

## N-Channel Power MOSFET

800V, 12A, 400mΩ

### 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

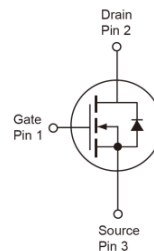
| KEY PERFORMANCE PARAMETERS |       |      |
|----------------------------|-------|------|
| PARAMETER                  | VALUE | UNIT |
| $V_{DS}$                   | 800   | V    |
| $R_{DS(on)}$ (max)         | 400   | mΩ   |
| $Q_g$                      | 51    | nC   |

### 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  | $V_{DS}$       | 800                       | V                |
| Gate-Source Voltage   | $V_{GS}$       | $\pm 30$                  | V                |
| Continuous Drain Current <sup>(Note 1)</sup>                                | $I_D$          | $T_C = 25^\circ\text{C}$  | 12               |
|   |                | $T_C = 100^\circ\text{C}$ | 7.5              |
| Pulsed Drain Current <sup>(Note 2)</sup>                                    | $I_{DM}$       | 48                        | A                |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$                          | $P_D$          | 69                        | W                |
| Single Pulse Avalanche Energy <sup>(Note 3)</sup>                           | $E_{AS}$       | 812                       | mJ               |
| Single Pulse Avalanche Current <sup>(Note 3)</sup>                          | $I_{AS}$       | 5.7                       | A                |
| Operating Junction and Storage Temperature Range                            | $T_J, T_{STG}$ | - 55 to +150              | $^\circ\text{C}$ |

| THERMAL PERFORMANCE                    |                 |       |                    |
|--|-----------------|-------|--------------------|
| PARAMETER                              | SYMBOL          | LIMIT | UNIT               |
| Junction to Case Thermal Resistance    | $R_{\theta JC}$ | 1.8   | $^\circ\text{C/W}$ |
| Junction to Ambient Thermal Resistance | $R_{\theta JA}$ | 62    | $^\circ\text{C/W}$ |

**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.

**ELECTRICAL SPECIFICATIONS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| PARAMETER                             | CONDITIONS  | SYMBOL       | MIN | TYP  | MAX       | UNIT       |
|---------------------------------------|---|--------------|-----|------|-----------|------------|
| <b>Static</b> (Note 4)                |   |              |     |      |           |            |
| Drain-Source Breakdown Voltage        | $V_{GS} = 0V, I_D = 250\mu A$                                   | $BV_{DSS}$   | 800 | --   | --        | V          |
| Gate Threshold Voltage                | $V_{DS} = V_{GS}, I_D = 250\mu A$                               | $V_{GS(TH)}$ | 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       | $V_{DS} = 800V, V_{GS} = 0V$                                    | $I_{DSS}$    | --  | --   | 1         | $\mu A$    |
| Drain-Source On-State Resistance      | $V_{GS} = 10V, I_D = 2.7A$                                      | $R_{DS(on)}$ | --  | 300  | 400       | m $\Omega$ |
| <b>Dynamic</b> (Note 5)               |   |              |     |      |           |            |
| Total Gate Charge                     | $V_{DS} = 640V, I_D = 8A,$<br>$V_{GS} = 10V$                    | $Q_g$        | --  | 51   | --        | nC         |
| Gate-Source Charge                    |   | $Q_{gs}$     | --  | 10   | --        |            |
| Gate-Drain Charge                     |   | $Q_{gd}$     | --  | 24   | --        |            |
| Input Capacitance                     | $V_{DS} = 100V, V_{GS} = 0V,$<br>$f = 1.0MHz$                   | $C_{iss}$    | --  | 1848 | --        | pF         |
| Output Capacitance                    |   | $C_{oss}$    | --  | 90   | --        |            |
| Gate Resistance                       | $f = 1.0MHz$  | $R_g$        | --  | 3.3  | 6.6       | $\Omega$   |
| <b>Switching</b> (Note 6)             |   |              |     |      |           |            |
| Turn-On Delay Time                    | $V_{DD} = 400V, I_D = 8A,$<br>$V_{GS} = 10V, R_{GEN} = 5\Omega$ | $t_{d(on)}$  | --  | 19   | --        | ns         |
| Turn-On Rise Time                     |   | $t_r$        | --  | 26   | --        |            |
| Turn-Off Delay Time                   |   | $t_{d(off)}$ | --  | 57   | --        |            |
| Turn-Off Fall Time                    |   | $t_f$        | --  | 28   | --        |            |
| <b>Source-Drain Diode</b> (Note 4)    |   |              |     |      |           |            |
| Body-Diode Continuous Forward Current |   | $I_S$        | --  | --   | 8         | A          |
| Body-Diode Pulsed Current             |   | $I_{SM}$     | --  | --   | 32        | A          |
| Forward Voltage                       | $I_S = 8A, V_{GS} = 0V$   | $V_{SD}$     | --  | --   | 1.4       | V          |
| Reverse Recovery Time                 | $I_S = 8A$  | $t_{rr}$     | --  | 340  | --        | ns         |
| Reverse Recovery Charge               | $di_f/dt = 100A/\mu s$  | $Q_{rr}$     | --  | 4.9  | --        | $\mu C$    |

