

## N-Channel Power MOSFET

600V, 8A, 0.6Ω

### FEATURES

- Super-Junction technology
- High performance, small  $R_{DS(ON)} * Q_g$  figure of merit (FOM)
- High ruggedness performance
- 100% UIS and  $R_g$  tested
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

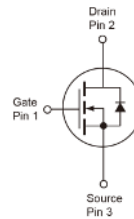
| KEY PERFORMANCE PARAMETERS |       |      |
|----------------------------|-------|------|
| PARAMETER                  | VALUE | UNIT |
| $V_{DS}$                   | 600   | V    |
| $R_{DS(on)}$ (max)         | 0.6   | Ω    |
| $Q_g$                      | 16    | nC   |

### APPLICATIONS

- Power Supply
- AC/DC LED Lighting



ITO-220S



| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |                |                           |      |
|---|----------------|---------------------------|------|
| PARAMETER   | SYMBOL         | LIMIT                     | UNIT |
| Drain-Source Voltage  | $V_{DS}$       | 600                       | V    |
| Gate-Source Voltage   | $V_{GS}$       | ±30                       | V    |
| Continuous Drain Current <sup>(Note 1)</sup>                                | $I_D$          | $T_C = 25^\circ\text{C}$  | 8    |
|   |                | $T_C = 100^\circ\text{C}$ | 3.6  |
| Pulsed Drain Current <sup>(Note 2)</sup>                                    | $I_{DM}$       | 24                        | A    |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$                          | $P_D$          | 41.7                      | W    |
| Single Pulse Avalanche Energy <sup>(Note 3)</sup>                           | $E_{AS}$       | 121                       | mJ   |
| Single Pulse Avalanche Current <sup>(Note 3)</sup>                          | $I_{AS}$       | 2.2                       | A    |
| Operating Junction and Storage Temperature Range                            | $T_J, T_{STG}$ | - 55 to +150              | °C   |

| THERMAL PERFORMANCE                    |                 |       |      |
|--|-----------------|-------|------|
| PARAMETER                              | SYMBOL          | LIMIT | UNIT |
| Junction to Case Thermal Resistance    | $R_{\theta JC}$ | 3     | °C/W |
| Junction to Ambient Thermal Resistance | $R_{\theta JA}$ | 62    | °C/W |

**Thermal Performance Note:**  $R_{\theta JA}$  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.  $R_{\theta JA}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.

| <b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |   |                              |          |      |           |               |
|---|---|------------------------------|----------|------|-----------|---------------|
| PARAMETER   | CONDITIONS  | SYMBOL                       | MIN      | TYP  | MAX       | UNIT          |
| <b>Static</b>   |   |                              |          |      |           |               |
| Drain-Source Breakdown Voltage  | $V_{GS} = 0V, I_D = 250\mu\text{A}$                                   | $BV_{DSS}$                   | 600      | --   | --        | V             |
| Gate Threshold Voltage  | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$                               | $V_{GS(TH)}$                 | 2        | 3.3  | 4         | V             |
| Gate Body Leakage   | $V_{GS} = \pm 30V, V_{DS} = 0V$                                       | $I_{GSS}$                    | --       | --   | $\pm 100$ | nA            |
| Zero Gate Voltage Drain Current   | $V_{DS} = 600V, V_{GS} = 0V$  | $I_{DSS}$                    | --       | --   | 1         | $\mu\text{A}$ |
| Drain-Source On-State Resistance<br>(Note 4)  | $V_{GS} = 10V, I_D = 1.7A$  | $R_{DS(on)}$                 | --       | 0.44 | 0.6       | $\Omega$      |
| <b>Dynamic</b> (Note 5)   |   |                              |          |      |           |               |
| Total Gate Charge   | $V_{DS} = 480V, I_D = 5A,$<br>$V_{GS} = 10V$                          | $Q_g$                        | --       | 16   | --        | nC            |
| Gate-Source Charge  |   | $Q_{gs}$                     | --       | 4    | --        |               |
| Gate-Drain Charge   |   | $Q_{gd}$                     | --       | 8    | --        |               |
| Input Capacitance   | $V_{DS} = 100V, V_{GS} = 0V,$<br>$f = 1.0\text{MHz}$                  | $C_{iss}$                    | --       | 528  | --        | pF            |
| Output Capacitance  |   | $C_{oss}$                    | --       | 31   | --        |               |
| Reverse Transfer Capacitance  |   | $C_{rss}$                    | --       | 1    | --        |               |
| Gate Resistance   | $f = 1.0\text{MHz}$   | $R_g$                        | --       | 3.2  | 6.4       | $\Omega$      |
| <b>Switching</b> (Note 6)   |   |                              |          |      |           |               |
| Turn-On Delay Time  | $V_{DD} = 300V,$<br>$R_{GEN} = 5\Omega,$<br>$I_D = 5A, V_{GS} = 10V,$ | $t_{d(on)}$                  | --       | 6.2  | --        | ns            |
| Turn-On Rise Time   |   | $t_r$                        | --       | 20   | --        |               |
| Turn-Off Delay Time   |   | $t_{d(off)}$                 | --       | 13   | --        |               |
| Turn-Off Fall Time  |   | $t_f$                        | --       | 20   | --        |               |
| <b>Source-Drain Diode</b>   |   |                              |          |      |           |               |
| Body-Diode Continuous Forward Current   |   | $I_S$                        | --       | --   | 8         | A             |
| Body-Diode Pulsed Current   |   | $I_{SM}$                     | --       | --   | 24        | A             |
| Forward Voltage (Note 4)  | $I_S = 5A, V_{GS} = 0V$   | $V_{SD}$                     | --       | --   | 1.4       | V             |
| Reverse Recovery Time   | $I_S = 5A$  | $t_{rr}$                     | --       | 210  | --        | ns            |
| Reverse Recovery Charge   |   | $di_f/dt = 100A/\mu\text{s}$ | $Q_{rr}$ | --   | 2         | --            |

