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ON Semiconductor®

## FDS6673BZ-F085

### P-Channel PowerTrench® MOSFET

-30V, -14.5A, 7.8mΩ

#### General Description

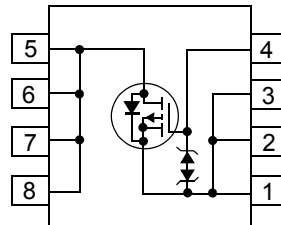
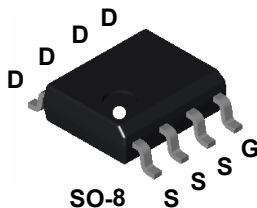
This P-Channel MOSFET is produced using ON Semiconductor's advanced Power Trench process that has been especially tailored to minimize the on-state resistance.

This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery Packs.



#### Features

- Max  $r_{DS(on)} = 7.8\text{m}\Omega$ ,  $V_{GS} = -10\text{V}$ ,  $I_D = -14.5\text{A}$
- Max  $r_{DS(on)} = 12\text{m}\Omega$ ,  $V_{GS} = -4.5\text{V}$ ,  $I_D = -12\text{A}$
- Extended  $V_{GS}$  range (-25V) for battery applications
- HBM ESD protection level of 6.5kV typical (note 3)
- High performance trench technology for extremely low  $r_{DS(on)}$
- High power and current handling capability
- RoHS compliant
- Qualified to AEC Q101



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

| Symbol         | Parameter                                       | Ratings    | Units            |
|----------------|---|------------|------------------|
| $V_{DS}$       | Drain to Source Voltage                         | -30        | V                |
| $V_{GS}$       | Gate to Source Voltage                          | $\pm 25$   | V                |
| $I_D$          | Drain Current -Continuous (Note1a)              | -14.5      | A                |
|                | -Pulsed   | -75        | A                |
| $P_D$          | Power Dissipation for Single Operation (Note1a) | 2.5        | W                |
|                | (Note1b)  | 1.2        |                  |
|                | (Note1c)  | 1.0        |                  |
| $T_J, T_{STG}$ | Operating and Storage Temperature               | -55 to 150 | $^\circ\text{C}$ |

#### Thermal Characteristics

|                 |   |    |                    |
|-----------------|---|----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 50 | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case (Note 1)     | 25 | $^\circ\text{C/W}$ |

#### Package Marking and Ordering Information

| Device Marking | Device         | Reel Size | Tape Width | Quantity   |
|----------------|----------------|-----------|------------|------------|
| FDS6673BZ      | FDS6673BZ-F085 | 13"       | 12mm       | 2500 units |

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

| Symbol                               | Parameter                                 | Test Conditions  | Min | Typ | Max      | Units                |
|--------------------------------------|---|--|-----|-----|----------|----------------------|
| $B_{VDSS}$                           | Drain to Source Breakdown Voltage         | $I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$             | -30 |     |          | V                    |
| $\frac{\Delta B_{VDSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$ |     | -20 |          | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = -24\text{V}$ , $V_{GS} = 0\text{V}$              |     |     | -1       | $\mu\text{A}$        |
| $I_{GSS}$                            | Gate to Source Leakage Current            | $V_{GS} = \pm 25\text{V}$ , $V_{DS} = 0\text{V}$           |     |     | $\pm 10$ | $\mu\text{A}$        |

**On Characteristics (Note 2)**

|  |  |  |    |      |     |                      |
|--|--|--|----|------|-----|----------------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}$ , $I_D = -250\mu\text{A}$                                | -1 | -1.9 | -3  | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$                 |    | 8.1  |     | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Drain to Source On Resistance                            | $V_{GS} = -10\text{V}$ , $I_D = -14.5\text{A}$                             |    | 6.5  | 7.8 | m $\Omega$           |
|  |  | $V_{GS} = -4.5\text{V}$ , $I_D = -12\text{A}$                              |    | 9.6  | 12  |                      |
|  |  | $V_{GS} = -10\text{V}$ , $I_D = -14.5\text{A}$ , $T_J = 125^\circ\text{C}$ |    | 9.7  | 12  |                      |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DS} = -5\text{V}$ , $I_D = -14.5\text{A}$                              |    | 60   |     | S                    |