**Notes:**

- Current limited by package.
- Pulse width limited by the maximum junction temperature.
- $L = 50mH, I_{AS} = 5.7A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
- Pulse test:  $PW \leq 300\mu s, \text{duty cycle} \leq 2\%$ .
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

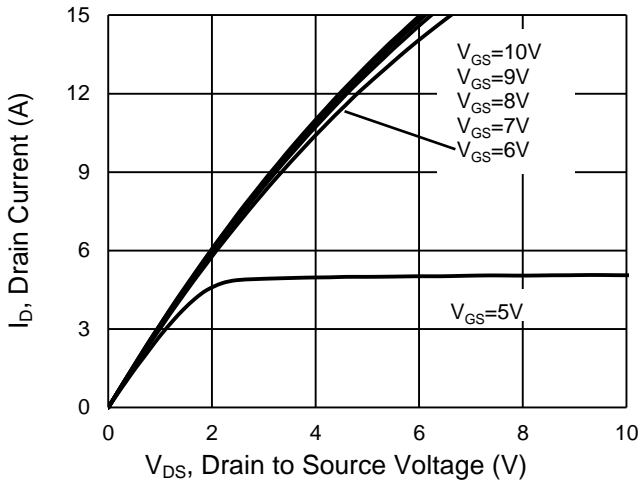
**ORDERING INFORMATION**

| PART NO.        | PACKAGE  | PACKING      |
|-----------------|----------|--------------|
| TSM80N400CF C0G | ITO-220S | 50pcs / Tube |

