

# IRL3402PBF-VB Datasheet

## N-Channel 20-V (D-S) MOSFET


**RoHS**  
 COMPLIANT

| PRODUCT SUMMARY   |                           |                        |
|-------------------|---------------------------|------------------------|
| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) <sup>a</sup> |
| 20                | 0.004@ $V_{GS} = 4.5$ V   | 100                    |
|                   | 0.005@ $V_{GS} = 2.5$ V   | 95                     |

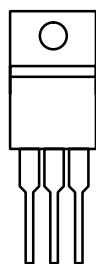
### FEATURES

- Trench Power MOSFET
- 100 %  $R_g$  and UIS Tested
- Compliant to RoHS Directive 2011/65/EU

### APPLICATIONS

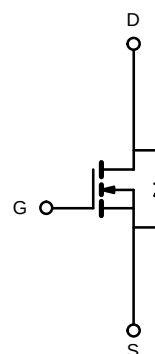
- OR-ing
- Server
- DC/DC

TO-220AB



G D S

Top View



N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) |                           |                |                  |                  |
|-----------------------------------------------------------------------------|---------------------------|----------------|------------------|------------------|
| Parameter                                                                   |                           | Symbol         | Limit            | Unit             |
| Drain-Source Voltage                                                        |                           | $V_{DS}$       | 20               | V                |
| Gate-Source Voltage                                                         |                           | $V_{GS}$       | $\pm 12$         |                  |
| Continuous Drain Current ( $T_J = 175^\circ\text{C}$ )                      | $T_C = 25^\circ\text{C}$  | $I_D$          | 100              | A                |
|                                                                             | $T_C = 100^\circ\text{C}$ |                | 85               |                  |
| Pulsed Drain Current                                                        |                           | $I_{DM}$       | 260              |                  |
| Avalanche Current                                                           |                           | $I_{AR}$       | 35               |                  |
| Repetitive Avalanche Energy <sup>b</sup>                                    |                           | $E_{AR}$       | 45               | mJ               |
| Power Dissipation                                                           |                           | $P_D$          | 125 <sup>a</sup> | W                |
| Operating Junction and Storage Temperature Range                            |                           | $T_J, T_{stg}$ | -55 to 175       | $^\circ\text{C}$ |

| THERMAL RESISTANCE RATINGS |                                 |            |       |                    |
|----------------------------|---------------------------------|------------|-------|--------------------|
| Parameter                  |                                 | Symbol     | Limit | Unit               |
| Junction-to-Ambient        | PCB Mount (TO-263) <sup>c</sup> | $R_{thJA}$ | 40    | $^\circ\text{C/W}$ |
|                            | Free Air (TO-220AB)             |            | 62.5  |                    |
| Junction-to-Case           |                                 | $R_{thJC}$ | 1.25  |                    |

Notes:

