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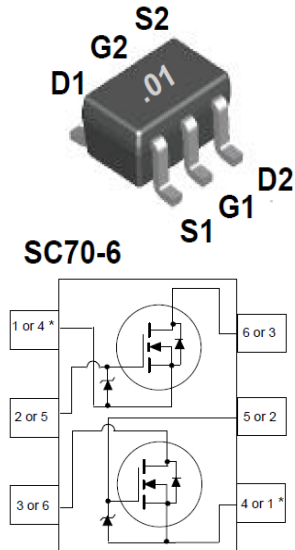


# FDG6301N\_F085

## Dual N-Channel, Digital FET

### Features

- 25 V, 0.22 A continuous, 0.65 A peak.
- $R_{DS(ON)} = 4 \Omega @ V_{GS} = 4.5 V$ ,
- $R_{DS(ON)} = 5 \Omega @ V_{GS} = 2.7 V$ .
- Very low level gate drive requirements allowing direct operation in 3 V circuits ( $V_{GS(th)} < 1.5 V$ ).
- Gate-Source Zener for ESD ruggedness (>6kV Human Body Model).
- Compact industry standard SC70-6 surface mount package.
- Qualified to AEC Q101
- RoHS Compliant



### Applications

- Low voltage applications as a replacement for bipolar digital transistors and small signal MOSFETs

### MOSFET Maximum Ratings $T_A = 25^\circ C$ unless otherwise noted

| Symbol          | Parameter   | Ratings     | Units        |
|-----------------|---|-------------|--------------|
| $V_{DSS}$       | 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 | $^\circ C$   |
| ESD             | Electrostatic Discharge Rating MIL-STD-883D Human Body Model(100 pF / 1500 W) | 6.0         | kV           |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient                                       | 415         | $^\circ C/W$ |

### Package Marking and Ordering Information

| Device Marking | Device        | Package | Reel Size | Tape Width | Quantity   |
|----------------|---------------|---------|-----------|------------|------------|
| FDG6301N       | FDG6301N_F085 | SC70-6  | 7"        | 8mm        | 3000 units |

#### Notes:

- 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.  $R_{\theta JA} = 415^\circ C/W$  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 Fairchild has officially announced in Aug 2014.
- 3: Pulse Test: Pulse Width < 300 $\mu s$ , Duty Cycle < 2.0%.

FDG6301N\_F085 Dual N-Channel Digital FET

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

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

**Off Characteristics**

|               |                                   |  |    |   |           |               |
|---------------|-----------------------------------|--|----|---|-----------|---------------|
| $B_{V_{DSS}}$ | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$     | 25 | - | -         | V             |
| $I_{DSS}$     | Zero Gate Voltage Drain Current   | $V_{DS} = 20\text{V},$<br>$V_{GS} = 0\text{V}$ | -  | - | 1         | $\mu\text{A}$ |
|               |                                   | $T_J = 55^\circ\text{C}$                       | -  | - | 10        |               |
| $I_{GSS}$     | Gate to Source Leakage Current    | $V_{GS} = \pm 8\text{V}$                       | -  | - | $\pm 100$ | nA            |

**On Characteristics**

|              |                                  |   |      |      |     |          |
|--------------|----------------------------------|---|------|------|-----|----------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$                                 | 0.65 | 0.85 | 1.5 | V        |
| $r_{DS(on)}$ | Drain to Source On Resistance    | $I_D = 0.22\text{A}, V_{GS} = 4.5\text{V}$                              | -    | 2.6  | 4   | $\Omega$ |
|              |                                  | $I_D = 0.19\text{A}, V_{GS} = 2.7\text{V}$                              | -    | 3.7  | 5   |          |
|              |                                  | $I_D = 0.22\text{A}, V_{GS} = 4.5\text{V}$<br>$T_J = 125^\circ\text{C}$ | -    | 5.3  | 7   |          |
| $I_{D(on)}$  | On-State Drain Current           | $V_{GS} = 4.5\text{V}, V_{DS} = 5\text{V}$                              | 0.22 | -    | -   |          |
| $g_{FS}$     | Forward Transconductance         | $I_D = 0.22\text{A}, V_{DS} = 5\text{V}$                                | -    | 0.2  | -   | S        |