**Notes:**

- Current limited by package.
- Pulse width limited by the maximum junction temperature.
- $L = 50\text{mH}, I_{AS} = 2.2A, V_{DD} = 50V, R_G = 25\Omega,$  Starting  $T_J = 25^\circ\text{C}$
- Pulse test:  $PW \leq 300\mu\text{s},$  duty cycle  $\leq 2\%$ .
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

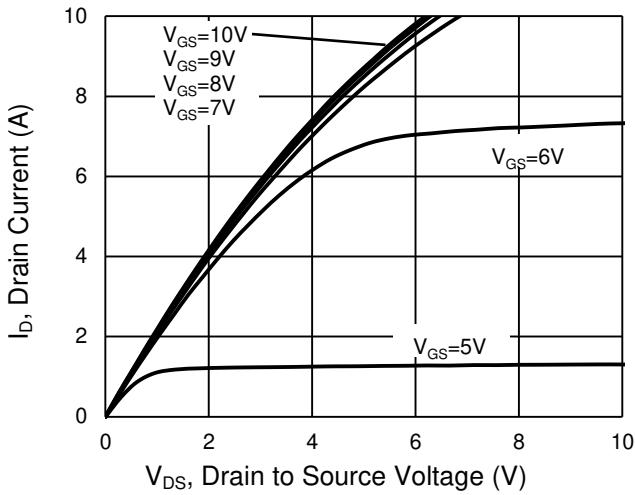
**ORDERING INFORMATION**

| PART NO.         | PACKAGE  | PACKING      |
|------------------|----------|--------------|
| TSM60NB600CF C0G | ITO-220S | 50pcs / Tube |

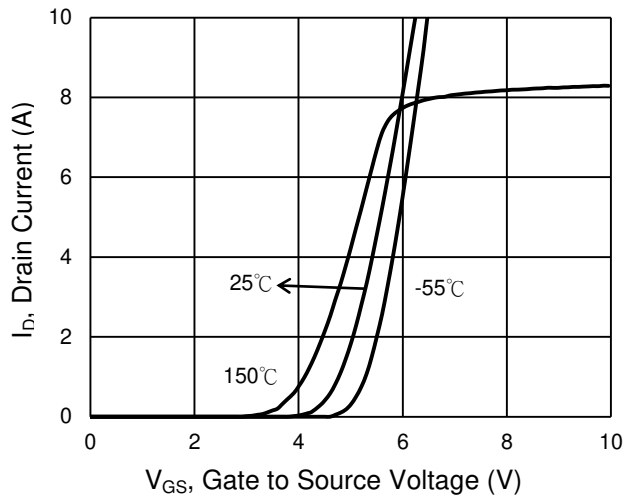
**CHARACTERISTICS CURVES**

( $T_C = 25^\circ\text{C}$  unless otherwise noted)

