

### Features

- 100% UIS and R<sub>g</sub> tested
- Advanced planar process

### Application

- Power Supply
- AC/DC LED Lighting

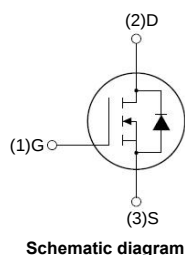
### Mechanical Data

**Case :** Molded plastic body

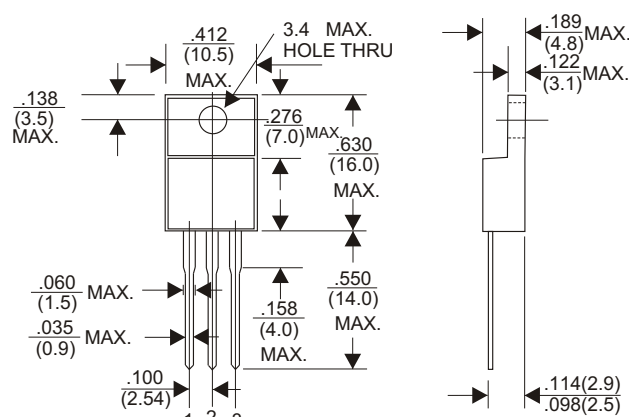
**Terminals :** Solder plated, solderable per MIL-STD-750, Method 2026

**Polarity :** As marked

**Mounting Position :** Any



### ITO-220AB(FULLY INSULATED)



### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted)

| PARAMETER                                        | SYMBOL                            | Limit        | UNIT |
|--------------------------------------------------|-----------------------------------|--------------|------|
| Drain-Source Voltage                             | V <sub>DS</sub>                   | 500          | V    |
| Gate-Source Voltage                              | V <sub>GS</sub>                   | ±30          | V    |
| Continuous Drain Current (Note 1)                | I <sub>D</sub>                    | 13           | A    |
|                                                  |                                   | 8            |      |
| Pulsed Drain Current (Note 2)                    | I <sub>DM</sub>                   | 52           | A    |
| Total Power Dissipation @ T <sub>C</sub> = 25°C  | P <sub>DTOT</sub>                 | 57           | W    |
| Single Pulse Avalanche Energy (Note 3)           | E <sub>AS</sub>                   | 608          | mJ   |
| Single Pulse Avalanche Current (Note 3)          | I <sub>AS</sub>                   | 7.8          | A    |
| Operating Junction and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | - 55 to +150 | °C   |

### THERMAL PERFORMANCE

| PARAMETER                              | SYMBOL           | Limit | UNIT |
|----------------------------------------|------------------|-------|------|
| Junction to Case Thermal Resistance    | R <sub>ΘJC</sub> | 2.2   | °C/W |
| Junction to Ambient Thermal Resistance | R <sub>ΘJA</sub> | 62    | °C/W |

**Thermal Performance Note:** R<sub>ΘJA</sub> is the sum of the junction-to-case and case-to-ambient thermal resistances. The case-thermal reference is defined at the solder mounting surface of the drain pins. R<sub>ΘJA</sub> is guaranteed by design while R<sub>ΘCA</sub> is determined by the user's board design.

