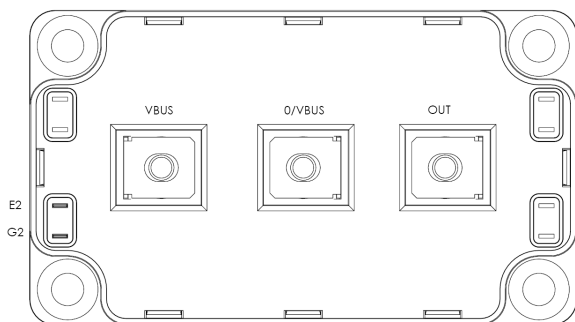
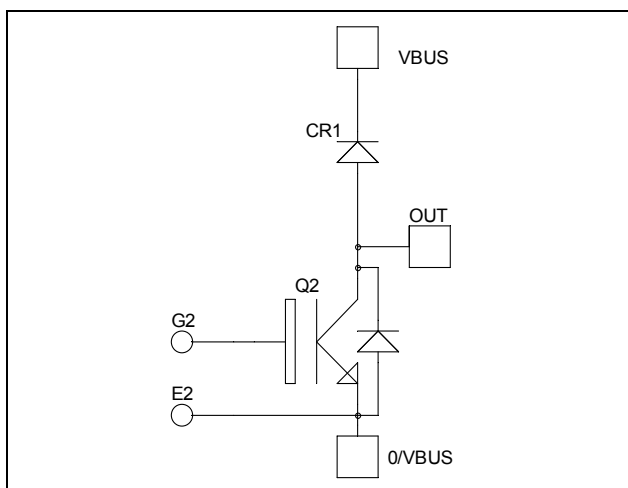


## Boost chopper NPT IGBT Power Module

**$V_{CES} = 600V$**   
 **$I_C = 350A @ T_c = 80^\circ C$**



### Application

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

### Features

- Non Punch Through (NPT) Fast IGBT
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 100 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
- High level of integration

### Benefits

- Outstanding performance at high frequency operation
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive  $T_C$  of  $V_{CEsat}$
- Low profile
- RoHS compliant

### Absolute maximum ratings

| Symbol    | Parameter                             | Max ratings         | Unit        |
|-----------|---------------------------------------|---------------------|-------------|
| $V_{CES}$ | Collector - Emitter Breakdown Voltage | 600                 | V           |
| $I_C$     | Continuous Collector Current          | $T_c = 25^\circ C$  | A           |
|           |                                       | $T_c = 80^\circ C$  |             |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^\circ C$  | 1225        |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V           |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^\circ C$  | 1562        |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 150^\circ C$ | 800A @ 600V |

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

**All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified**

### Electrical Characteristics

| Symbol        | Characteristic                       | Test Conditions                  | Min                       | Typ | Max       | Unit          |
|---------------|--------------------------------------|----------------------------------|---------------------------|-----|-----------|---------------|
| $I_{CES}$     | Zero Gate Voltage Collector Current  | $V_{GE} = 0V$<br>$V_{CE} = 600V$ | $T_j = 25^\circ\text{C}$  |     | 200       | $\mu\text{A}$ |
|               |                                      |                                  | $T_j = 125^\circ\text{C}$ |     | 1750      |               |
| $V_{CE(sat)}$ | Collector Emitter saturation Voltage | $V_{GE} = 15V$<br>$I_C = 360A$   | $T_j = 25^\circ\text{C}$  | 2.0 | 2.5       | V             |
|               |                                      |                                  | $T_j = 125^\circ\text{C}$ | 2.2 |           |               |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 4mA$     | 3                         |     | 5         | V             |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = \pm 20V, V_{CE} = 0V$  |                           |     | $\pm 300$ | nA            |

