

2N6387, 2N6388

2N6388 is a Preferred Device

Plastic Medium-Power Silicon Transistors

These devices are designed for general-purpose amplifier and low-speed switching applications.

Features

- High DC Current Gain - $h_{FE} = 2500$ (Typ) @ $I_C = 4.0$ Adc
- Collector-Emitter Sustaining Voltage - @ 100 mAdc
 $V_{CEO(sus)} = 60$ Vdc (Min) - 2N6387
 $= 80$ Vdc (Min) - 2N6388
- Low Collector-Emitter Saturation Voltage -
 $V_{CE(sat)} = 2.0$ Vdc (Max) @ $I_C = 5.0$ Adc - 2N6387, 2N6388
- Monolithic Construction with Built-In Base-Emitter Shunt Resistors
- TO-220AB Compact Package
- Pb-Free Packages are Available*

MAXIMUM RATINGS (Note 1)

| Rating | Symbol | Value | Unit |
|---|------------------|-----------------------|--------------------------|
| Collector-Emitter Voltage | 2N6387 2N6388 | V_{CEO} 60 80 | Vdc |
| Collector-Base Voltage | 2N6387 2N6388 | V_{CB} 60 80 | Vdc |
| Emitter-Base Voltage | | V_{EB} 5.0 | Vdc |
| Collector Current - Continuous - Peak | | I_C 10 15 | Adc |
| Base Current | | I_B 250 | mA dc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | | P_D 65 0.52 | W W/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°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 | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristics | Symbol | Max | Unit |
|---|-----------------|------|---------------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 1.92 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62.5 | $^\circ\text{C}/\text{W}$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Indicates JEDEC Registered Data.

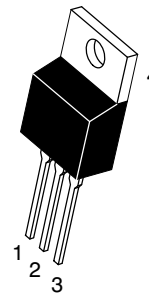


ON Semiconductor®

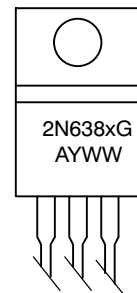
<http://onsemi.com>

DARLINGTON NPN SILICON POWER TRANSISTORS 8 AND 10 AMPERES 65 WATTS, 60 - 80 VOLTS

MARKING DIAGRAM



TO-220AB
CASE 221A
STYLE 1



2N638x = Device Code

x = 7 or 8

G = Pb-Free Package

A = Assembly Location

Y = Year

WW = Work Week

ORDERING INFORMATION

| Device | Package | Shipping |
|---------|-----------------------|-----------------|
| 2N6387 | TO-220AB | 50 Units / Rail |
| 2N6387G | TO-220AB (Pb-Free) | 50 Units / Rail |
| 2N6388 | TO-220AB | 50 Units / Rail |
| 2N6388G | TO-220AB (Pb-Free) | 50 Units / Rail |

Preferred devices are recommended choices for future use and best overall value.

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

2N6387, 2N6388

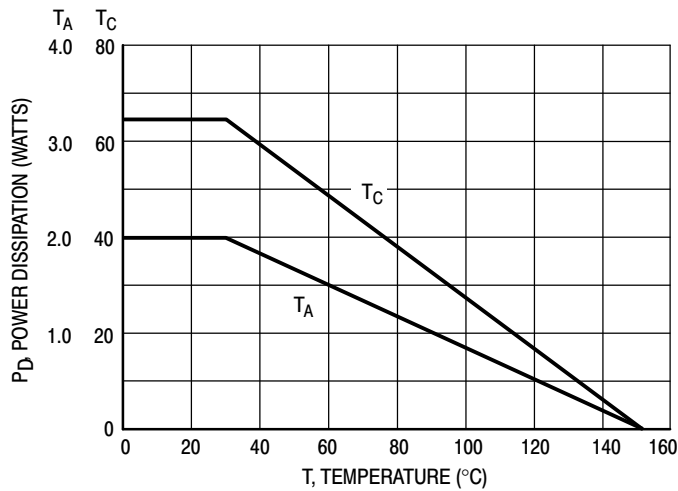


Figure 1. Power Derating

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted) (Note 2)

