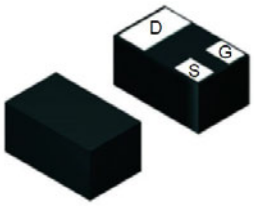
GOOD-ARK SEMICONDUCTOR

# GSFW02056

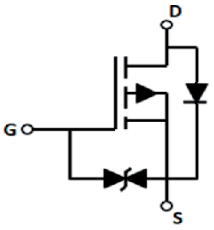
**20V P-Channel MOSFET**

## Main Product Characteristics

| | |
|---|---|
| $BV_{DSS}$ | -20V |
| $R_{DS(ON)}$ | 850mΩ (max.) |
| $I_D$ | -0.56A |




SOT-883




Schematic Diagram

## Features and Benefits

- Advanced MOSFET process technology
- ESD Protection
- Low on-resistance with low gate charge
- Fast switching and reverse body recovery

## Description

GSFW02056 is the P-Channel enhancement mode power field effect transistors with high cell density, trench tech-nology. This high density process and design have been optimized switching performance and especially tailored to minimize on-state resistance.

## Absolute Maximum Ratings ($T_A$=25°C unless otherwise specified)

| Parameter | Symbol | Max. | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | -20 | V |
| Gate-Source Voltage | $V_{GS}$ | ±10 | V |
| Continuous Drain Current, ($T_A$=25°C, t≤5s ) | $I_D$ | -0.56 | A |
| Continuous Drain Current, @ Steady-State ($T_A$=25°C) | | -0.5 | A |
| Continuous Drain Current, @ Steady-State ($T_A$=75°C) | | -0.39 | A |
| Pulsed Drain Current[1] | $I_{DM}$ | -2.24 | A |
| Total Power Dissipation @ $T_A$=25°C, t≤5s[2] | $P_D$ | 430 | mW |
| Total Power Dissipation @ $T_A$=25°C, Steady-State[2] | | 340 | |
| Thermal Resistance Junction-to-Ambient @ t≤5s[2] | $R_{\theta JA}$ | 294 | °C/W |
| Thermal Resistance Junction-to-Ambient @ Steady State[2] | | 366 | |
| Junction and Storage Temperature Range | $T_J/T_{STG}$ | -55 to +150 | °C |

Note:

1. Pulse test: pulse width ≤ 300us, duty cycle ≤ 2%.
2. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch. With 2oz Copper, t≤10s

## Electrical Characteristics ($T_J$=25°C unless otherwise specified)

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **On / Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=-250μA | -20 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=-20V, $V_{GS}$=0V, $T_C$=25°C | - | - | -1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±10V, $V_{DS}$=0V | - | - | ±10 | uA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=-250μA | -0.35 | - | -1.2 | V |
| Static Drain-Source on-Resistance | $R_{DS(on)}$ | $V_{GS}$=-4.5V, $I_D$=-0.5A | - | 610 | 850 | mΩ |
| | | $V_{GS}$=-2.5V, $I_D$=-0.3A | - | 930 | 1200 | |
| **Dynamic and Switching Characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=-10V, $V_{GS}$=0V, F=1MHz | - | 70 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 19 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 14 | - | |
| Total Gate Charge | $Q_g$ | $V_{GS}$=-4.5V, $V_{DS}$=-10V, $I_D$=-0.5A | - | 1.22 | - | nC |
| Gate Source Charge | $Q_{gs}$ | | - | 0.36 | - | |
| Gate Drain Charge | $Q_{gd}$ | | - | 0.26 | - | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{GS}$=-4.5V, $V_{DD}$=-10V, $R_L$=2.5Ω, $R_{GEN}$=2.5Ω | - | 4.5 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 18 | - | |
| Turn-off Delay Time | $t_{d(off)}$ | | - | 15 | - | |
| Turn-off Fall Time | $t_f$ | | - | 23 | - | |
| **Source-Drain Ratings and Characteristics** | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=-0.56A, $V_{GS}$=0V | - | - | -1.2 | V |
| Maximum Body-Diode Continuous Current | $I_S$ | - | - | - | -0.56 | A |