### Dynamic Characteristics

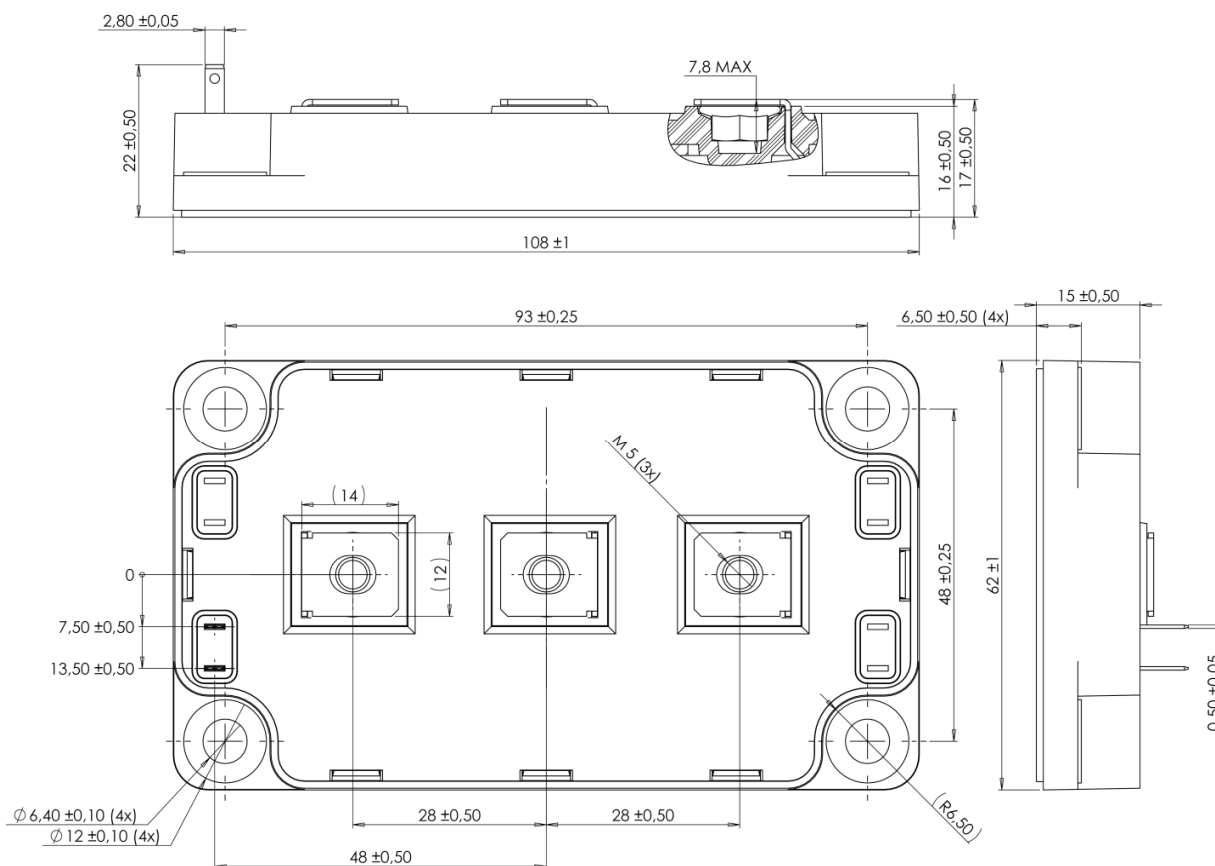
| Symbol       | Characteristic               | Test Conditions                                    | Min                       | Typ  | Max | Unit |
|--------------|------------------------------|--|---------------------------|------|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0V$                                      |                           | 17.2 |     | nF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25V$                                     |                           | 1.88 |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1MHz$   |                           | 1.6  |     |      |
| $Q_g$        | Total gate Charge            | $V_{GE} = 15V$                                     |                           | 1320 |     | nC   |
| $Q_{ge}$     | Gate – Emitter Charge        | $V_{Bus} = 300V$                                   |                           | 1160 |     |      |
| $Q_{gc}$     | Gate – Collector Charge      | $I_C = 360A$                                       |                           | 800  |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )         |                           | 26   |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = 15V$                                     |                           | 25   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $V_{Bus} = 400V$                                   |                           | 150  |     |      |
| $T_f$        | Fall Time                    | $I_C = 360A$<br>$R_G = 1.25\Omega$                 |                           | 30   |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )        |                           | 26   |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = 15V$                                     |                           | 25   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $V_{Bus} = 400V$                                   |                           | 170  |     |      |
| $T_f$        | Fall Time                    | $I_C = 360A$<br>$R_G = 1.25\Omega$                 |                           | 40   |     |      |
| $E_{on}$     | Turn-on Switching Energy     | $V_{GE} = 15V$<br>$V_{Bus} = 400V$<br>$I_C = 360A$ | $T_j = 125^\circ\text{C}$ | 17.2 |     | mJ   |
| $E_{off}$    | Turn-off Switching Energy    | $R_G = 1.25\Omega$                                 | $T_j = 125^\circ\text{C}$ | 14   |     |      |

