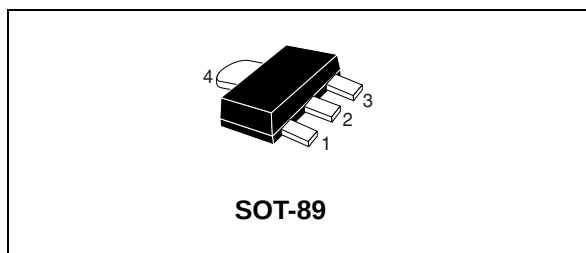
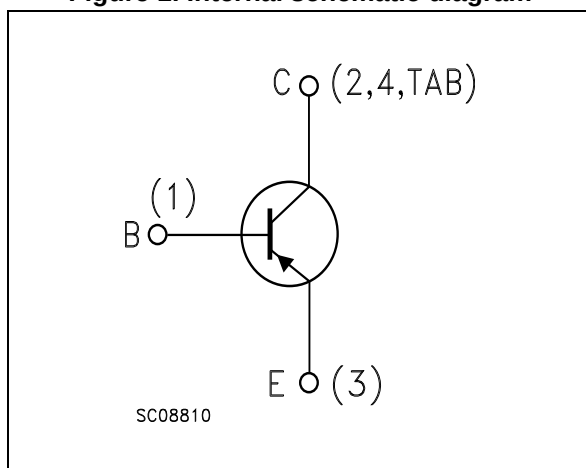


## Low voltage fast-switching PNP power transistors

Datasheet - production data



**Figure 1. Internal schematic diagram**



### Applications

- Emergency lighting
- LED
- Voltage regulation
- Relay drive

### Description

The device is PNP transistor manufactured using new "PB-HDC" (power bipolar high density current) technology. The resulting transistor shows exceptional high gain performances coupled with very low saturation voltage.

### Features

- Very low collector-emitter saturation voltage
- High current gain characteristic
- Fast-switching speed

**Table 1. Device summary**

| Order code | Marking | Package | Packaging     |
|------------|---------|---------|---------------|
| 2STF2360   | 2360    | SOT-89  | Tape and reel |

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# 1 Absolute maximum ratings

**Table 2. Absolute maximum ratings**

| Symbol    | Parameter                               | Value      | Unit |
|-----------|-----------------------------------------|------------|------|
| $V_{CBO}$ | Collector-base voltage ( $I_E = 0$ )    | -60        | V    |
| $V_{CEO}$ | Collector-emitter voltage ( $I_B = 0$ ) | -60        | V    |
| $V_{EBO}$ | Emitter-base voltage ( $I_C = 0$ )      | -6         | V    |
| $I_C$     | Collector current                       | -3         | A    |
| $I_{CM}$  | Collector peak current ( $t_p < 5$ ms)  | -5         | A    |
| $I_B$     | Base current                            | -0.2       | A    |
| $I_{BM}$  | Base peak current ( $t_p < 5$ ms)       | -0.4       | A    |
| $P_{TOT}$ | Total dissipation at $T_{amb} = 25$ °C  | 1.4        | W    |
| $T_{stg}$ | Storage temperature                     | -65 to 150 | °C   |
| $T_J$     | Max. operating junction temperature     | 150        | °C   |

**Table 3. Thermal data**

| Symbol           | Parameter                               | SOT-89 | Unit |
|------------------|-----------------------------------------|--------|------|
| $R_{thJA}^{(1)}$ | Thermal resistance junction-ambient Max | 89     | °C/W |

1. Device mounted on a PCB area of 1 cm<sup>2</sup>

## 2 Electrical characteristics

$T_{CASE} = 25^{\circ}\text{C}$ ; unless otherwise specified.

