DATA SHEET

NEC

GaAs FET

NES1823M-240

240 W L, S-BAND PUSH-PULL POWER GaAs FET

DESCRIPTION

The NES1823M-240 is a 240 W push-pull type GaAs FET designed for high power transmitter applications for IMT-2000 base station systems. It operates at 12 V and is capable of delivering 240 W of output power (CW) with high linear gain, high efficiency and low distortion. Its primary band is 1.8 to 2.3 GHz. The device employs 0.7 μm Tungsten Silicide gates, via holes, plated heat sink, and silicon dioxide passivation for superior performance, thermal characteristics, and reliability.

FEATURES

- Push-pull type GaAs FET
- V_{DS} = 12.0 V operation
- High output power: P_{out} = 240 W TYP.
- High linear gain: G_L = 12.0 dB TYP.
- High power added efficiency: η_{add} = 45% TYP. @ V_{DS} = 12.0 V, I_{Dset} = 2.0 A (total), f = 2.17 GHz
- Hollow plastic package

★ ORDERING INFORMATION

Part Number	Order Number	Package	Supplying Form
NES1823M-240	NES1823M-240-A	T-92M (Pb-Free)	ESD protective tray

Remark To order evaluation samples, contact your neaby sales office.

Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

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The mark ★ shows major revised points.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Operation in excess of any one of these parameters may result in permanent damage.

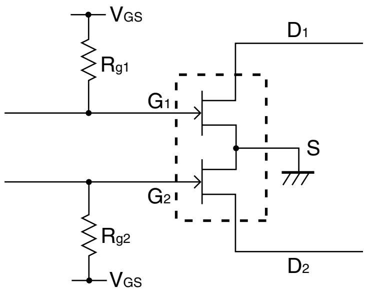
Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V_{DS}	19	V
Gate to Source Voltage	V_{GSO}	–7	V
Gate to Drain Voltage	V_{GDO}	–26	V
Gate Current	I_G	900	mA
Total Power Dissipation	P_{tot}	250	W
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	–65 to +150	°C
Gain Compression(CW)	Gcomp	3.0	dB

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}		–	12.0	12.0	V
Channel Temperature	T_{ch}		–	–	+150	°C
Set Drain Current	I_{Dset}	V_{DS} = 12.0 V, RF OFF	–	2.0	6.0	A
Gate Resistance	R_g Note		–	0.6	1.2	Ω

Note R_g is the series resistance between the gate supply and the FET gate.

$$R_g = \frac{R_{g1} \times R_{g2}}{R_{g1} + R_{g2}}$$



ELECTRICAL CHARACTERISTICS (T_A = +25°C)

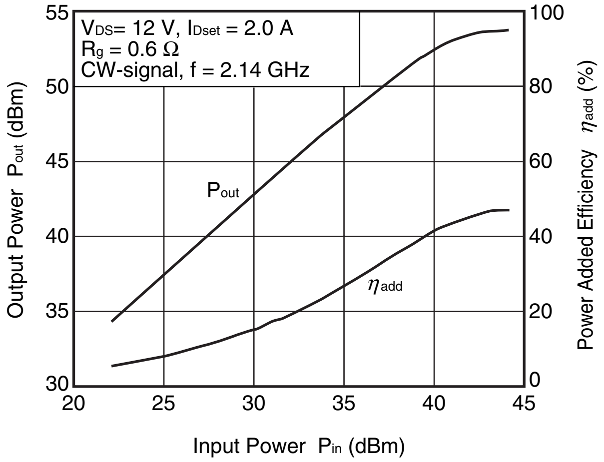
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Pinch-off Voltage	V_p	V_{DS} = 2.5 V, I_D = 650 mA	–0.8	–0.5	–0.2	V
Thermal Resistance	R_{th}	Channel to Case	–	0.30	0.40	°C/W
Output Power	P_{out}	f = 2.17 GHz, V_{DS} = 12.0 V,	52.8	53.4	–	dBm
Drain Current	I_D	P_{in} = 44.0 dBm, R_g = 0.6 Ω,	–	38.5	–	A
Power Added Efficiency	η_{add}	I_{Dset} = 2.0 A Total (RF OFF) Note1	–	45	–	%
Linear Gain	G_L Note2		11.0	12.0	–	dB