### Chopper diode ratings and characteristics

| Symbol    | Characteristic                          | Test Conditions                           | Min                       | Typ  | Max  | Unit          |
|-----------|---|---|---------------------------|------|------|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |   | 600                       |      |      | V             |
| $I_{RM}$  | Maximum Reverse Leakage Current         | $V_R = 600V$                              | $T_j = 25^\circ\text{C}$  |      | 750  | $\mu\text{A}$ |
|           |   |   | $T_j = 125^\circ\text{C}$ |      | 1500 |               |
| $I_F$     | DC Forward Current                      | $T_c = 80^\circ\text{C}$                  |                           | 400  |      | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 400A$                              |                           | 1.6  | 1.8  | V             |
|           |   | $I_F = 800A$                              |                           | 1.9  |      |               |
|           |   | $I_F = 400A$<br>$T_j = 125^\circ\text{C}$ |                           | 1.4  |      |               |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 400A$<br>$V_R = 400V$              | $T_j = 25^\circ\text{C}$  | 180  |      | ns            |
|           |   | $di/dt = 800A/\mu s$                      | $T_j = 125^\circ\text{C}$ | 220  |      |               |
| $Q_{rr}$  | Reverse Recovery Charge                 | $T_j = 25^\circ\text{C}$                  |                           | 1560 |      | nC            |
|           |   | $T_j = 125^\circ\text{C}$                 |                           | 5800 |      |               |

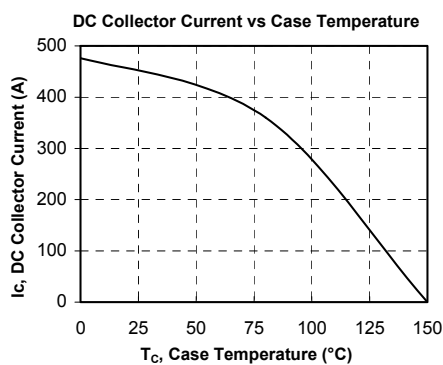
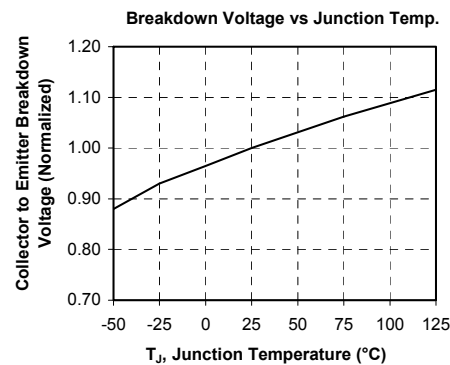
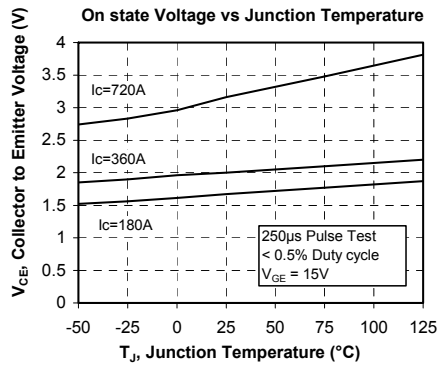
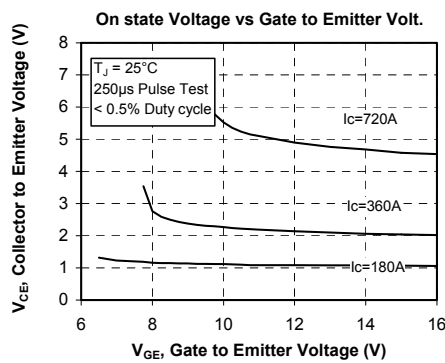
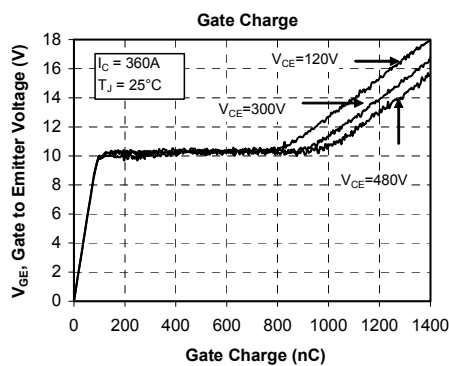
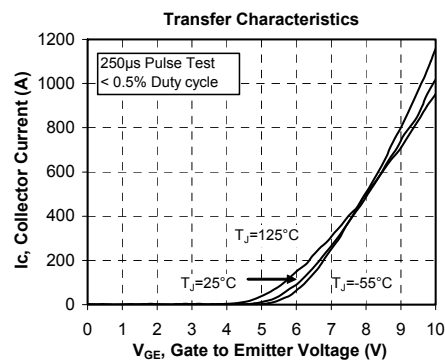
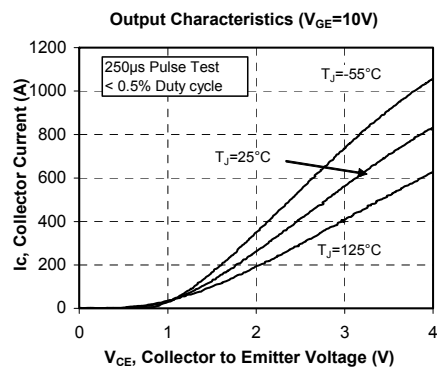
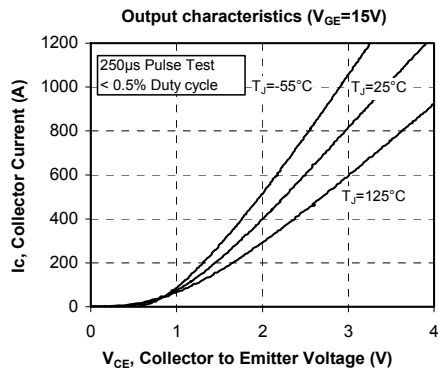
**Thermal and package characteristics**

