

SKM150GAR12T4



SEMITRANS®2

Fast IGBT4 Modules

SKM150GAR12T4

Features

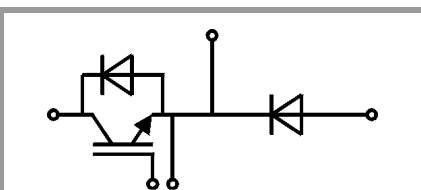
- IGBT4 = 4. Generation (Trench)IGBT
- VCEsat with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_{CNOM}
- Soft switching 4. Generation CAL diode (CAL4)

Typical Applications

- DC/DC – converter
- Brake chopper
- Switched reluctance motor
- DC – Motor

Remarks

- Case temperature limited to T_c = 125°C max, recomm. Top = -40 ... +150°C, product rel. results valid for T_j = 150°



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Absolute Maximum Ratings					
Symbol	Conditions		Values	Unit	
IGBT					
V _{CES}			1200	V	
I _C	T _j = 175 °C	T _c = 25 °C	232	A	
		T _c = 80 °C	179	A	
I _{Cnom}			150	A	
I _{CRM}	I _{CRM} = 3xI _{Cnom}		450	A	
V _{GES}			-20 ... 20	V	
t _{psc}	V _{CC} = 800 V	T _j = 150 °C	10	µs	
	V _{GE} ≤ 15 V				
	V _{CES} ≤ 1200 V				
T _j			-40 ... 175	°C	
Inverse diode					
I _F	T _j = 175 °C	T _c = 25 °C	189	A	
		T _c = 80 °C	141	A	
I _{Fnom}			150	A	
I _{FRM}	I _{FRM} = 3xI _{Fnom}		450	A	
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		900	A	
T _j			-40 ... 175	°C	
Freewheeling diode					
I _F	T _j = 175 °C	T _c = 25 °C	189	A	
		T _c = 80 °C	141	A	
I _{Fnom}			150	A	
I _{FRM}	I _{FRM} = 3xI _{Fnom}		450	A	
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		900	A	
T _j			-40 ... 175	°C	
Module					
I _{t(RMS)}			200	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 = 150 A	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	6.7	7.7	mΩ	
		T _j = 150 °C	10.0	10.7	mΩ	
V _{GE(th)}	V _{GE} =V _{CE} , I _C = 6 mA		5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V	T _j = 25 °C	0.1		0.3	mA
		T _j = 150 °C				mA
C _{ies}	V _{CE} = 25 V	f = 1 MHz	9.3		nF	
C _{oes}		f = 1 MHz	0.58		nF	
C _{res}		f = 1 MHz	0.51		nF	
Q _G	V _{GE} = - 8 V...+ 15 V		850		nC	
R _{Gint}	T _j = 25 °C		5.0		Ω	

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- Soft switching 4. Generation CAL diode (CAL4)

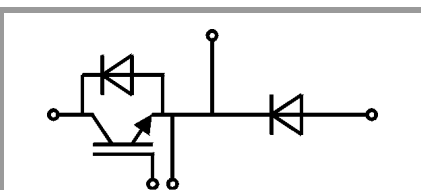
Typical Applications

- DC/DC – converter
- Brake chopper
- Switched reluctance motor
- DC – Motor

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max, recomm.
Top = $-40 \dots +150^\circ\text{C}$, product rel. results valid for $T_j = 150^\circ$