# 13N50F

## ELECTRICAL SPECIFICATIONS (T<sub>A</sub> = 25°C unless otherwise noted)

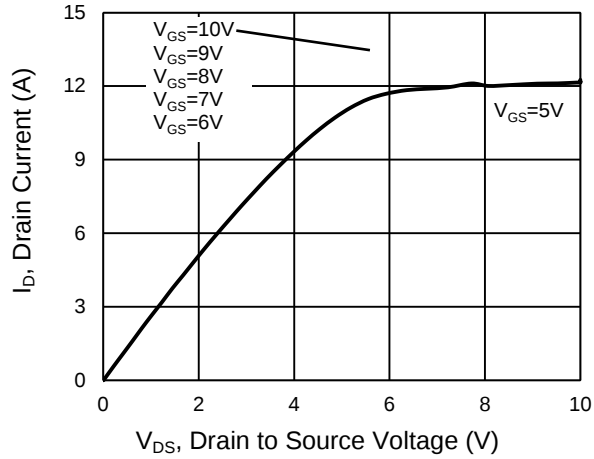
| PARAMETER                                    | CONDITIONS                                                                                   | SYMBOL              | MIN | TYP  | MAX  | UNIT |
|----------------------------------------------|----------------------------------------------------------------------------------------------|---------------------|-----|------|------|------|
| Static                                       |                                                                                              |                     |     |      |      |      |
| Drain-Source Breakdown Voltage               | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                 | BV <sub>DSS</sub>   | 500 | --   | --   | V    |
| Gate Threshold Voltage                       | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                   | V <sub>GS(TH)</sub> | 2.5 | 3    | 3.8  | V    |
| Gate Body Leakage                            | V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V                                                 | I <sub>GSS</sub>    | --  | --   | ±100 | nA   |
| Zero Gate Voltage Drain Current              | V <sub>DS</sub> = 500V, V <sub>GS</sub> = 0V                                                 | I <sub>DSS</sub>    | --  | --   | 1    | μA   |
| Drain-Source On-State Resistance<br>(Note 4) | V <sub>GS</sub> = 10V, I <sub>D</sub> = 3.3A                                                 | R <sub>DS(on)</sub> | --  | 0.37 | 0.48 | Ω    |
| Dynamic (Note 5)                             |                                                                                              |                     |     |      |      |      |
| Total Gate Charge                            | V <sub>DS</sub> = 400V, I <sub>D</sub> = 6.5A,<br>V <sub>GS</sub> = 10V                      | Q <sub>g</sub>      | --  | 39   | --   | nC   |
| Gate-Source Charge                           |                                                                                              | Q <sub>gs</sub>     | --  | 10   | --   |      |
| Gate-Drain Charge                            |                                                                                              | Q <sub>gd</sub>     | --  | 12   | --   |      |
| Input Capacitance                            | V <sub>DS</sub> = 50V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                   | C <sub>iss</sub>    | --  | 1877 | --   | pF   |
| Output Capacitance                           |                                                                                              | C <sub>oss</sub>    | --  | 128  | --   |      |
| Reverse Transfer Capacitance                 |                                                                                              | C <sub>rss</sub>    | --  | 7    | --   |      |
| Gate Resistance                              |                                                                                              | R <sub>g</sub>      | --  | 1.1  | 2.2  | Ω    |
| Switching (Note 6)                           |                                                                                              |                     |     |      |      |      |
| Turn-On Delay Time                           | V <sub>DD</sub> = 250V, R <sub>G</sub> = 5Ω,<br>I <sub>D</sub> = 6.5A, V <sub>GS</sub> = 10V | t <sub>d(on)</sub>  | --  | 11   | --   | ns   |
| Turn-On Rise Time                            |                                                                                              | t <sub>r</sub>      | --  | 21   | --   |      |
| Turn-Off Delay Time                          |                                                                                              | t <sub>d(off)</sub> | --  | 32   | --   |      |
| Turn-Off Fall Time                           |                                                                                              | t <sub>f</sub>      | --  | 22   | --   |      |
| Source-Drain Diode                           |                                                                                              |                     |     |      |      |      |
| Body-Diode Continuous Forward Current        |                                                                                              | I <sub>S</sub>      | --  | --   | 13   | A    |
| Body-Diode Pulsed Current                    |                                                                                              | I <sub>SM</sub>     | --  | --   | 52   | A    |
| Forward Voltage (Note 4)                     | I <sub>S</sub> = 6.5A, V <sub>GS</sub> = 0V                                                  | V <sub>SD</sub>     | --  | --   | 1.2  | V    |
| Reverse Recovery Time                        | I <sub>S</sub> = 6.5A                                                                        | t <sub>rr</sub>     | --  | 282  | --   | ns   |
| Reverse Recovery Charge                      | dI <sub>F</sub> /dt = 100A/μs                                                                | Q <sub>rr</sub>     | --  | 2.9  | --   | μC   |

### Notes:

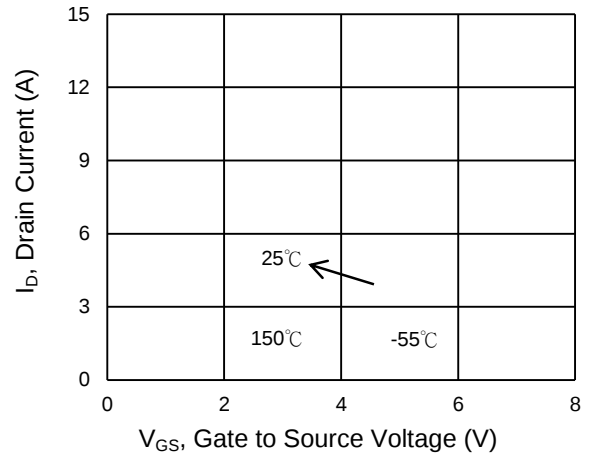
1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. L = 20mH, I<sub>AS</sub> = 7.8A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C
4. Pulse test: PW ≤ 300μs, duty cycle ≤ 2%
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