| Symbol            | Characteristic   |               | Min  | Typ | Max  | Unit |
|-------------------|--|---------------|------|-----|------|------|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance                            | IGBT          |      |     | 0.08 | °C/W |
|                   |  | Diode         |      |     | 0.16 |      |
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz |               | 4000 |     |      | V    |
| T <sub>J</sub>    | Operating junction temperature range                           |               | -40  |     | 150  | °C   |
| T <sub>STG</sub>  | Storage Temperature Range                                      |               | -40  |     | 125  |      |
| T <sub>C</sub>    | Operating Case Temperature                                     |               | -40  |     | 100  |      |
| Torque            | Mounting torque  | To heatsink   | M6   | 3   | 5    | N.m  |
|                   |  | For terminals | M5   | 2   | 3.5  |      |
| Wt                | Package Weight   |               |      |     | 300  | g    |

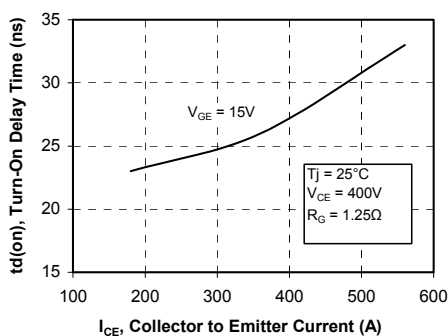
**SP6 Package outline (dimensions in mm)**


See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

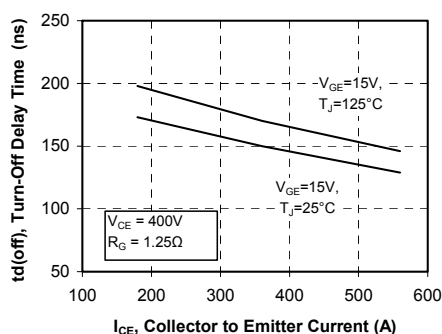
## Typical Performance Curve



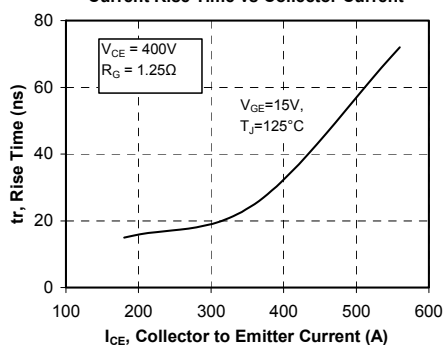
Turn-On Delay Time vs Collector Current



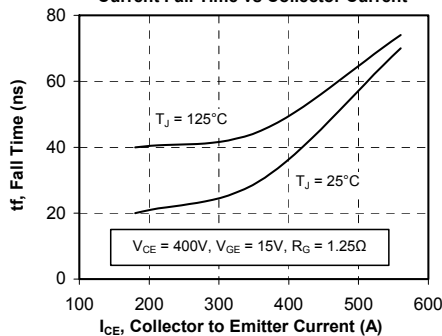
Turn-Off Delay Time vs Collector Current



