DATA SHEET

NEC

SILICON POWER MOS FET
NE552R679A

3.0 V OPERATION SILICON RF POWER LD-MOS FET FOR 460 MHz 0.6 W TRANSMISSION AMPLIFIERS

DESCRIPTION

The NE552R679A is an N-channel silicon power laterally diffused MOS FET specially designed as the transmission power amplifier for 3.0 V FRS (Family Radio Service). Dies are manufactured using our NEWMOS2 technology (our WSi gate lateral-diffusion MOS FET) and housed in a surface mount package. This device can deliver 28.0 dBm output power with 60% power added efficiency at 460 MHz under the 3.0 V supply voltage.

FEATURES

- High output power : P_{out} = 28.0 dBm TYP. (V_{DS} = 3.0 V, I_{Dset} = 300 mA, f = 460 MHz, P_{in} = 15 dBm)
- High power added efficiency : η_{add} = 60% TYP. (V_{DS} = 3.0 V, I_{Dset} = 300 mA, f = 460 MHz, P_{in} = 15 dBm)
- High linear gain : G_L = 20 dB TYP. (V_{DS} = 3.0 V, I_{Dset} = 300 mA, f = 460 MHz, P_{in} = 5 dBm)
- Surface mount package : 5.7 × 5.7 × 1.1 mm MAX.
- Single supply : V_{DS} = 2.8 to 6.0 V

APPLICATIONS

- Family Radio Service : 3.0 V Handsets

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
NE552R679A-T1	79A	AU	• 12 mm wide embossed taping • Gate pin face the perforation side of the tape • Qty 1 kpcs/reel
NE552R679A-T1A			• 12 mm wide embossed taping • Gate pin face the perforation side of the tape • Qty 5 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: NE552R679A

Caution Please handle this device at static-free workstation, because this is an electrostatic sensitive device.

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ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V_{DS}	8.0	V
Gate to Source Voltage	V_{GS}	5.0	V
Drain Current	I_{DS}	350	mA
Drain Current (Pulse Test)	I_{DS} **Note**	600	mA
Total Power Dissipation	P_t	10	W
Channel Temperature	T_{ch}	125	°C
Storage Temperature	T_{stg}	–55 to +125	°C

Note Duty Cycle 50%, $T_{on} \leq 1$ s

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}		2.8	3.0	6.0	V
Gate to Source Voltage	V_{GS}		0	2.0	3.0	V
Drain Current	I_{DS}		–	300	500	mA
Input Power	P_{in}	f = 460 MHz, V_{DS} = 3.0 V	14	15	20	dBm

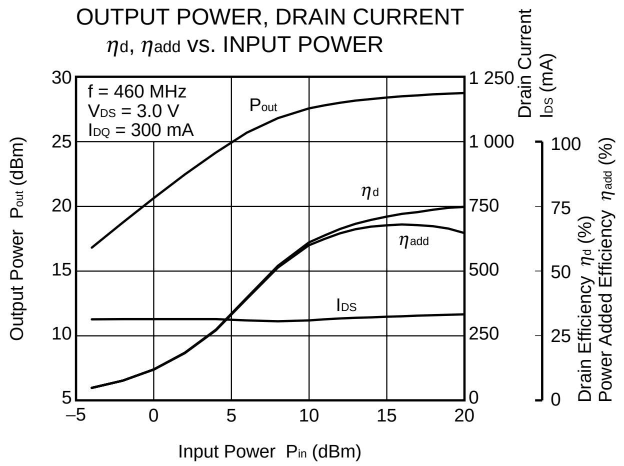
ELECTRICAL CHARACTERISTICS
(T_A = +25°C, Unless otherwise specified, using NEC standard test fixture)