## Typical Performance Characteristics

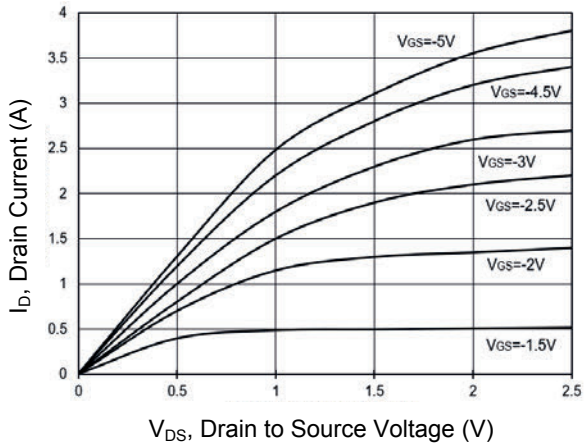



**Figure 1. Output Characteristics**

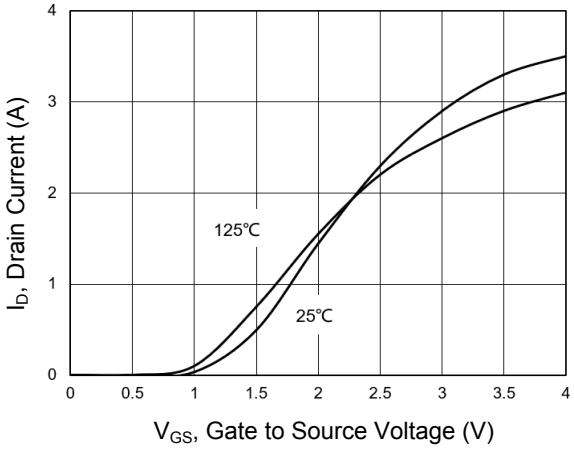



**Figure 2. Transfer Characteristics**

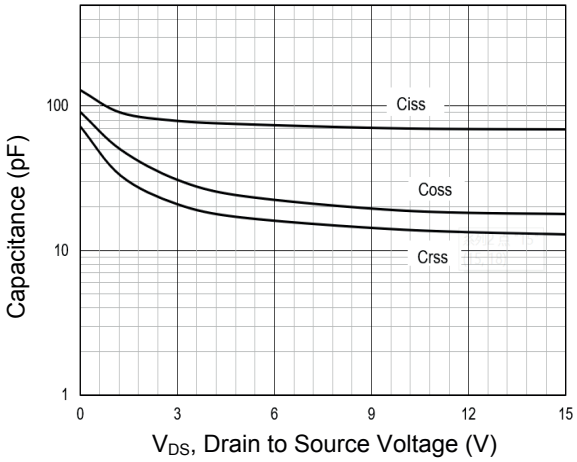



**Figure 3. Capacitance Characteristics**

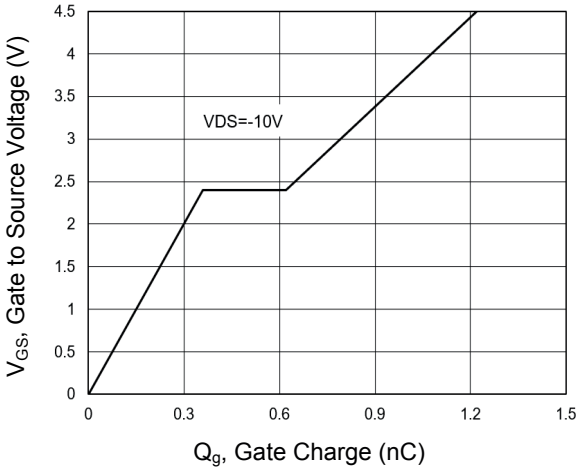



**Figure 4. Gate Charge**

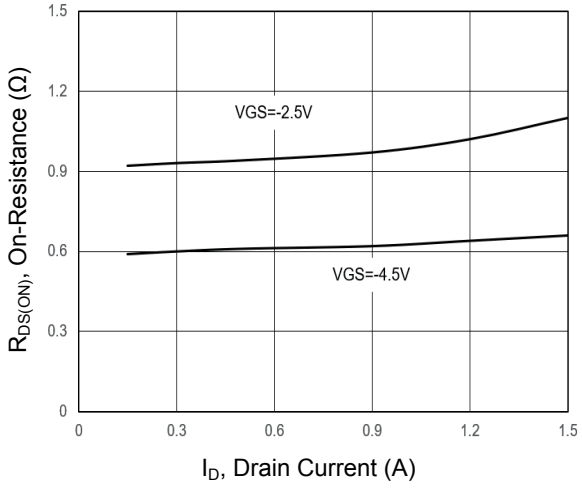



**Figure 5. Drain to Source on Resistance**

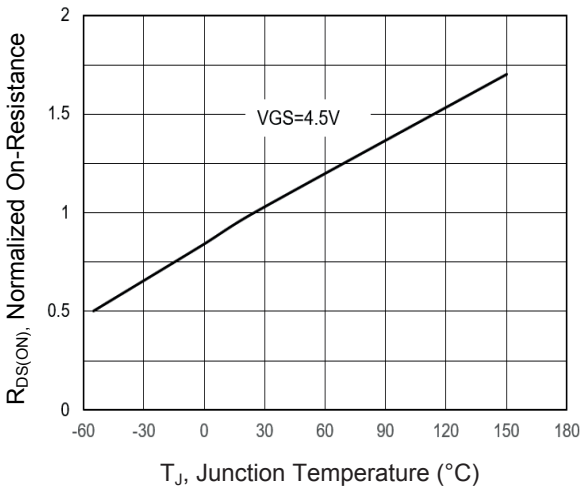