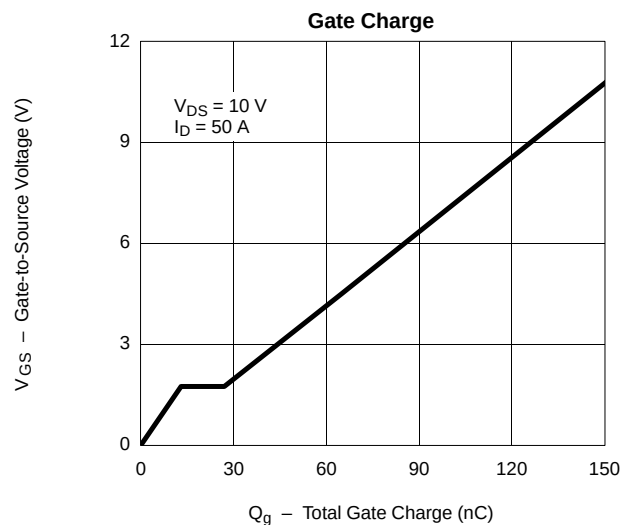
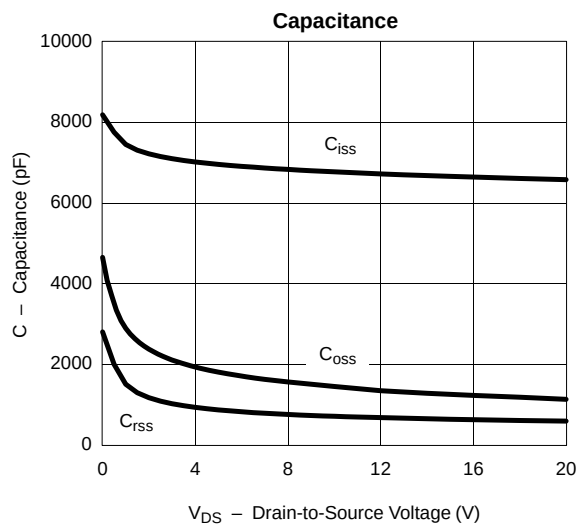
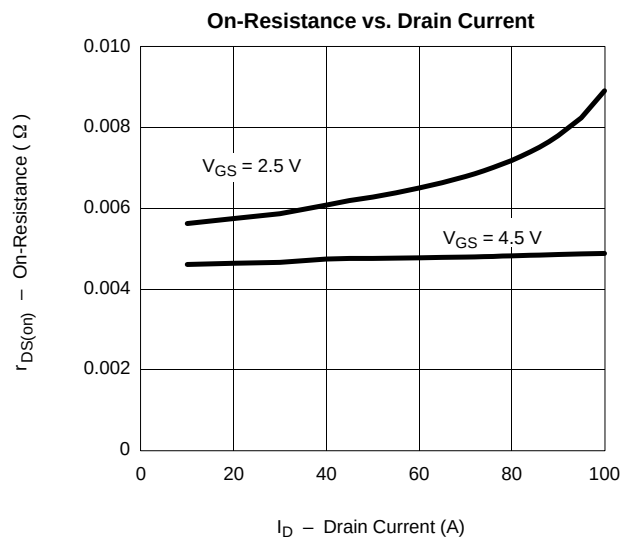
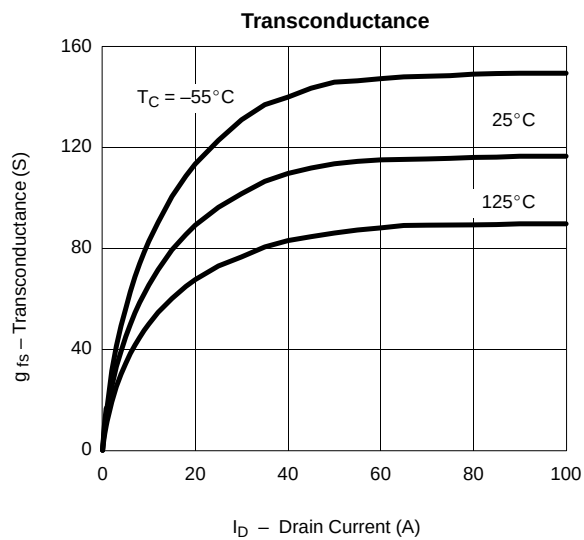
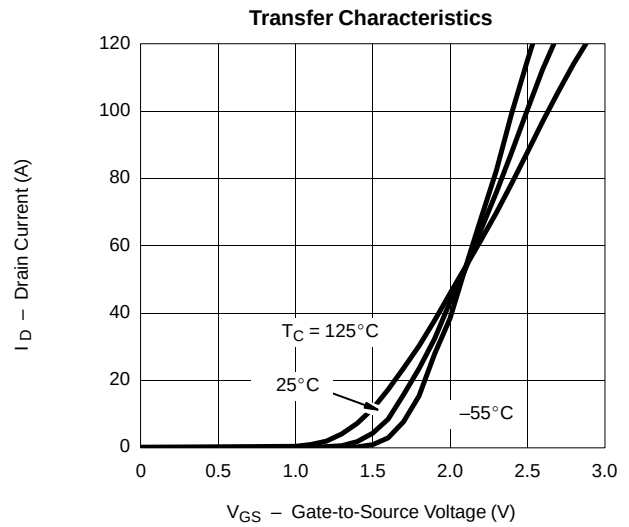
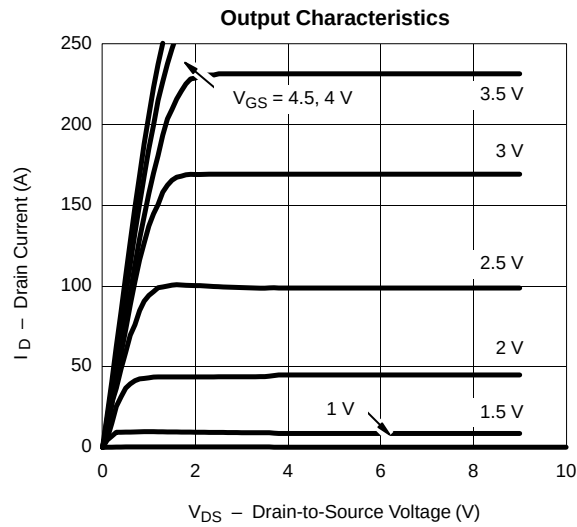
- See SOA curve for voltage derating.
- Duty cycle  $\leq 1\%$ .
- When mounted on 1" square PCB (FR-4 material).