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		180		ns
t_r	$I_C = 150\text{ A}$	$T_j = 150^\circ\text{C}$		42		ns
E_{on}	$V_{GE} = \pm 15\text{ V}$	$T_j = 150^\circ\text{C}$		19.2		mJ
$t_{d(off)}$	$R_{G\ on} = 1\ \Omega$	$T_j = 150^\circ\text{C}$		410		ns
t_f	$R_{G\ off} = 1\ \Omega$	$T_j = 150^\circ\text{C}$		72		ns
E_{off}	$di/dt_{on} = 3400\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		15.8		mJ
$R_{th(j-c)}$	per IGBT				0.19	K/W
Inverse diode						
$V_F = V_{EC}$	$I_F = 150\text{ A}$	$T_j = 25^\circ\text{C}$		2.14	2.46	V
	$V_{GE} = 0\text{ V}$ chip	$T_j = 150^\circ\text{C}$		2.07	2.38	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$		5.6	6.4	m Ω
		$T_j = 150^\circ\text{C}$		7.8	8.5	m Ω
I_{RRM}	$I_F = 150\text{ A}$	$T_j = 150^\circ\text{C}$		120		A
Q_{rr}	$di/dt_{off} = 3100\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		31.3		μC
E_{rr}	$V_{GE} = \pm 15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		13		mJ
$R_{th(j-c)}$	per diode				0.31	K/W
Freewheeling diode						
$V_F = V_{EC}$	$I_F = 150\text{ A}$	$T_j = 25^\circ\text{C}$		2.14	2.46	V
	$V_{GE} = 0\text{ V}$ chip	$T_j = 150^\circ\text{C}$		2.07	2.38	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.3	1.5	V
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E_{rr}	$V_{GE} = \pm 15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		13		mJ
$R_{th(j-c)}$	per Diode				0.31	K/W
Module						
L_{CE}					30	nH
$R_{CC+EE'}$	terminal-chip	$T_C = 25^\circ\text{C}$		0.65		m Ω
		$T_C = 125^\circ\text{C}$		1		m Ω
$R_{th(c-s)}$	per module			0.04	0.05	K/W
M_s	to heat sink M6			3	5	Nm
M_t		to terminals M5		2.5	5	Nm
						Nm
w					160	g



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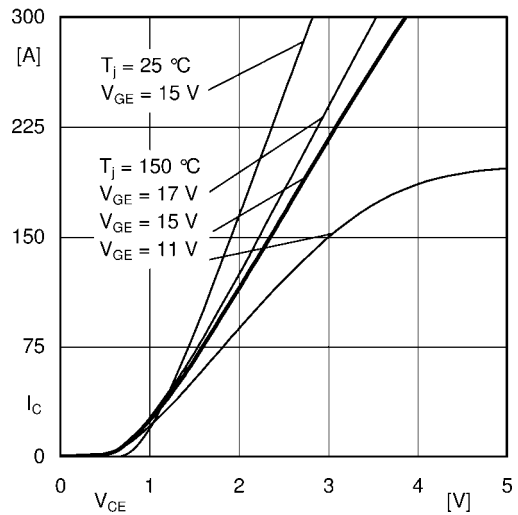


