

# Dual N-Channel, Digital FET

## FDG6301N-F085

### Features

- 25 V, 0.22 A Continuous, 0.65 A Peak
- $R_{DS(ON)} = 4 \Omega @ V_{GS} = 4.5 \text{ V}$ ,
- $R_{DS(ON)} = 5 \Omega @ V_{GS} = 2.7 \text{ V}$ .
- Very Low Level Gate Drive Requirements allowing Directop-  
eration in 3 V Circuits ( $V_{GS(th)} < 1.5 \text{ V}$ )
- Gate-Source Zener for ESD Ruggedness ( $>6 \text{ kV}$  Human Body  
Model)
- Compact Industry Standard SC70-6 Surface Mount Package.
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS  
Compliant

### Applications

- Low Voltage Applications as a Replacement for Bipolar Digital  
Transistors and Small Signal MOSFETs

### MOSFET MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Symbol          | Parameter                                                                            | Ratings    | Units              |
|-----------------|--------------------------------------------------------------------------------------|------------|--------------------|
| $V_{DS}$        | Drain to Source Voltage                                                              | 25         | V                  |
| $V_{GS}$        | Gate to Source Voltage                                                               | 8          | V                  |
| $I_D$           | Drain Current Continuous                                                             | 0.22       | A                  |
|                 | Pulsed                                                                               | 0.65       |                    |
| $P_D$           | Power Dissipation                                                                    | 0.3        | W                  |
| $T_J, T_{STG}$  | Operating and Storage Temperature                                                    | -55 to 150 | $^\circ\text{C}$   |
| ESD             | Electrostatic Discharge Rating<br>MIL-STD-883D Human Body Model<br>(100 pF / 1500 W) | 6.0        | kV                 |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient                                              | 415        | $^\circ\text{C/W}$ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance, where the case thermal reference is defined as the Solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design, while  $R_{\theta JA}$  is determined by the board design.  $R_{\theta JA} = 415^\circ\text{C/W}$  on minimum pad mounting on FR-4 board in still air.
2. A suffix as "...F085P" has been temporarily introduced in order to manage a double source strategy as ON Semiconductor has officially announced in August 2014.
3. Pulse Test: Pulse Width  $< 300 \mu\text{s}$ , Duty Cycle  $< 2.0\%$

### ORDERING INFORMATION

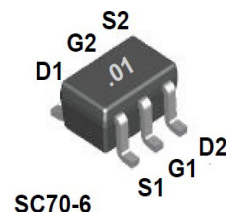
| Device        | Device Marking | Package                                         | Shipping†                 |
|---------------|----------------|-------------------------------------------------|---------------------------|
| FDG6301N-F085 | FDG6301N       | SC-88 (SC-70 6 Lead)<br>(Pb-Free, Halogen Free) | 3,000 units / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D

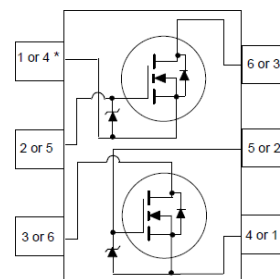


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SC-88 (SC-70 6 Lead), 1.25x2  
CASE 419AD



# FDG6301N-F085

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|-----------|--------|-----------------|-----|-----|-----|-------|
|-----------|--------|-----------------|-----|-----|-----|-------|

### Off Characteristics

|                                   |                  |                                                |    |  |      |    |
|-----------------------------------|------------------|------------------------------------------------|----|--|------|----|
| Drain to Source Breakdown Voltage | B <sub>VDS</sub> | I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V | 25 |  |      | V  |
| Zero Gate Voltage Drain Current   | I <sub>DSS</sub> | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V  |    |  | 1    | μA |
|                                   |                  | T <sub>J</sub> = 55°C                          |    |  | 10   |    |
| Gate to Source Leakage Current    | I <sub>GSS</sub> | V <sub>GS</sub> = ±8 V                         |    |  | ±100 | nA |

### On Characteristics

|                                  |                     |                                                                          |      |      |     |   |
|----------------------------------|---------------------|--------------------------------------------------------------------------|------|------|-----|---|
| Gate to Source Threshold Voltage | V <sub>GS(th)</sub> | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA              | 0.65 | 0.85 | 1.5 | V |
| Drain to Source On Resistance    | r <sub>DS(on)</sub> | I <sub>D</sub> = 0.22 A, V <sub>GS</sub> = 4.5 V                         |      | 2.6  | 4   | Ω |
|                                  |                     | I <sub>D</sub> = 0.19 A, V <sub>GS</sub> = 2.7 V                         |      | 3.7  | 5   |   |
|                                  |                     | I <sub>D</sub> = 0.22 A, V <sub>GS</sub> = 4.5 V, T <sub>J</sub> = 125°C |      | 5.3  | 7   |   |
| On-State Drain Current           | I <sub>D(on)</sub>  | V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 5 V                           | 0.22 |      |     |   |
| Forward Transconductance         | g <sub>FS</sub>     | I <sub>D</sub> = 0.22 A, V <sub>DS</sub> = 5 V                           |      | 0.2  |     | s |