## RATING AND CHARACTERISTIC CURVES (13N50F)

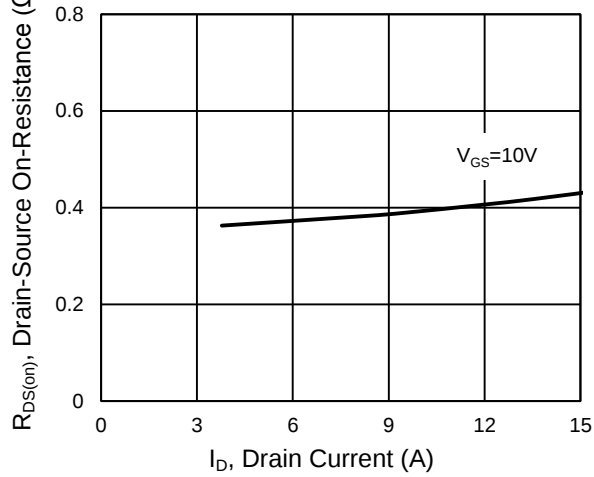
**Output Characteristics**



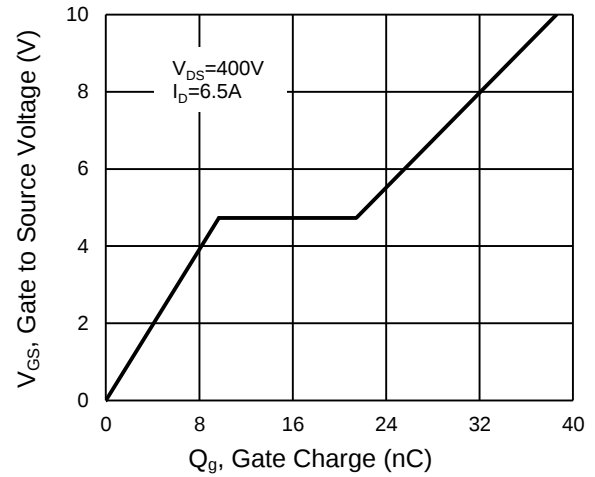
**Transfer Characteristics**



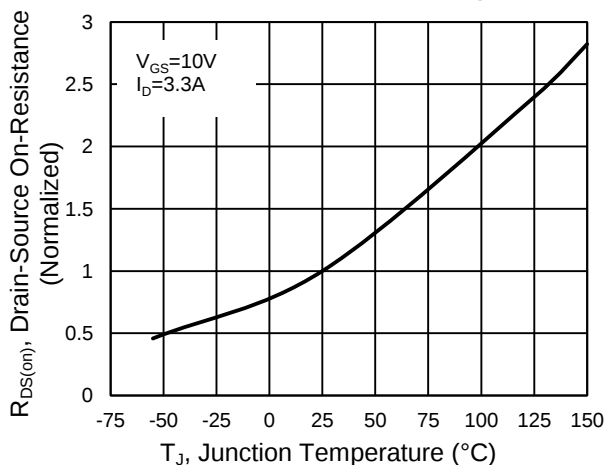
**On-Resistance vs. Drain Current**



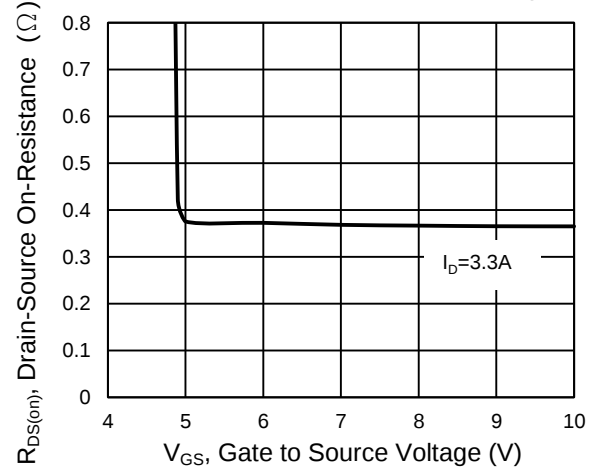
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**