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

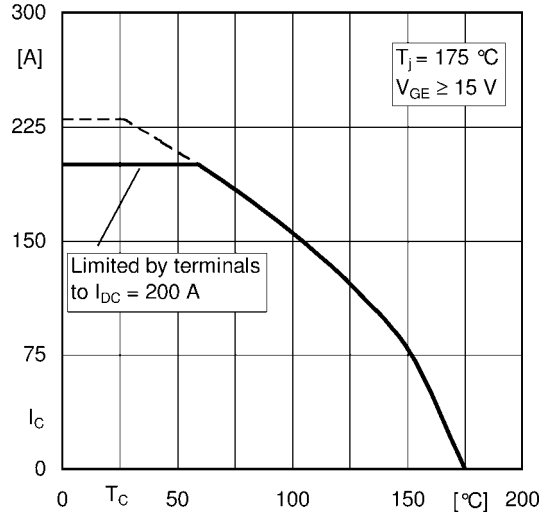


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

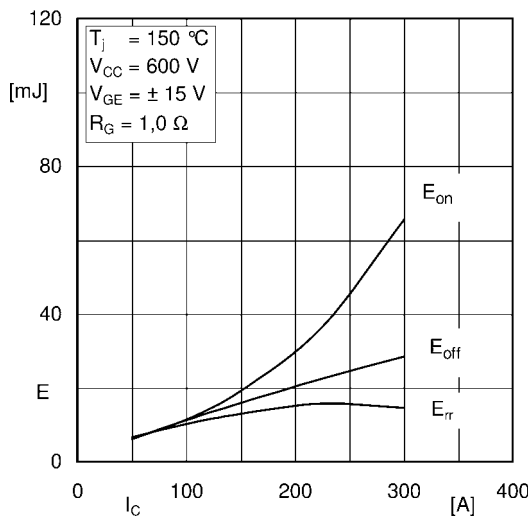


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

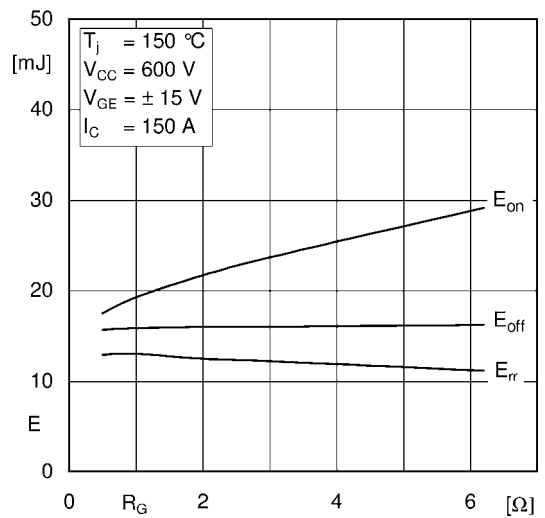


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

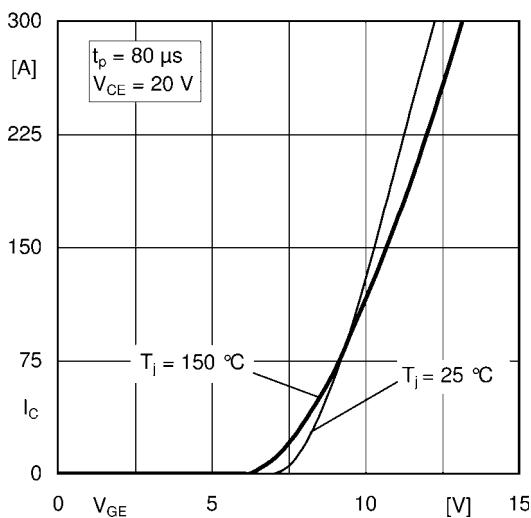


Fig. 5: Typ. transfer characteristic