**Table 4. Electrical characteristics**

| Symbol              | Parameter                                  | Test conditions                                                                                                         | Min. | Typ. | Max. | Unit |
|---------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $I_{CBO}$           | Collector cut-off current<br>( $I_E = 0$ ) | $V_{CB} = -60\text{ V}$                                                                                                 |      |      | -100 | nA   |
| $I_{EBO}$           | Emitter cut-off current<br>( $I_C = 0$ )   | $V_{EB} = -6\text{ V}$                                                                                                  |      |      | -100 | nA   |
| $V_{BE(on)}$        | Base-emitter on voltage                    | $V_{CE} = -2\text{ V}$ $I_C = -100\text{ mA}$                                                                           | -630 | -650 | -730 | mV   |
| $V_{CE(sat)}^{(1)}$ | Collector-emitter<br>saturation voltage    | $I_C = -2\text{ A}$ $I_B = -100\text{ mA}$                                                                              |      | -200 | -320 | mV   |
|                     |                                            | $I_C = -3\text{ A}$ $I_B = -150\text{ mA}$                                                                              |      | -300 | -500 | mV   |
| $V_{BE(sat)}^{(1)}$ | Base-emitter saturation<br>voltage         | $I_C = -2\text{ A}$ $I_B = -100\text{ mA}$                                                                              |      | -0.9 | -1.2 | V    |
| $h_{FE}^{(1)}$      | DC current gain                            | $I_C = -100\text{ mA}$ $V_{CE} = -2\text{ V}$                                                                           | 200  |      |      |      |
|                     |                                            | $I_C = -1\text{ A}$ $V_{CE} = -2\text{ V}$                                                                              | 160  |      | 400  |      |
| $t_d$               | Resistive load<br>Delay time               | $I_C = -3\text{ A}$ $V_{CC} = -10\text{ V}$<br>$I_{B(on)} = -I_{B(off)} = -300\text{ mA}$<br>$V_{BE(off)} = 5\text{ V}$ |      | 10   | 15   | ns   |
| $t_r$               | Rise time                                  |                                                                                                                         |      | 75   | 100  | ns   |
| $t_s$               | Storage time                               |                                                                                                                         |      | 250  | 350  | ns   |
| $t_f$               | Fall time                                  |                                                                                                                         |      | 35   | 50   | ns   |
| $f_T$               | Transition frequency                       | $I_C = -0.1\text{ A}$ $V_{CE} = -10\text{ V}$                                                                           |      | 130  |      | MHz  |

1. Pulse test: pulse duration  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$

## 2.1 Typical characteristics (curves)

Figure 2. DC current gain ( $V_{CE} = -2\text{ V}$ )

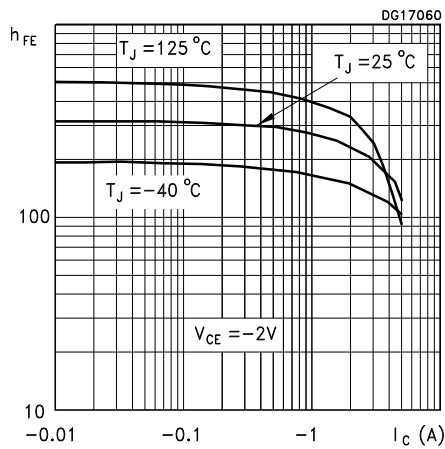


Figure 3. DC current gain ( $V_{CE} = -5\text{ V}$ )

