



**THE DATASHEET OF  
MJE15031G**



# MJE15028, MJE15030 (NPN), MJE15029, MJE15031 (PNP)

## Complementary Silicon Plastic Power Transistors

These devices are designed for use as high-frequency drivers in audio amplifiers.

### Features

- High Current Gain – Bandwidth Product
- TO-220 Compact Package
- These Devices are Pb-Free and are RoHS Compliant\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage MJE15028G, MJE15029G MJE15030G, MJE15031G	$V_{CEO}$	120 150	Vdc
Collector–Base Voltage MJE15028G, MJE15029G MJE15030G, MJE15031G	$V_{CB}$	120 150	Vdc
Emitter–Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current – Continuous	$I_C$	8.0	Adc
Collector Current – Peak	$I_{CM}$	16	Adc
Base Current	$I_B$	2.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	50 0.40	W W/ $^\circ\text{C}$
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	2.0 0.016	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

Characteristics	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.5	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C}/\text{W}$

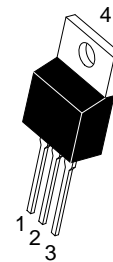
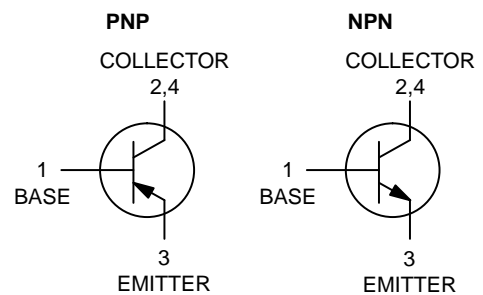
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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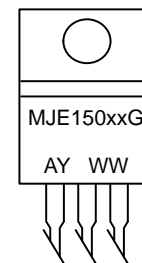
<http://onsemi.com>

## 8 AMPERE POWER TRANSISTORS COMPLEMENTARY SILICON 120–150 VOLTS, 50 WATTS



TO-220  
CASE 221A  
STYLE 1

### MARKING DIAGRAM



MJE150xx = Device Code  
x = 28, 29, 30, or 31  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# MJE15028, MJE15030 (NPN), MJE15029, MJE15031 (PNP)

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage (Note 1) ( $I_C = 10\text{ mA}$ , $I_B = 0$ ) MJE15028, MJE15029 MJE15030, MJE15031	$V_{CE(sus)}$	120 150	– –	Vdc
Collector Cutoff Current ( $V_{CE} = 120\text{ Vdc}$ , $I_B = 0$ ) MJE15028, MJE15029 ( $V_{CE} = 150\text{ Vdc}$ , $I_B = 0$ ) MJE15030, MJE15031	$I_{CEO}$	– –	0.1 0.1	mA
Collector Cutoff Current ( $V_{CB} = 120\text{ Vdc}$ , $I_E = 0$ ) MJE15028, MJE15029 ( $V_{CB} = 150\text{ Vdc}$ , $I_E = 0$ ) MJE15030, MJE15031	$I_{CBO}$	– –	10 10	$\mu\text{A}$
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	10	$\mu\text{A}$

## ON CHARACTERISTICS (Note 1)

DC Current Gain ( $I_C = 0.1\text{ A}$ , $V_{CE} = 2.0\text{ Vdc}$ ) ( $I_C = 2.0\text{ A}$ , $V_{CE} = 2.0\text{ Vdc}$ ) ( $I_C = 3.0\text{ A}$ , $V_{CE} = 2.0\text{ Vdc}$ ) ( $I_C = 4.0\text{ A}$ , $V_{CE} = 2.0\text{ Vdc}$ )	$h_{FE}$	40 40 40 20	– – – –	–
DC Current Gain Linearity ( $V_{CE}$ From 2.0 V to 20 V, $I_C$ From 0.1 A to 3 A) (NPN to PNP)	$h_{FE}$		Typ 2 3	
Collector–Emitter Saturation Voltage ( $I_C = 1.0\text{ A}$ , $I_B = 0.1\text{ A}$ )	$V_{CE(sat)}$	–	0.5	Vdc
Base–Emitter On Voltage ( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ Vdc}$ )	$V_{BE(on)}$	–	1.0	Vdc

## DYNAMIC CHARACTERISTICS

Current Gain – Bandwidth Product (Note 2) ( $I_C = 500\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 10\text{ MHz}$ )	$f_T$	30	–	MHz
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Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .
2.  $f_T = |h_{fe}| \cdot f_{test}$ .

