



Micro Commercial Components



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# SI2301A

## Features

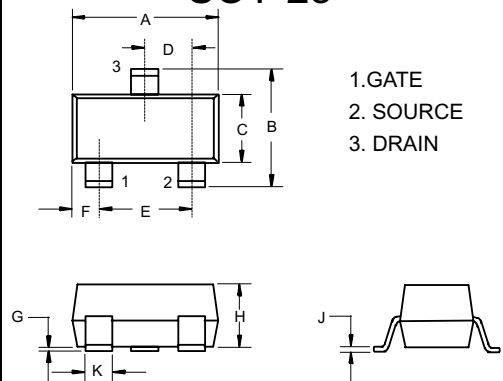
- Halogen free available upon request by adding suffix "-HF"
- -20V, -2.8A,  $R_{DS(ON)}=120m\ \Omega$  @  $V_{GS}=-4.5V$   
 $R_{DS(ON)}=150m\ \Omega$  @  $V_{GS}=-2.5V$
- High dense cell design for extremely low  $R_{DS(ON)}$
- Rugged and reliable
- High Speed Switching
- SOT-23 Package
- Epoxy meets UL 94 V-0 flammability rating
- Moisture Sensitivity Level 1

### Maximum Ratings @ 25°C Unless Otherwise Specified

| Symbol          | Parameter   | Rating      | Unit          |
|-----------------|---|-------------|---------------|
| $V_{DS}$        | Drain-source Voltage                                | -20         | V             |
| $I_D$           | Drain Current-Continuous                            | -2.8        | A             |
| $I_{DM}$        | Drain Current-Pulsed <sup>a</sup>                   | -10         | A             |
| $V_{GS}$        | Gate-source Voltage                                 | $\pm 8$     | V             |
| $P_D$           | Total Power Dissipation                             | 1.0         | W             |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient <sup>b</sup> | 125         | $^{\circ}C/W$ |
| $T_J$           | Operating Junction Temperature                      | -55 to +150 | $^{\circ}C$   |
| $T_{STG}$       | Storage Temperature                                 | -55 to +150 | $^{\circ}C$   |

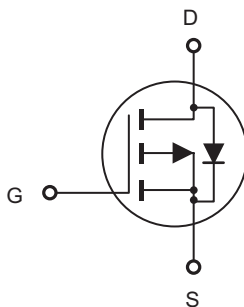
## P-Channel Enhancement Mode Field Effect Transistor

### SOT-23

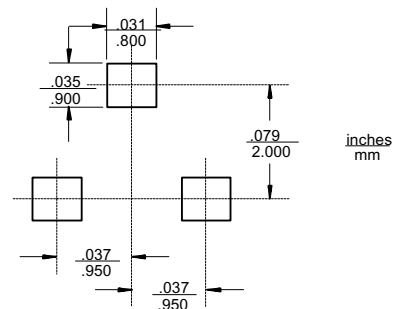


| DIM | INCHES |       | MM   |      | NOTE |
|-----|--------|-------|------|------|------|
|     | MIN    | MAX   | MIN  | MAX  |      |
| A   | .110   | .120  | 2.80 | 3.04 |      |
| B   | .083   | .104  | 2.10 | 2.64 |      |
| C   | .047   | .055  | 1.20 | 1.40 |      |
| D   | .035   | .041  | .89  | 1.03 |      |
| E   | .070   | .081  | 1.78 | 2.05 |      |
| F   | .018   | .024  | .45  | .60  |      |
| G   | .0005  | .0039 | .013 | .100 |      |
| H   | .035   | .044  | .89  | 1.12 |      |
| J   | .003   | .007  | .085 | .180 |      |
| K   | .015   | .020  | .37  | .51  |      |