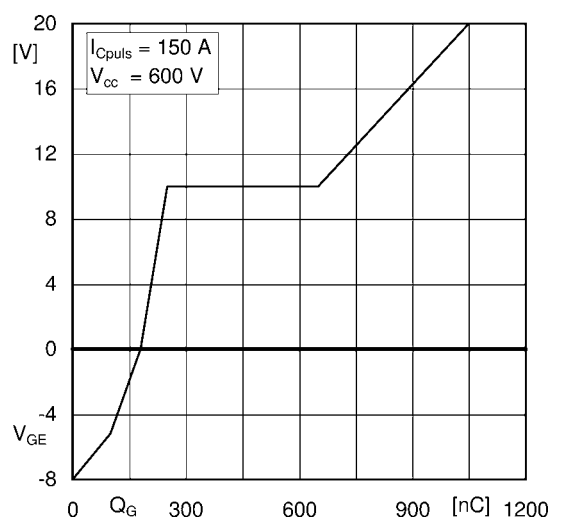


Fig. 6: Typ. gate charge characteristic

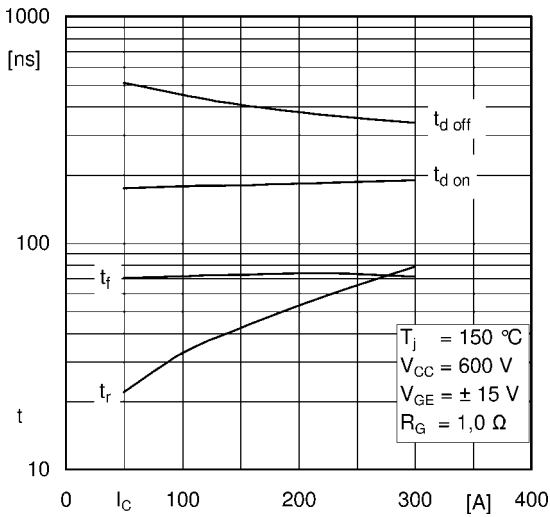


Fig. 7: Typ. switching times vs. I_C

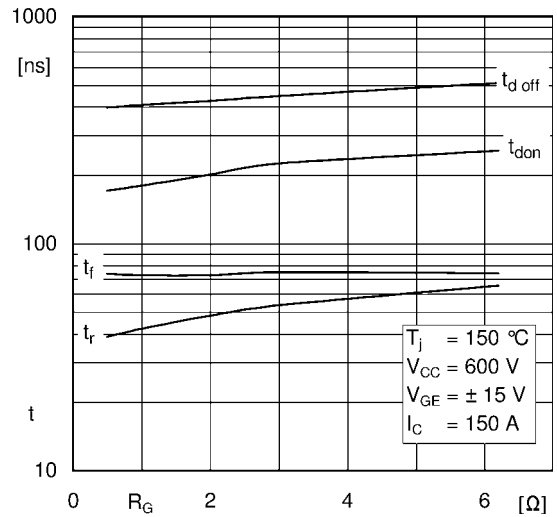


Fig. 8: Typ. switching times vs. gate resistor R_G

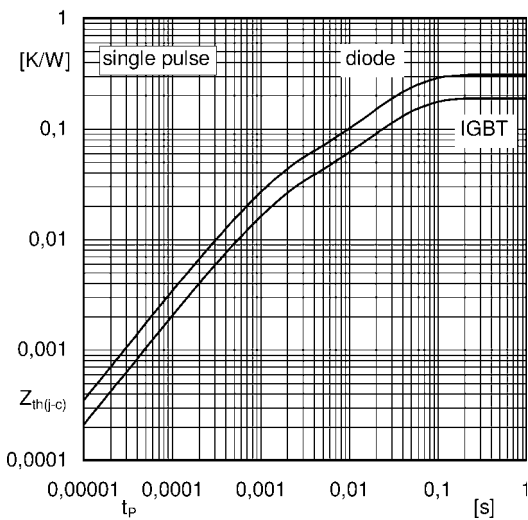


Fig. 9: Transient thermal impedance

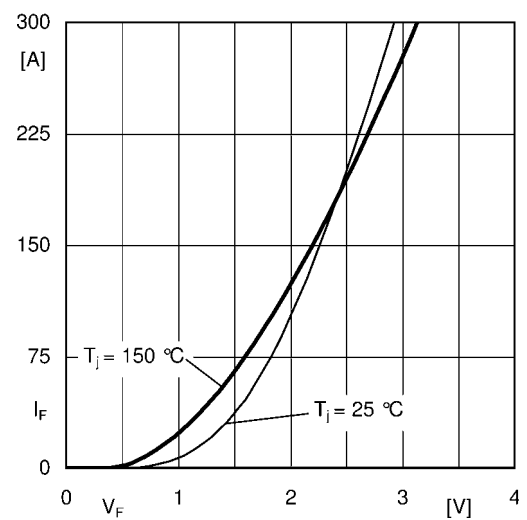