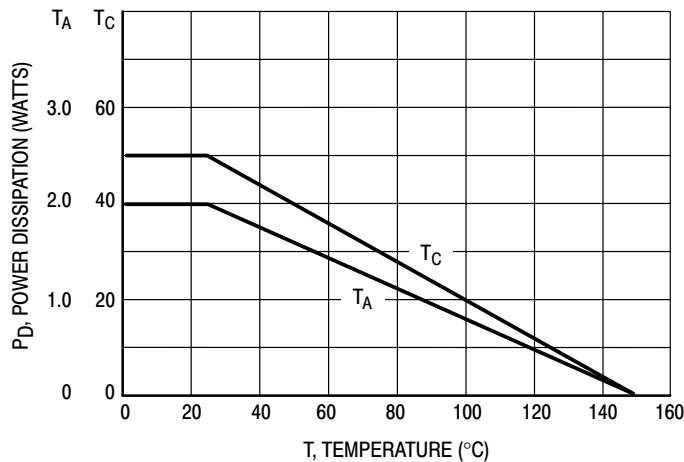


Figure 1. Power Derating

# MJE15028, MJE15030 (NPN), MJE15029, MJE15031 (PNP)

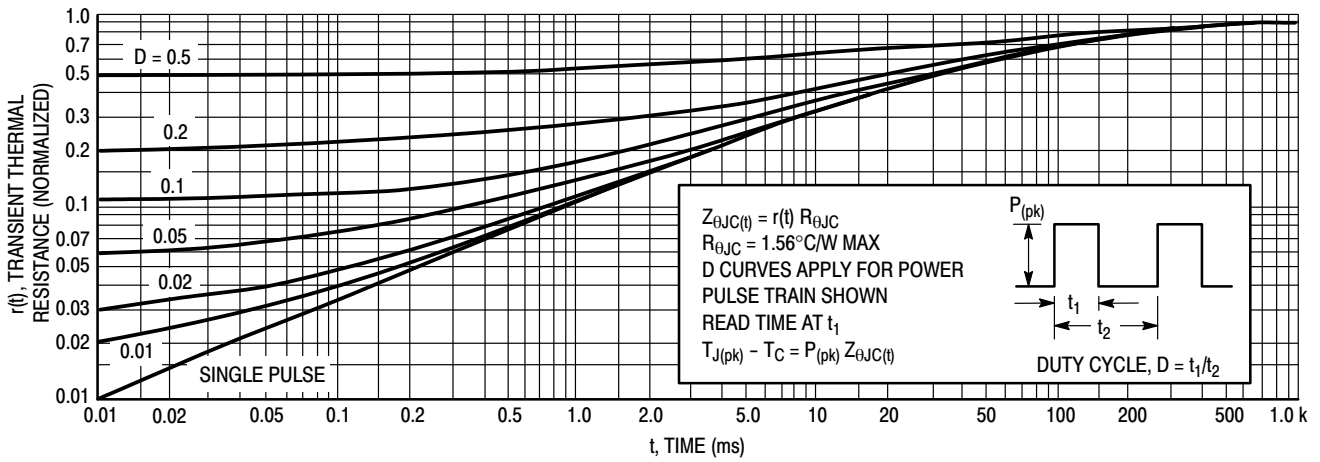


Figure 2. Thermal Response

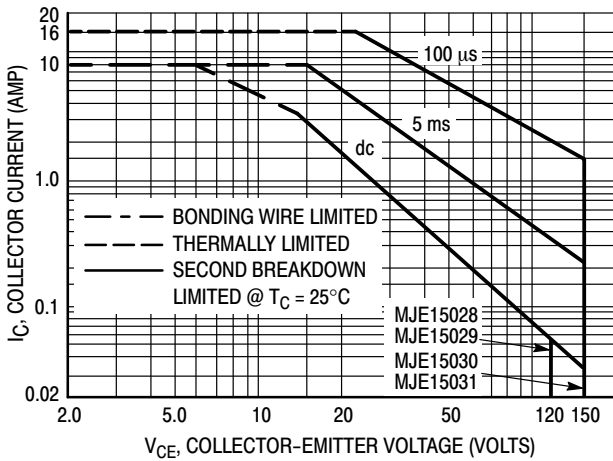


Figure 3. Forward Bias Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation, i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figures 3 and 4 is based on  $T_{J(pk)} = 150^{\circ}\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} < 150^{\circ}\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 2. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