**Dynamic Characteristics**

|           |                              |  |  |      |      |    |
|-----------|------------------------------|--|--|------|------|----|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = -15\text{V}$ , $V_{GS} = 0\text{V}$ ,<br>$f = 1.0\text{MHz}$ |  | 3500 | 4700 | pF |
| $C_{oss}$ | Output Capacitance           |  |  | 600  | 800  | pF |
| $C_{rss}$ | Reverse Transfer Capacitance |  |  | 600  | 900  | pF |

**Switching Characteristics (Note 2)**

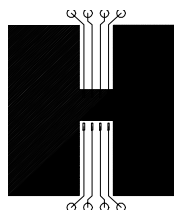
|              |                            |  |  |      |     |    |
|--------------|----------------------------|--|--|------|-----|----|
| $t_{d(on)}$  | Turn-On Delay Time         | $V_{DD} = -15\text{V}$ , $I_D = -1\text{A}$<br>$V_{GS} = -10\text{V}$ , $R_{GS} = 6\Omega$ |  | 14   | 26  | ns |
| $t_r$        | Rise Time                  |  |  | 16   | 29  | ns |
| $t_{d(off)}$ | Turn-Off Delay Time        |  |  | 225  | 306 | ns |
| $t_f$        | Fall Time                  |  |  | 105  | 167 | ns |
| $Q_g$        | Total Gate Charge          | $V_{DS} = -15\text{V}$ , $V_{GS} = -10\text{V}$ ,<br>$I_D = -14.5\text{A}$                 |  | 88   | 124 | nC |
| $Q_g$        | Total Gate Charge          | $V_{DS} = -15\text{V}$ , $V_{GS} = -5\text{V}$ ,<br>$I_D = -14.5\text{A}$                  |  | 46   | 65  | nC |
| $Q_{gs}$     | Gate to Source Gate Charge |  |  | 8    |     | nC |
| $Q_{gd}$     | Gate to Drain Charge       |  |  | 23.5 |     | nC |

**Drain-Source Diode Characteristics**

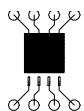
|          |                                       |  |  |      |      |    |
|----------|---------------------------------------|--|--|------|------|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{V}$ , $I_S = -2.1\text{A}$              |  | -0.7 | -1.2 | V  |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = 14.5\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$ |  |      | 45   | ns |
| $Q_{rr}$ | Reverse Recovery Charge               | $I_F = 14.5\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$ |  |      | 34   | nC |

**Notes:**

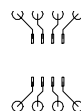
1:  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a) 50  $^\circ\text{C}/\text{W}$  (10 sec)  
when mounted on a 1 in<sup>2</sup>  
pad of 2 oz copper



b) 105  $^\circ\text{C}/\text{W}$  when mounted  
on a .04 in<sup>2</sup> pad of 2 oz  
copper



c) 125  $^\circ\text{C}/\text{W}$  when mounted  
on a minimum pad

Scale 1 : 1 on letter size paper

2: Pulse Test: Pulse Width < 300 $\mu\text{s}$ , Duty Cycle < 2.0%.