| MOSFET SPECIFICATIONS (T <sub>J</sub> =25 °C UNLESS OTHERWISE NOTED)                |                      |                                                                                                                            |     |       |      |      |
|-------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------|-----|-------|------|------|
| Parameter                                                                           | Symbol               | Test Condition                                                                                                             | Min | Typ   | Max  | Unit |
| Static                                                                              |                      |                                                                                                                            |     |       |      |      |
| Drain-Source Breakdown Voltage                                                      | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                                                                             | 20  |       |      | V    |
| Gate Threshold Voltage                                                              | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 250 μA                                                               | 0.5 |       | 1.5  |      |
| Gate-Body Leakage                                                                   | I <sub>GSS</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±12 V                                                                             |     |       | ±100 | nA   |
| Zero Gate Voltage Drain Current                                                     | I <sub>DSS</sub>     | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V                                                                              |     |       | 1    | μA   |
|                                                                                     |                      | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C                                                      |     |       | 50   |      |
|                                                                                     |                      | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175°C                                                      |     |       | 150  |      |
| On-State Drain Current <sup>a</sup>                                                 | I <sub>D(on)</sub>   | V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 4.5 V                                                                             | 120 |       |      | A    |
| Drain-Source On-State Resistance <sup>a</sup>                                       | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A                                                                             |     | 0.004 |      | Ω    |
|                                                                                     |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 125°C                                                     |     | 0.007 |      |      |
|                                                                                     |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 175°C                                                     |     | 0.010 |      |      |
|                                                                                     |                      | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 20 A                                                                             |     | 0.005 |      |      |
| Forward Transconductance <sup>a</sup>                                               | g <sub>fs</sub>      | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 30 A                                                                               | 20  |       |      | S    |
| Dynamic <sup>b</sup>                                                                |                      |                                                                                                                            |     |       |      |      |
| Input Capacitance                                                                   | C <sub>iss</sub>     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 20 V, f = 1 MHz                                                                   |     | 6000  |      | pF   |
| Output Capacitance                                                                  | C <sub>oss</sub>     |                                                                                                                            |     | 1100  |      |      |
| Reversen Transfer Capacitance                                                       | C <sub>rss</sub>     |                                                                                                                            |     | 600   |      |      |
| Total Gate Charge <sup>c</sup>                                                      | Q <sub>g</sub>       | V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 85 A                                                     |     | 65    | 130  | nC   |
| Gate-Source Charge <sup>c</sup>                                                     | Q <sub>gs</sub>      |                                                                                                                            |     | 13    |      |      |
| Gate-Drain Charge <sup>c</sup>                                                      | Q <sub>gd</sub>      |                                                                                                                            |     | 14    |      |      |
| Turn-On Delay Time <sup>c</sup>                                                     | t <sub>d(on)</sub>   | V <sub>DD</sub> = 10 V, R <sub>L</sub> = 0.12 Ω<br>I <sub>D</sub> ≈ 85 A, V <sub>GEN</sub> = 4.5 V, R <sub>G</sub> = 2.5 Ω |     | 25    | 40   | ns   |
| Rise Time <sup>c</sup>                                                              | t <sub>r</sub>       |                                                                                                                            |     | 120   | 180  |      |
| Turn-Off Delay Time <sup>c</sup>                                                    | t <sub>d(off)</sub>  |                                                                                                                            |     | 80    | 120  |      |
| Fall Time <sup>c</sup>                                                              | t <sub>f</sub>       |                                                                                                                            |     | 100   | 150  |      |
| Source-Drain Diode Ratings and Characteristics (T <sub>C</sub> = 25°C) <sup>b</sup> |                      |                                                                                                                            |     |       |      |      |
| Pulsed Current                                                                      | I <sub>SM</sub>      |                                                                                                                            |     |       | 240  | A    |
| Forward Voltage <sup>a</sup>                                                        | V <sub>SD</sub>      | I <sub>F</sub> = 100 A, V <sub>GS</sub> = 0 V                                                                              |     | 1.2   | 1.5  | V    |
| Reverse Recovery Time                                                               | t <sub>rr</sub>      | I <sub>F</sub> = 50 A, di/dt = 100 A/μs                                                                                    |     | 45    | 100  | ns   |

