

SEMITOP®4

IGBT module

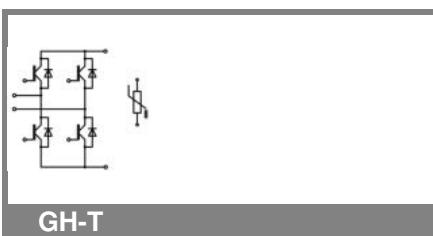
SK50GH12T4T

## Features

- One screw mounting module
- Fully compatible with SEMITOP®1,2,3
- Improved thermal performances by aluminium oxide substrate
- New IGBT4 Technology
- CAL 4 technology FWD
- Integrated NTC Temperature sensor

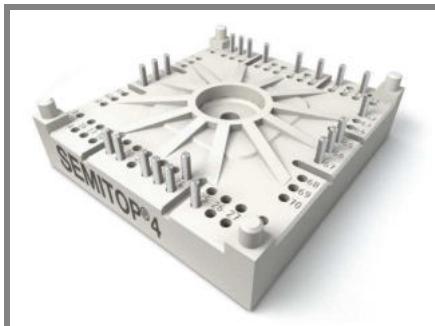
## Typical Applications\*

- Voltage regulator



Absolute Maximum Ratings		$T_s = 25^\circ\text{C}$ , unless otherwise specified		
Symbol	Conditions	Values		Units
<b>IGBT</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$	1200		V
$I_C$	$T_j = 175^\circ\text{C}$ $T_s = 25^\circ\text{C}$ $T_s = 70^\circ\text{C}$	75 60		A A
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$ , $t_p \leq 1\text{ms}$	150		A
$V_{GES}$		$\pm 20$		V
$t_{psc}$	$V_{CC} = 800\text{ V}$ ; $V_{GE} \leq 15\text{ V}$ ; $T_j = 150^\circ\text{C}$ $V_{CES} < 1200\text{ V}$	10		$\mu\text{s}$
<b>Inverse Diode</b>				
$I_F$	$T_j = 175^\circ\text{C}$ $T_s = 25^\circ\text{C}$ $T_s = 70^\circ\text{C}$	56 45		A A
$I_{FRM}$	$I_{FRM} = 3 \times I_{Fnom}$ , $t_p \leq 1\text{ms}$	150		A
$I_{FSM}$	$t_p = 10\text{ ms}$ ; half sine wave $T_j = 150^\circ\text{C}$	335		A
<b>Module</b>				
$I_{t(RMS)}$				A
$T_{vj}$		-40 ... +175		$^\circ\text{C}$
$T_{stg}$		-40 ... +125		$^\circ\text{C}$
$V_{isol}$	AC, 1 min.	2500		V

Characteristics		$T_c = 25^\circ\text{C}$ , unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	
<b>IGBT</b>					
$V_{GE(th)}$	$V_{GE} = V_{CE}$ , $I_C = 1,7\text{ mA}$	5	5,8	6,5	V
$I_{CES}$	$V_{GE} = 0\text{ V}$ , $V_{CE} = V_{CES}$ $T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$			1,0 0,4	mA mA
$I_{GES}$	$V_{CE} = 0\text{ V}$ , $V_{GE} = 20\text{ V}$ $T_j = 125^\circ\text{C}$		600		nA
$V_{CE0}$		0,8 0,7	0,9 0,8		V V
$r_{CE}$	$V_{GE} = 15\text{ V}$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	20 30			$\text{m}\Omega$ $\text{m}\Omega$
$V_{CE(sat)}$	$I_{Cnom} = 50\text{ A}$ , $V_{GE} = 15\text{ V}$ $T_j = 25^\circ\text{C}_{\text{chiplev.}}$ $T_j = 150^\circ\text{C}_{\text{chiplev.}}$	1,8 2,2	2 2,4		V V
$C_{ies}$ $C_{oes}$ $C_{res}$	$V_{CE} = 25$ , $V_{GE} = 0\text{ V}$ $f = 1\text{ MHz}$	5,54 0,41 0,32			nF nF nF
$Q_G$	$V_{GE} = -7\text{V...+15V}$	375			nC
$R_{Gint}$	$T_j = 25^\circ\text{C}$	4			$\Omega$
$t_{d(on)}$ $t_r$ $E_{on}$	$R_{Gon} = 32\text{ }\Omega$ $di/dt = 920\text{ A}/\mu\text{s}$	63 65 8,3			ns ns mJ
$t_{d(off)}$ $t_f$ $E_{off}$	$R_{Goff} = 32\text{ }\Omega$ $T_j = 150^\circ\text{C}$	521 80 5			ns ns mJ
$R_{th(j-s)}$	per IGBT	0,65			K/W