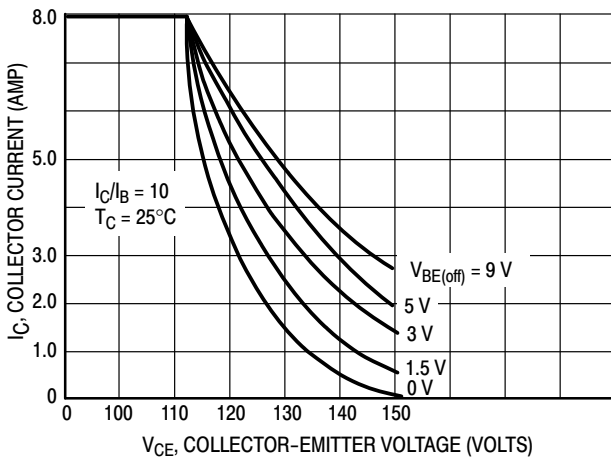


Figure 4. Reverse-Bias Switching Safe Operating Area

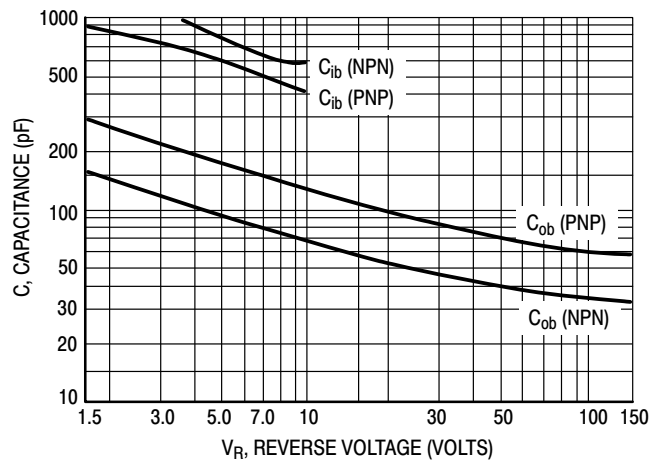


Figure 5. Capacitances

# MJE15028, MJE15030 (NPN), MJE15029, MJE15031 (PNP)

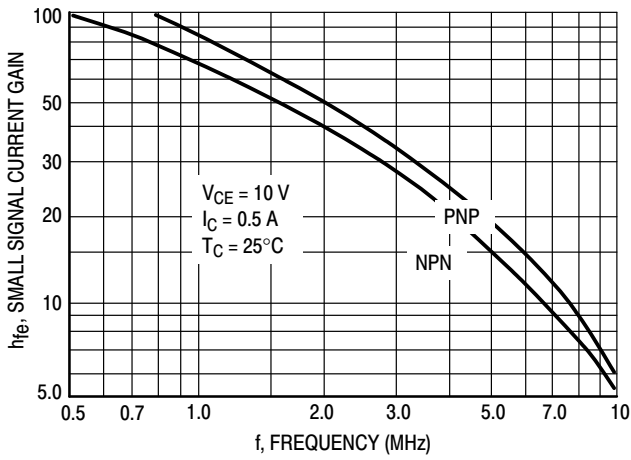


Figure 6. Small-Signal Current Gain