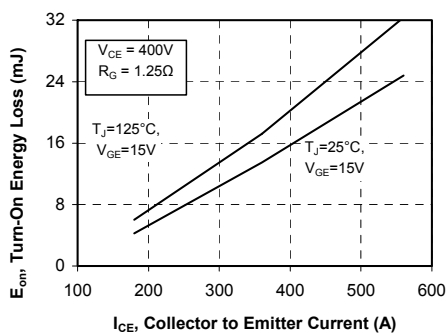
Current Rise Time vs Collector Current



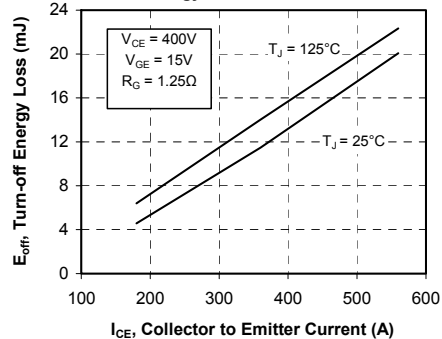
Current Fall Time vs Collector Current



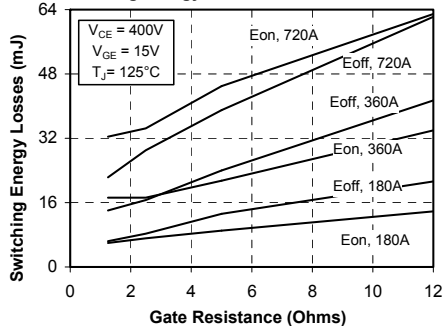
Turn-On Energy Loss vs Collector Current



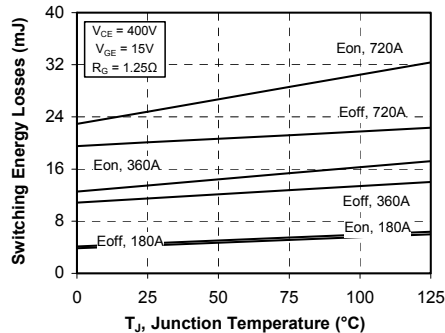
Turn-Off Energy Loss vs Collector Current

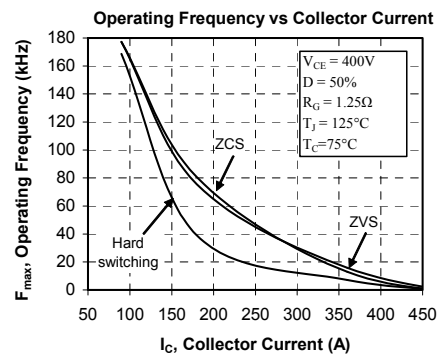
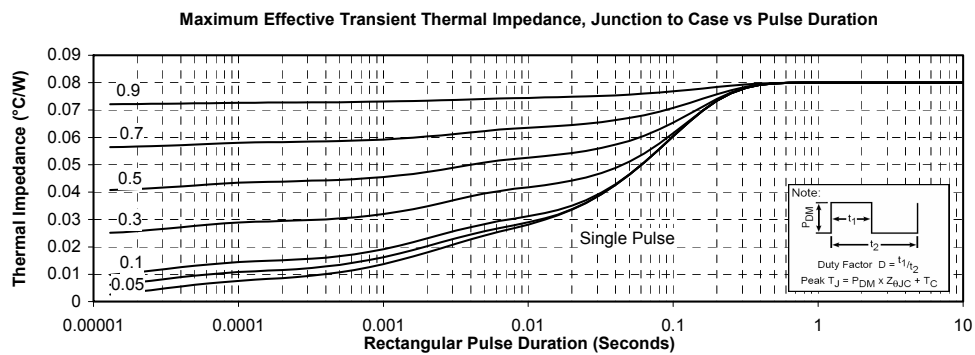
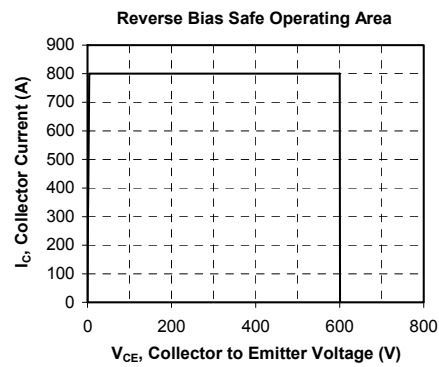
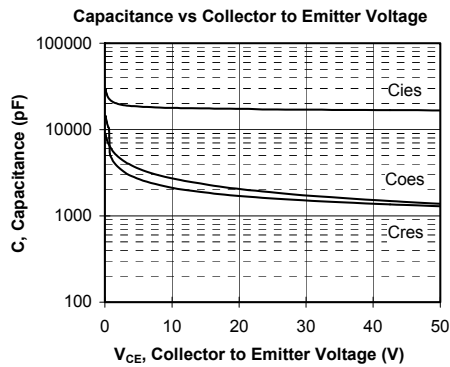


Switching Energy Losses vs Gate Resistance



Switching Energy Losses vs Junction Temp.





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