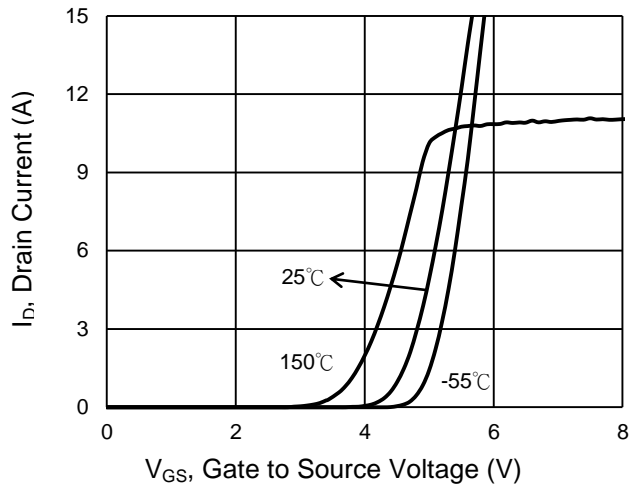
**CHARACTERISTICS CURVES**

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

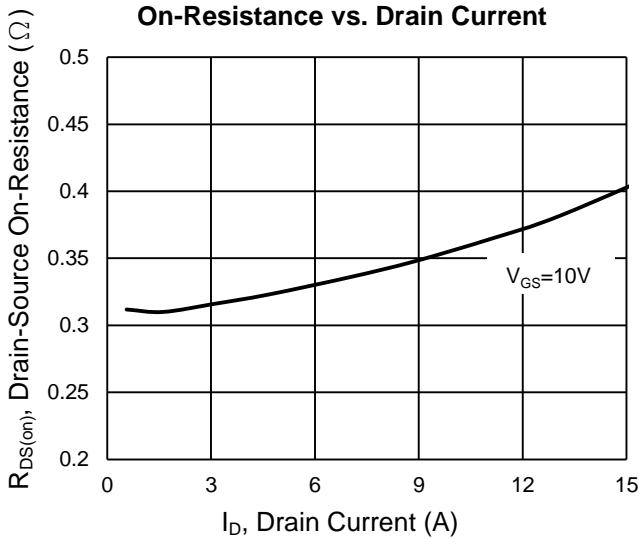
**Output Characteristics**



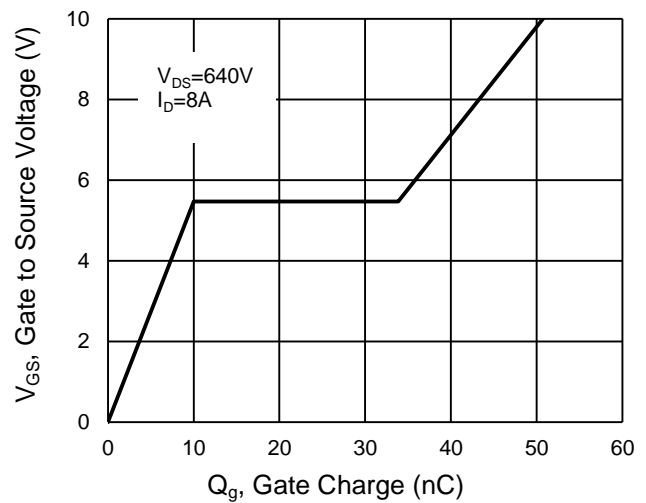
**Transfer Characteristics**



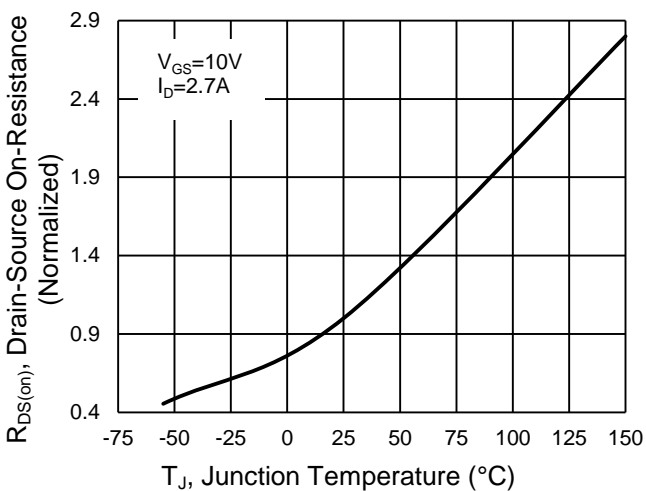
**On-Resistance vs. Drain Current**



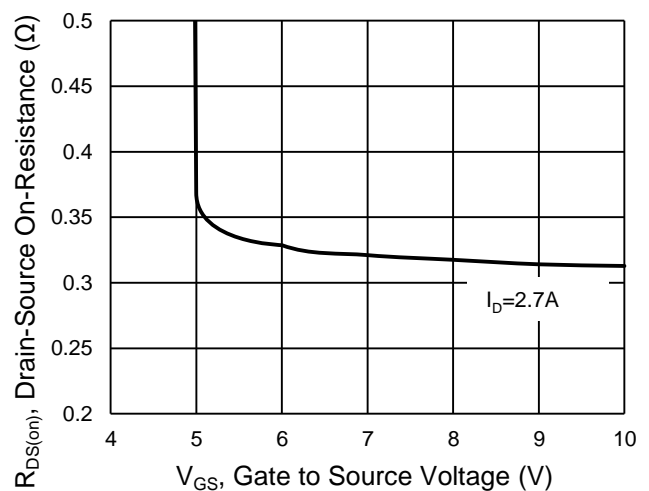
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**