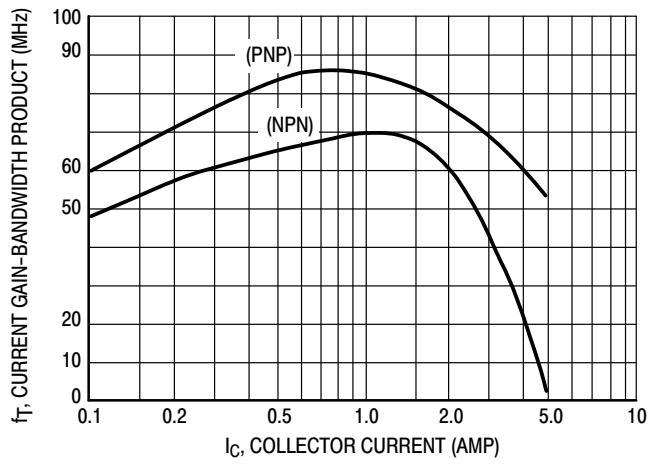
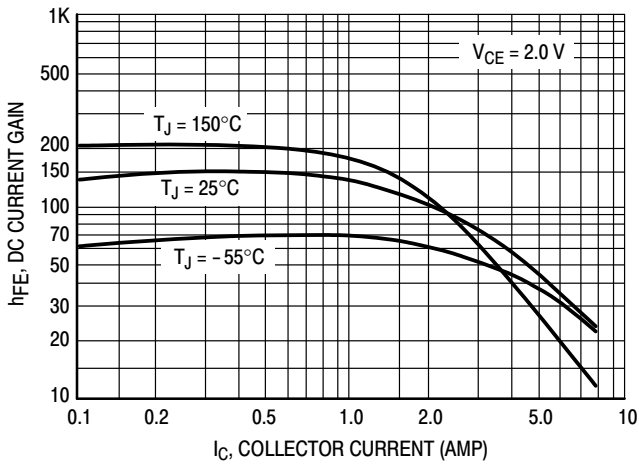


Figure 7. Current Gain-Bandwidth Product

## NPN — MJE15028 MJE15030



## PNP — MJE15029 MJE15031

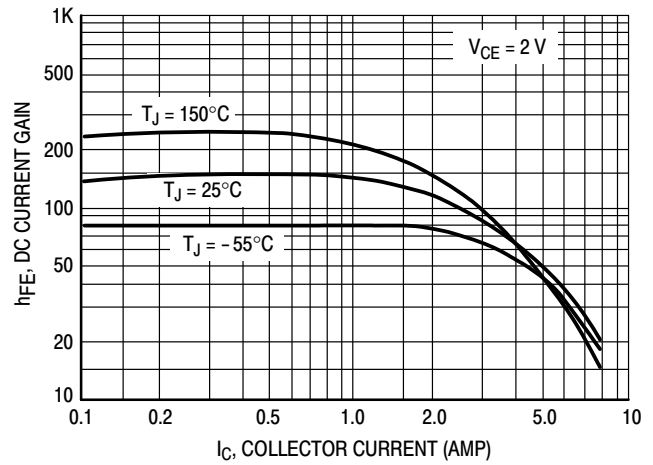
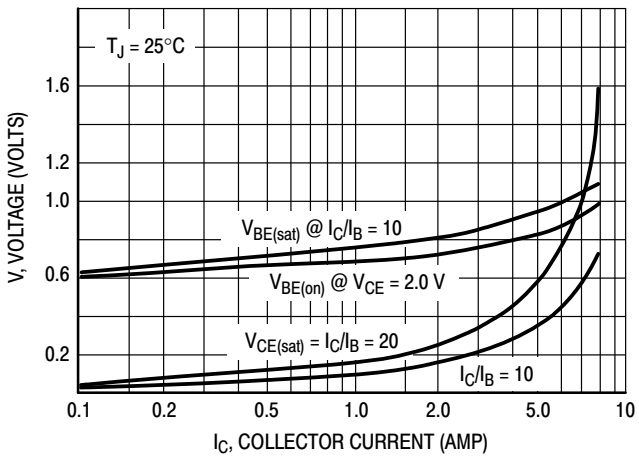