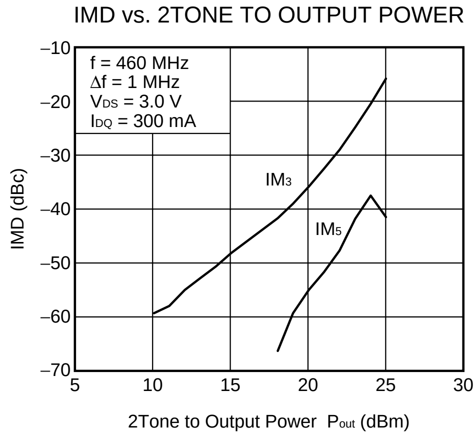
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	I_{GSO}	V_{GS} = 5.0 V	–	–	100	nA
Saturated Drain Current (Zero Gate Voltage Drain Current)	I_{DSS}	V_{DS} = 8.0 V	–	–	100	nA
Gate Threshold Voltage	V_{th}	V_{DS} = 3.5 V, I_{DS} = 1 mA	1.0	1.4	1.9	V
Thermal Resistance	R_{th}	Channel to Case	–	–	10	°C/W
Transconductance	g_m	V_{DS} = 3.0 V, I_{DS} = 300 mA	–	0.6	–	S
Drain to Source Breakdown Voltage	BV_{DSS}	I_{DSS} = 10 μA	15	18	–	V
Output Power	P_{out}	f = 460 MHz, V_{DS} = 3.0 V,	26.0	28.0	–	dBm
Drain Current	I_D	P_{in} = 15 dBm,	–	320	–	mA
Power Added Efficiency	η_{add}	I_{Dset} = 300 mA (RF OFF) , **Note1**	55	60	–	%
Linear Gain **Note2**	G_L		–	20	–	dB

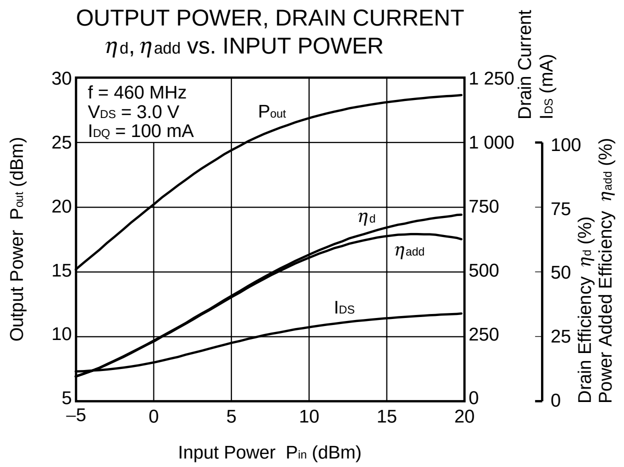
Note 1. DC performance is 100% testing. RF performance is testing several samples per wafer.
Wafer rejection criteria for standard devices is 1 reject for several samples.

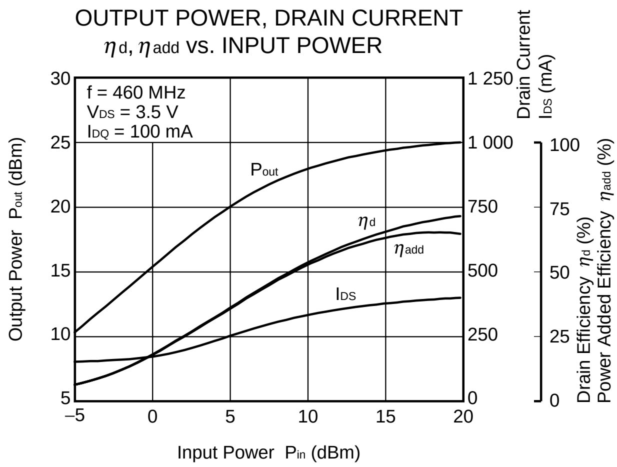
2. P_{in} = 5 dBm

TYPICAL CHARACTERISTICS (T_A = +25°C)









Remark The graphs indicate nominal characteristics.