SEMITOP®4

## IGBT module

SK50GH12T4T

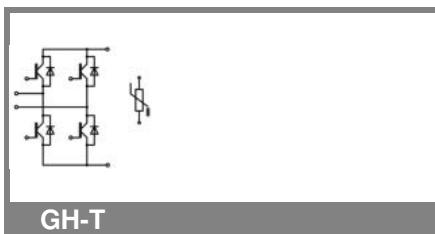
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Symbol	Conditions	min.	typ.	max.	Units
<b>Inverse Diode</b>					
$V_F = V_{EC}$	$I_{Fnom} = 50 \text{ A}; V_{GE} = 0 \text{ V}$ $T_j = 25 \text{ }^\circ\text{C}_{\text{chiplev.}}$ $T_j = 150 \text{ }^\circ\text{C}_{\text{chiplev.}}$	2,2	2,5		V
$V_{F0}$	$T_j = 25 \text{ }^\circ\text{C}$ $T_j = 150 \text{ }^\circ\text{C}$	2,1	2,45		V
$r_F$	$T_j = 25 \text{ }^\circ\text{C}$ $T_j = 150 \text{ }^\circ\text{C}$	18			$\text{m}\Omega$
$I_{RRM}$ $Q_{rr}$ $E_{rr}$	$I_F = 50 \text{ A}$ $\text{di/dt} = 920 \text{ A}/\mu\text{s}$ $V_{CC} = 600 \text{ V}$	30	7,2	2,15	A $\mu\text{C}$ mJ
$R_{th(j-s)D}$	per diode		1,05		K/W
<b>Freewheeling Diode</b>					
$V_F = V_{EC}$	$I_{Fnom} = A; V_{GE} = V$ $T_j = {}^\circ\text{C}_{\text{chiplev.}}$				V
$V_{F0}$	$T_j = {}^\circ\text{C}$				V
$r_F$	$T_j = {}^\circ\text{C}$				V
$I_{RRM}$ $Q_{rr}$ $E_{rr}$	$I_F = A$ $T_j = {}^\circ\text{C}$				A $\mu\text{C}$ mJ
	per diode				K/W
$M_s$	to heat sink	2,5	2,75		Nm
$w$			60		g
<b>Temperature sensor</b>					
$R_{100}$	$T_s = 100 \text{ }^\circ\text{C} (R_{25} = 5 \text{ k}\Omega)$		493 $\pm$ 5%		$\Omega$



