



MiniSKiiP® 1

Sixpack

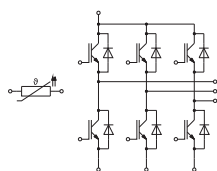
SKiiP 11AC12T7V1

Features*

- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Remarks

- Max. case temperature limited to $T_C = T_S = 125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$; $T_{j,op} > 150^\circ\text{C}$ during overload (Details see AN19-002)
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AC

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Inverter - IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 70 °C	20	A
	T _j = 175 °C	T _s = 100 °C	16	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 70 °C	22	A
	T _j = 175 °C	T _s = 100 °C	18	A
I _{Cnom}			10	A
I _{CRM}			20	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 175 °C	7	μs
T _j			-40 ... 175	°C
Inverse - Diode				
V _{RRM}	T _j = 25 °C		1200	V
I _F	λ _{paste} =0.8 W/(mK)	T _s = 70 °C	13	A
	T _j = 175 °C	T _s = 100 °C	11	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 70 °C	14	A
	T _j = 175 °C	T _s = 100 °C	12	A
I _{FRM}			16	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		36	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}	T _{terminal} = 80 °C, 20 A per spring		40	A
T _{stg}	module without TIM		-40 ... 125	°C
V _{isol}	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 10\text{ A}$	$T_j = 25^\circ\text{C}$	1.60	1.75	V
	$V_{GE} = 15\text{ V}$	$T_j = 150^\circ\text{C}$	1.78	1.93	V
	chiplevel	$T_j = 175^\circ\text{C}$	1.82	1.97	V
V_{CE0}		$T_j = 25^\circ\text{C}$	1.00	1.05	V
	chiplevel	$T_j = 150^\circ\text{C}$	0.80	0.85	V
		$T_j = 175^\circ\text{C}$	0.75	0.80	V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	60	70	$\text{m}\Omega$
	chiplevel	$T_j = 150^\circ\text{C}$	98	108	$\text{m}\Omega$
		$T_j = 175^\circ\text{C}$	107	117	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 0.22\text{ mA}$	5.15	5.8	6.45	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_j = 25^\circ\text{C}$			1	mA
C_{ies}	$V_{CE} = 25\text{ V}$	$f = 1\text{ MHz}$	1.90		nF
C_{oes}	$V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	0.02		nF
C_{res}		$f = 1\text{ MHz}$	0.01		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		140		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0		Ω

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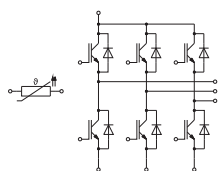
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Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 10\text{ A}$ $R_{G\ on} = 32\ \Omega$ $R_{G\ off} = 32\ \Omega$ $V_{GE} = +15/-15\text{ V}$	$T_j = 25^\circ\text{C}$	44		ns
		$T_j = 150^\circ\text{C}$	46		ns
		$T_j = 175^\circ\text{C}$	47		ns
t_r		$T_j = 25^\circ\text{C}$	39		ns
		$T_j = 150^\circ\text{C}$	44		ns
		$T_j = 175^\circ\text{C}$	47		ns
E_{on}	$R_{G\ on} = 32\ \Omega$ $R_{G\ off} = 32\ \Omega$ $V_{GE} = +15/-15\text{ V}$	$T_j = 25^\circ\text{C}$	0.88		mJ
		$T_j = 150^\circ\text{C}$	1.2		mJ
		$T_j = 175^\circ\text{C}$	1.3		mJ
$t_{d(off)}$		$T_j = 25^\circ\text{C}$	198		ns
		$T_j = 150^\circ\text{C}$	288		ns
		$T_j = 175^\circ\text{C}$	313		ns
t_f	@ $T_j = 150^\circ\text{C}$: $di/dt_{on} = 190\text{ A}/\mu\text{s}$ $di/dt_{off} = 130\text{ A}/\mu\text{s}$ $dv/dt = 3580\text{ V}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	42		ns
		$T_j = 150^\circ\text{C}$	63		ns
		$T_j = 175^\circ\text{C}$	85		ns
E_{off}		$T_j = 25^\circ\text{C}$	0.65		mJ
		$T_j = 150^\circ\text{C}$	1.1		mJ
		$T_j = 175^\circ\text{C}$	1.2		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste} = 0.8\text{ W}/(\text{mK})$		1.7		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste} = 2.5\text{ W}/(\text{mK})$		1.46		K/W