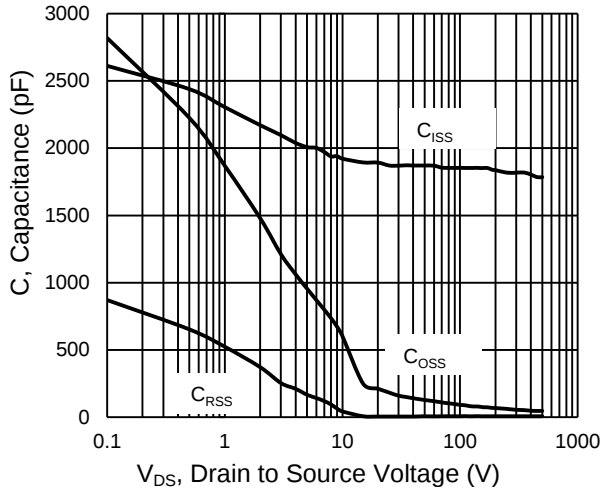


**On-Resistance vs. Gate-Source Voltage**

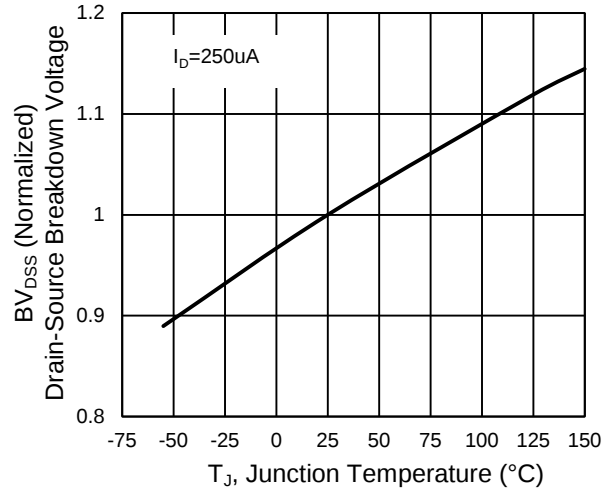


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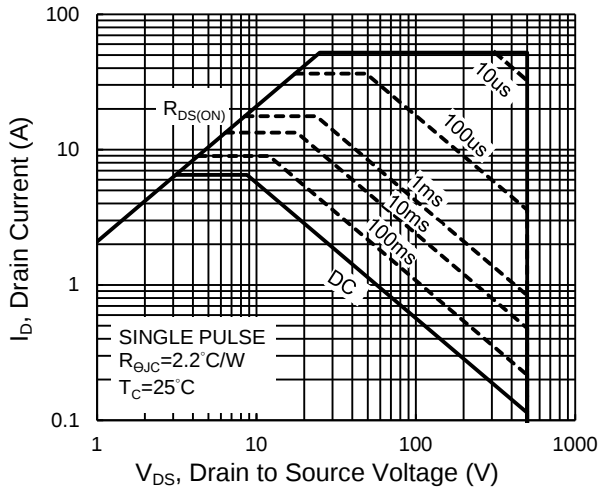
**Capacitance vs. Drain-Source Voltage**



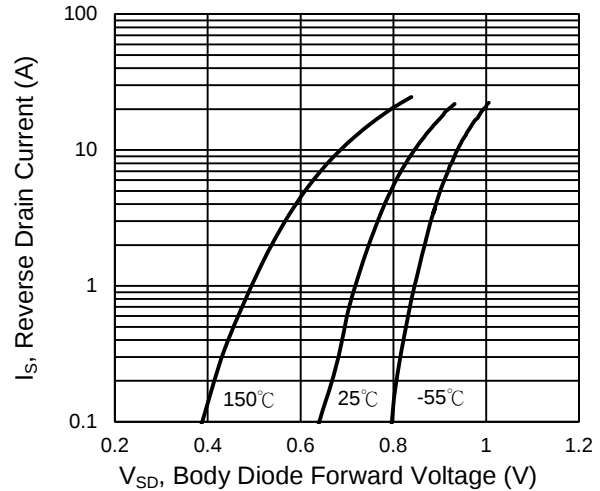
**$BV_{DSS}$  vs. Junction Temperature**



**Maximum Safe Operating Area, Junction-to-Case**



**Source-Drain Diode Forward Current vs. Voltage**



**Normalized Thermal Transient Impedance, Junction-to-Case**