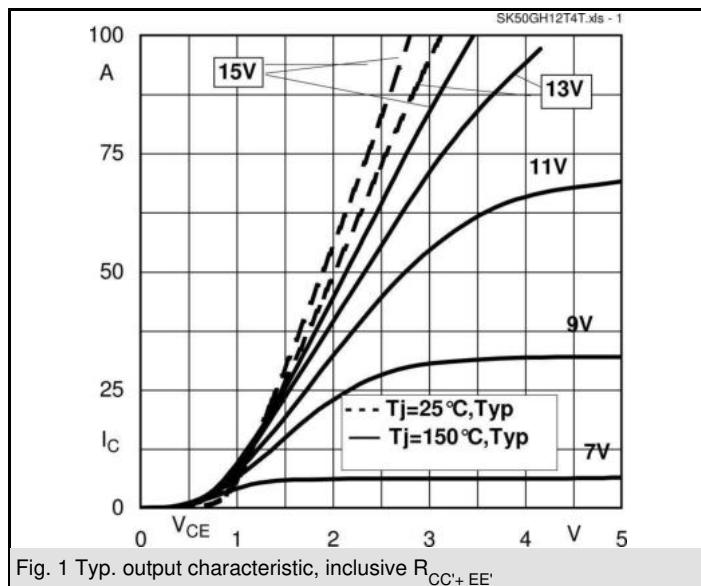


Fig. 1 Typ. output characteristic, inclusive  $R_{CC+EE'}$

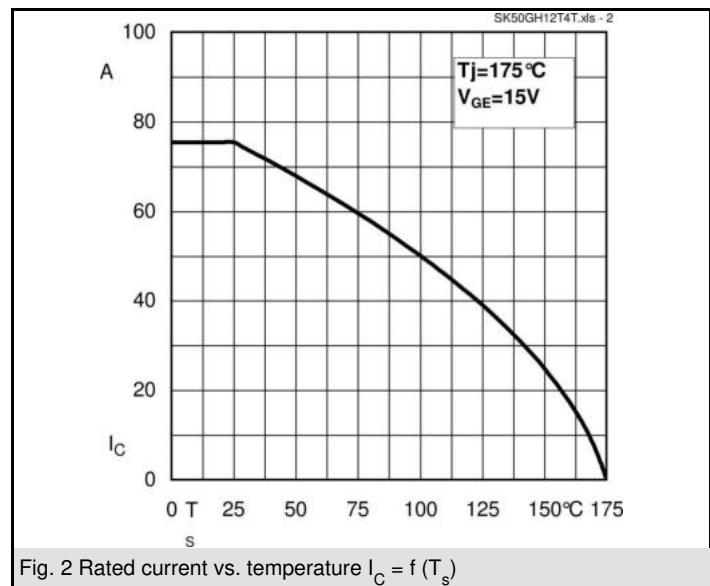


Fig. 2 Rated current vs. temperature  $I_C = f (T_s)$

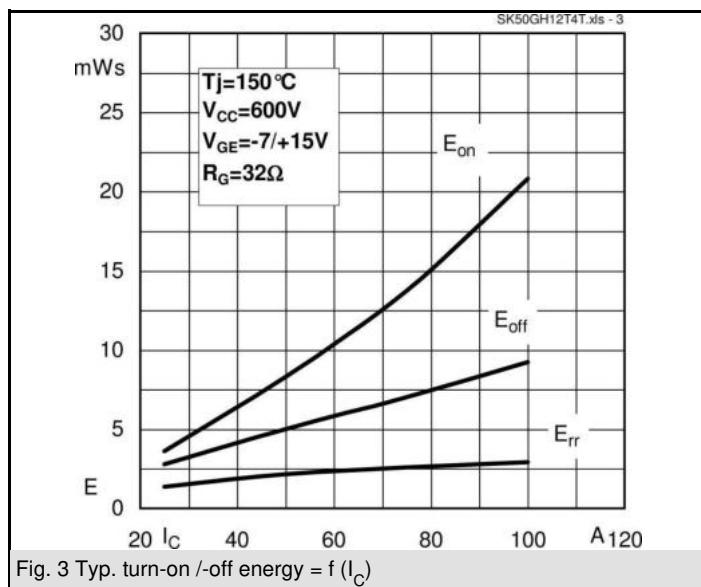


Fig. 3 Typ. turn-on /-off energy = f (I\_C)

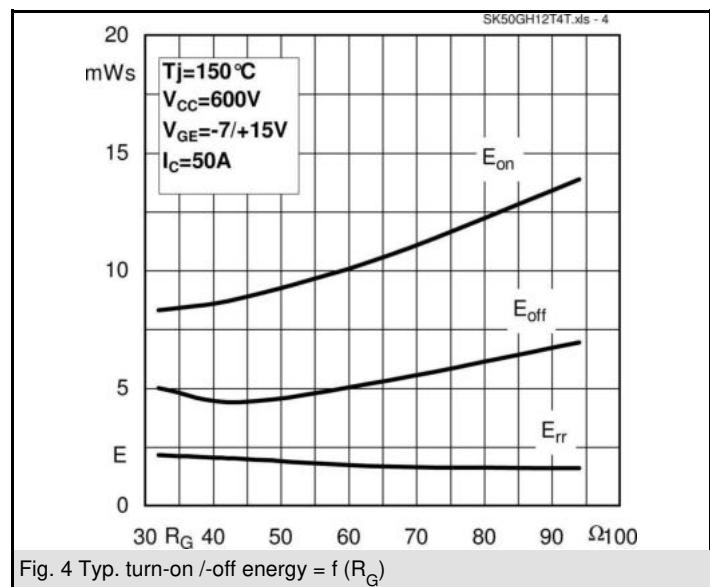


Fig. 4 Typ. turn-on /-off energy = f (R\_G)