Notes1. I_{Dset} = 1.0 A each drain

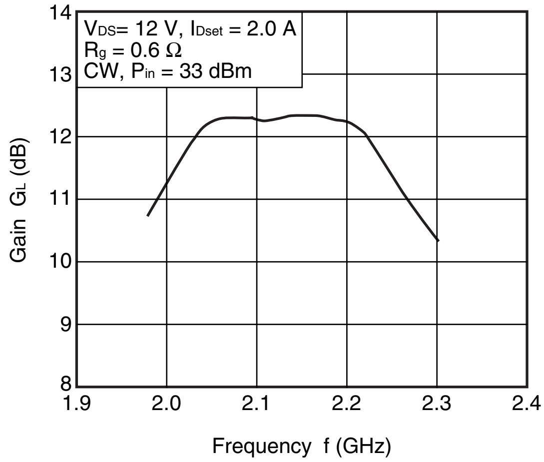
2. P_{in} = 33 dBm

TYPICAL CHARACTERISTICS (T_A = +25°C)

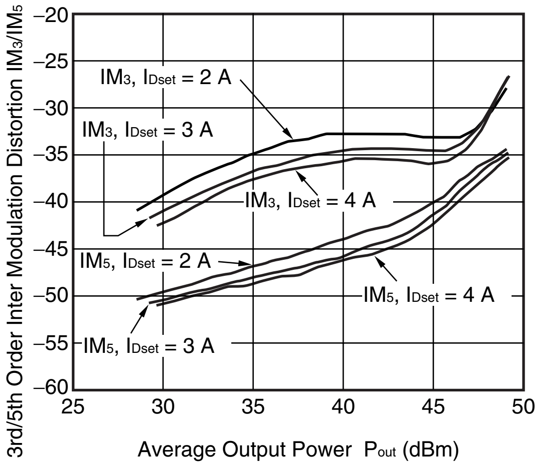
OUTPUT POWER, η_{add} vs. INPUT POWER



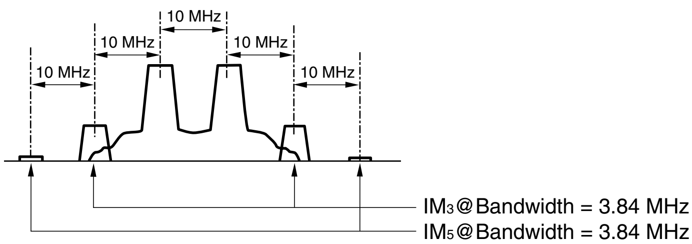
GAIN vs. FREQUNCY RESPONSE



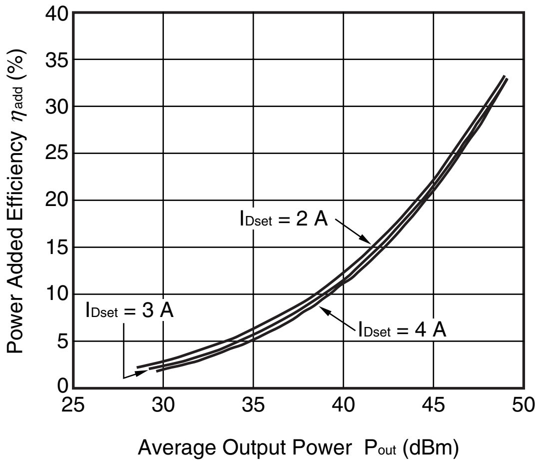
IM3/IM5 vs. AVERAGE OUTPUT POWER (SET IDS DEPENDENCE)



V_{DS}= 12 V,
R_g = 0.6 Ω,
W-CDMA,
3 GPP test model 1, 64 DPCH,
2 carriers, Clipping 100%
f_1 = 2.135 GHz
f_2 = 2.145 GHz
(Δf = 10 MHz)



