

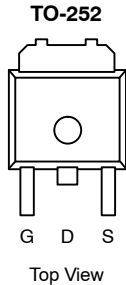
## FR3704-VB Datasheet

**N-Channel 20-V (D-S)175 °C MOSFET****PRODUCT SUMMARY**

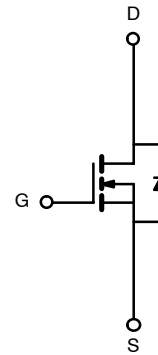
| $V_{DS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) <sup>a</sup> |
|--------------|---------------------------|------------------------|
| 20           | 0.0045 @ $V_{GS} = 4.5$ V | 100                    |
|              | 0.006 @ $V_{GS} = 2.5$ V  | 90                     |

**FEATURES**

- Trench Power MOSFET
- 175°C Maximum Junction Temperature
- 100%  $R_g$  Tested



Drain Connected to Tab



N-Channel MOSFET

**ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

| Parameter                                                 |                           | Symbol         | Limit               | Unit             |
|-----------------------------------------------------------|---------------------------|----------------|---------------------|------------------|
| Drain-Source Voltage                                      |                           | $V_{DS}$       | 20                  | V                |
| Gate-Source Voltage                                       |                           | $V_{GS}$       | $\pm 15$            |                  |
| Continuous Drain Current <sup>a</sup>                     | $T_C = 25^\circ\text{C}$  | $I_D$          | 100                 | A                |
|                                                           | $T_C = 100^\circ\text{C}$ |                | 80                  |                  |
| Pulsed Drain Current                                      |                           | $I_{DM}$       | 200                 |                  |
| Continuous Source Current (Diode Conduction) <sup>a</sup> |                           | $I_S$          | 65                  |                  |
| Maximum Power Dissipation                                 | $T_C = 25^\circ\text{C}$  | $P_D$          | 71                  | W                |
|                                                           | $T_A = 25^\circ\text{C}$  |                | 8.3 <sup>b, c</sup> |                  |
| Operating Junction and Storage Temperature Range          |                           | $T_J, T_{stg}$ | -55 to 175          | $^\circ\text{C}$ |

**THERMAL RESISTANCE RATINGS**

| Parameter                                |                  | Symbol     | Typical | Maximum | Unit               |
|------------------------------------------|------------------|------------|---------|---------|--------------------|
| Maximum Junction-to-Ambient <sup>b</sup> | $t \leq 10$ sec. | $R_{thJA}$ | 15      | 18      | $^\circ\text{C/W}$ |
|                                          | Steady State     |            | 40      | 50      |                    |
| Maximum Junction-to-Case                 |                  | $R_{thJC}$ | 1.75    | 2.1     |                    |