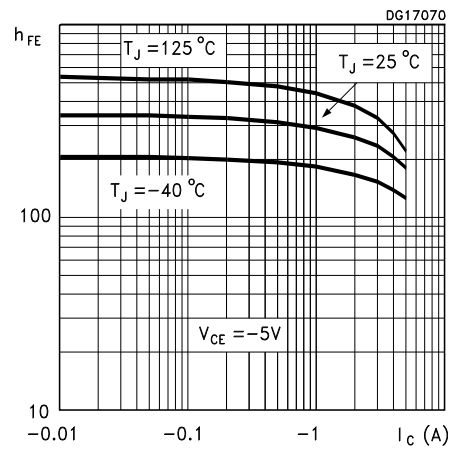


Figure 4. Collector emitter saturation voltage

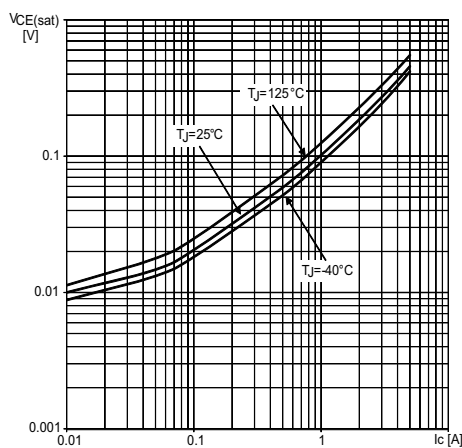


Figure 5. Base emitter saturation voltage

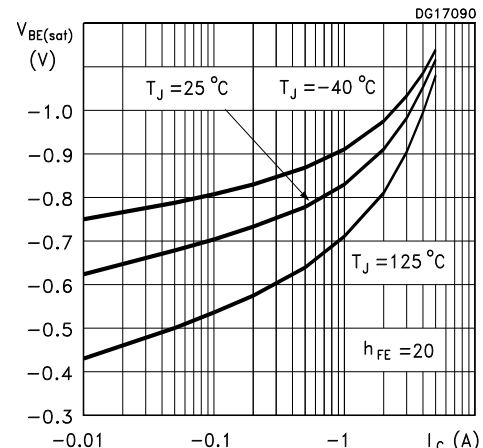


Figure 6. Resistive load switching on

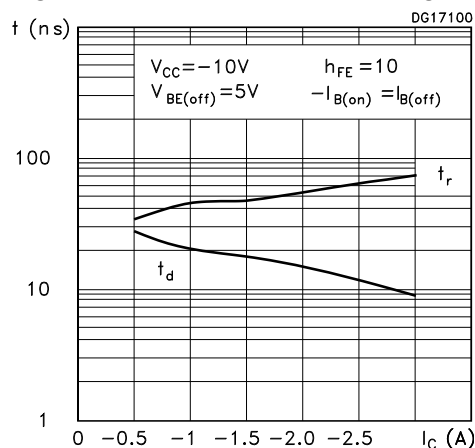
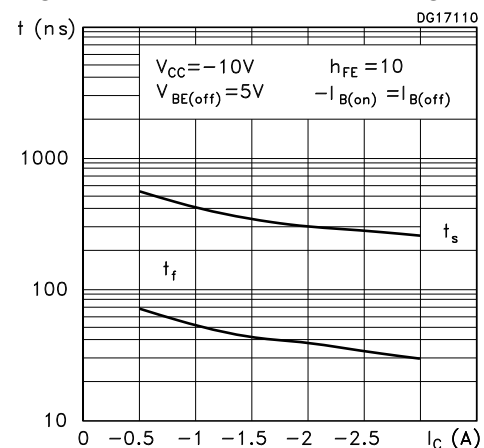
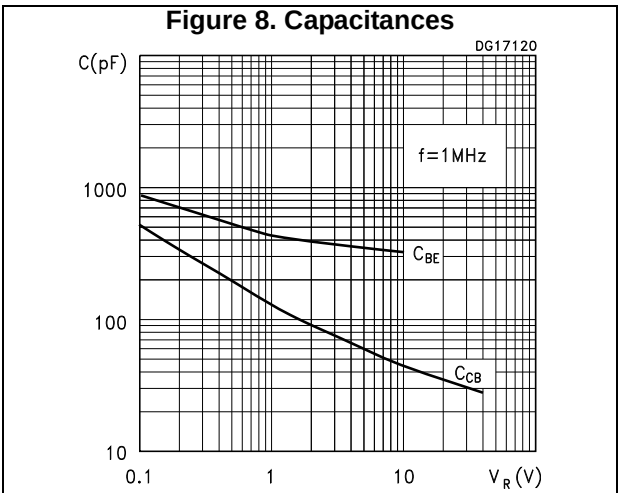