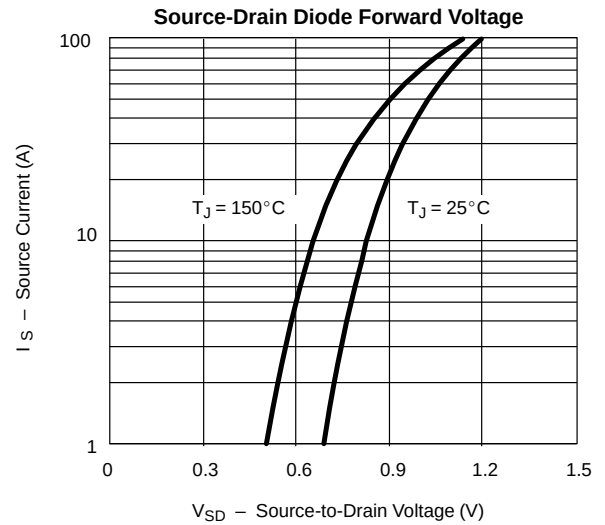
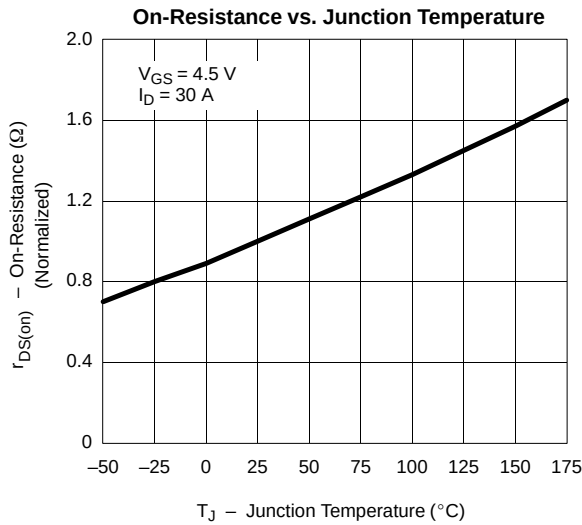
Notes:

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.  
 b. Guaranteed by design, not subject to production testing.  
 c. Independent of operating temperature.