### Dynamic Characteristics

|                               |                     |                                                                              |  |      |     |    |
|-------------------------------|---------------------|------------------------------------------------------------------------------|--|------|-----|----|
| Input Capacitance             | C <sub>iss</sub>    | V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz                     |  | 9.5  |     | pF |
| Output Capacitance            | C <sub>oss</sub>    |                                                                              |  | 6    |     | pF |
| Reverse Transfer Capacitance  | C <sub>rss</sub>    |                                                                              |  | 4.5  |     | pF |
| Total Gate Charge at -4.5 V   | Q <sub>g(TOT)</sub> | V <sub>GS</sub> = 0 to 4.5 V; V <sub>DD</sub> = 5 V, I <sub>D</sub> = 0.22 A |  | 0.29 | 0.4 | nC |
| Gate to Source Gate Charge    | Q <sub>gs</sub>     | V <sub>DD</sub> = 5 V, I <sub>D</sub> = 0.22 A                               |  | 0.12 |     |    |
| Gate to Drain "Miller" Charge | Q <sub>gd</sub>     |                                                                              |  | 0.03 |     |    |

### Switching Characteristics

|                     |                     |                                                                                                 |  |     |    |    |
|---------------------|---------------------|-------------------------------------------------------------------------------------------------|--|-----|----|----|
| Turn-On Delay Time  | t <sub>d(on)</sub>  | V <sub>DD</sub> = 5 V, I <sub>D</sub> = 0.5 A, V <sub>GS</sub> = 4.5 V, R <sub>GEN</sub> = 50 Ω |  | 5   | 10 | ns |
| Rise Time           | t <sub>r</sub>      |                                                                                                 |  | 4.5 | 10 | ns |
| Turn-Off Delay Time | t <sub>d(off)</sub> |                                                                                                 |  | 4   | 8  | ns |
| Fall Time           | t <sub>f</sub>      |                                                                                                 |  | 3.2 | 7  | ns |

### Drain-Source Diode Characteristics

|                                   |                 |                                                 |  |     |      |   |
|-----------------------------------|-----------------|-------------------------------------------------|--|-----|------|---|
| Maximum Continuous Source Current | I <sub>S</sub>  |                                                 |  |     | 0.25 | A |
| Source to Drain Diode Voltage     | V <sub>SD</sub> | I <sub>SD</sub> = 0.25 A, V <sub>GS</sub> = 0 V |  | 0.8 | 1.2  | V |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## TYPICAL CHARACTERISTICS