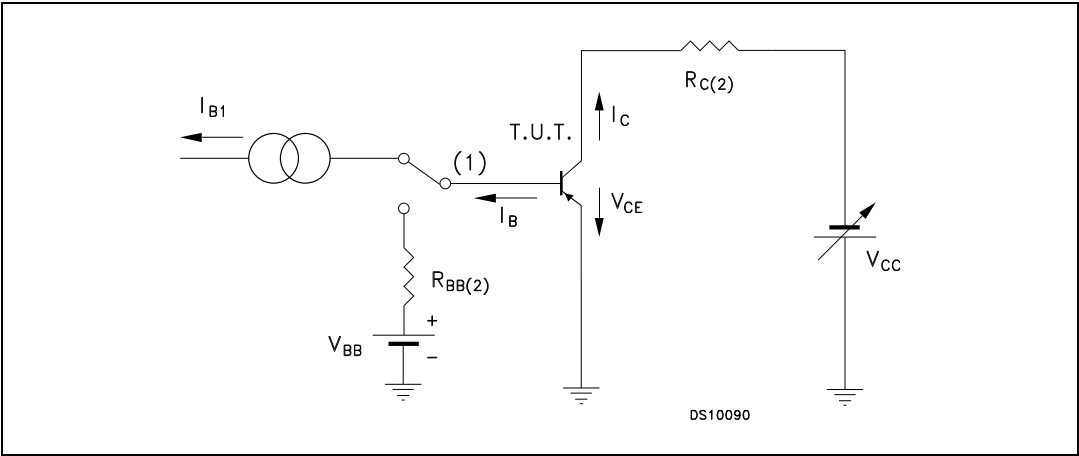
Figure 7. Resistive load switching off





## 2.2 Test circuits

**Figure 9. Resistive load switching**



1. Fast electronic switch
2. Non-inductive resistor