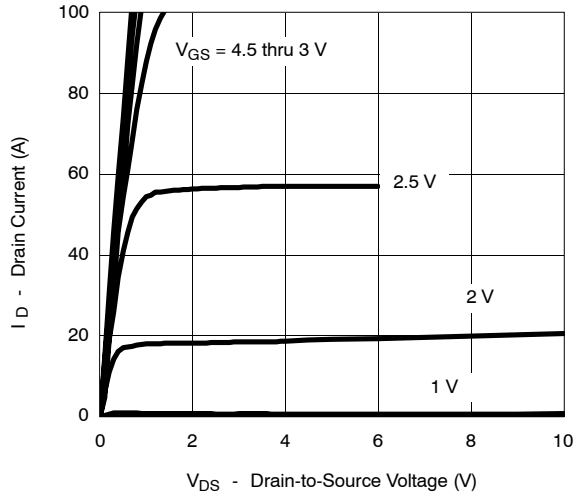
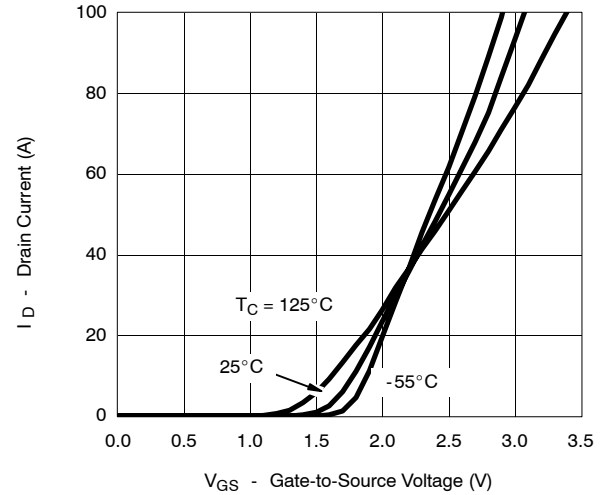
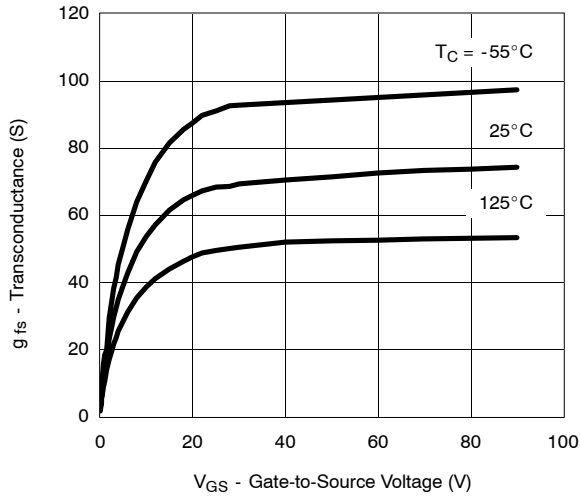
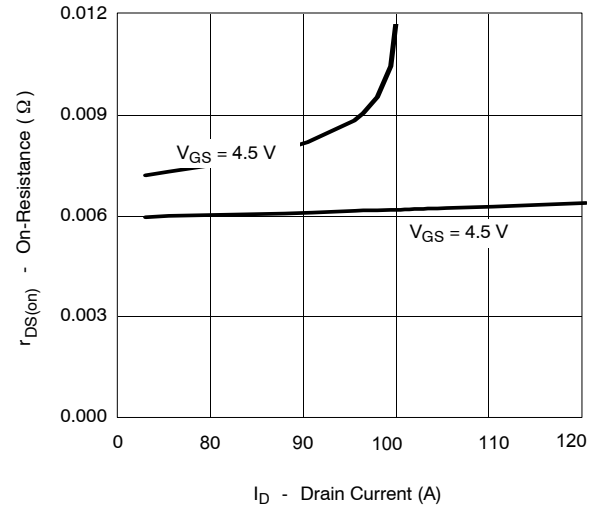
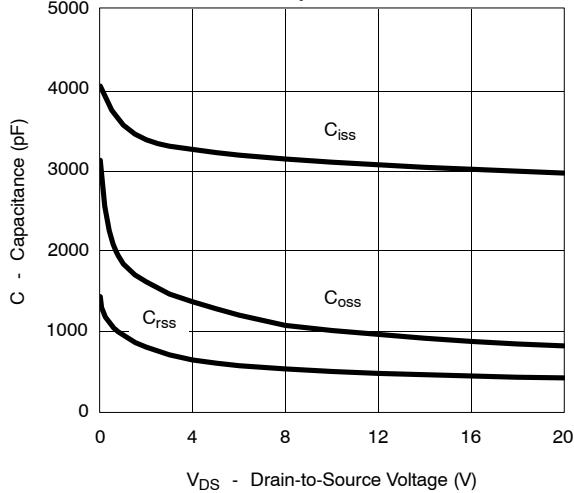
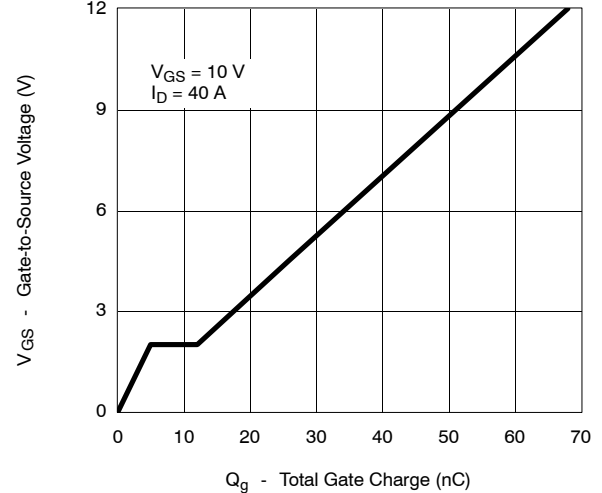
**Notes**

- a. Package Limited  
 b. Surface Mounted on 1" x 1" FR4 Board  
 c.  $t \leq 10$  sec