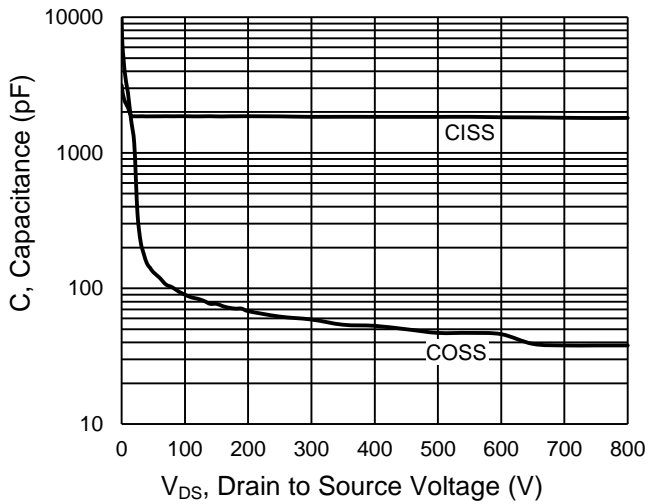
**On-Resistance vs. Gate-Source Voltage**



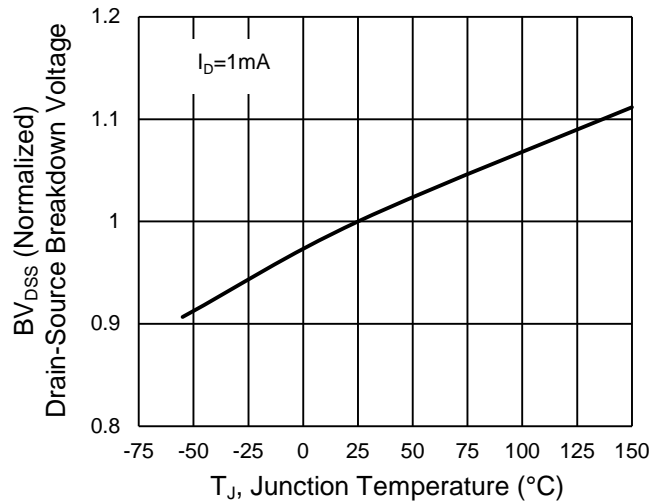
**CHARACTERISTICS CURVES**

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

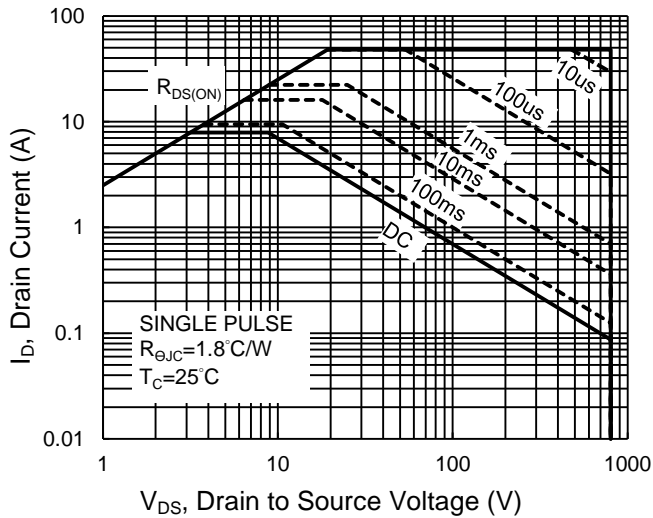
**Capacitance vs. Drain-Source Voltage**



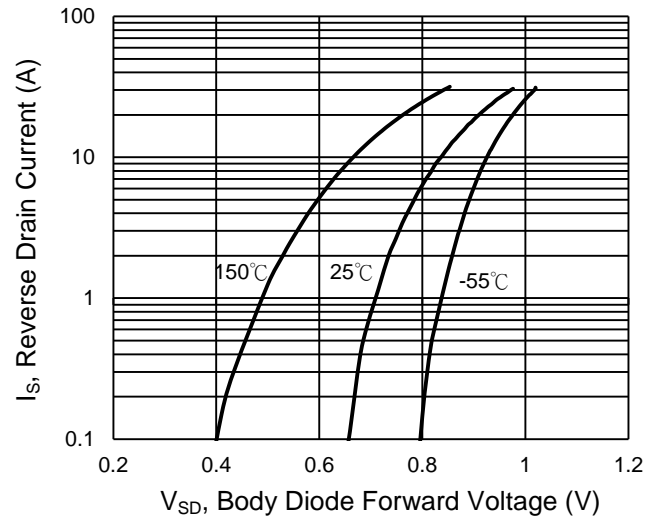
**$BV_{DSS}$  vs. Junction Temperature**