S-PARAMETERS

Test Conditions: V_{DS} = 3.0 V, I_{Dset} = 300 mA, T_A = +25 °C)

Frequency	S11			S21			S12		S22		MAG Note	MSG Note	K
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.	dB	dB	–
0.1	0.655	–120.2	21.2	11.42	115.3	–31.6	0.026	28.7	0.633	–167.5		26.4	0.59
0.2	0.651	–142.0	17.2	7.25	99.3	–29.0	0.035	10.3	0.757	–167.9		23.1	0.36
0.3	0.666	–156.1	13.8	4.89	88.2	–29.3	0.034	–0.1	0.796	–173.0		21.5	0.40
0.4	0.660	–161.4	11.5	3.74	81.6	–29.2	0.034	–5.6	0.808	–175.0		20.4	0.50
0.5	0.656	–165.8	9.4	2.96	77.2	–29.2	0.035	–11.8	0.815	–175.9		19.3	0.62
0.6	0.655	–168.4	7.8	2.46	72.6	–29.3	0.034	–15.9	0.819	–176.8		18.6	0.76
0.7	0.654	–170.2	6.5	2.10	68.4	–29.5	0.033	–20.1	0.823	–177.4		18.0	0.91
0.8	0.658	–171.8	5.2	1.81	64.4	–29.6	0.033	–24.2	0.828	–178.0	16.2		1.04
0.9	0.656	–172.8	4.1	1.61	60.6	–29.7	0.033	–27.6	0.831	–179.4	14.2		1.20
1.0	0.658	–173.8	3.1	1.43	56.6	–29.8	0.032	–31.5	0.835	–179.9	12.8		1.37
1.1	0.663	–175.0	2.1	1.27	53.3	–30.0	0.031	–35.3	0.840	179.6	11.7		1.54
1.2	0.668	–175.8	1.1	1.14	49.9	–30.2	0.031	–39.1	0.843	179.2	10.7		1.75
1.3	0.668	–176.8	0.4	1.04	46.6	–30.3	0.030	–42.1	0.846	178.7	9.8		1.93
1.4	0.668	–177.6	–0.4	0.96	43.7	–30.6	0.030	–45.4	0.851	178.2	9.1		2.14
1.5	0.672	–178.5	–1.1	0.88	40.6	–30.7	0.029	–49.0	0.853	177.7	8.2		2.38
1.6	0.674	–179.2	–1.8	0.81	37.5	–31.0	0.028	–51.8	0.857	177.4	7.6		2.61
1.7	0.673	–180.0	–2.5	0.75	34.6	–31.1	0.028	–55.3	0.859	176.6	6.8		2.87
1.8	0.675	179.2	–3.2	0.69	31.7	–31.3	0.027	–58.6	0.862	176.1	6.1		3.20
1.9	0.677	178.5	–3.8	0.65	28.9	–31.6	0.026	–61.5	0.864	175.5	5.5		3.51
2.0	0.677	177.8	–4.4	0.61	26.4	–31.7	0.026	–64.6	0.867	174.9	5.0		3.76
2.1	0.677	177.0	–4.9	0.57	24.0	–31.9	0.025	–68.3	0.869	174.2	4.4		4.12
2.2	0.677	176.2	–5.4	0.54	21.2	–32.2	0.025	–71.4	0.869	173.6	3.8		4.57
2.3	0.681	175.4	–6.0	0.50	19.2	–32.2	0.025	–75.1	0.863	172.6	3.0		5.14
2.4	0.677	174.7	–6.5	0.48	16.6	–32.5	0.024	–78.2	0.873	172.4	2.8		5.35
2.5	0.675	174.6	–6.9	0.45	13.9	–32.7	0.023	–82.0	0.874	171.7	2.2		5.82
2.6	0.674	173.8	–7.4	0.43	11.7	–32.8	0.023	–85.1	0.874	170.9	1.7		6.29
2.7	0.673	173.2	–7.9	0.40	9.5	–33.0	0.022	–89.7	0.873	170.1	1.2		6.90
2.8	0.670	172.3	–8.3	0.39	7.8	–33.2	0.022	–92.3	0.875	169.4	0.8		7.45
2.9	0.667	171.4	–8.7	0.37	5.7	–33.4	0.021	–96.7	0.874	168.7	0.3		8.10
3.0	0.665	170.7	–9.1	0.35	3.5	–33.4	0.021	–101.5	0.873	167.9	–0.2		8.64
3.1	0.662	169.9	–9.5	0.33	1.4	–33.7	0.021	–106.4	0.873	167.2	–0.8		9.63
3.2	0.648	168.9	–9.8	0.32	–0.1	–34.1	0.020	–111.8	0.879	166.8	–1.0		10.28
3.3	0.656	168.6	–10.4	0.30	–1.4	–34.6	0.019	–117.6	0.872	165.7	–1.7		12.13
3.4	0.652	167.6	–10.6	0.29	–2.8	–35.3	0.017	–122.0	0.871	164.9	–2.1		13.80
3.5	0.651	167.1	–11.0	0.28	–4.5	–35.6	0.017	–123.8	0.871	164.1	–2.4		14.87
3.6	0.648	166.2	–11.3	0.27	–6.6	–35.6	0.017	–126.7	0.870	163.1	–2.8		15.51
3.7	0.644	165.4	–11.6	0.26	–7.9	–35.7	0.016	–130.5	0.869	162.3	–3.2		16.66
3.8	0.641	164.7	–12.0	0.25	–10.1	–36.0	0.016	–135.9	0.868	161.4	–3.7		18.41
3.9	0.636	163.8	–12.3	0.24	–11.5	–36.1	0.016	–140.3	0.867	160.4	–4.0		19.61
4.0	0.633	163.0	–12.6	0.23	–12.5	–36.2	0.015	–144.7	0.865	159.4	–4.4		21.02