## Internal Block Diagram



### Suggested Solder Pad Layout





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

| Parameter  | Symbol       | Test Condition   | Min  | Typ  | Max   | Units     |
|--|--------------|--|------|------|-------|-----------|
| <b>Off Characteristics</b>   |              |  |      |      |       |           |
| Drain-Source Breakdown Voltage   | $BV_{DSS}$   | $V_{GS} = 0V, I_D = -250\mu A$                               | -20  |      |       | V         |
| Zero Gate Voltage Drain Current  | $I_{DSS}$    | $V_{DS} = -20V, V_{GS} = 0V$                                 |      |      | -1    | $\mu A$   |
| Gate Body Leakage Current, Forward   | $I_{GSSF}$   | $V_{GS} = 8V, V_{DS} = 0V$                                   |      |      | 100   | nA        |
| Gate Body Leakage Current, Reverse   | $I_{GSSR}$   | $V_{GS} = -8V, V_{DS} = 0V$                                  |      |      | -100  | nA        |
| <b>On Characteristics <sup>c</sup></b>   |              |  |      |      |       |           |
| Gate Threshold Voltage   | $V_{GS(th)}$ | $V_{GS} = V_{DS}, I_D = -250\mu A$                           | -0.5 | -0.7 | -0.9  | V         |
| Static Drain-Source On-Resistance  | $R_{DS(on)}$ | $V_{GS} = -4.5V, I_D = -2.8A$                                |      | 80   | 120   | $m\Omega$ |
|  |              | $V_{GS} = -2.5V, I_D = -2.0A$                                |      | 110  | 150   | $m\Omega$ |
| Forward Transconductance   | $g_{FS}$     | $V_{DS} = -5V, I_D = -2.8A$                                  |      | 8    |       | S         |
| <b>Dynamic Characteristics <sup>d</sup></b>  |              |  |      |      |       |           |
| Input Capacitance  | $C_{iss}$    | $V_{DS} = -6V, V_{GS} = 0V, f = 1.0\text{ MHz}$              |      | 880  |       | pF        |
| Output Capacitance   | $C_{oss}$    |  |      | 270  |       | pF        |
| Reverse Transfer Capacitance   | $C_{rss}$    |  |      | 175  |       | pF        |
| <b>Switching Characteristics <sup>d</sup></b>  |              |  |      |      |       |           |
| Turn-On Delay Time   | $t_{d(on)}$  | $V_{DD} = -6V, I_D = -1A, V_{GS} = -4.5V, R_{GEN} = 6\Omega$ |      | 11   | 20    | ns        |
| Turn-On Rise Time  | $t_r$        |  |      | 5    | 10    | ns        |
| Turn-Off Delay Time  | $t_{d(off)}$ |  |      | 32   | 65    | ns        |
| Turn-Off Fall Time   | $t_f$        |  |      | 23   | 45    | ns        |
| Total Gate Charge  | $Q_g$        | $V_{DS} = -6V, I_D = -2.8A, V_{GS} = -4.5V$                  |      | 11   | 14.5  | nC        |
| Gate-Source Charge   | $Q_{gs}$     |  |      | 1.5  |       | nC        |
| Gate-Drain Charge  | $Q_{gd}$     |  |      | 2.1  |       | nC        |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b>  |              |  |      |      |       |           |
| Drain-Source Diode Forward Current <sup>b</sup>  | $I_S$        |  |      |      | -0.75 | A         |
| Drain-Source Diode Forward Voltage <sup>c</sup>  | $V_{SD}$     | $V_{GS} = 0V, I_S = -0.75A$                                  |      |      | -1.2  | V         |
| <b>Notes :</b><br>a.Repetitive Rating : Pulse width limited by maximum junction temperature.<br>b.Surface Mounted on FR4 Board, $t < 5\text{ sec}$ .<br>c.Pulse Test : Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$ .<br>d.Guaranteed by design, not subject to production testing. |              |  |      |      |       |           |