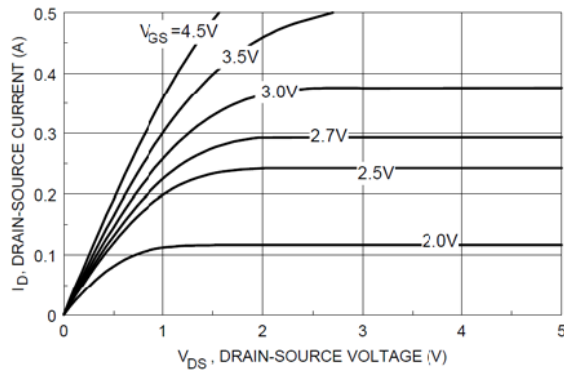


Figure 1. On-Region Characteristics

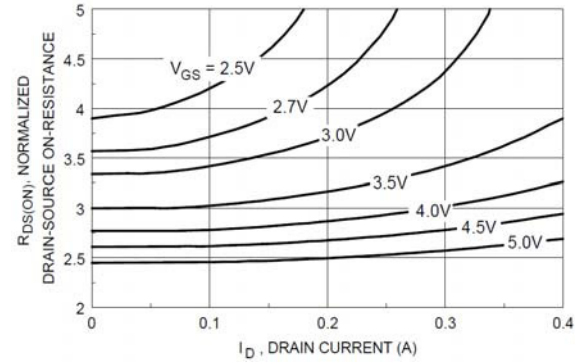


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

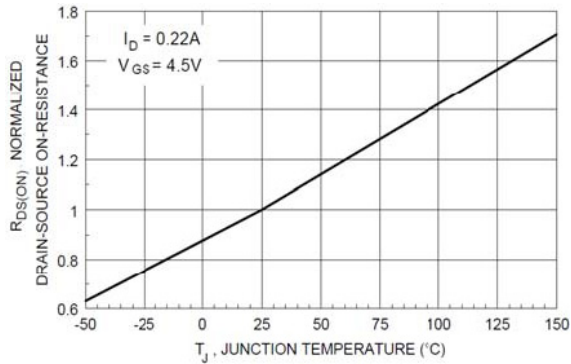


Figure 3. On-Resistance Variation with Temperature

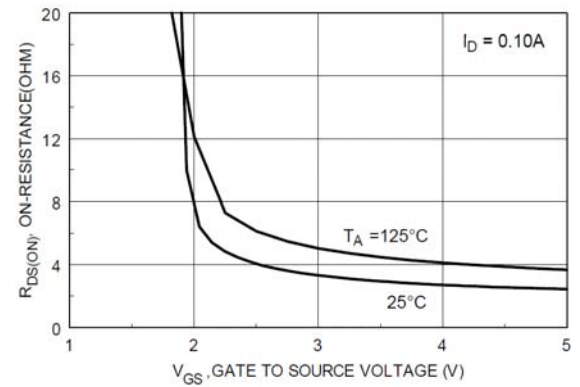


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

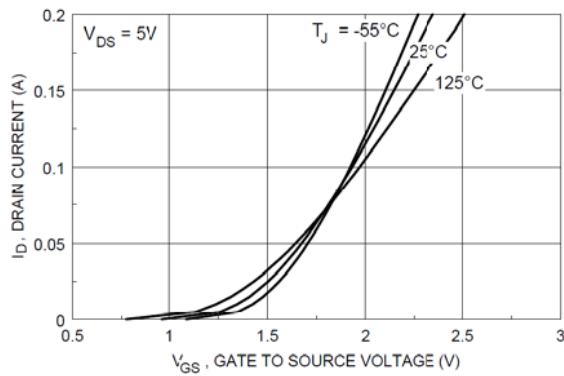


Figure 5. Transfer Characteristics

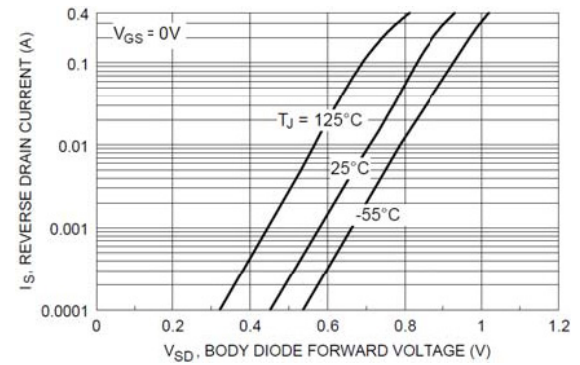


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

## TYPICAL CHARACTERISTICS

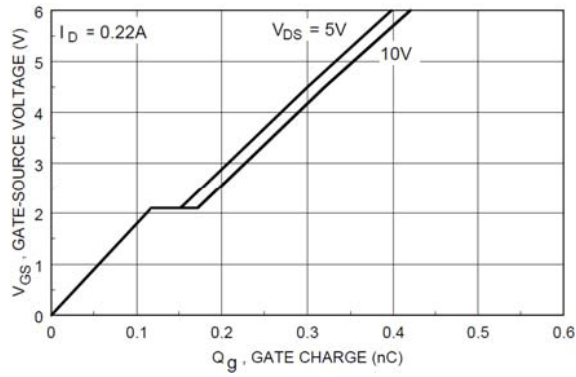


Figure 7. Gate Charge Characteristics

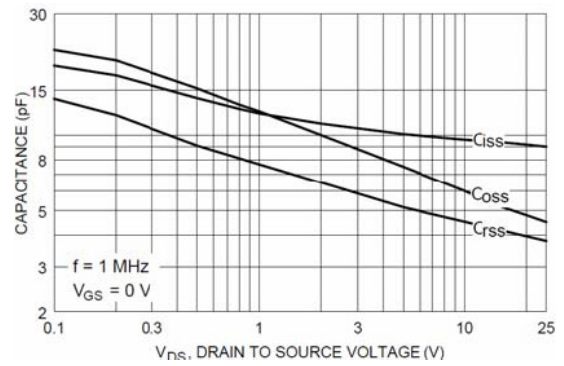


Figure 8. Capacitance Characteristics

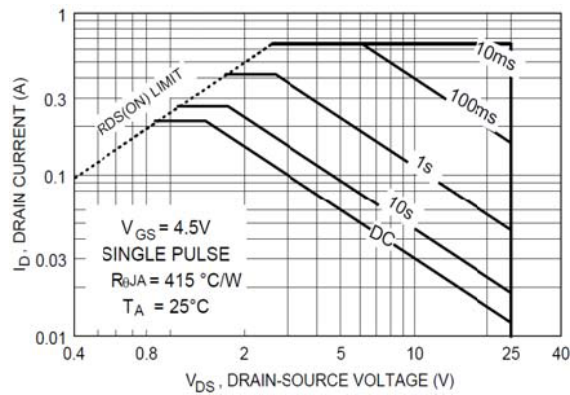


Figure 9. Maximum Safe Operating Area

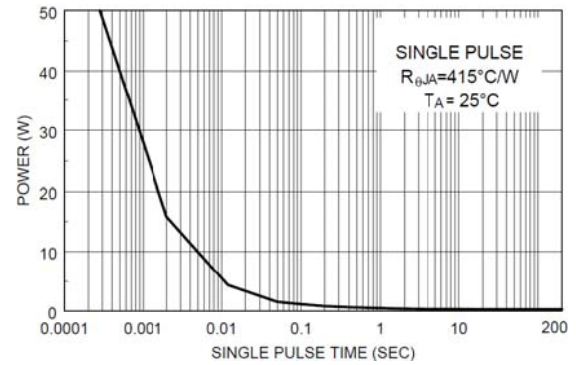


Figure 10. Single Pulse Maximum Power Dissipation

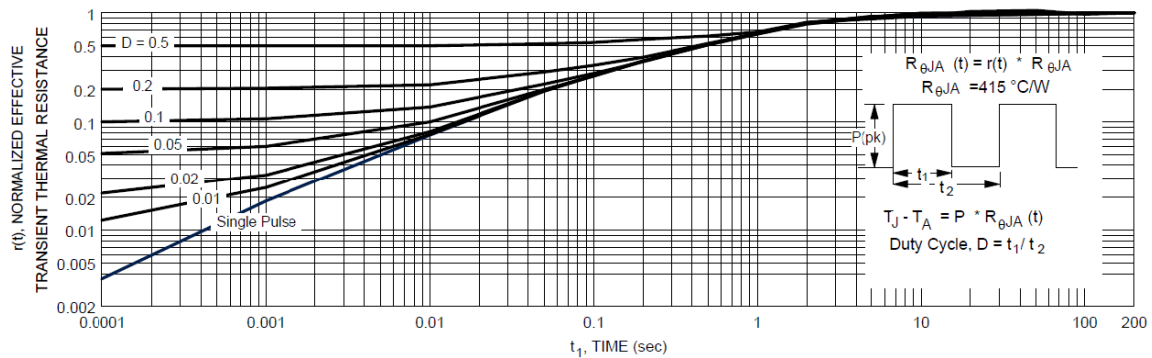
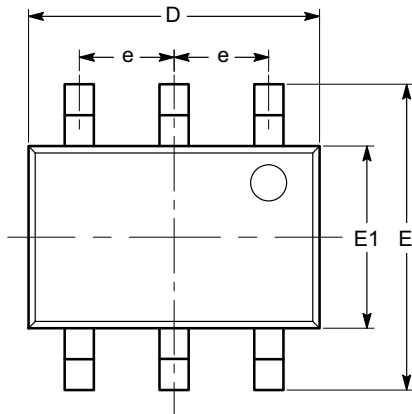


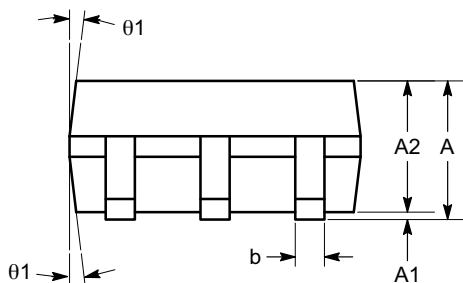
Figure 11. Transient Thermal Response Curve