Note When K ≥ 1, the MAG (Maximum Available Gain) is used. $\text{MAG} = \left|\frac{S_{21}}{S_{12}}\right|\left(K - \sqrt{(K^2 - 1)}\right)$

When K < 1, the MSG (Maximum Stable Gain) is used. $\text{MSG} = \left|\frac{S_{21}}{S_{12}}\right|$, $K = \frac{1 + |\Delta|^2 - |S_{11}|^2}{-|S_{22}|^2}$,

$\Delta = S_{11} \cdot S_{22} - S_{21} \cdot S_{12}$

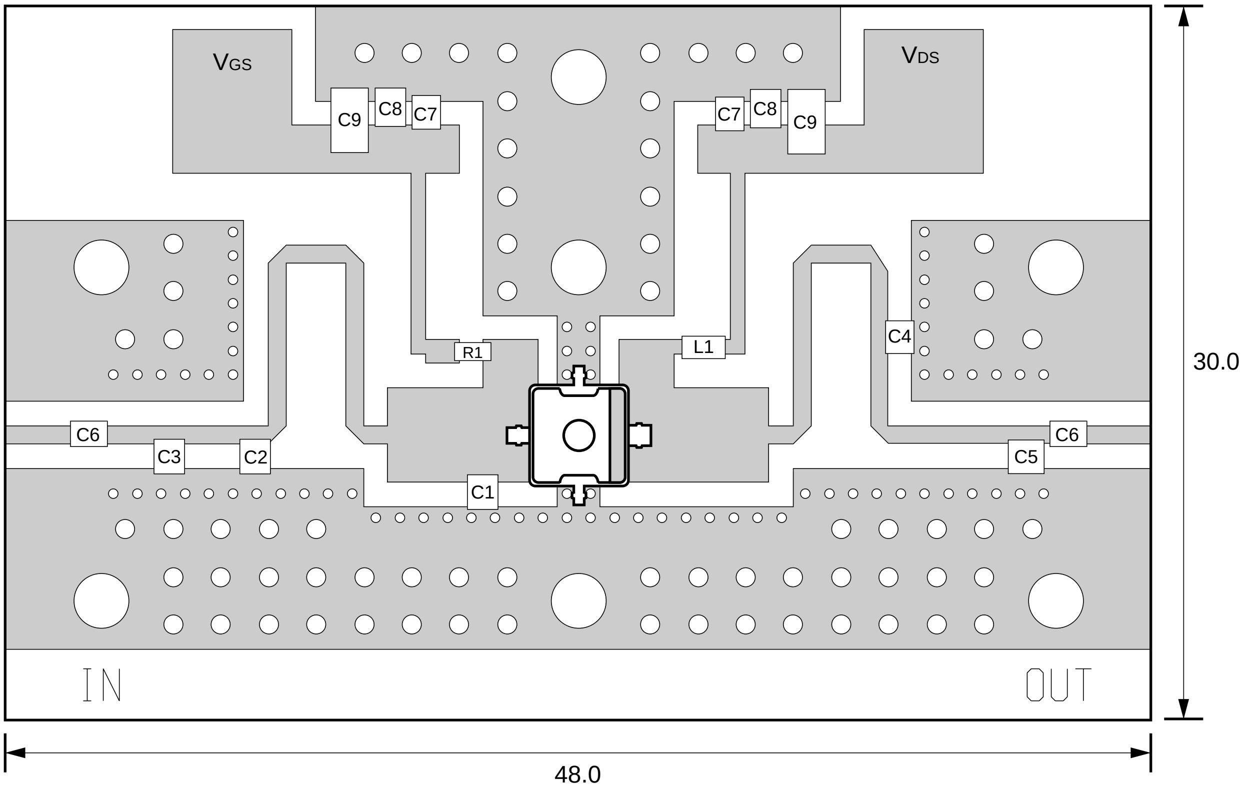
LARGE SIGNAL IMPEDANCE (V_{DS} = 3.0 V, I_{DS} = 300 mA, f = 460 MHz)

f (MHz)	Z_{in} (Ω)	Z_{OL} (Ω) Note
460	7.47 +j18.24	4.82 +j5.04

Note Z_{OL} is the conjugate of optimum load impedance at given voltage, idling current, input power and frequency.