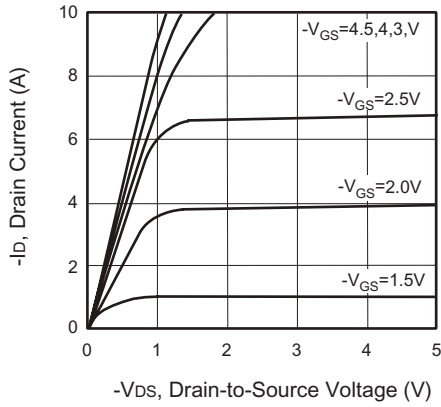


Figure 1. Output Characteristics

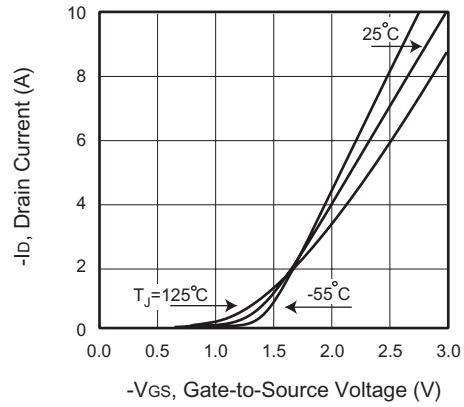


Figure 2. Transfer Characteristics

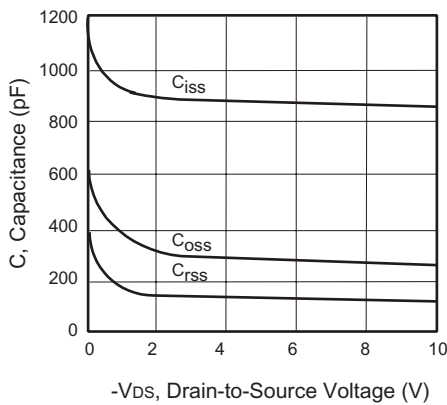


Figure 3. Capacitance

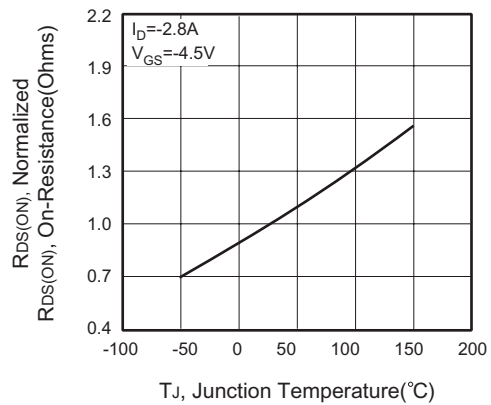


Figure 4. On-Resistance Variation with Temperature

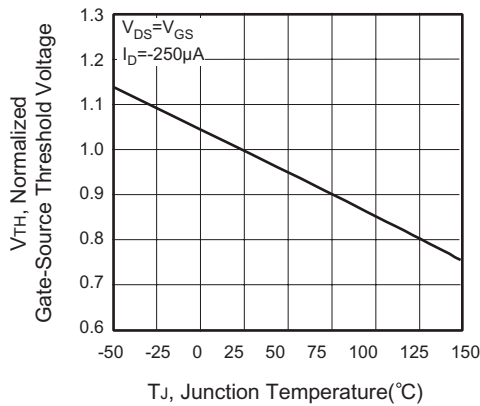


Figure 5. Gate Threshold Variation with Temperature

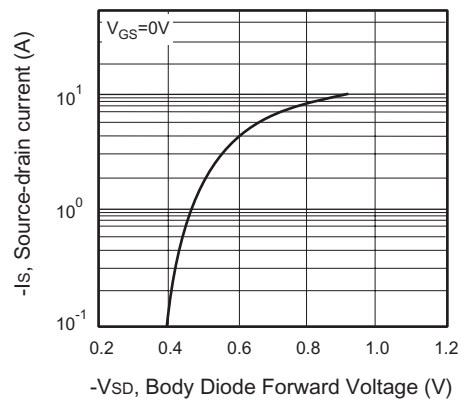


Figure 6. Body Diode Forward Voltage Variation with Source Current

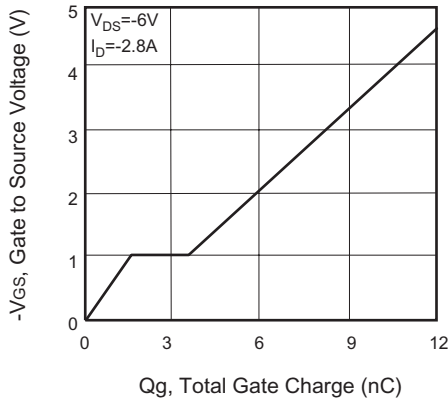


Figure 7. Gate Charge