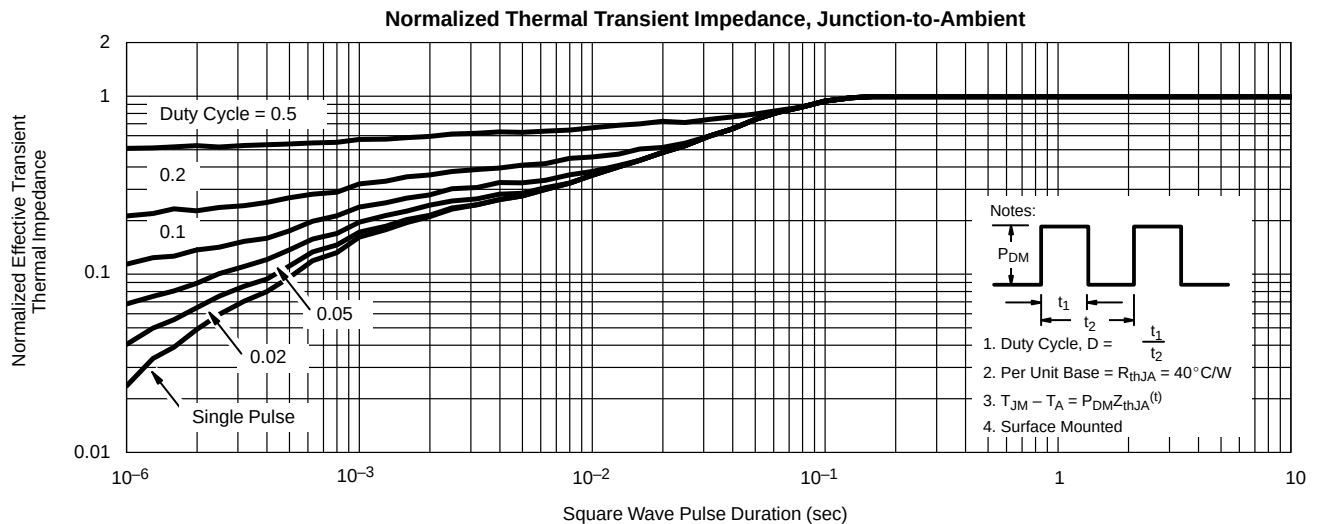
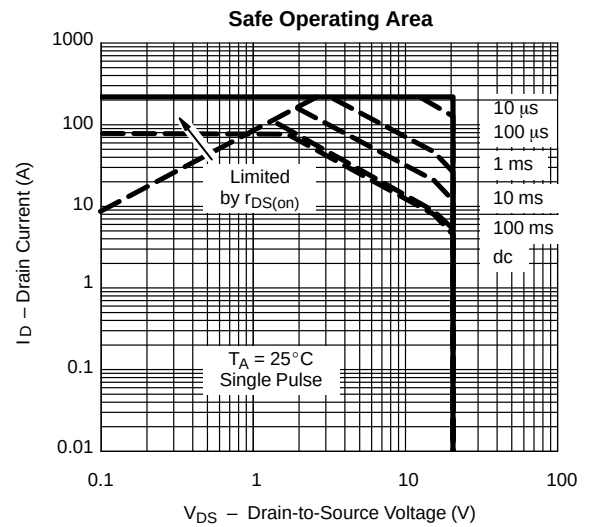
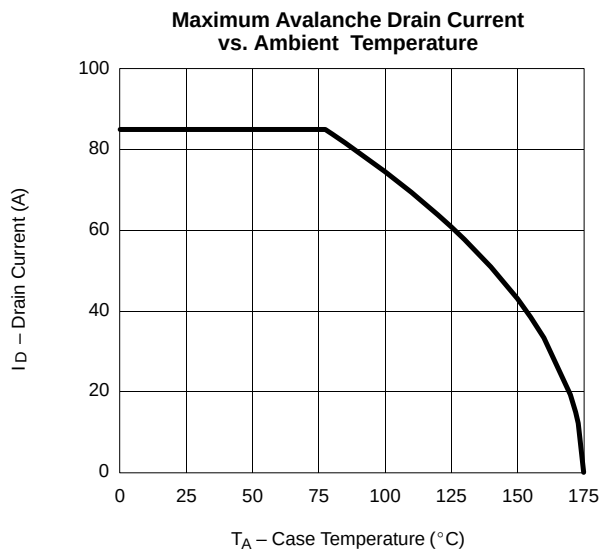
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**



