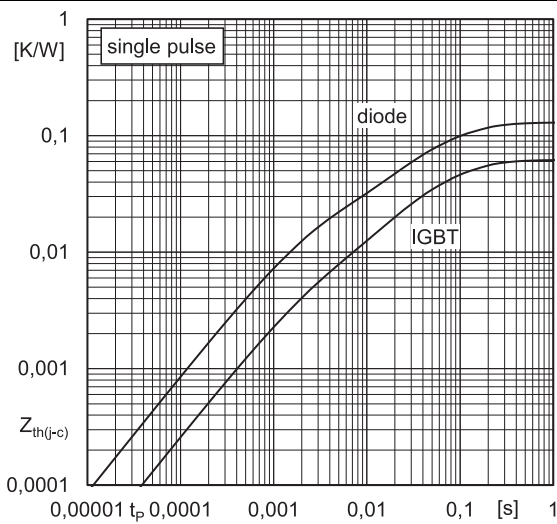


Fig. 9: Transient thermal impedance

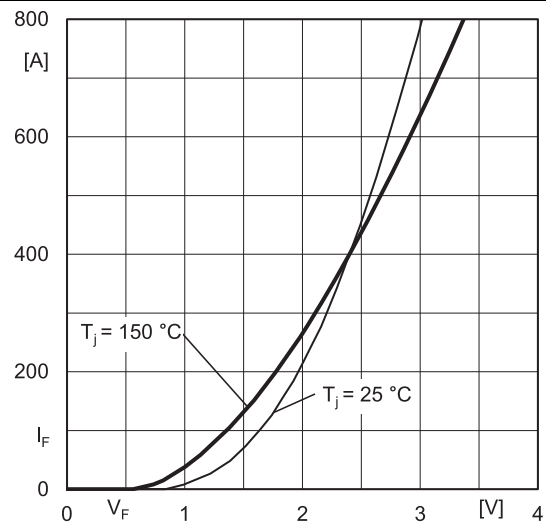


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

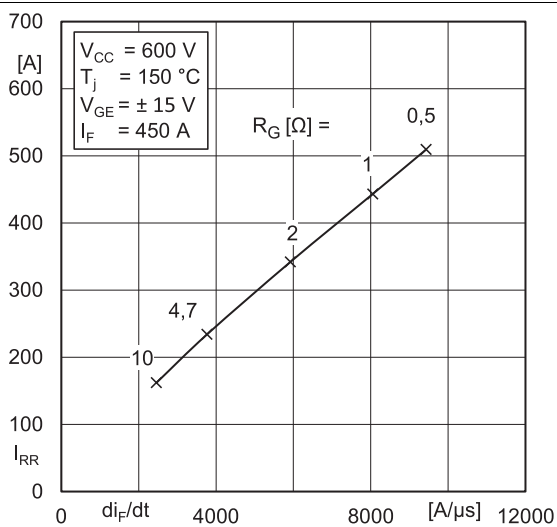


Fig. 11: CAL diode peak reverse recovery current