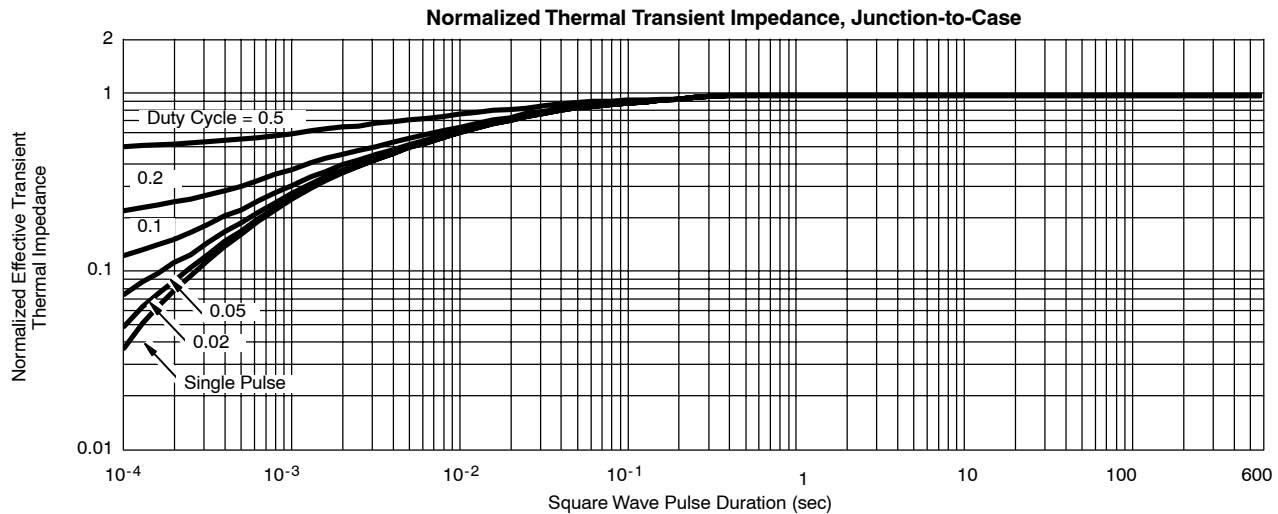
| SPECIFICATIONS (T <sub>J</sub> = 25° C UNLESS OTHERWISE NOTED)         |                      |                                                                                                                            |     |                  |       |      |
|------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------|-----|------------------|-------|------|
| Parameter                                                              | Symbol               | Test Condition                                                                                                             | Min | Typ <sup>a</sup> | 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>D</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    |      |
| On-State Drain Current <sup>b</sup>                                    | I <sub>D(on)</sub>   | V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 4.5 V                                                                             | 100 |                  |       | A    |
| Drain-Source On-State Resistance <sup>b</sup>                          | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A                                                                             |     | 0.0045           |       | Ω    |
|                                                                        |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125°C                                                     |     | 0.0055           |       |      |
|                                                                        |                      | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 20 A                                                                             |     | 0.006            |       |      |
| Forward Transconductance <sup>b</sup>                                  | g <sub>fs</sub>      | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 40 A                                                                               | 20  |                  |       | S    |
| Dynamic <sup>a</sup>                                                   |                      |                                                                                                                            |     |                  |       |      |
| Input Capacitance                                                      | C <sub>iss</sub>     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 20 V, f = 1 MHz                                                                   |     | 3660             |       | pF   |
| Output Capacitance                                                     | C <sub>oss</sub>     |                                                                                                                            |     | 730              |       |      |
| Reverse Transfer Capacitance                                           | C <sub>rss</sub>     |                                                                                                                            |     | 375              |       |      |
| 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> = 40 A                                                     |     | 26               | 35    | nC   |
| Gate-Source Charge <sup>c</sup>                                        | Q <sub>gs</sub>      |                                                                                                                            |     | 5                |       |      |
| Gate-Drain Charge <sup>c</sup>                                         | Q <sub>gd</sub>      |                                                                                                                            |     | 7                |       |      |
| Gate Resistance                                                        | R <sub>g</sub>       |                                                                                                                            | 1   |                  | 3.7   | Ω    |
| Turn-On Delay Time <sup>c</sup>                                        | t <sub>d(on)</sub>   | V <sub>DD</sub> = 10 V, R <sub>L</sub> = 0.25 Ω<br>I <sub>D</sub> ≅ 40 A, V <sub>GEN</sub> = 4.5 V, R <sub>G</sub> = 2.5 Ω |     | 20               | 35    | ns   |
| Rise Time <sup>c</sup>                                                 | t <sub>r</sub>       |                                                                                                                            |     | 120              | 190   |      |
| Turn-Off Delay Time <sup>c</sup>                                       | t <sub>d(off)</sub>  |                                                                                                                            |     | 45               | 70    |      |
| Fall Time <sup>c</sup>                                                 | t <sub>f</sub>       |                                                                                                                            |     | 20               | 35    |      |
| Source-Drain Diode Ratings and Characteristic (T <sub>C</sub> = 25° C) |                      |                                                                                                                            |     |                  |       |      |
| Pulsed Current                                                         | I <sub>SM</sub>      |                                                                                                                            |     |                  | 100   | A    |
| Diode Forward Voltage <sup>b</sup>                                     | V <sub>SD</sub>      | I <sub>F</sub> = 100 A, V <sub>GS</sub> = 0 V                                                                              |     | 1.2              | 1.5   | V    |
| Source-Drain Reverse Recovery Time                                     | t <sub>rr</sub>      | I <sub>F</sub> = 40 A, di/dt = 100 A/μs                                                                                    |     | 35               | 70    | ns   |