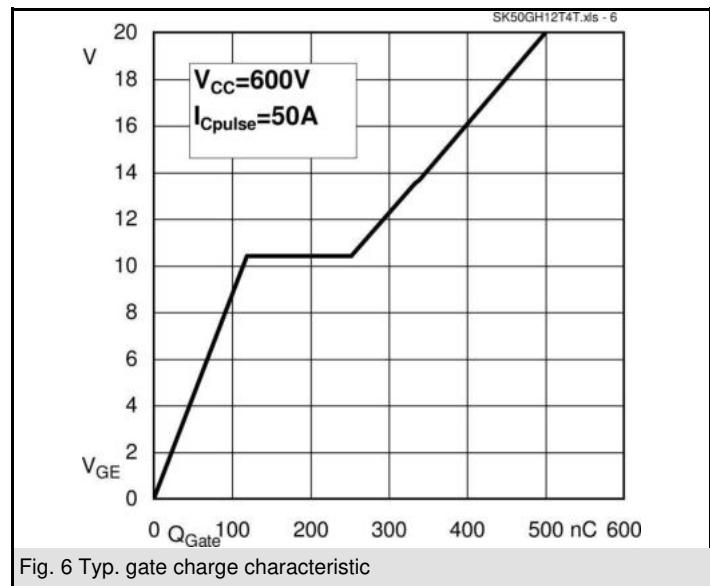


Fig. 6 Typ. gate charge characteristic

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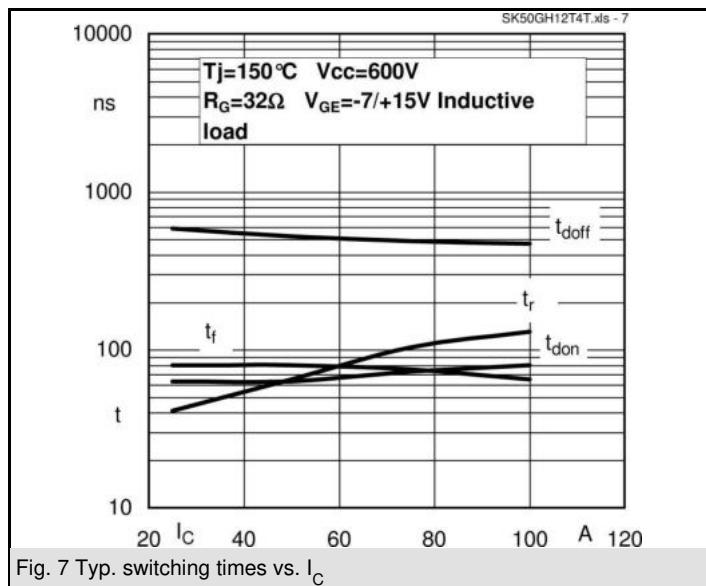