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Inverse - Diode					
$V_F = V_{EC}$	$I_F = 10\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	2.59	2.94	V
		$T_j = 150^\circ\text{C}$	2.71	3.08	V
		$T_j = 175^\circ\text{C}$	2.53	2.89	V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$	1.30	1.50	V
		$T_j = 150^\circ\text{C}$	0.90	1.10	V
		$T_j = 175^\circ\text{C}$	0.82	0.98	V
r_F	chipelevel	$T_j = 25^\circ\text{C}$	129	144	m Ω
		$T_j = 150^\circ\text{C}$	181	198	m Ω
		$T_j = 175^\circ\text{C}$	171	191	m Ω
I_{RRM}	$I_F = 10\text{ A}$ $V_{GE} = +15/-15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 25^\circ\text{C}$	6		A
		$T_j = 150^\circ\text{C}$	7		A
		$T_j = 175^\circ\text{C}$	8		A
Q_{rr}		$T_j = 25^\circ\text{C}$	0.7		μC
		$T_j = 150^\circ\text{C}$	1.4		μC
		$T_j = 175^\circ\text{C}$	1.6		μC
E_{rr}	@ $T_j = 150^\circ\text{C}$: $di/dt_{off} = 210\text{ A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	0.19		mJ
		$T_j = 150^\circ\text{C}$	0.53		mJ
		$T_j = 175^\circ\text{C}$	0.69		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 0.8\text{ W}/(\text{mK})$		2.33		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 2.5\text{ W}/(\text{mK})$		2		K/W
Module					
L_{CE}			-		nH
M_s	to heat sink	2		2.5	Nm
w			30		g

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Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Temperature Sensor					
R_{100}	$T_r=100^{\circ}\text{C}$ ($R_{25}=1000\Omega$)		$1670 \pm 3\%$		Ω
$R_{(T)}$	$R_{(T)}=1000\Omega[1+A(T-25^{\circ}\text{C})+B(T-25^{\circ}\text{C})^2]$, $A = 7.635 \cdot 10^{-3}^{\circ}\text{C}^{-1}$, $B = 1.731 \cdot 10^{-5}^{\circ}\text{C}^{-2}$				

Creepage distance (spring to spring) between temperature sensor and phase W = 2.9mm (CTI 600)