**Dynamic Characteristics**

|              |                               |   |   |      |     |    |
|--------------|-------------------------------|---|---|------|-----|----|
| $C_{iss}$    | Input Capacitance             | $V_{DS} = 10\text{V}, V_{GS} = 0\text{V},$<br>$f = 1\text{MHz}$ | - | 9.5  | -   | pF |
| $C_{oss}$    | Output Capacitance            |   | - | 6    | -   | pF |
| $C_{rss}$    | Reverse Transfer Capacitance  |   | - | 1.3  | -   | pF |
| $Q_{g(TOT)}$ | Total Gate Charge at -4.5V    | $V_{GS} = 0$ to 4.5V  | - | 0.29 | 0.4 | nC |
| $Q_{gs}$     | Gate to Source Gate Charge    | $V_{DD} = 5\text{V}$<br>$I_D = 0.22\text{A}$                    | - | 0.12 | -   | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |   | - | 0.03 | -   | nC |

**Switching Characteristics**

|              |                     |   |   |     |    |    |
|--------------|---------------------|---|---|-----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 5\text{V}, I_D = 0.5\text{A}$<br>$V_{GS} = 4.5\text{V}, R_{GEN} = 50\Omega$ | - | 5   | 10 | ns |
| $t_r$        | Rise Time           |   | - | 4.5 | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |   | - | 4   | 8  | ns |
| $t_f$        | Fall Time           |   | - | 3.2 | 7  | ns |

**Drain-Source Diode Characteristics**

|          |                                   |   |   |      |     |   |
|----------|-----------------------------------|---|---|------|-----|---|
| $I_S$    | Maximum Continuous Source Current | -   | - | 0.25 | A   |   |
| $V_{SD}$ | Source to Drain Diode Voltage     | $I_{SD} = 0.25\text{A}, V_{GS} = 0\text{V}$ | - | 0.8  | 1.2 | V |

## Typical Characteristics

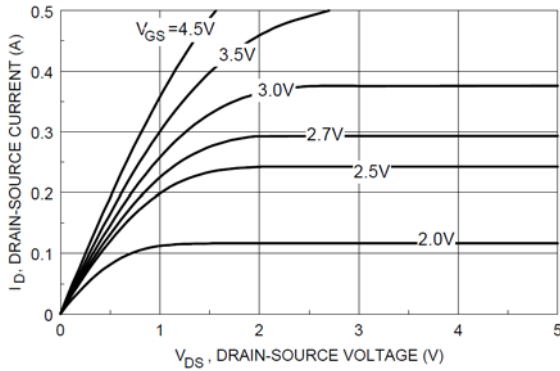


Figure 1. On-Region Characteristics.

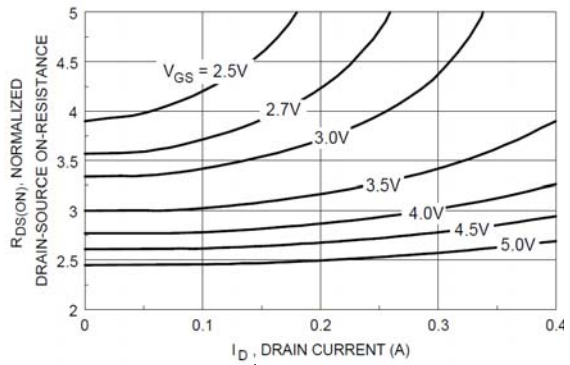


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

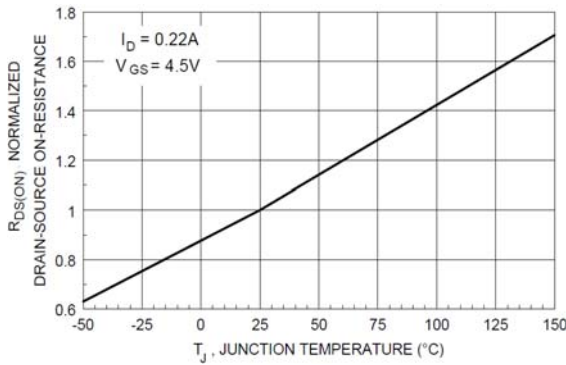


Figure 3. On-Resistance Variation with Temperature.