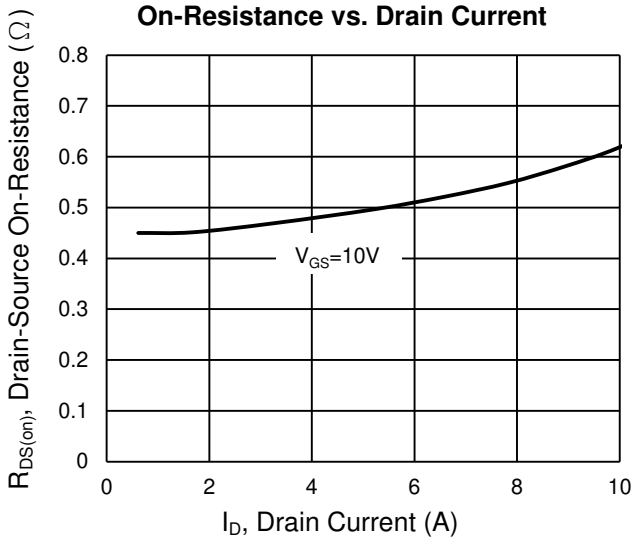
**Output Characteristics**



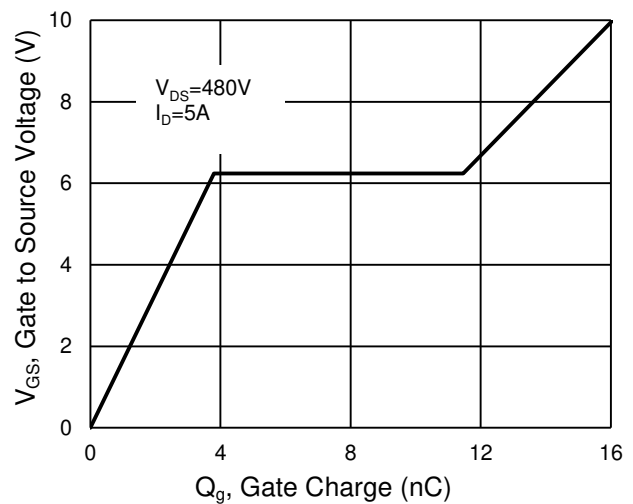
**Transfer Characteristics**



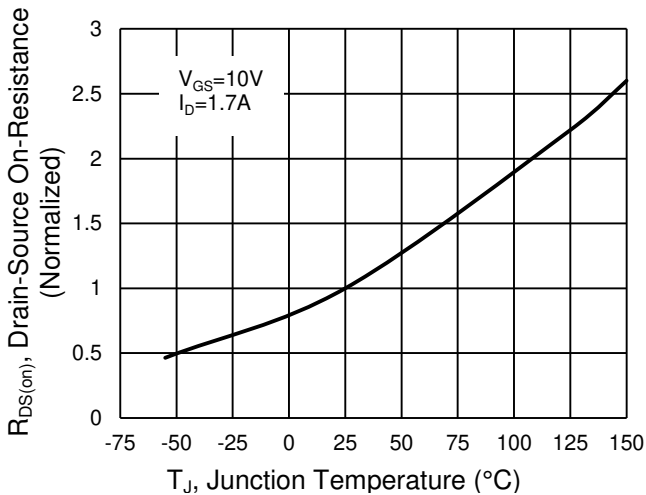
**On-Resistance vs. Drain Current**



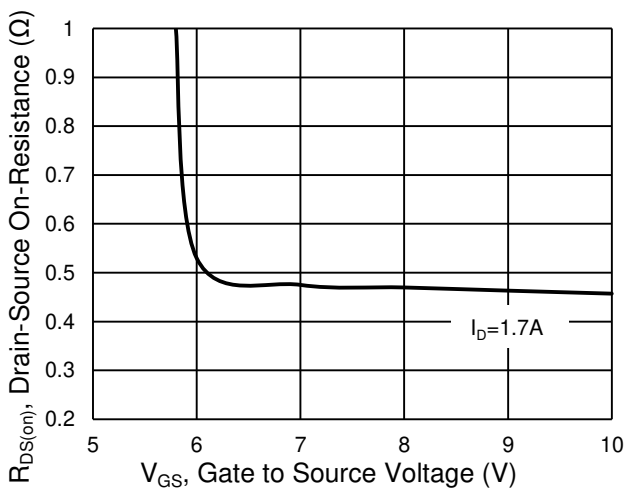
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**