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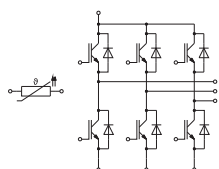
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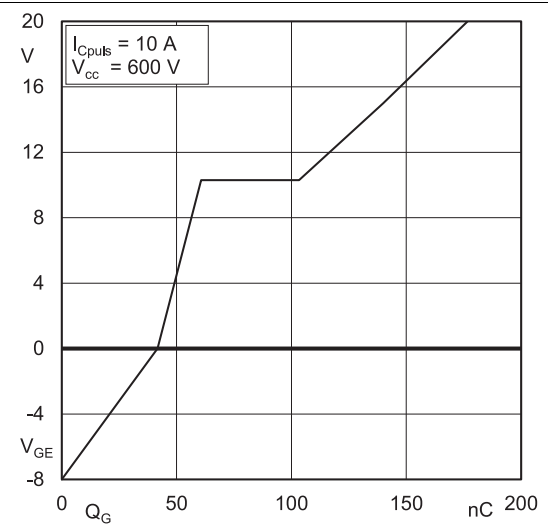
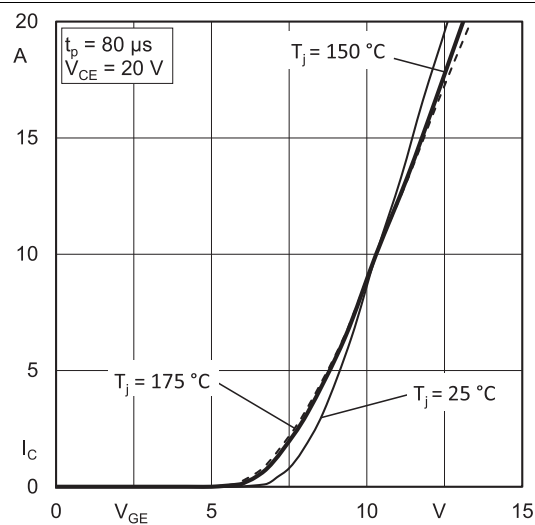
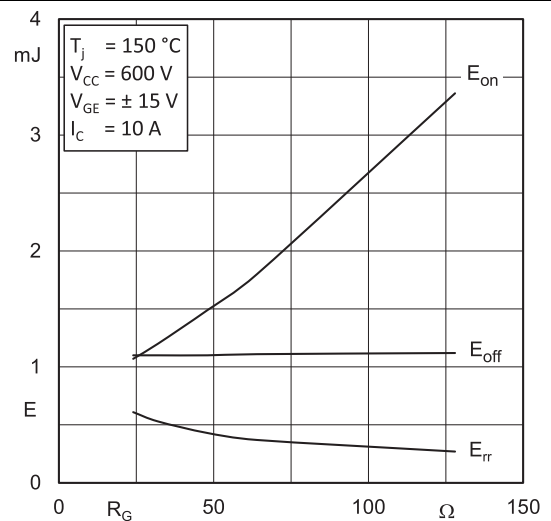
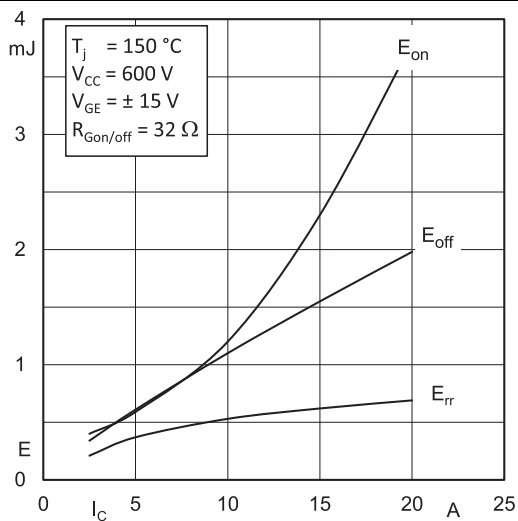
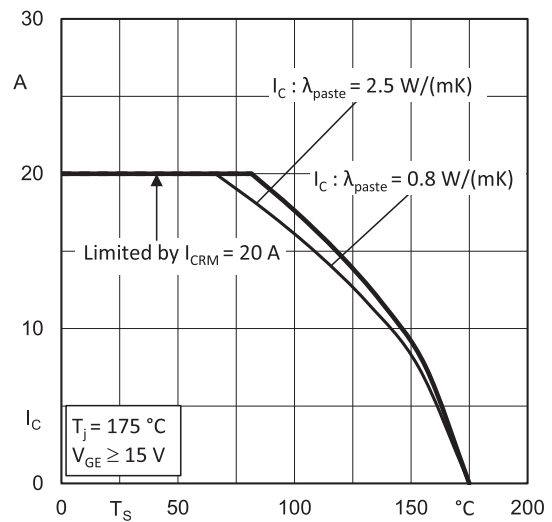
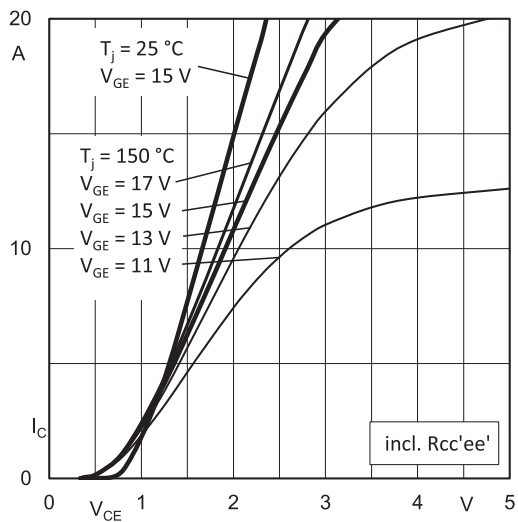
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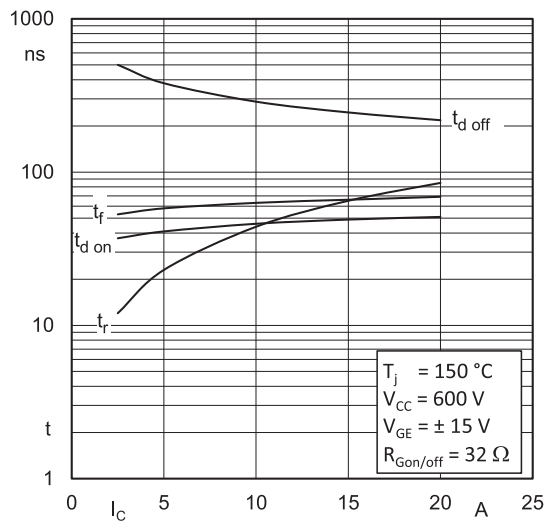