**Figure 6. Normalized $R_{DS(ON)}$ vs. $T_J$**

## Typical Performance Characteristics

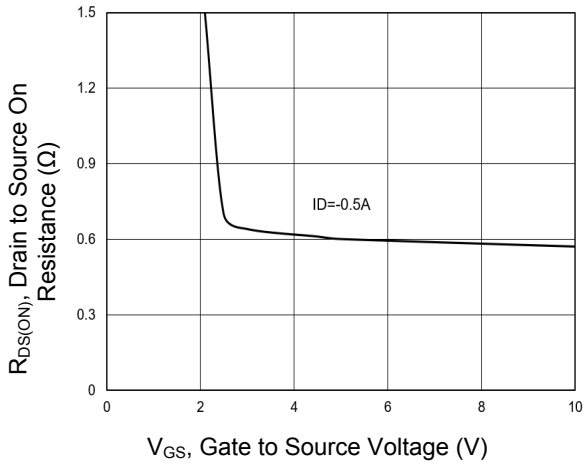



**Figure 7. Typical Drain to Source ON Resistance vs. Gate Voltage and Drain Current**

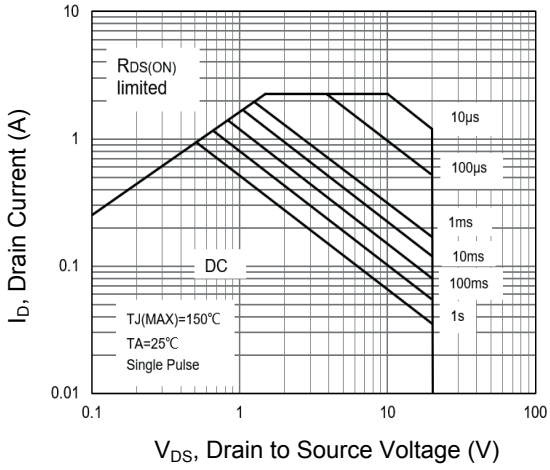



**Figure 8. Safe Operation Area**

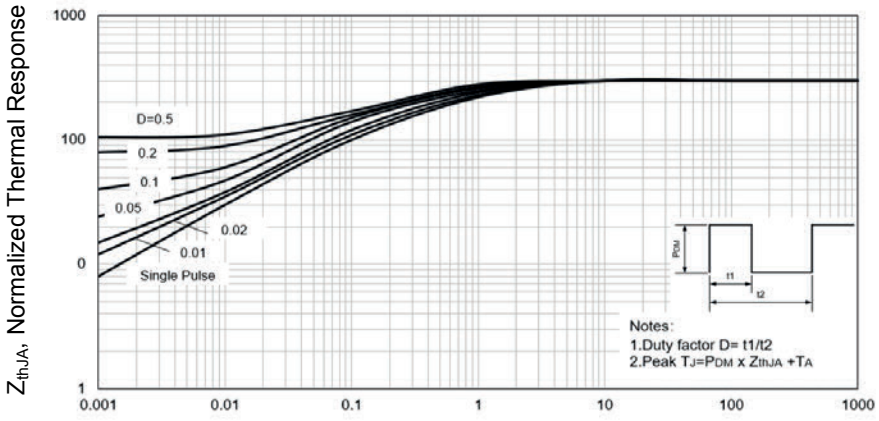
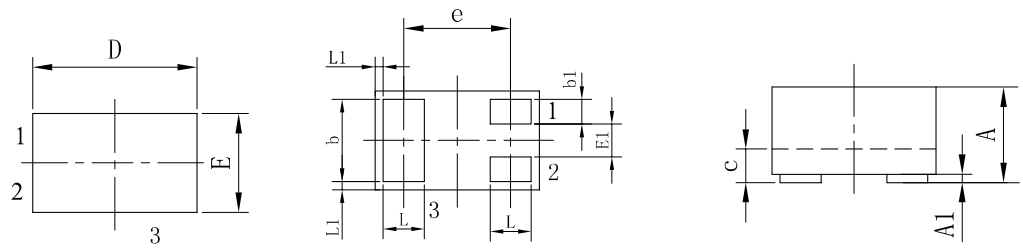


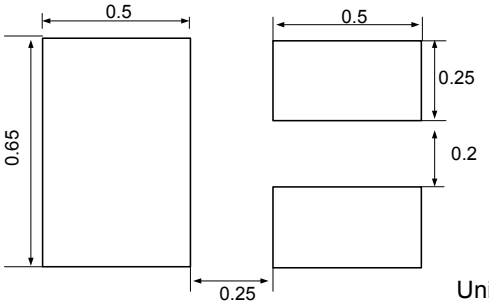

**Figure 9. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient**

## Package Outline Dimensions (DFN1006-3L)




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.45 | 0.55 | 0.018 | 0.022 |
| A1 | 0.00 | 0.05 | 0.000 | 0.002 |
| b | 0.45 | 0.55 | 0.018 | 0.022 |
| b1 | 0.10 | 0.20 | 0.004 | 0.008 |
| c | 0.12 | 0.18 | 0.005 | 0.007 |
| D | 0.95 | 1.05 | 0.037 | 0.041 |
| e | 0.65 BSC | | 0.026 BSC | |
| E | 0.55 | 0.65 | 0.022 | 0.026 |
| E1 | 0.15 | 0.25 | 0.006 | 0.010 |
| L | 0.20 | 0.30 | 0.008 | 0.012 |
| L1 | 0.05 REF | | 0.002 REF | |

## Recommended Pad Layout




Unit: mm

## Order Information

| Device | Package | Marking | Carrier | Quantity |
|---|---|---|---|---|
| GSFW02056 | SOT-883 | M5 | Tape & Reel | 10,000 pcs / 7" Reel |