Figure 8. DC Current Gain

## NPN



## PNP

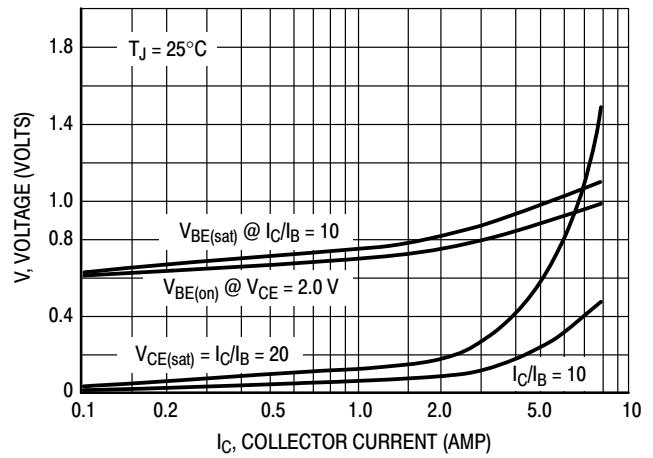
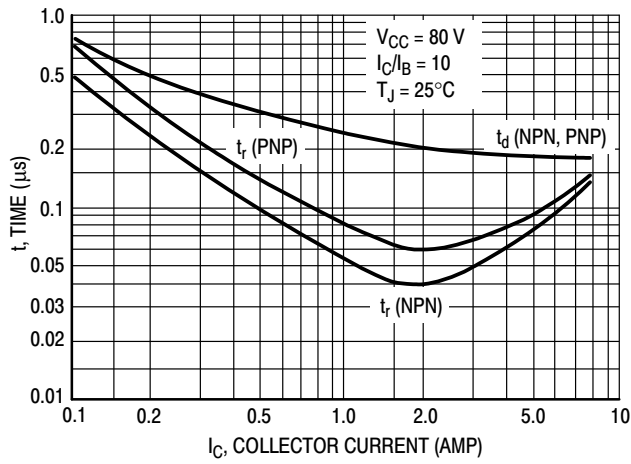
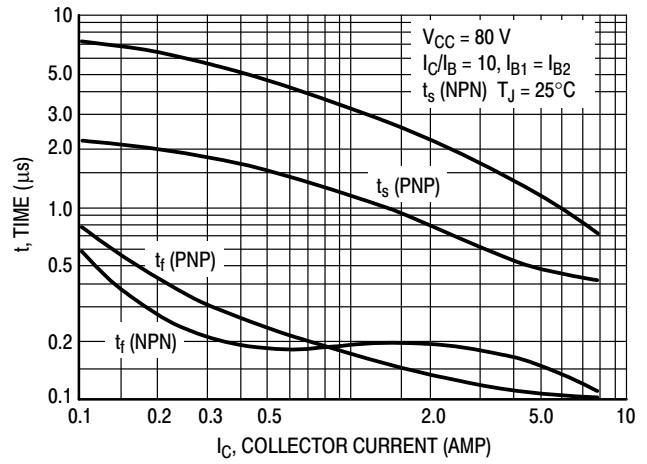


Figure 9. "On" Voltage

## MJE15028, MJE15030 (NPN), MJE15029, MJE15031 (PNP)



**Figure 10. Turn-On Times**



**Figure 11. Turn-Off Times**

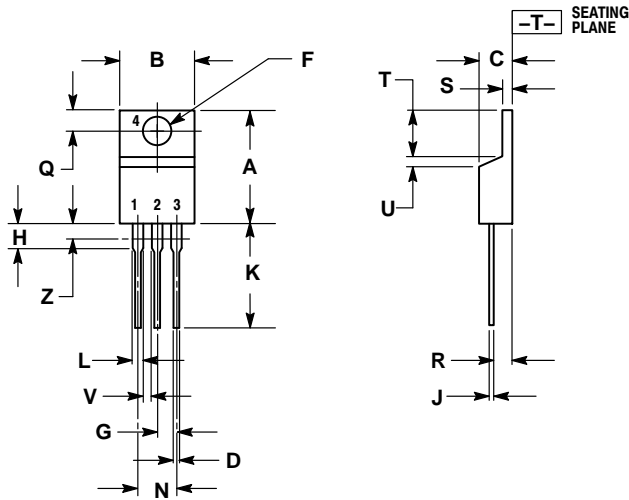
### ORDERING INFORMATION

Device	Package	Shipping
MJE15028G	TO-220 (Pb-Free)	50 Units / Rail
MJE15029G	TO-220 (Pb-Free)	50 Units / Rail
MJE15030G	TO-220 (Pb-Free)	50 Units / Rail
MJE15031G	TO-220 (Pb-Free)	50 Units / Rail

# MJE15028, MJE15030 (NPN), MJE15029, MJE15031 (PNP)

## PACKAGE DIMENSIONS

TO-220  
CASE 221A-09  
ISSUE AH



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 1:

- PIN 1. BASE
- 2. COLLECTOR
- 3. EMITTER
- 4. COLLECTOR

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