Fig. 7: Typ. switching times vs. I_C

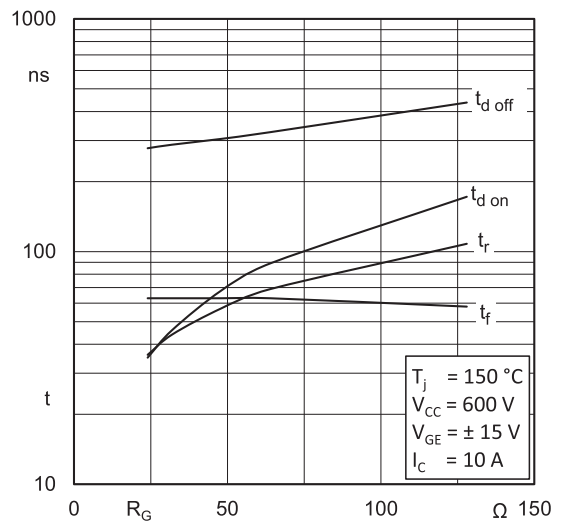


Fig. 8: Typ. switching times vs. gate resistor R_G

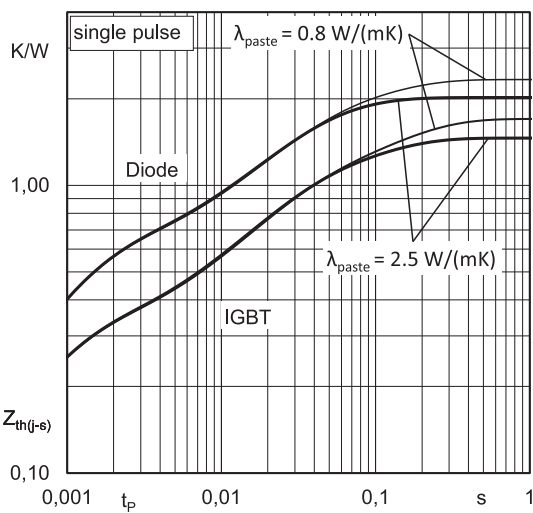


Fig. 9: Typ. transient thermal impedance

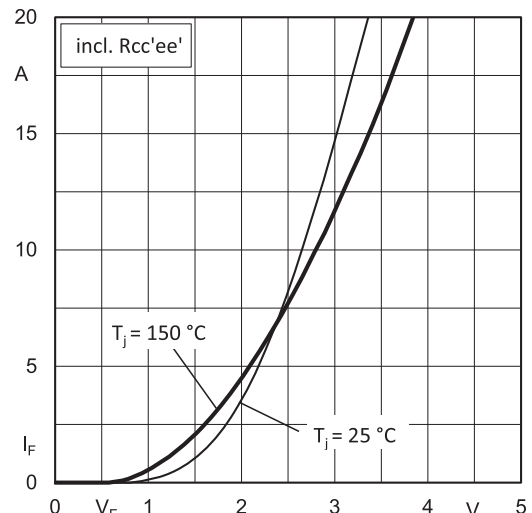


Fig. 10: Typ. CAL diode forward characteristic

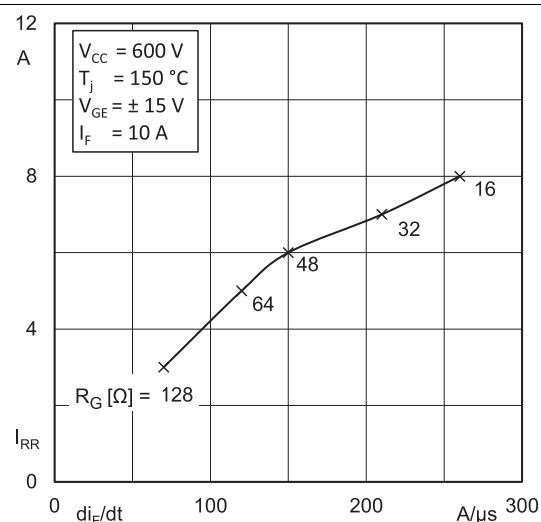


Fig. 11: Typ. CAL diode peak reverse recovery current

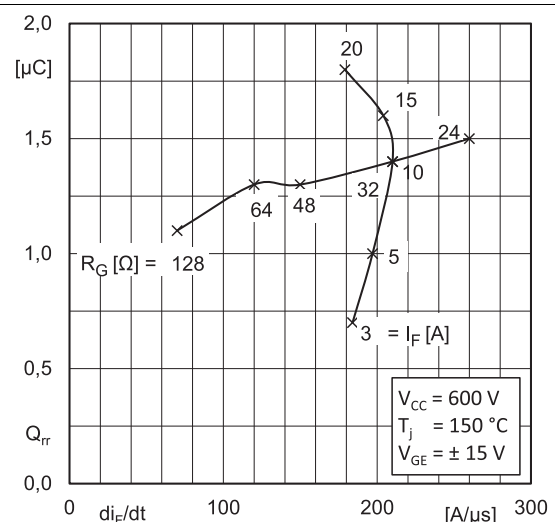
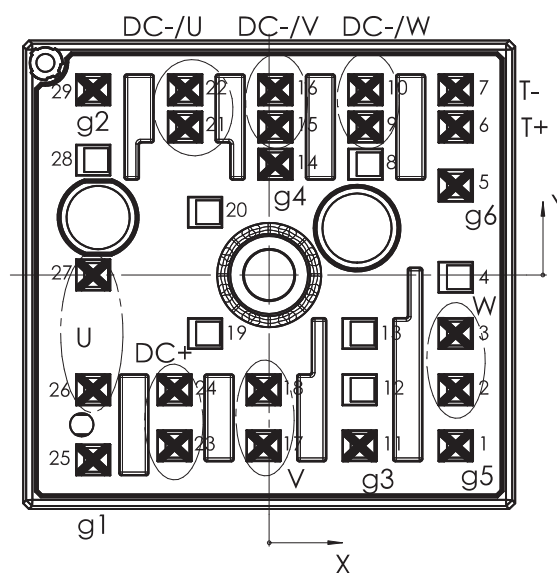


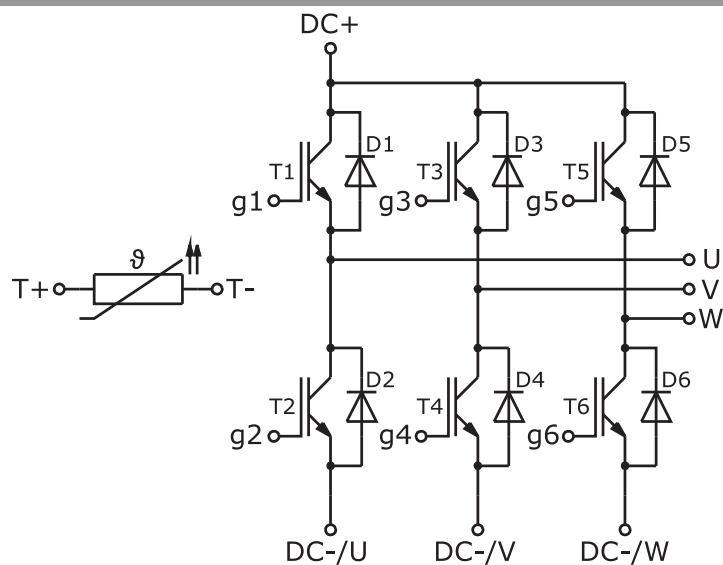
Fig. 12: Typ. CAL diode recovery charge

Pin out							
Pin	X	Y	Function	Pin	X	Y	Function
1	15,93	-14,6	g5	16	0,53	15,8	DC-/V
2	15,93	-9,8	W	17	-0,48	-14,6	V
3	15,93	-5	W	18	-0,48	-9,8	V
4				19			
5	15,93	7,63	g6	20			
6	15,93	12,63	T+	21	-7,18	12,63	DC-/U
7	15,93	15,8	T-	22	-7,18	15,8	DC-/U
8				23	-8,08	-14,6	DC+
9	8,23	12,63	DC-/W	24	-8,08	-9,8	DC+
10	8,23	15,8	DC-/W	25	-15,03	-15,8	g1
11	7,73	-14,6	g3	26	-15,03	-9,8	U
12	7,73	-9,8		27	-15,03	0	U
13				28			
14	0,53	9,45	g4	29	-15,03	15,8	g2
15	0,53	12,63	DC-/V				

all values in mm



Pinout and Dimensions



Pinout

SKiiP 11AC12T7V1

This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

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