| Characteristic | Symbol | Min | Max | Unit |
|--|--------------------------------------|----------------|------------------|---|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Sustaining Voltage (Note 3) ($I_C = 200\text{ mAdc}$, $I_B = 0$) | 2N6387 2N6388 | $V_{CEO(sus)}$ | 60 80 | - - Vdc |
| Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 80\text{ Vdc}$, $I_B = 0$) | 2N6387 2N6388 | I_{CEO} | - - | 1.0 1.0 mAdc |
| Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 80\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 125^\circ\text{C}$) ($V_{CE} = 80\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 125^\circ\text{C}$) | 2N6387 2N6388 2N6387 2N6388 | I_{CEX} | - - - - | 300 300 3.0 3.0 μAdc mAdc |
| Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$) | | I_{EBO} | - | 5.0 mAdc |
| ON CHARACTERISTICS (Note 3) | | | | |
| DC Current Gain ($I_C = 5.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) ($I_C = 1.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) | 2N6387, 2N6388 2N6387, 2N6388 | h_{FE} | 1000 100 | 20,000 - - |
| Collector-Emitter Saturation Voltage ($I_C = 5.0\text{ Adc}$, $I_B = 0.01\text{ Adc}$) ($I_C = 10\text{ Adc}$, $I_B = 0.1\text{ Adc}$) | 2N6387, 2N6388 2N6387, 2N6388 | $V_{CE(sat)}$ | - - | 2.0 3.0 Vdc |
| Base-Emitter On Voltage ($I_C = 5.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) ($I_C = 10\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) | 2N6387, 2N6388 2N6387, 2N6388 | $V_{BE(on)}$ | - - | 2.8 4.5 Vdc |
| DYNAMIC CHARACTERISTICS | | | | |
| Small-Signal Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$, $f_{test} = 1.0\text{ MHz}$) | | $ h_{fe} $ | 20 | - - |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$) | | C_{ob} | - | 200 pF |
| Small-Signal Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$, $f = 1.0\text{ kHz}$) | | h_{fe} | 1000 | - - |