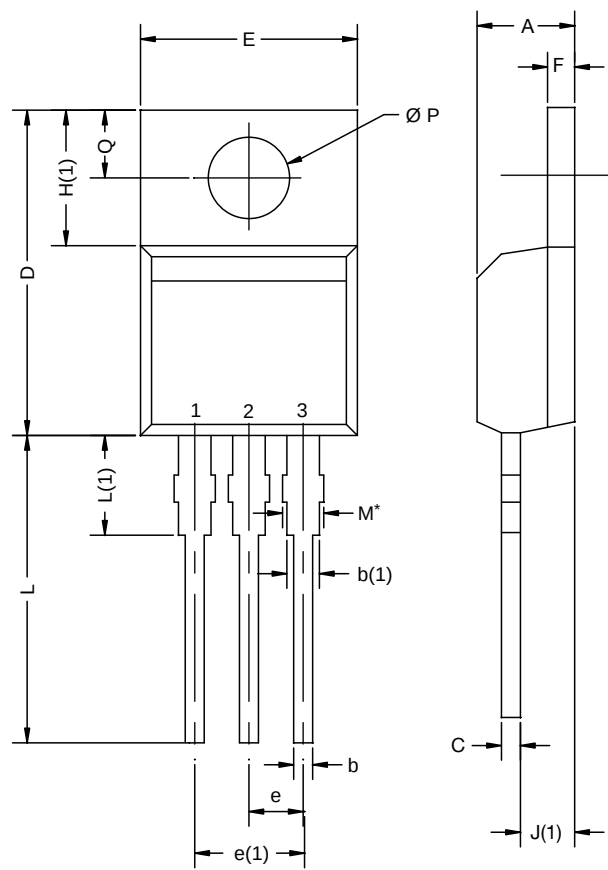
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**



**THERMAL RATINGS**



TO-220AB



| DIM. | MILLIMETERS |       | INCHES |       |
|------|-------------|-------|--------|-------|
|      | MIN.        | MAX.  | MIN.   | MAX.  |
| A    | 4.25        | 4.65  | 0.167  | 0.183 |
| b    | 0.69        | 1.01  | 0.027  | 0.040 |
| b(1) | 1.20        | 1.73  | 0.047  | 0.068 |
| c    | 0.36        | 0.61  | 0.014  | 0.024 |
| D    | 14.85       | 15.49 | 0.585  | 0.610 |
| E    | 10.04       | 10.51 | 0.395  | 0.414 |
| e    | 2.41        | 2.67  | 0.095  | 0.105 |
| e(1) | 4.88        | 5.28  | 0.192  | 0.208 |
| F    | 1.14        | 1.40  | 0.045  | 0.055 |
| H(1) | 6.09        | 6.48  | 0.240  | 0.255 |
| J(1) | 2.41        | 2.92  | 0.095  | 0.115 |
| L    | 13.35       | 14.02 | 0.526  | 0.552 |
| L(1) | 3.32        | 3.82  | 0.131  | 0.150 |
| Ø P  | 3.54        | 3.94  | 0.139  | 0.155 |
| Q    | 2.60        | 3.00  | 0.102  | 0.118 |

ECN: X12-0208-Rev. N, 08-Oct-12  
DWG: 5471

**Notes**  
\* M = 1.32 mm to 1.62 mm (dimension including protrusion)  
Heatsink hole for HVM

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