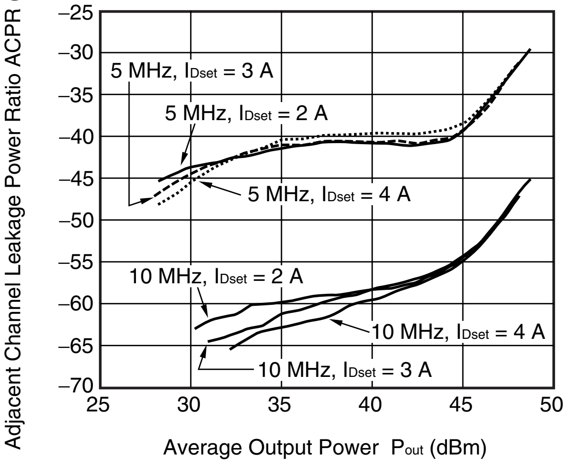
η_{add} vs. AVERAGE OUTPUT POWER (SET IDS DEPENDENCE)

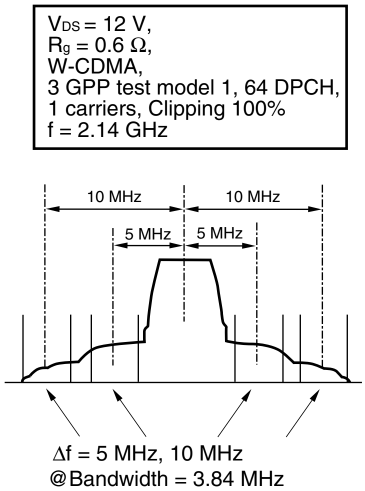


V_{DS}= 12 V,
R_g = 0.6 Ω,
W-CDMA,
3 GPP test model 1, 64 DPCH,
2 carriers, Clipping 100%
f_1 = 2.135 GHz
f_2 = 2.145 GHz
(Δf = 10 MHz)

Remark The graphs indicate nominal characteristics.

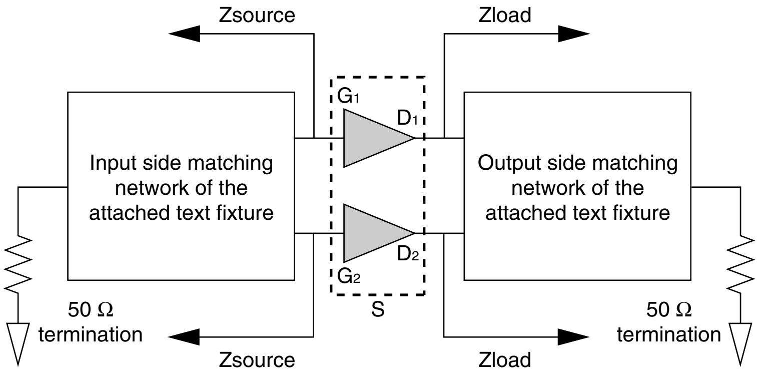
ACPR vs. AVERAGE OUTPUT POWER
(SET I_{DS} DEPENDENCE)





Remark The graphs indicate nominal characteristics.

LARGE SIGNAL IMPEDANCES
(HALF (EACH SIDE) DEVICE OPTIMAL INPUT AND OUTPUT IMPEDANCE)



Test fixture tuning condition
V_{DS} = 12 V, I_{Dset} = 2.0 A
R_g = 0.6 Ω, P_{IN} = 44 dBm

Remarks1. $Z_{in} = R_{in} + jX_{in}$ (Conjugate of Zsource for single ended device)
$Z_{out} = R_{out} + jX_{out}$ (Conjugate of Zload for single ended device)
2. Z_{out} was chosen based on tradeoffs between gain, PAE and IM.