Fig. 7 Typ. switching times vs.  $I_C$

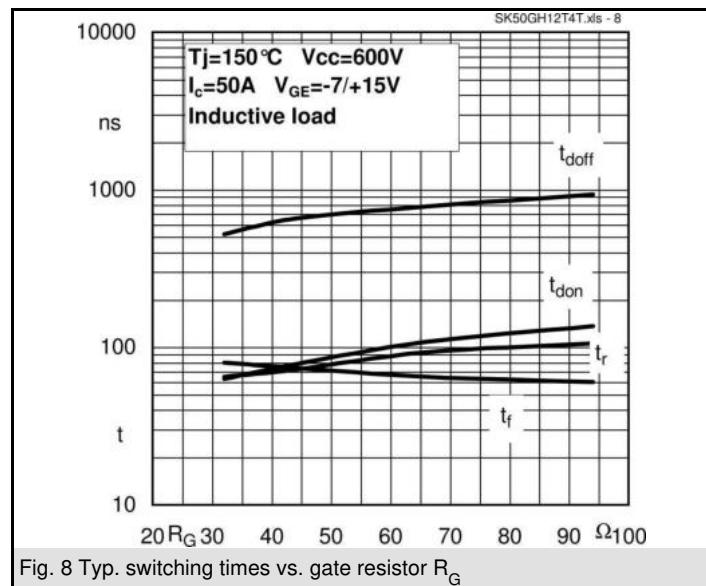


Fig. 8 Typ. switching times vs. gate resistor  $R_G$

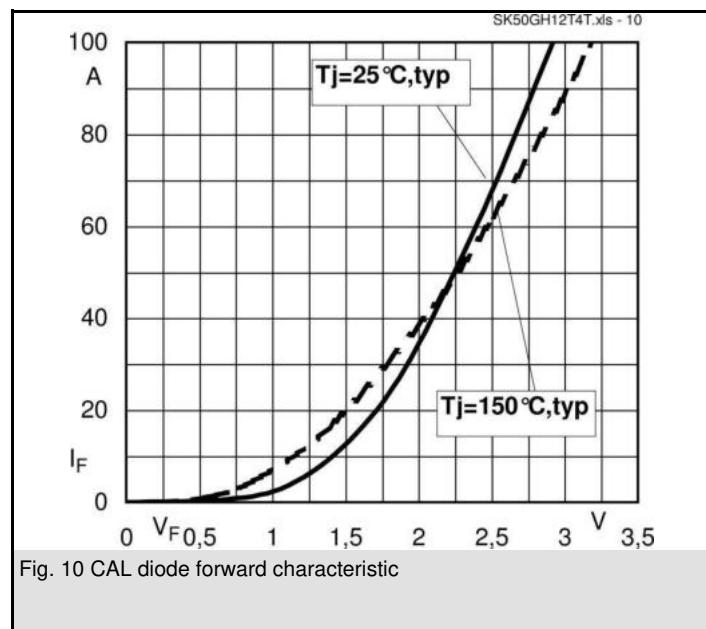
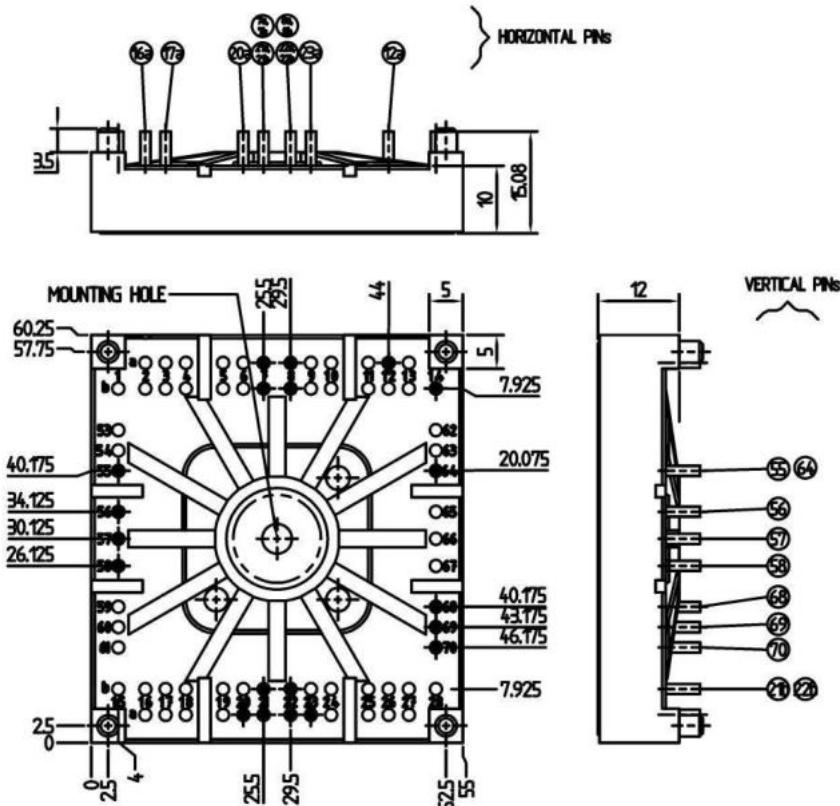
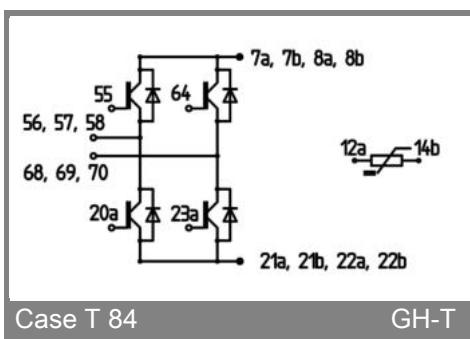


Fig. 10 CAL diode forward characteristic



Case T84 (Suggested hole diameter, in the PCB, for solder pins and plastic mounting pins: 2mm)



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

## **\*IMPORTANT INFORMATION AND WARNINGS**

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