2. Indicates JEDEC Registered Data.

3. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

2N6387, 2N6388

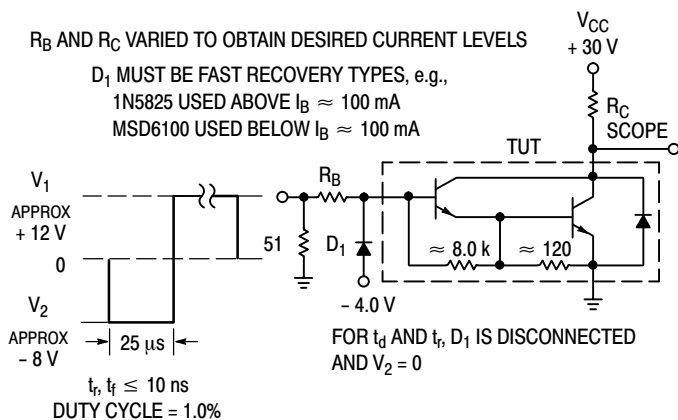


Figure 2. Switching Times Test Circuit

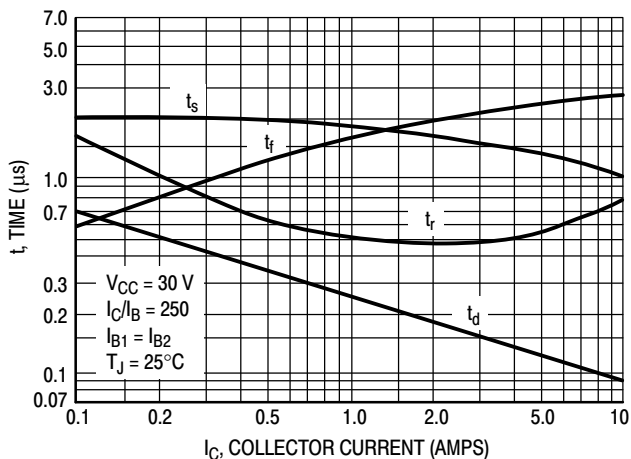


Figure 3. Switching Times

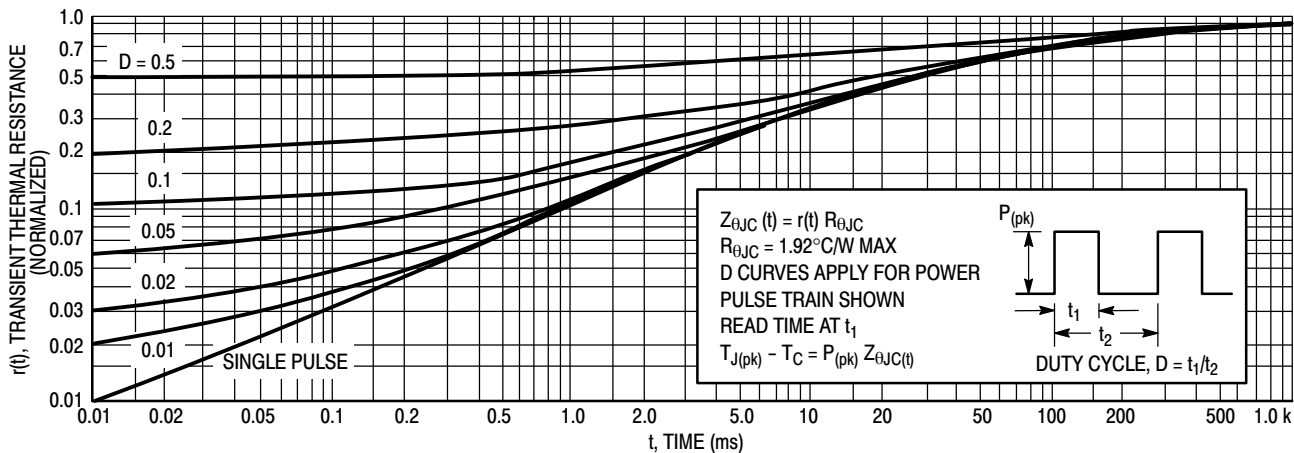


Figure 4. Thermal Response

2N6387, 2N6388

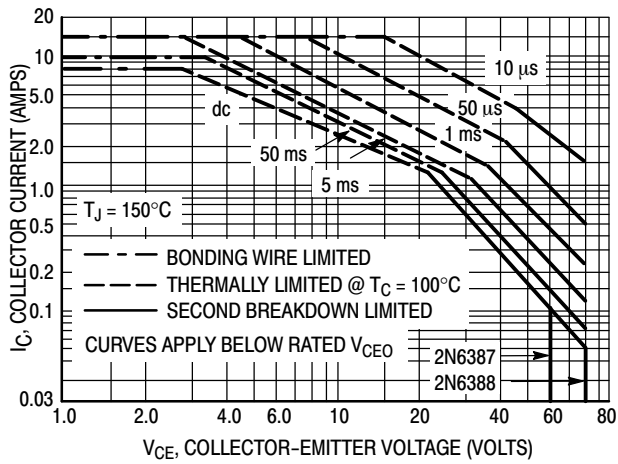


Figure 5. Active-Region Safe Operating Area

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 Figure 5 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 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown

