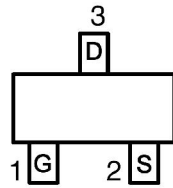
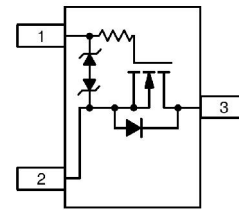


### Main Product Characteristics:

|              |       |
|--------------|-------|
| $V_{DSS}$    | 20V   |
| $R_{DS(on)}$ | 3Ω    |
| $I_D$        | 238mA |



Pin Assignment



Schematic Diagram

### Features and Benefits:

- Low Gate Charge for Fast Switching
- Small 1.6 x 1.6 mm Footprint
- ESD Protected Gate
- Lead free product
- 150°C operating temperature



### Description:

It utilizes the latest trench processing techniques to achieve fast switching speed and short reverse recovery time. These features combine to make this design an extremely efficient and reliable device for use in Power Management Load Switch, Level Shift, Cell Phones, Media Players, Digital Cameras, PDA's, Video Games, Hand Held Computers, etc.

### Absolute Max Rating @ $T_A=25^{\circ}C$ unless otherwise specified

| Symbol          | Parameter  | Max.       | Units       |
|-----------------|--|------------|-------------|
| $I_D$           | Continuous Drain Current ①                       | 238        | mA          |
| $I_{DM}$        | Pulsed Drain Current ( $t_p \leq 10\mu s$ ) ②    | 714        |             |
| PD              | Power Dissipation ③                              | 300        | mW          |
| VDS             | Drain-Source Voltage                             | 20         | V           |
| VGS             | Gate-to-Source Voltage                           | $\pm 10$   | V           |
| $T_J$ $T_{STG}$ | Operating Junction and Storage Temperature Range | -55 to 150 | $^{\circ}C$ |
| $T_L$           | Lead Temperature for Soldering Purposes          | 260        |             |
| $I_{SD}$        | Continuous Source Current (Body Diode)           | 238        | mA          |

### Thermal Resistance

| Symbol          | Characterizes                        | Value | Unit          |
|-----------------|--------------------------------------|-------|---------------|
| $R_{\theta JA}$ | Junction-to-Ambient (steady-state) ④ | 416   | $^{\circ}C/W$ |

**Electrical Characteristics** @ $T_A=25^{\circ}\text{C}$  unless otherwise specified

| Symbol  | Parameter                            | Min. | Typ. | Max. | Units    | Conditions                                   |
|---------|--------------------------------------|------|------|------|----------|--|
| BVDSS   | Drain-to-Source breakdown voltage    | 20   | —    | —    | V        | VGS = 0V,<br>ID = 100 $\mu$ A                |
| RDS(on) | Static Drain-to-Source on-resistance | —    | 1.5  | 3.0  | $\Omega$ | VGS = 4.5V, ID = 10mA                        |
|         |                                      | —    | 2.2  | 3.5  |          | VGS = 2.5V, ID = 10mA                        |
| VGS(th) | Gate threshold voltage               | 0.5  | 1.0  | 1.5  | V        | VDS = 3V,<br>ID = 100 $\mu$ A                |
| IDSS    | Drain-to-Source leakage current      | —    | —    | 1.0  | $\mu$ A  | VDS = 20V,<br>VGS = 0V                       |
| IGSS    | Gate-to-Source forward leakage       | —    | —    | 100  | $\mu$ A  | VGS = 10V                                    |
|         | Gate-to-Source reverse leakage       | -100 | —    | —    |          | VGS = -10V                                   |
| gFS     | Forward Transconductance             | —    | 50   | —    | mS       | ID = 10mA, VDS=3V                            |
| td(on)  | Turn-on delay time                   | —    | 13   | —    | ns       | VGS=4.5V, VDS=5V,<br>ID=10mA, RG=10 $\Omega$ |
| tr      | Rise time                            | —    | 15   | —    |          |  |
| td(off) | Turn-Off delay time                  | —    | 98   | —    |          |  |
| tf      | Fall time                            | —    | 60   | —    |          |  |
| Ciss    | Input capacitance                    | —    | 11.5 | 20   | pF       | VGS = 0V,<br>VDS = 5V,<br>f = 1.0MHz         |
| Coss    | Output capacitance                   | —    | 10   | 15   |          |  |
| Crss    | Reverse transfer capacitance         | —    | 3.5  | 6.0  |          |  |