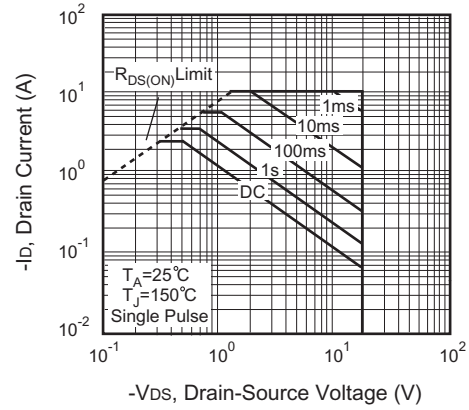


Figure 8. Maximum Safe Operating Area

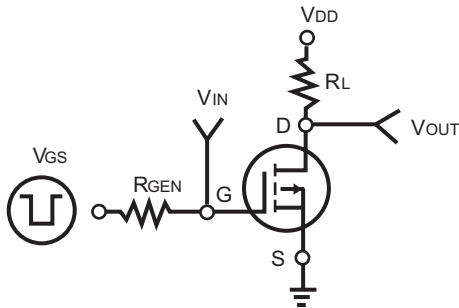


Figure 9. Switching Test Circuit

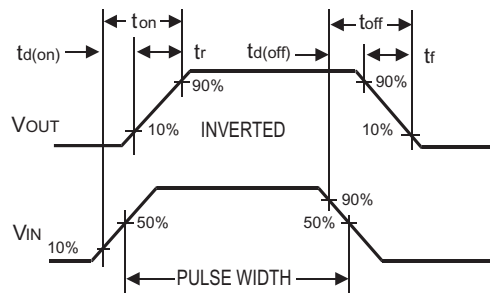


Figure 10. Switching Waveforms

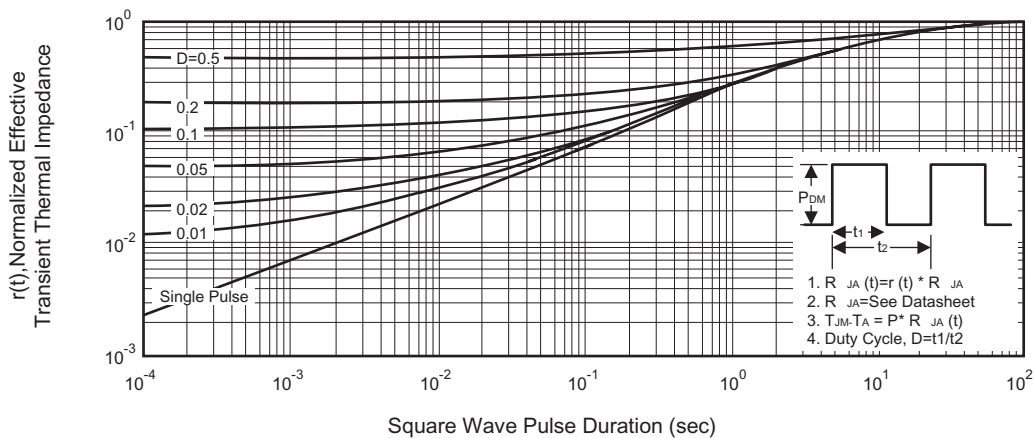


Figure 11. Normalized Thermal Transient Impedance Curve



## Ordering Information :

| Device         | Packing               |
|----------------|-----------------------|
| Part Number-TP | Tape&Reel: 3Kpcs/Reel |

Note : Adding "-HF" suffix for halogen free, eg. Part Number-TP-HF

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