## Notes

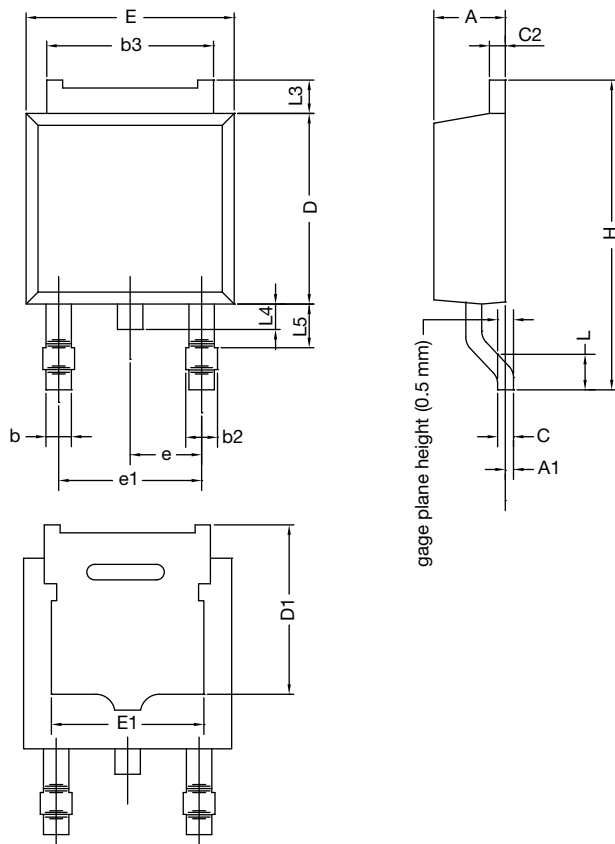
- a. Guaranteed by design, not subject to production testing.  
b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.  
c. Independent of operating temperature.

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

**Transfer Characteristics**

**Transconductance**

**On-Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**


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

**THERMAL RATINGS**


## TO-252AA CASE OUTLINE



| DIM.                            | MILLIMETERS |       | INCHES    |       |
|---------------------------------|-------------|-------|-----------|-------|
|                                 | MIN.        | MAX.  | MIN.      | MAX.  |
| A                               | 2.18        | 2.38  | 0.086     | 0.094 |
| A1                              | -           | 0.127 | -         | 0.005 |
| b                               | 0.64        | 0.88  | 0.025     | 0.035 |
| b2                              | 0.76        | 1.14  | 0.030     | 0.045 |
| b3                              | 4.95        | 5.46  | 0.195     | 0.215 |
| C                               | 0.46        | 0.61  | 0.018     | 0.024 |
| C2                              | 0.46        | 0.89  | 0.018     | 0.035 |
| D                               | 5.97        | 6.22  | 0.235     | 0.245 |
| D1                              | 5.21        | -     | 0.205     | -     |
| E                               | 6.35        | 6.73  | 0.250     | 0.265 |
| E1                              | 4.32        | -     | 0.170     | -     |
| H                               | 9.40        | 10.41 | 0.370     | 0.410 |
| e                               | 2.28 BSC    |       | 0.090 BSC |       |
| e1                              | 4.56 BSC    |       | 0.180 BSC |       |
| L                               | 1.40        | 1.78  | 0.055     | 0.070 |
| L3                              | 0.89        | 1.27  | 0.035     | 0.050 |
| L4                              | -           | 1.02  | -         | 0.040 |
| L5                              | 1.14        | 1.52  | 0.045     | 0.060 |
| ECN: X12-0247-Rev. M, 24-Dec-12 |             |       |           |       |
| DWG: 5347                       |             |       |           |       |

### Note

- Dimension L3 is for reference only.

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