**SC-88 (SC-70 6 Lead), 1.25x2**  
CASE 419AD-01  
ISSUE A

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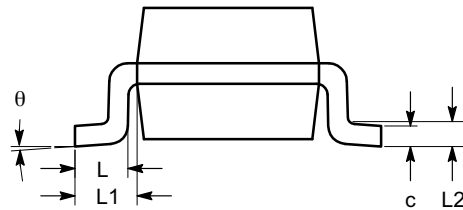


TOP VIEW



SIDE VIEW

| SYMBOL | MIN      | NOM  | MAX  |
|--------|----------|------|------|
| A      | 0.80     |      | 1.10 |
| A1     | 0.00     |      | 0.10 |
| A2     | 0.80     |      | 1.00 |
| b      | 0.15     |      | 0.30 |
| c      | 0.10     |      | 0.18 |
| D      | 1.80     | 2.00 | 2.20 |
| E      | 1.80     | 2.10 | 2.40 |
| E1     | 1.15     | 1.25 | 1.35 |
| e      | 0.65 BSC |      |      |
| L      | 0.26     | 0.36 | 0.46 |
| L1     | 0.42 REF |      |      |
| L2     | 0.15 BSC |      |      |
| θ      | 0°       |      | 8°   |
| θ1     | 4°       |      | 10°  |



END VIEW

**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-203.

|                         |                                     |                                                                                                                                                                                  |
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