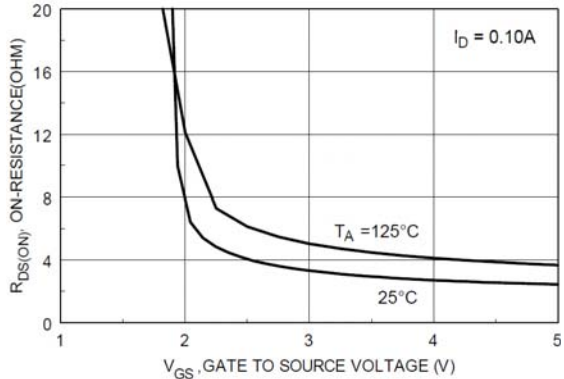


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

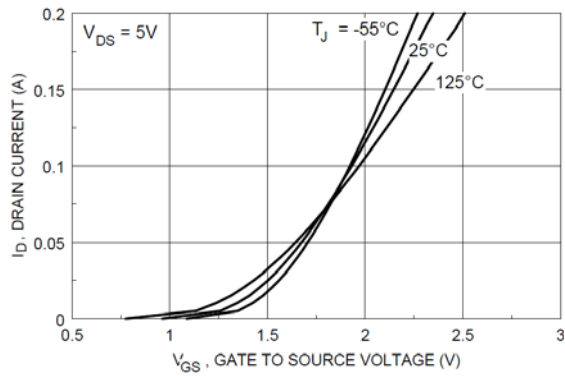


Figure 5. Transfer Characteristics.

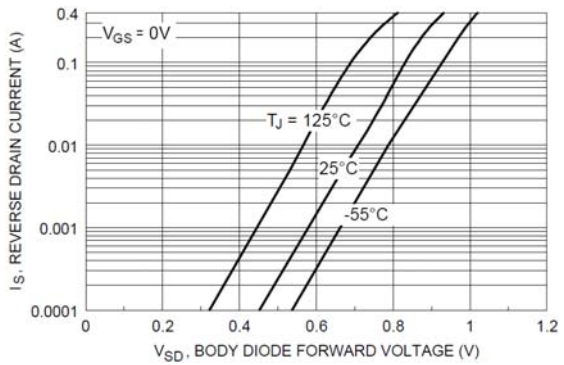


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics

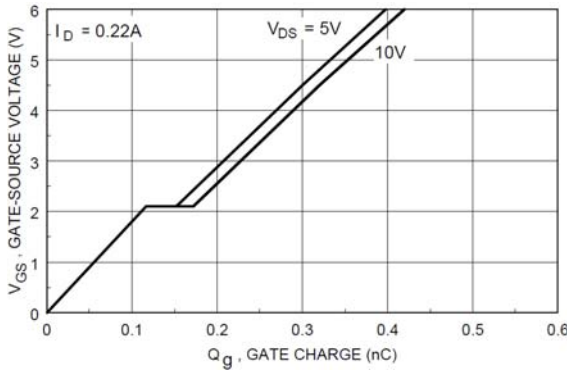


Figure 7. Gate Charge Characteristics.

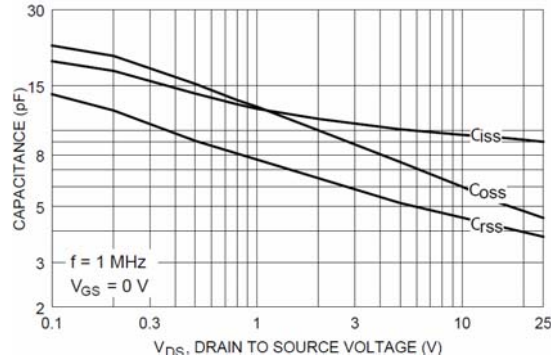


Figure 8. Capacitance Characteristics.