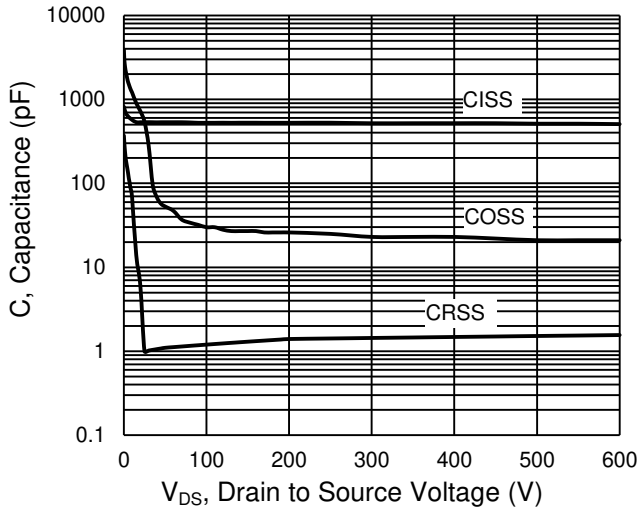
**On-Resistance vs. Gate-Source Voltage**



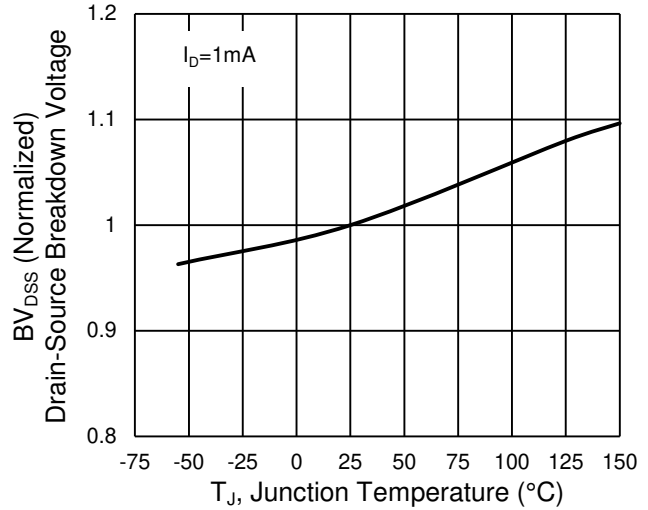
**CHARACTERISTICS CURVES**

( $T_C = 25^\circ\text{C}$  unless otherwise noted)

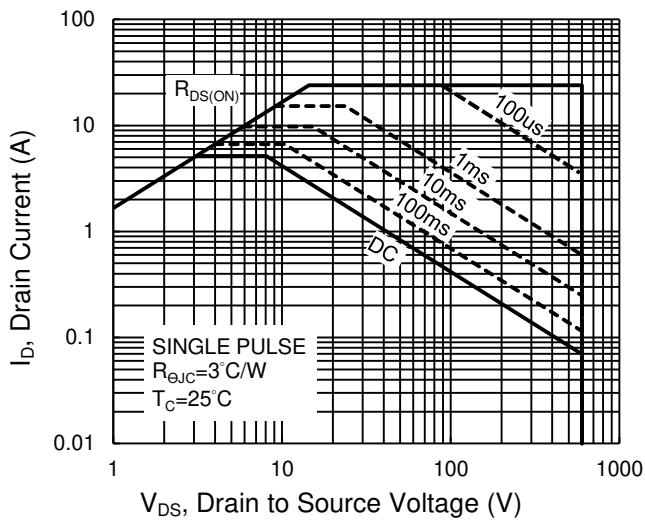
**Capacitance vs. Drain-Source Voltage**



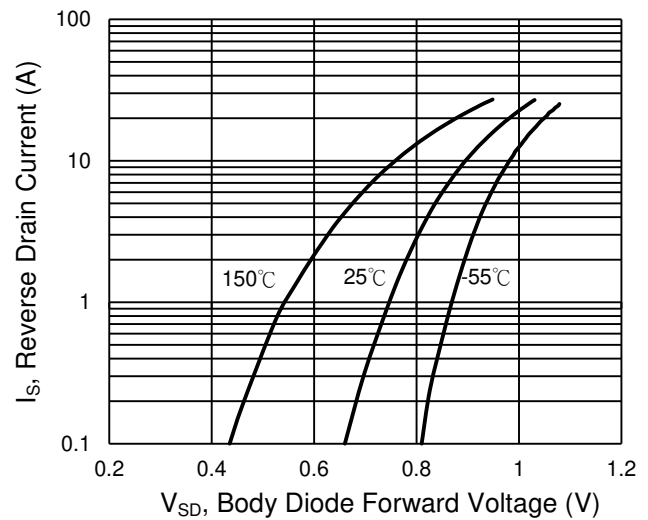
**$BV_{DSS}$  vs. Junction Temperature**