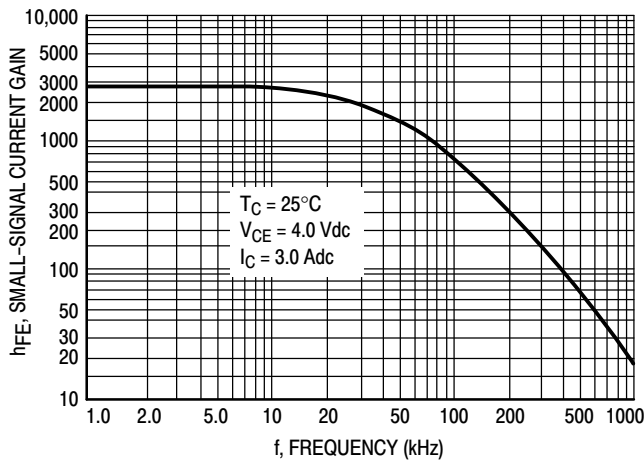


Figure 6. Small-Signal Current Gain

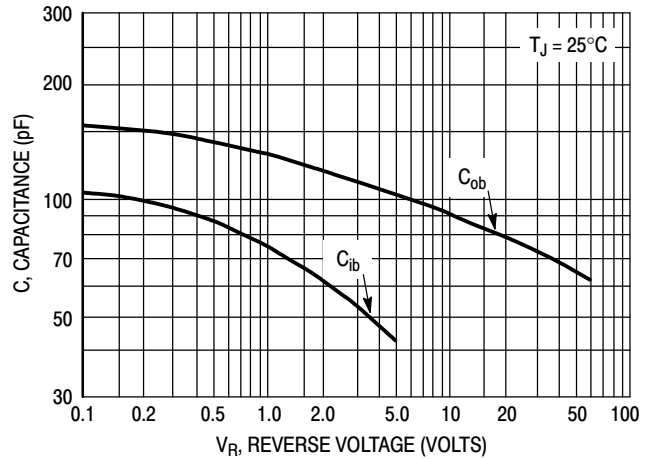


Figure 7. Capacitance

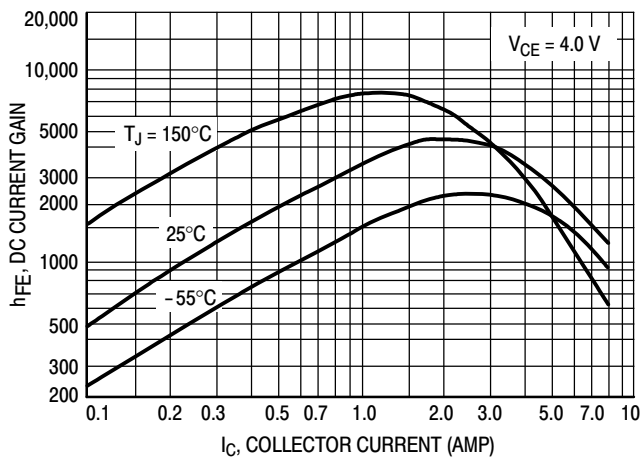


Figure 8. DC Current Gain

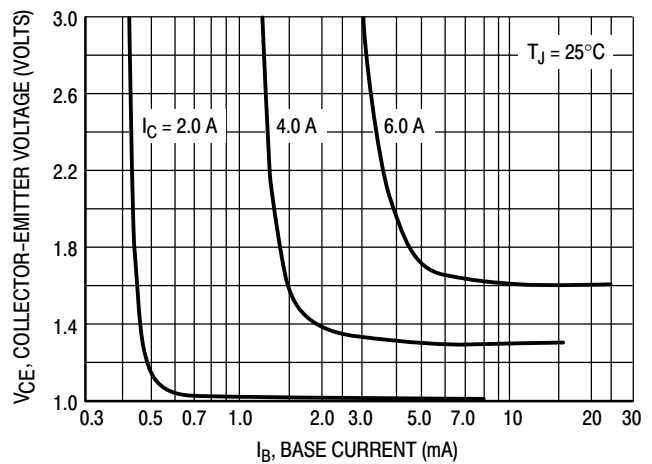


Figure 9. Collector Saturation Region

2N6387, 2N6388

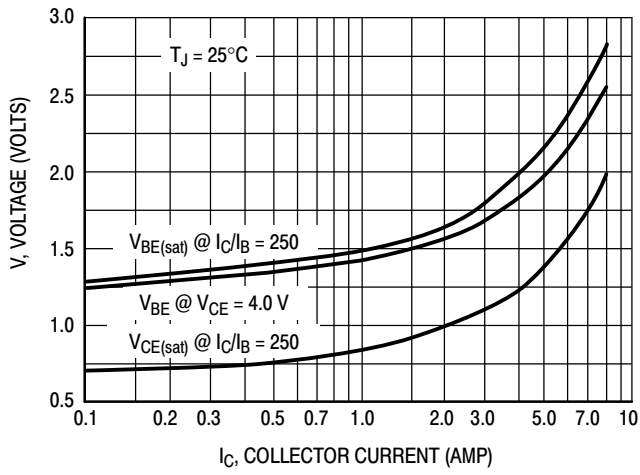


Figure 10. "On" Voltages

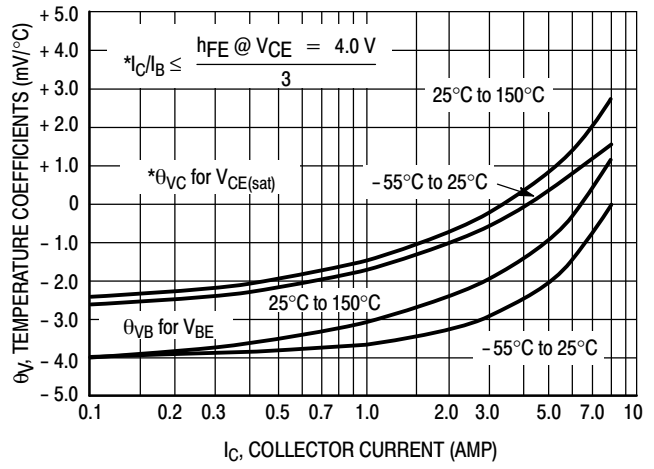


Figure 11. Temperature Coefficients

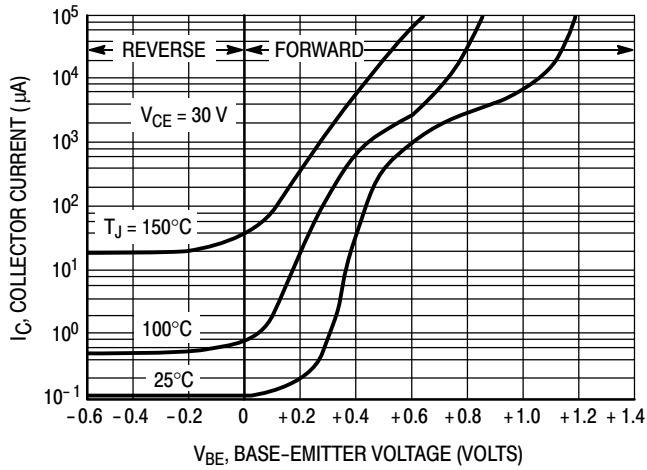


Figure 12. Collector Cut-Off Region

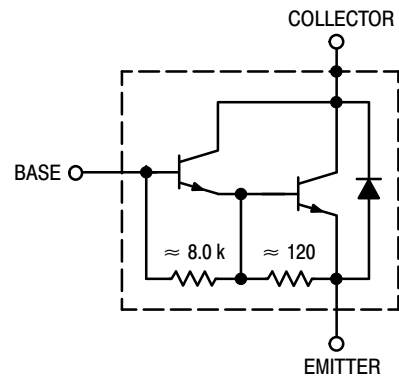