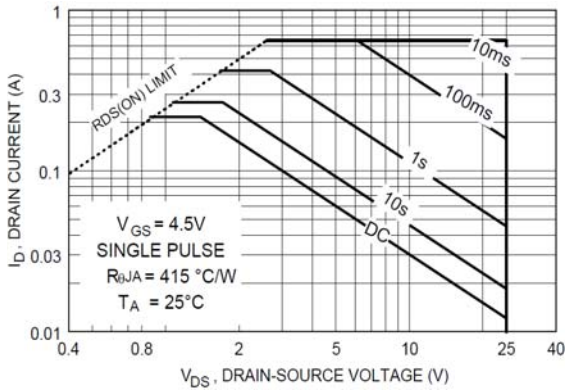


Figure 9. Maximum Safe Operating Area.

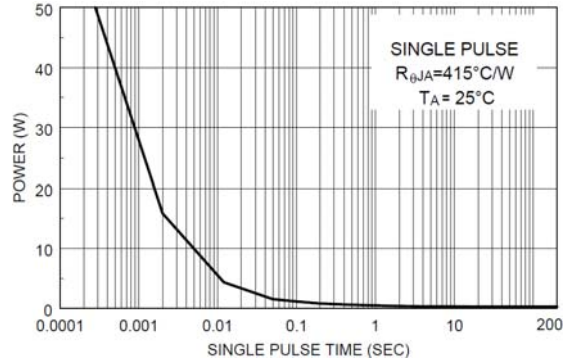


Figure 10. Single Pulse Maximum Power Dissipation.