**Source-Drain Ratings and Characteristics**

| Symbol | Parameter             | Min. | Typ. | Max. | Units | Conditions      |
|--------|-----------------------|------|------|------|-------|-----------------|
| VSD    | Diode Forward Voltage | —    | 0.66 | 0.8  | V     | IS=10mA, VGS=0V |

**Notes:**

- ① The maximum current rating is limited by bond-wires.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of  $R_{\theta JA}$  is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^{\circ}\text{C}$

## Typical Electrical and Thermal Characteristics

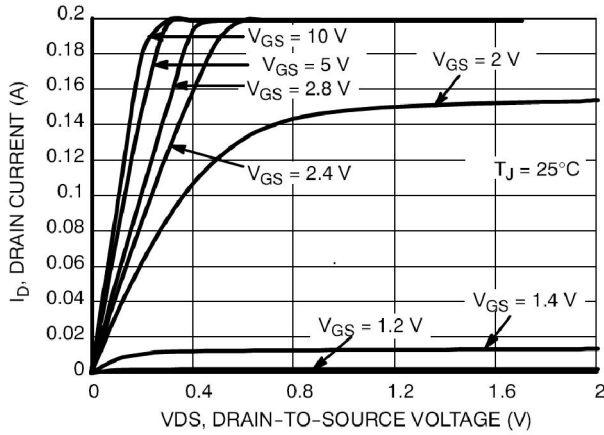


Figure 1. On-region Characteristics

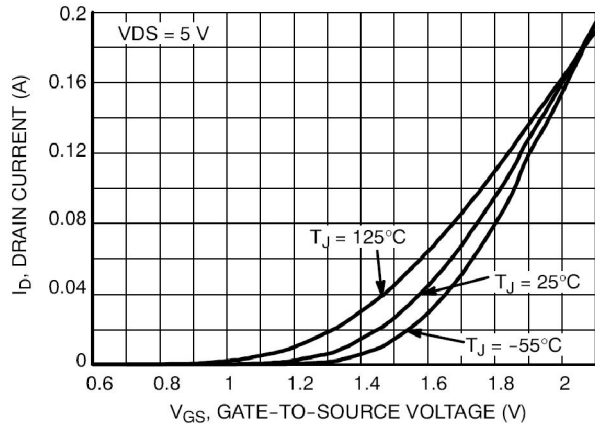


Figure 2. Transfer Characteristics

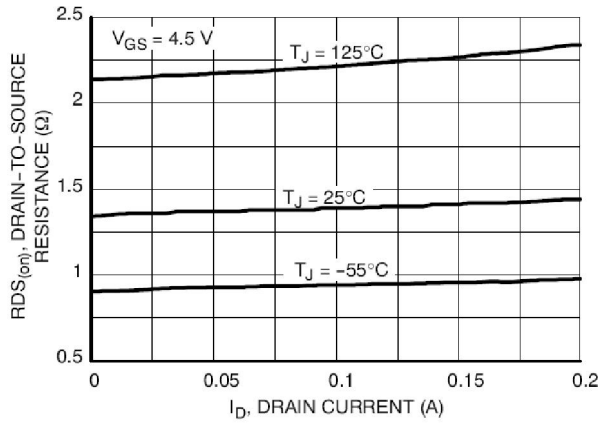


Figure 3. On-resistance versus Drain Current and Temperature

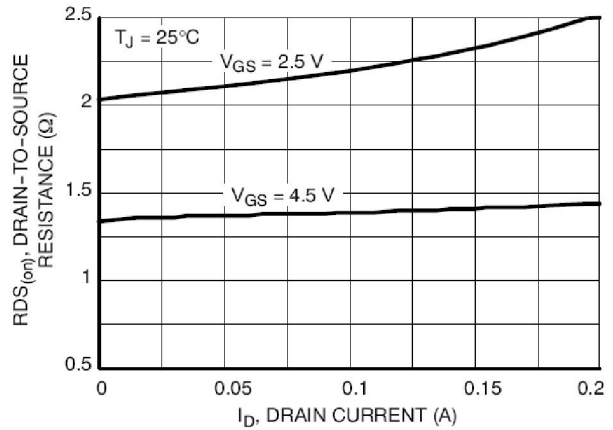


Figure 4. On-resistance versus Drain Current and Gate Voltage