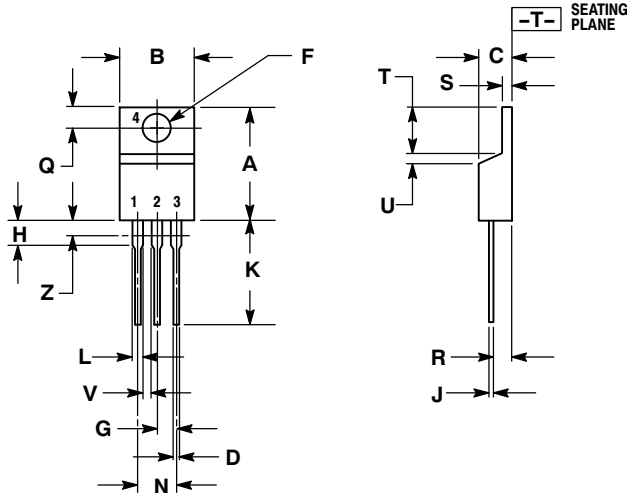


Figure 13. Darlington Schematic

2N6387, 2N6388

PACKAGE DIMENSIONS

TO-220
CASE 221A-09
ISSUE AE



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 | 0.405 | 9.66 | 10.28 |
| C | 0.160 | 0.190 | 4.07 | 4.82 |
| D | 0.025 | 0.035 | 0.64 | 0.88 |
| F | 0.142 | 0.161 | 3.61 | 4.09 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.155 | 2.80 | 3.93 |
| J | 0.014 | 0.025 | 0.36 | 0.64 |
| 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 |

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