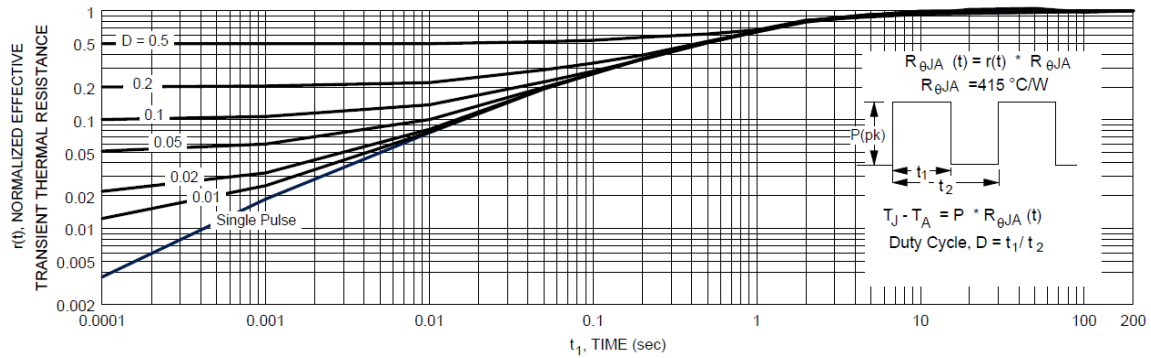
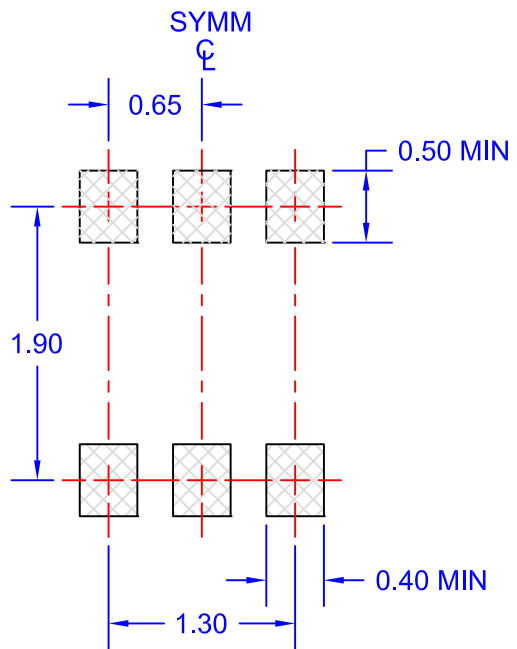
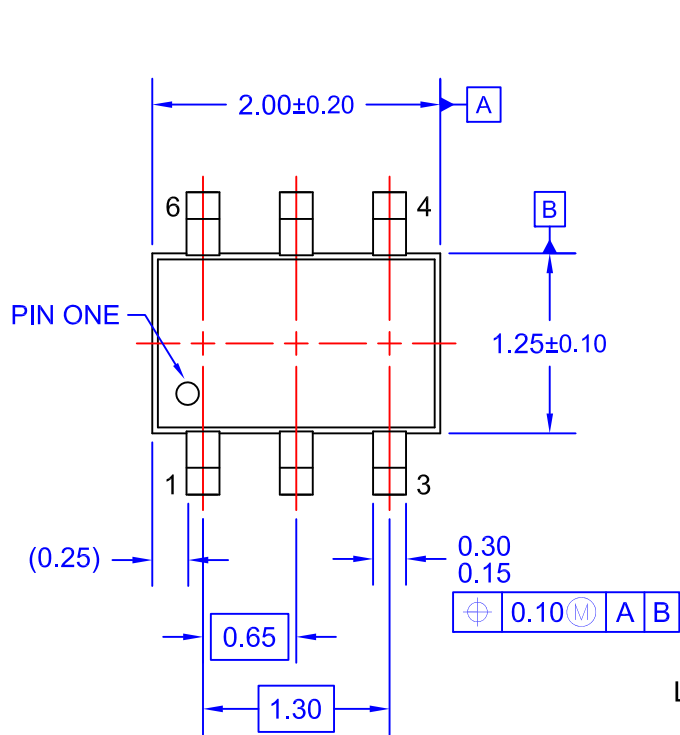
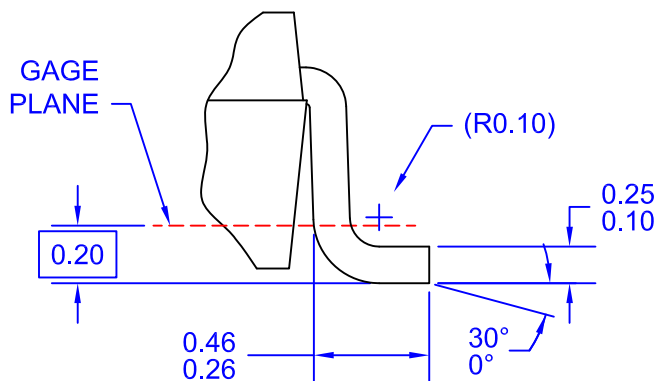
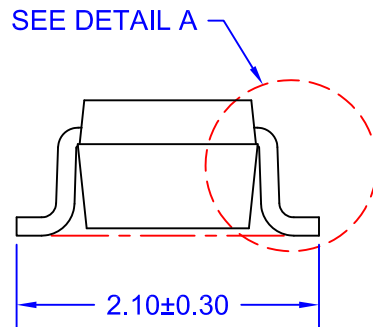
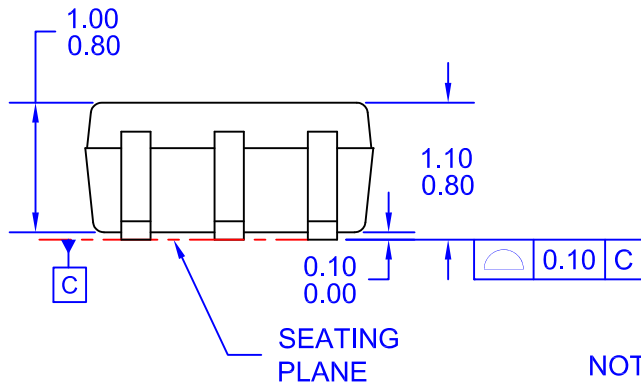


Figure 11. Transient Thermal Response Curve.



LAND PATTERN RECOMMENDATION



DETAIL A  
SCALE: 60X

NOTES: UNLESS OTHERWISE SPECIFIED  
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C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.

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