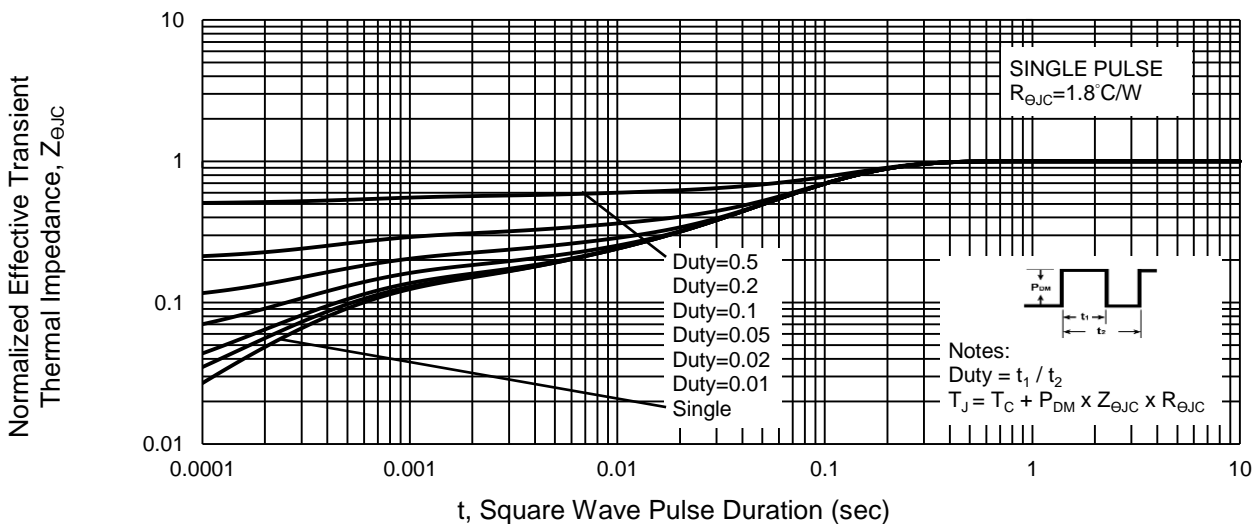
**Maximum Safe Operating Area, Junction-to-Case**



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

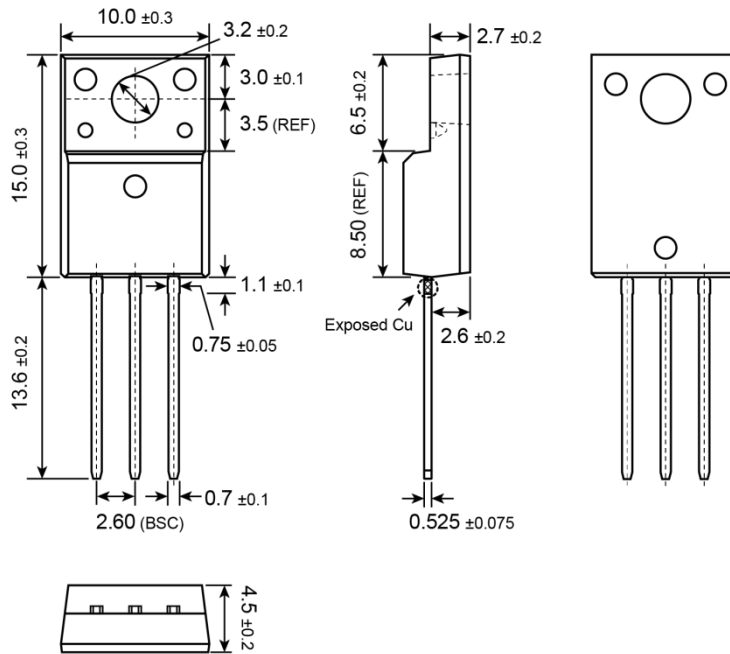


**Normalized Thermal Transient Impedance, Junction-to-Case**

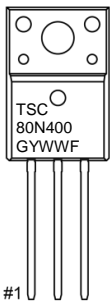


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**ITO-220S**



**MARKING DIAGRAM**



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

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