EVALUATION BOARD for 460 MHz

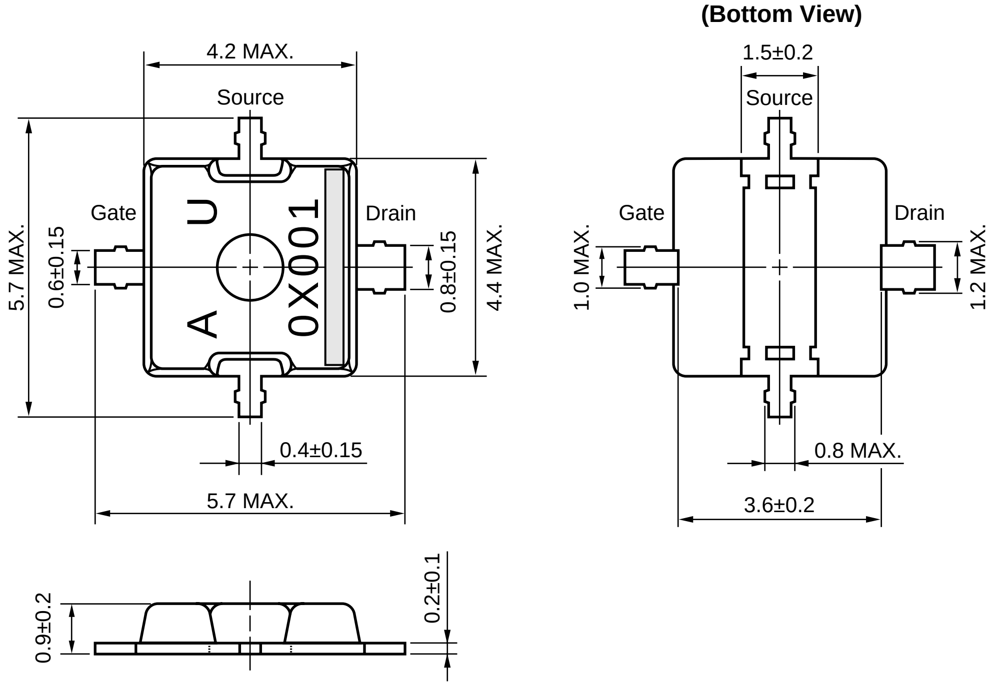
Unit : mm



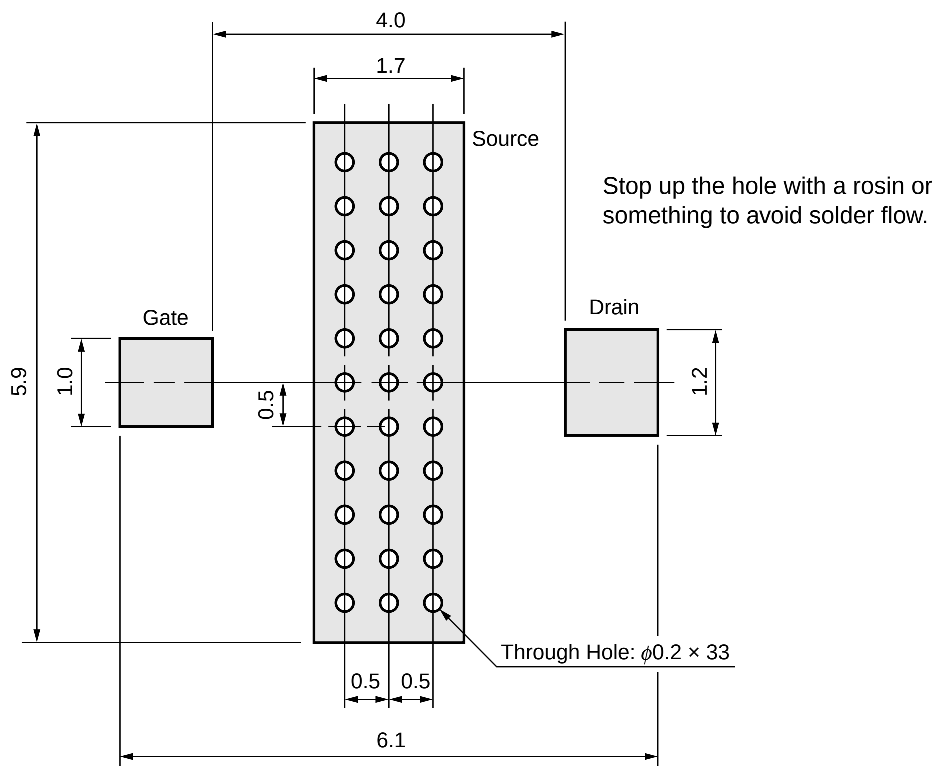
Symbol	Value	Comment
C1	9.1 pF	
C2	12 pF	
C3	20 pF	
C4	3.3 pF	
C5	13 pF	
C6	22 pF	
C7	1 000 pF	
C8	0.33 μF	
C9	3.3 μF - 16V	
R1	1 000 Ω	
L1	22 nH	
Circuit Board	t = 0.4 mm, ε r = 4.5	R4775

PACKAGE DIMENSIONS

79A (UNIT: mm)



79A PACKAGE RECOMMENDED P.C.B. LAYOUT (UNIT: mm)



RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

Soldering Method	Soldering Conditions		Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
VPS	Peak temperature (package surface temperature) Time at temperature of 200°C or higher Preheating time at 120 to 150°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 215°C or below : 25 to 40 seconds : 30 to 60 seconds : 3 times : 0.2%(Wt.) or below	VP215
Wave Soldering	Peak temperature (molten solder temperature) Time at peak temperature Preheating temperature (package surface temperature) Maximum number of flow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 120°C or below : 1 time : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (pin temperature) Soldering time (per pin of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350-P3

Caution Do not use different soldering methods together (except for partial heating).

▶**Business issue**

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▶**Technical issue**

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