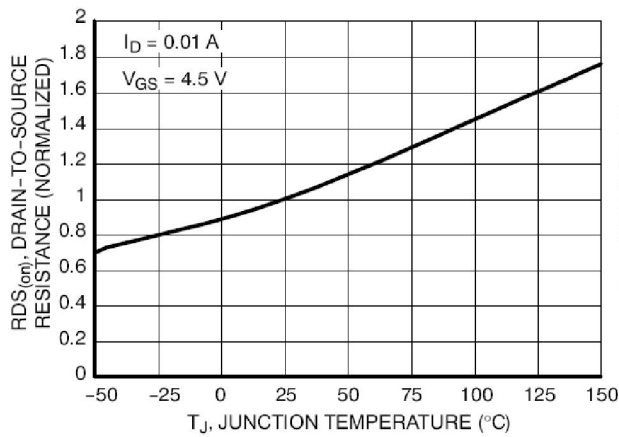


Figure 5. On-resistance Variation with Temperature

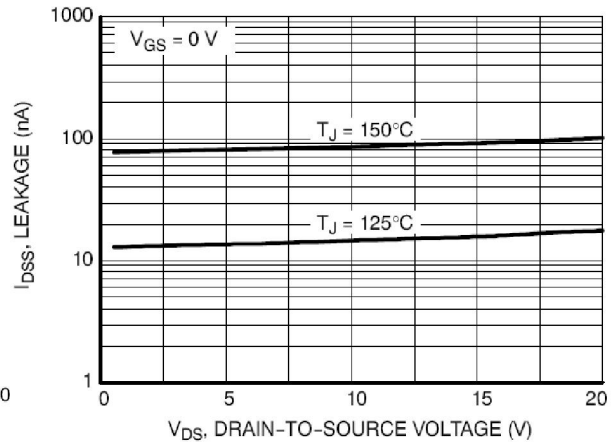


Figure 6. Drain-to-Source Leakage Current versus Voltage

### Typical Electrical and Thermal Characteristics

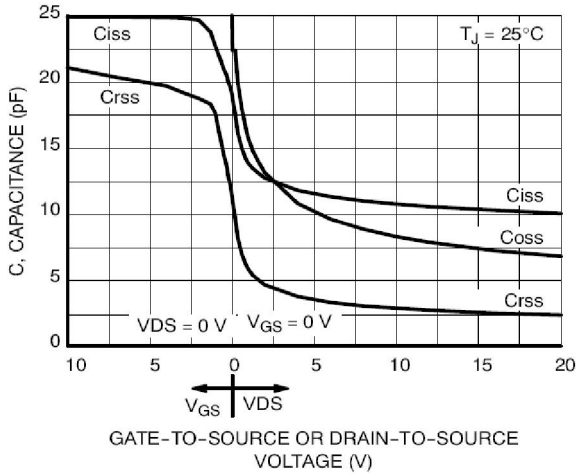


Figure 7. Capacitance Variation

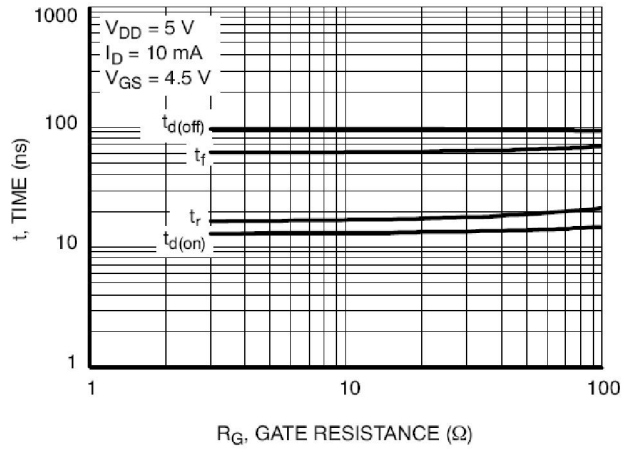


Figure 8. Resistive Switching Time Variation versus Gate Resistance

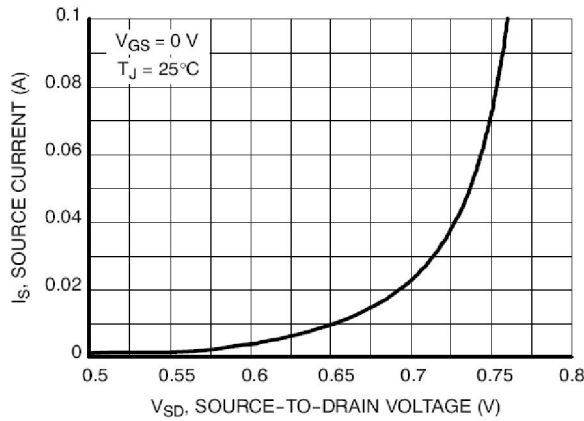
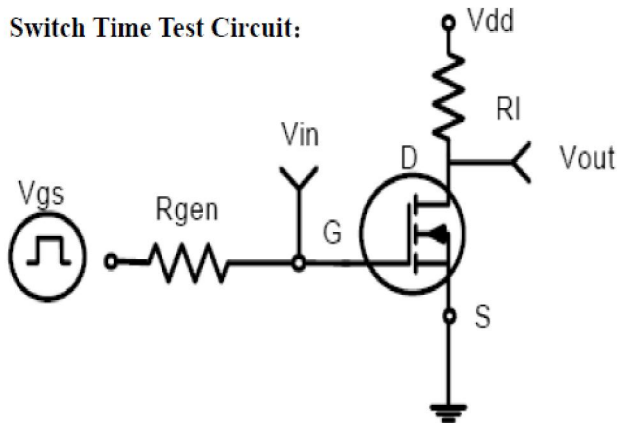


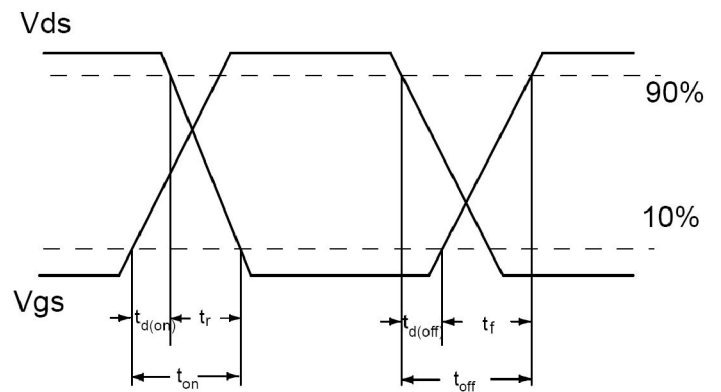
Figure 9. Diode Forward Voltage versus Current

### Test Circuits and Waveforms

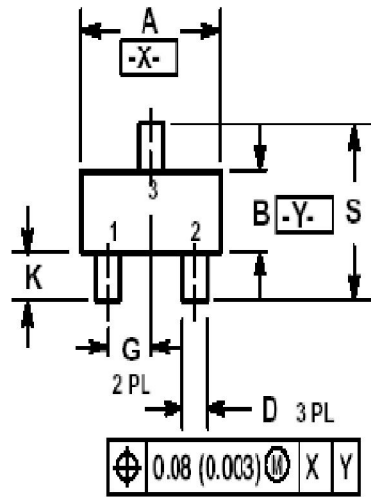
Switch Time Test Circuit:



Switch Waveforms:

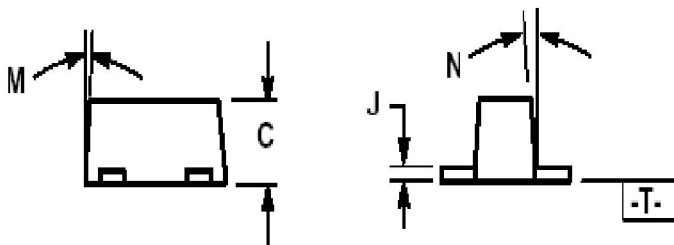


**Mechanical Data(SC-89):**



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.



| DIM | MILLIMETERS |      |      | INCHES    |       |       |
|-----|-------------|------|------|-----------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN       | NOM   | MAX   |
| A   | 1.50        | 1.60 | 1.70 | 0.059     | 0.063 | 0.067 |
| B   | 0.75        | 0.85 | 0.95 | 0.030     | 0.034 | 0.040 |
| C   | 0.60        | 0.70 | 0.80 | 0.024     | 0.028 | 0.031 |
| D   | 0.23        | 0.28 | 0.33 | 0.009     | 0.011 | 0.013 |
| G   | 0.50 BSC    |      |      | 0.020 BSC |       |       |
| H   | 0.53 REF    |      |      | 0.021 REF |       |       |
| J   | 0.10        | 0.15 | 0.20 | 0.004     | 0.006 | 0.008 |
| K   | 0.30        | 0.40 | 0.50 | 0.012     | 0.016 | 0.020 |
| L   | 1.10 REF    |      |      | 0.043 REF |       |       |
| M   | ---         | ---  | 10 ° | ---       | ---   | 10 °  |
| N   | ---         | ---  | 10 ° | ---       | ---   | 10 °  |
| S   | 1.50        | 1.60 | 1.70 | 0.059     | 0.063 | 0.067 |