### 3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

#### 3.1 SOT-89

Figure 10. SOT-89 package outline

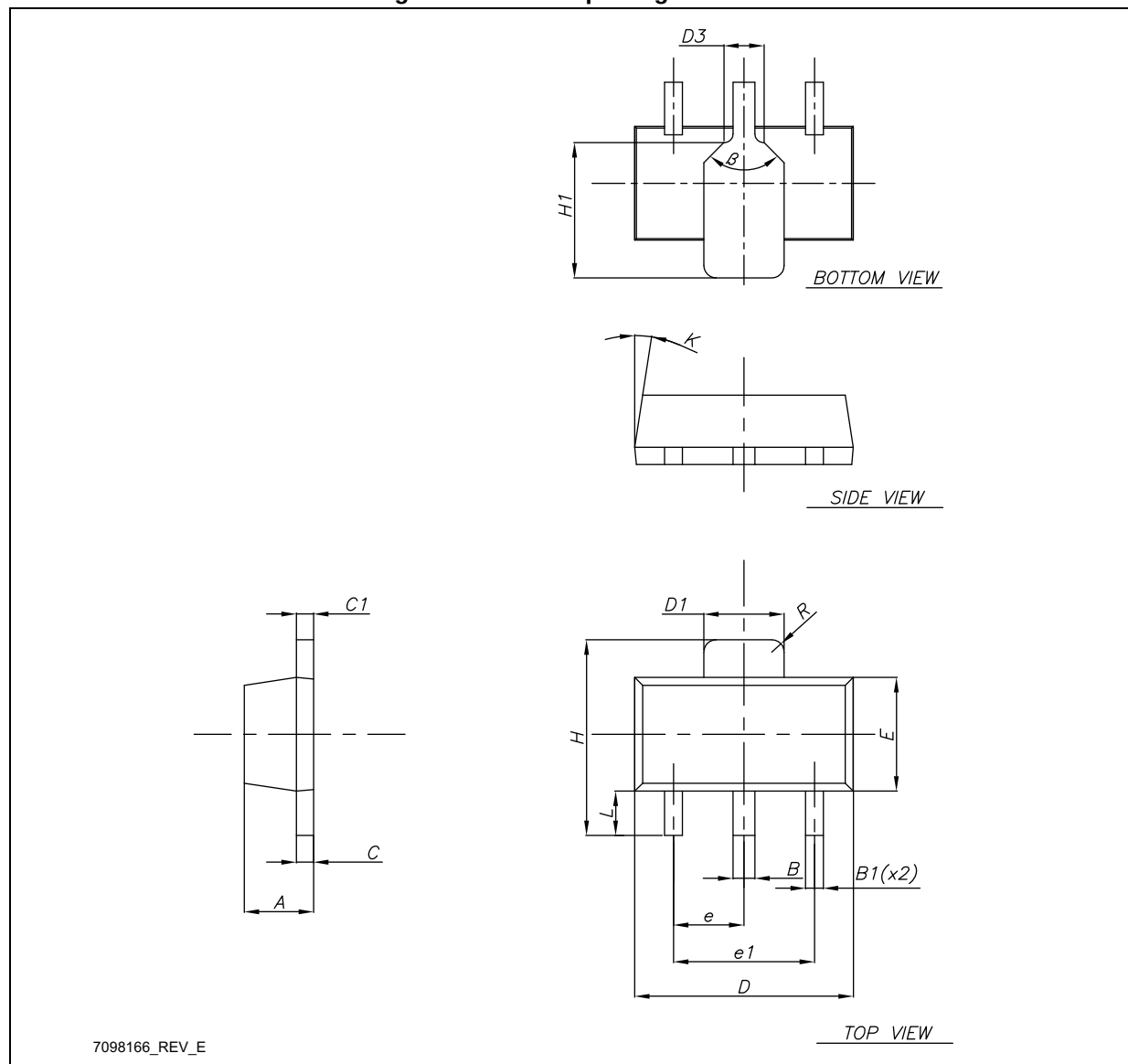
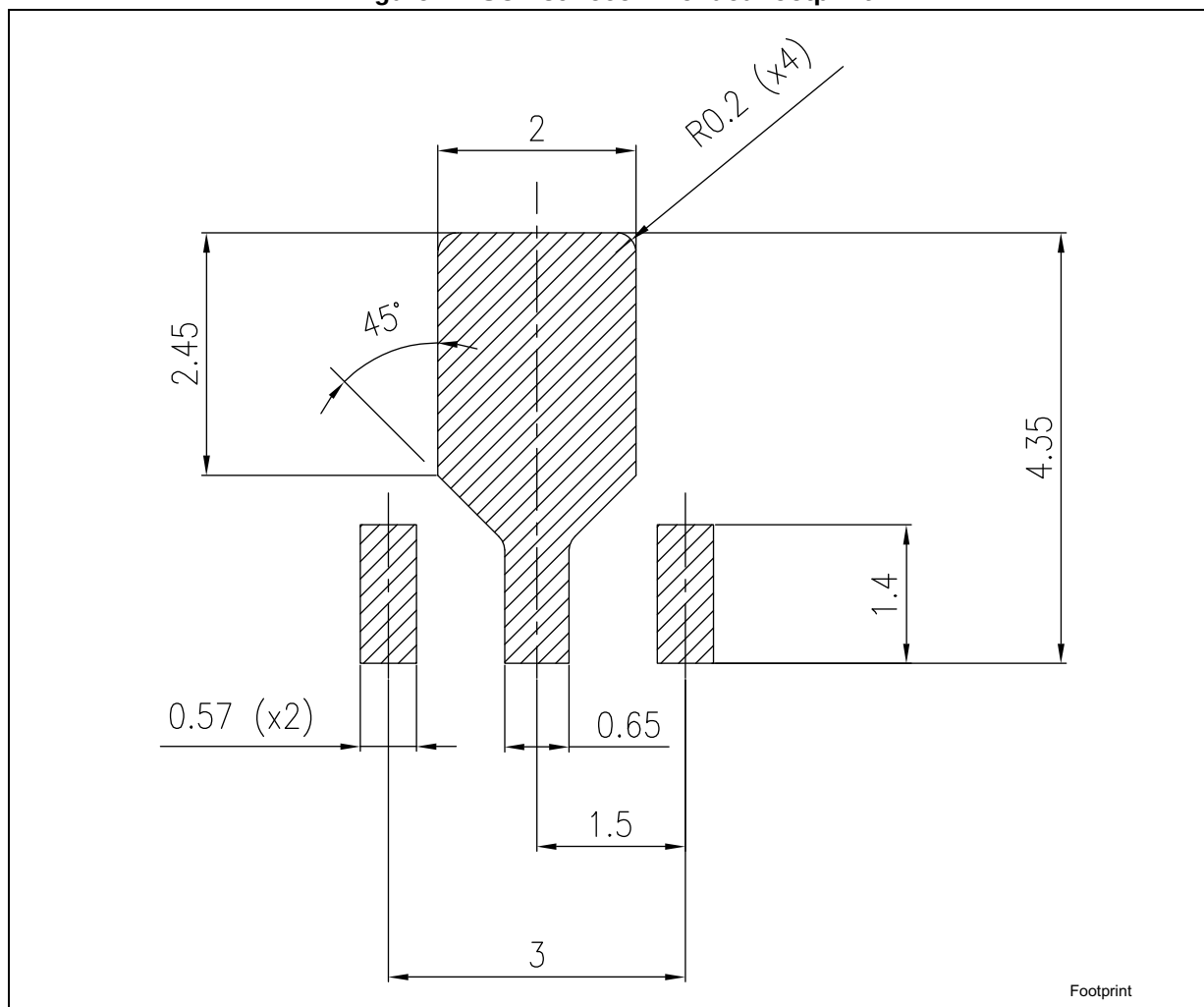