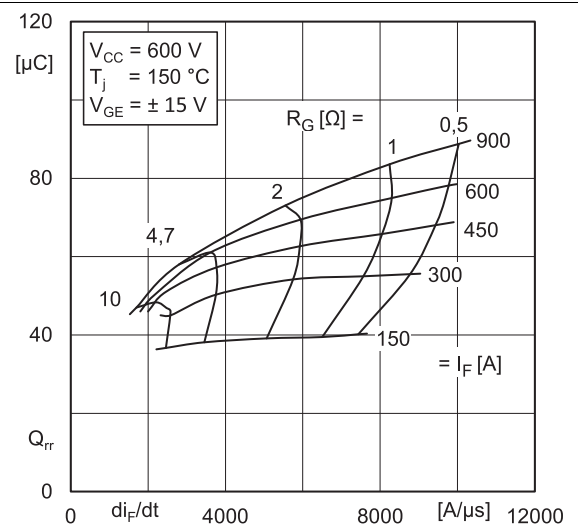
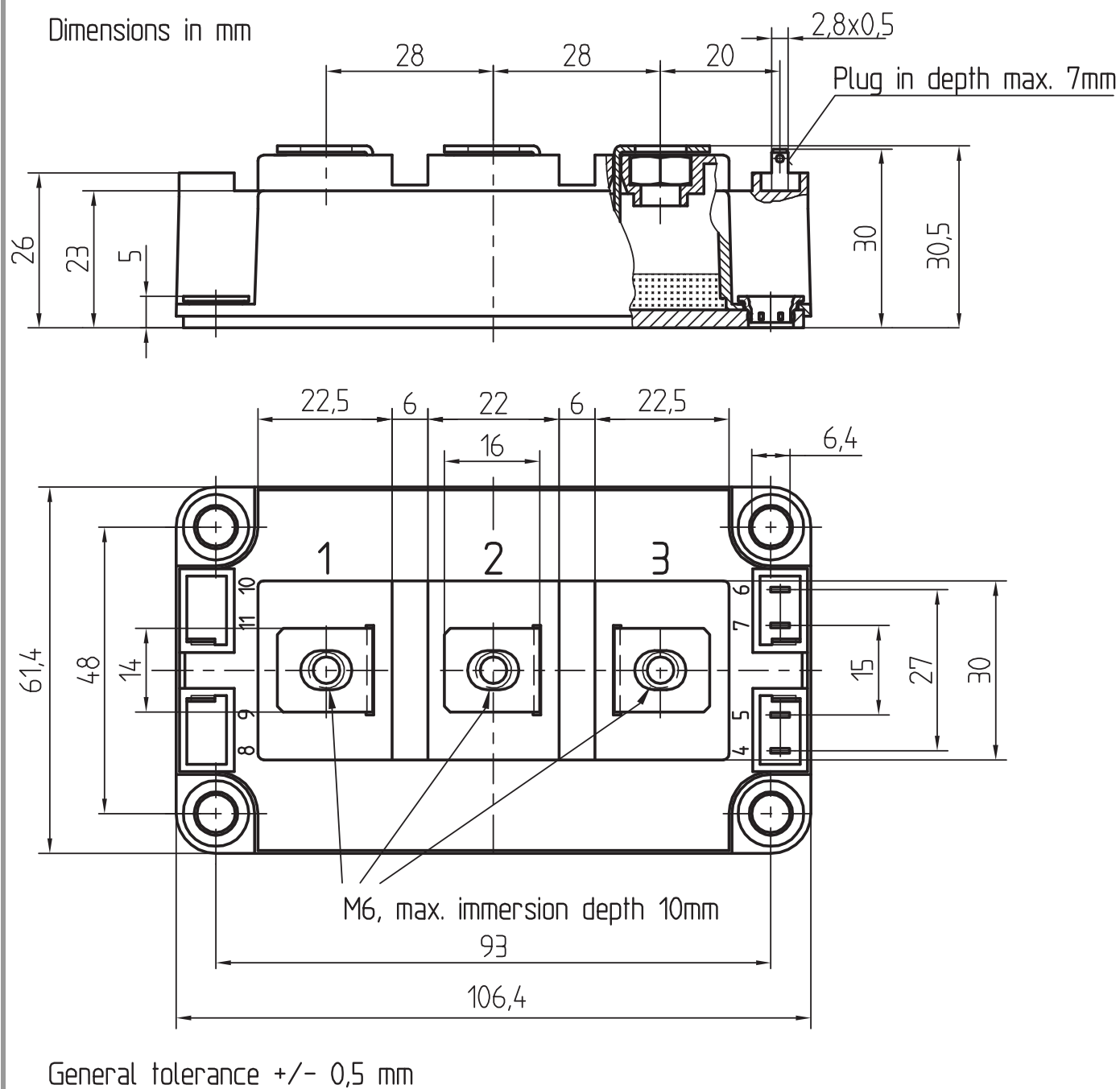
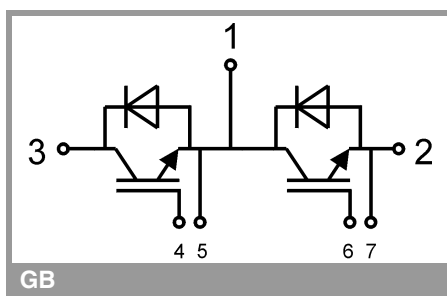


Fig. 12: Typ. CAL diode peak reverse recovery charge



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

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