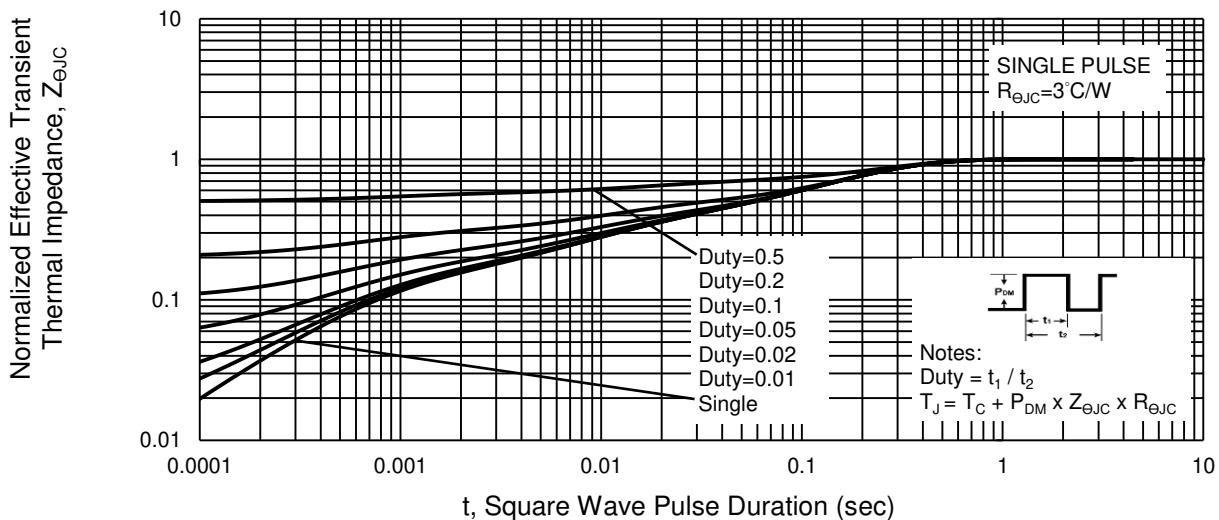
**Maximum Safe Operating Area, Junction-to-Case**



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

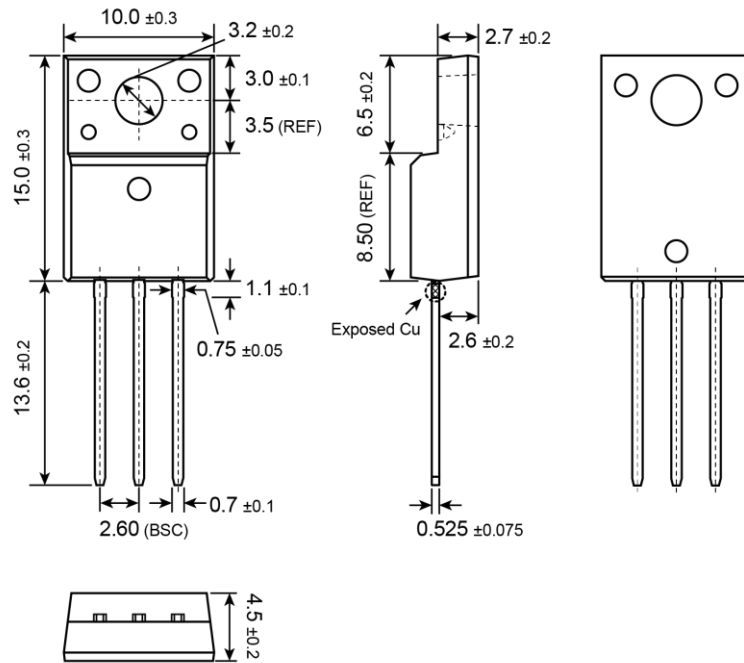


**Normalized Thermal Transient Impedance, Junction-to-Case**

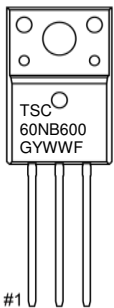


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**ITO-220S**



**MARKING DIAGRAM**



- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

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