Table 5. SOT-89 mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    | 1.40 |      | 1.60 |
| B    | 0.44 |      | 0.56 |
| B1   | 0.36 |      | 0.48 |
| C    | 0.35 |      | 0.44 |
| C1   | 0.35 |      | 0.44 |
| D    | 4.40 |      | 4.60 |
| D1   | 1.62 |      | 1.83 |
| D3   |      | 0.90 |      |
| E    | 2.29 |      | 2.60 |
| e    | 1.42 |      | 1.57 |
| e1   | 2.92 |      | 3.07 |
| H    | 3.94 |      | 4.25 |
| H1   | 2.70 |      | 3.10 |
| K    | 1°   |      | 8°   |
| L    | 0.89 |      | 1.20 |
| R    |      | 0.25 |      |
| b    |      | 90°  |      |



Figure 11. SOT-89 recommended footprint



## 4 Revision history

**Table 6. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13-Sep-2006 | 1        | Initial release                                                                                                                                                                                                                                                                                                                                                                            |
| 02-Mar-2007 | 2        | New graphics have been added                                                                                                                                                                                                                                                                                                                                                               |
| 23-Jan-2009 | 3        | Updated mechanical data                                                                                                                                                                                                                                                                                                                                                                    |
| 09-Oct-2009 | 4        | Added 2STD2360T4 in TO-252 (DPAK) package                                                                                                                                                                                                                                                                                                                                                  |
| 14-Oct-2009 | 5        | Modified <a href="#">Table 1 on page 1</a> .                                                                                                                                                                                                                                                                                                                                               |
| 05-Dec-2014 | 6        | Removed SOT-223 and TO-250 (DPAK) packages.<br>Update description in cover page, <a href="#">Table 1: Device summary</a> ,<br><a href="#">Section 1: Absolute maximum ratings</a> , <a href="#">Table 4: Electrical characteristics</a> , <a href="#">Section 2.1: Typical characteristics (curves)</a> and<br><a href="#">Section 3: Package mechanical data</a> .<br>Minor text changes. |

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