f (GHz)	Z_{in} (Ω)	Z_{out} (Ω)
2.10	1.063 – j7.204	3.862 – j5.151
2.11	1.060 – j6.685	3.994 – j4.854
2.12	1.111 – j6.233	4.114 – j4.653
2.13	1.129 – j5.839	4.218 – j4.519
2.14	1.135 – j5.403	4.296 – j4.400
2.15	1.173 – j5.161	4.368 – j4.304
2.16	1.176 – j4.735	4.402 – j4.083
2.17	1.188 – j4.384	1.382 – j3.948
2.18	1.184 – j4.013	4.442 – j3.780
2.19	1.201 – j3.694	4.457 – j3.726

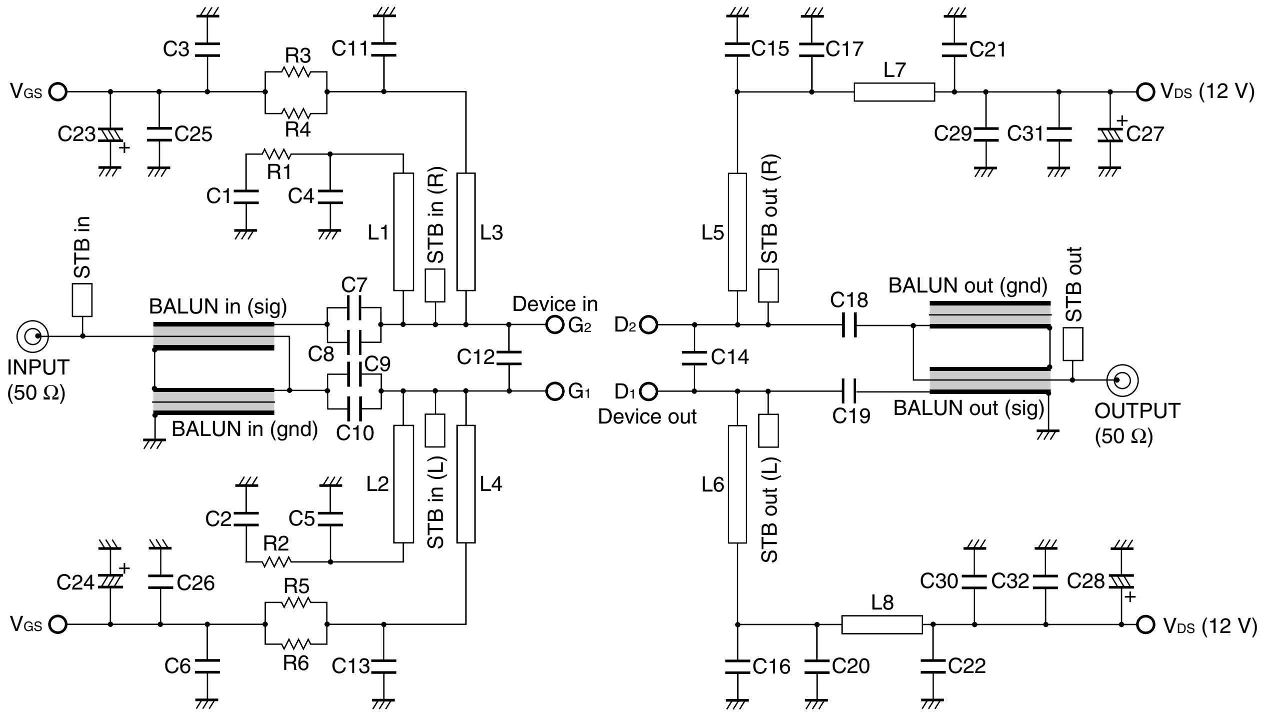
f (GHz)	Z_{in} (Ω)	Z_{out} (Ω)
2.20	1.268 – j3.319	4.441 – j3.539
2.21	1.283 – j2.838	4.463 – j3.350
2.22	1.315 – j2.518	4.462 – j3.257
2.23	1.401 – j2.172	4.451 – j3.102
2.24	1.458 – j1.777	4.429 – j2.921
2.25	1.544 – j1.408	4.452 – j2.755
2.26	1.622 – j1.129	4.454 – j2.614
2.27	1.711 – j0.773	4.456 – j2.431
2.28	1.794 – j0.482	4.399 – j2.184
2.29	1.899 – j0.180	4.454 – j2.074
2.30	1.971 + j0.174	4.493 – j1.836