Fig. 10: CAL diode forward characteristic

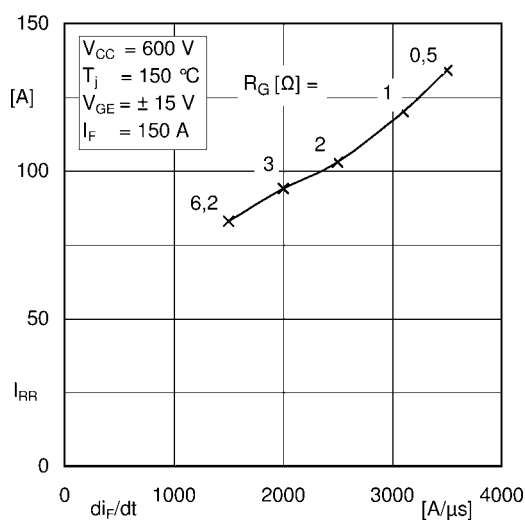


Fig. 11: CAL diode peak reverse recovery current

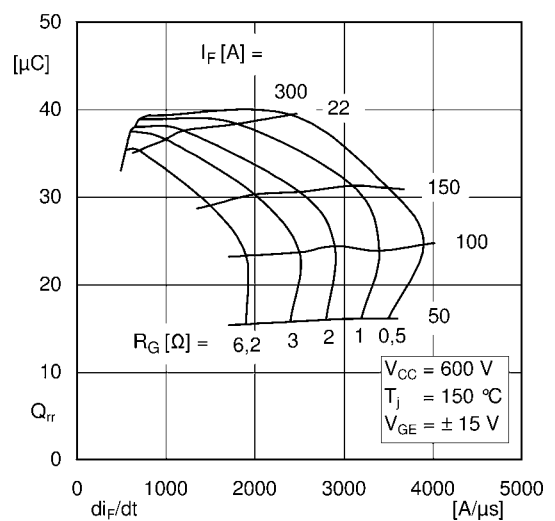
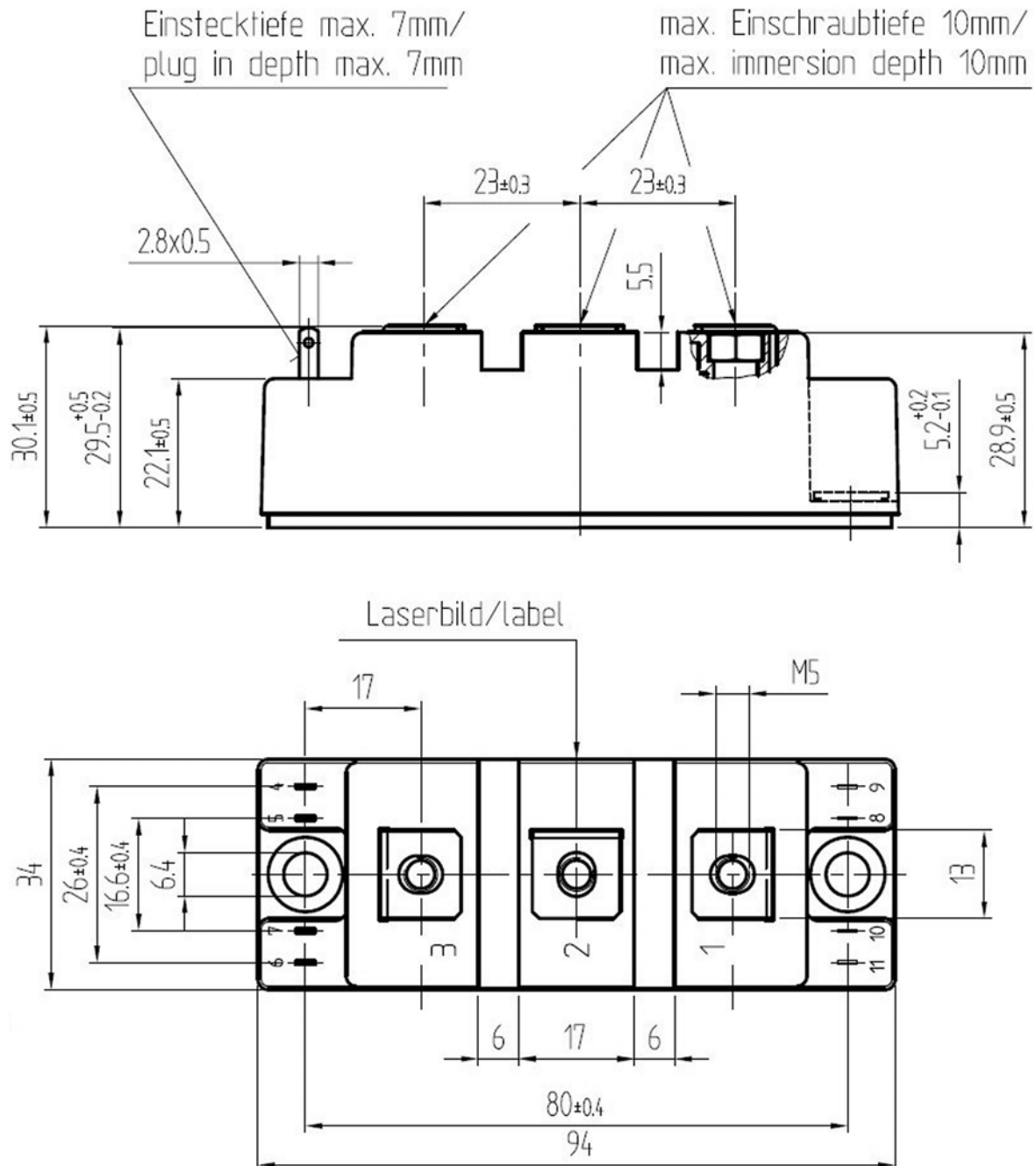
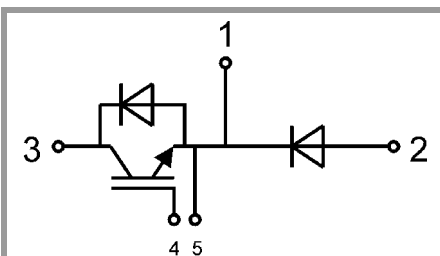


Fig. 12: Typ. CAL diode peak reverse recovery charge

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

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