S-PARAMETERS

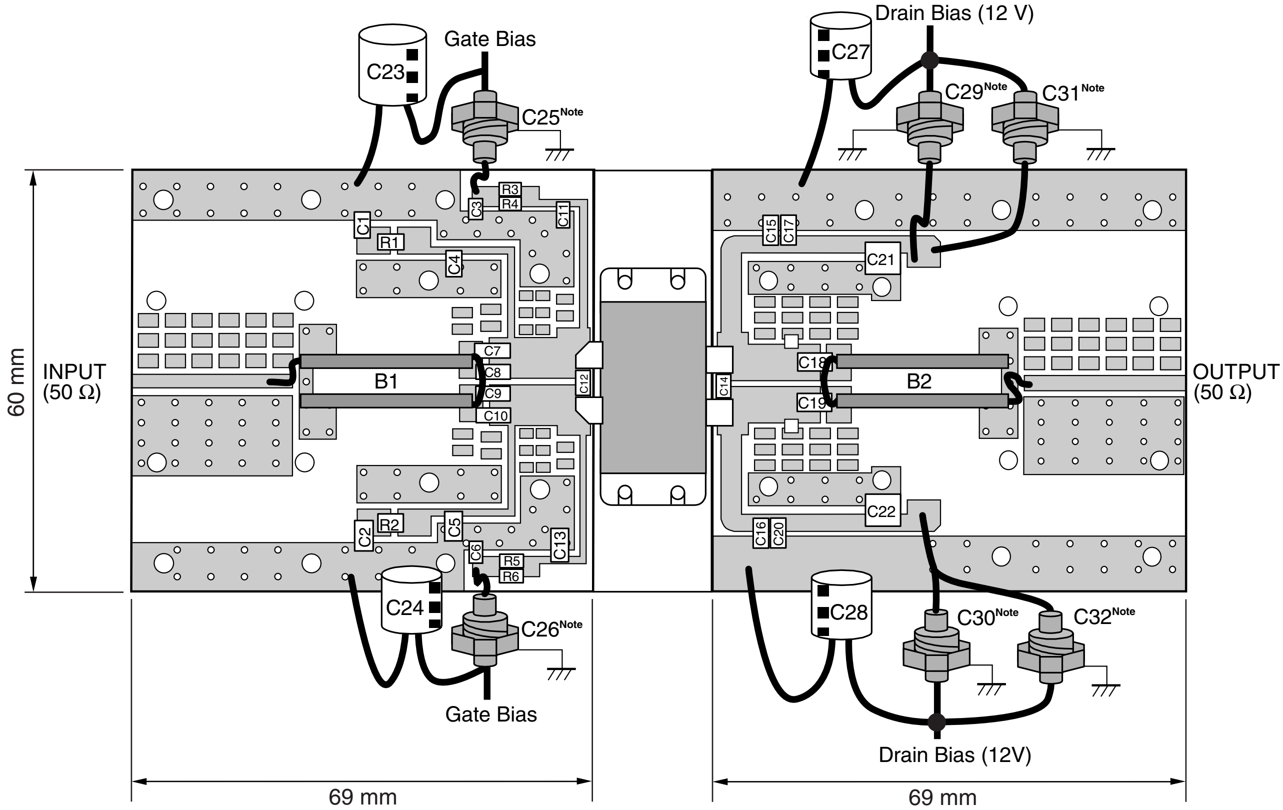
S-parameters/Noise parameters are provided on the NEC Compound Semiconductor Devices Web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

Click here to download S-parameters.
[RF and Microwave] → [Device Parameters]
URL http://www.ncsd.necel.com/

★ EVALUATION PWB CIRCUIT



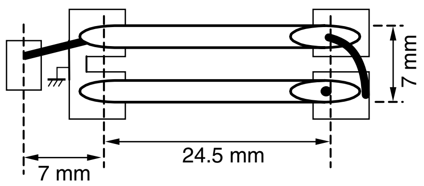
EVALUATION PWB PARTS LAYOUT



Note Feed-through capacitor

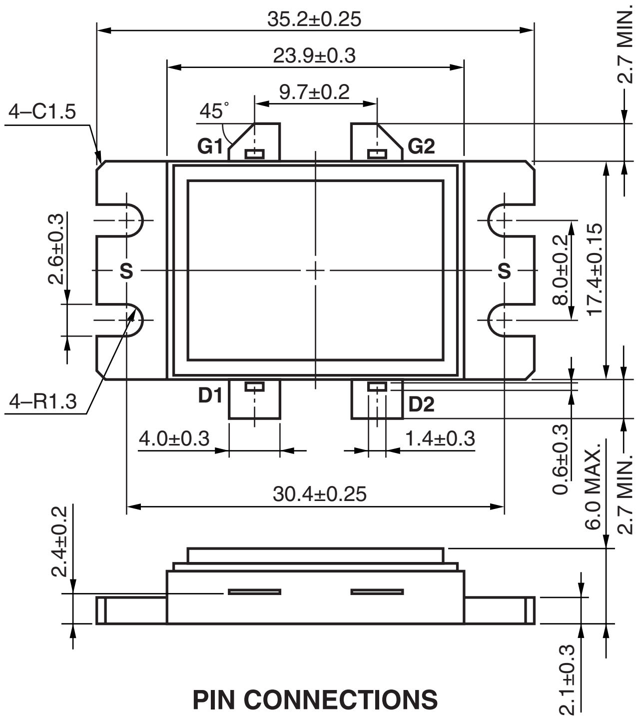
Parts Name	Parts Value
C12, C14	1 pF chip capacitor
C4, C5, C11, C13	4 pF chip capacitor
C18, C19	10 pF chip capacitor
C7, C8, C9, C10	12 pF chip capacitor
C15, C16	22 pF chip capacitor
C1, C2, C3, C6	1 000 pF chip capacitor
C25, C26, C29, C30, C31, C32	1 000 pF feed-through capacitor
C17, C20	0.1 μF chip capacitor
C21, C22	10 μF chip capacitor (25 V)
C23, C24, C27, C28	100 μF Electrolytic capacitor (25 V)
R3, R4, R5, R6	2.2 Ω chip resistor (1/4 W)
R1, R2	10 Ω chip resistor (1/4 W)
B1, B2	BALUN
Circuit Board	Material ; Teflon, Er = 2.6, PWB Thickness : 0.8 mm, Cu-Pattern Thickness : 18 μm

BALUN
(An example of Assembly)



PACKAGE DIMENSIONS

T-92M (UNIT: mm)



PIN CONNECTIONS

G1, G2 : Gate
D1, D2 : Drain
S : Source

RECOMMENDED MOUNTING CONDITIONS FOR CORRECT USE

(1) Fix to a heat sink or mount surface completely with screws at the four holes of the flange.
(2) The recommended torque strength of the screws is 29.4 N·cm typical using M2.3 type screws.
(3) The recommended flatness of the mount surface is less than ±10 μm (roughness of surface is ∇∇∇).

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
Partial Heating	Peak temperature (terminal temperature) Soldering time (per terminal 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).

DEFINIITON OF THERMAL RESISTANCE

This thermal resistance (R_{th} : channel to case) guaranteed in the electrical characteristics shows the value between chip surface and the backside surface of the package.

The thermal resistance between chip surface and mount surface is 0.2 (MAX.) °C/W larger than the thermal resistance value guaranteed in the electrical characteristics, when the package is under the above-mentioned recommendation mounting condition screwed down.

Caution	GaAs Products	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.

▶**For further information, please contact**

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