3: The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

## Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

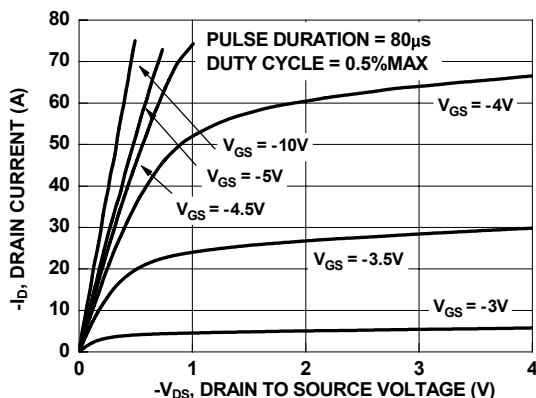


Figure 1. On Region Characteristics

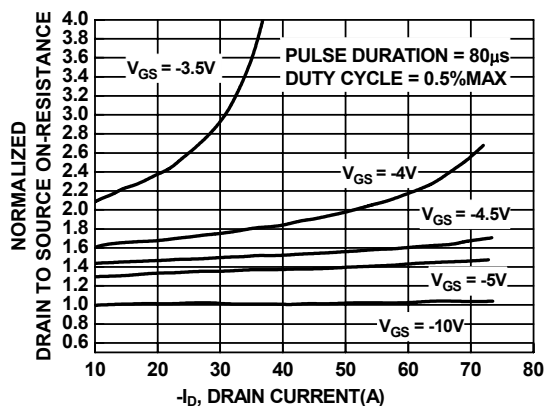


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

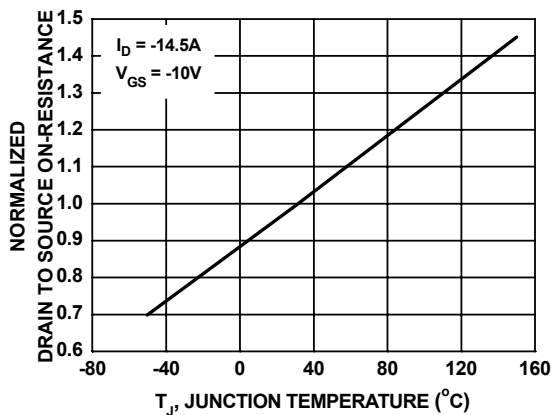


Figure 3. Normalized On Resistance vs Junction Temperature

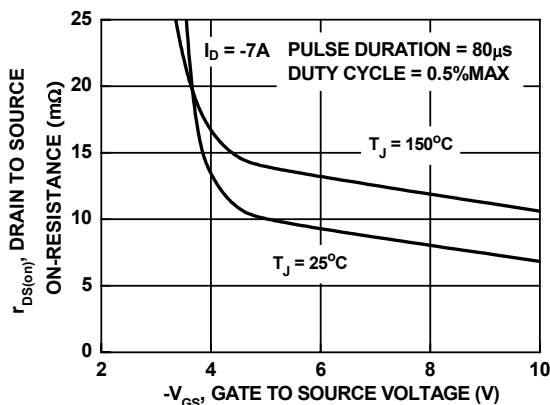


Figure 4. On-Resistance vs Gate to Source Voltage

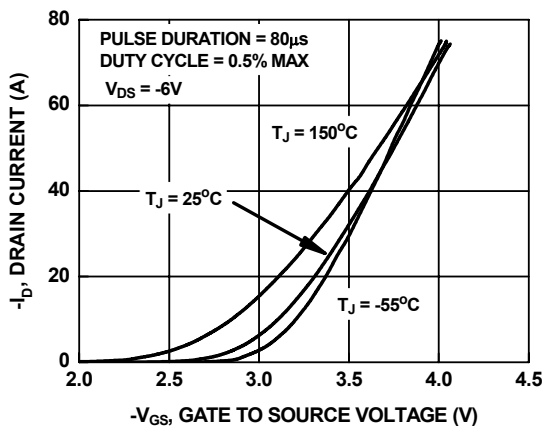


Figure 5. Transfer Characteristics

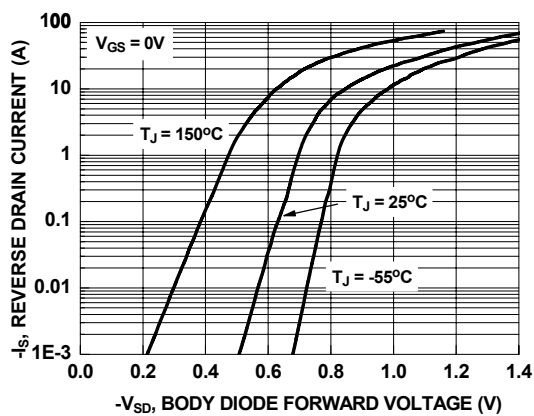


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

## Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

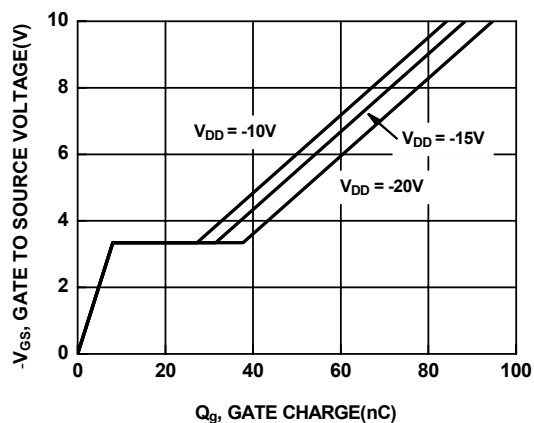


Figure 7. Gate Charge Characteristics

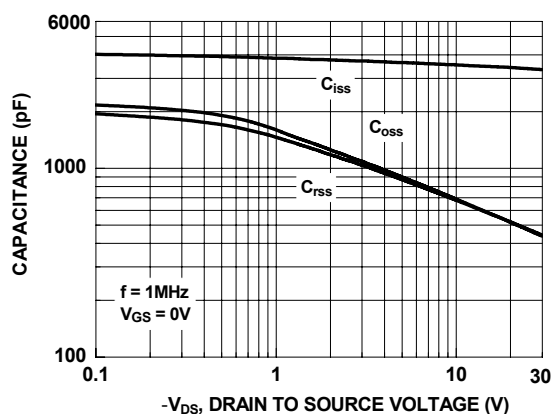


Figure 8. Capacitance vs Drain to Source Voltage

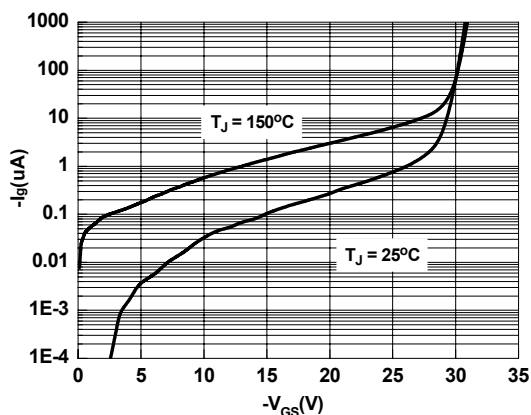


Figure 9.  $I_g$  vs  $V_{GS}$

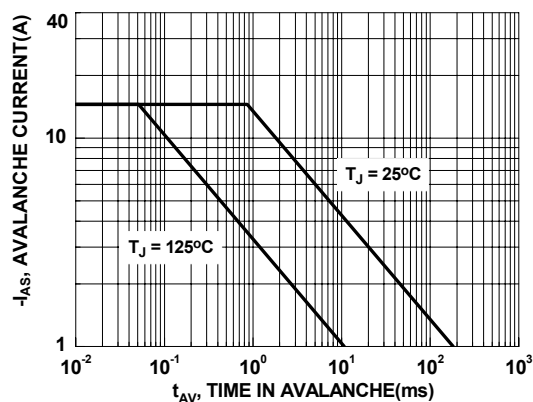


Figure 10. Unclamped Inductive Switching Capability

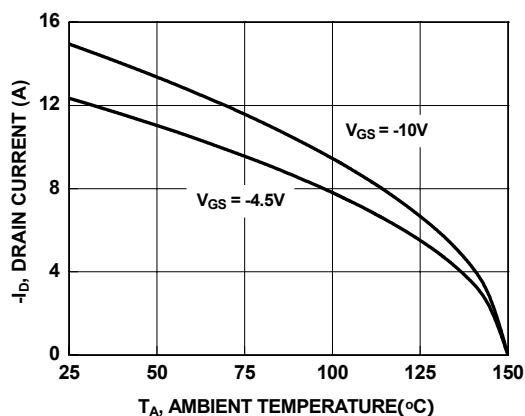


Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

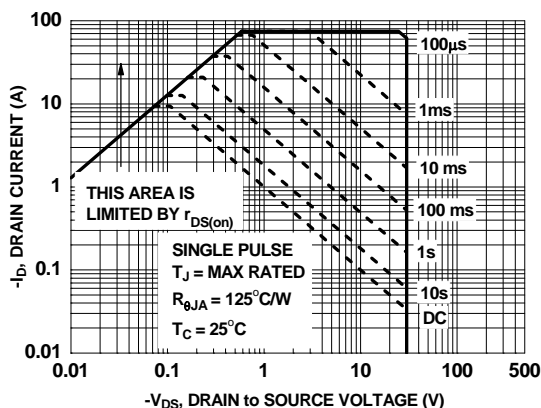


Figure 12. Forward Bias Safe Operating Area

# Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

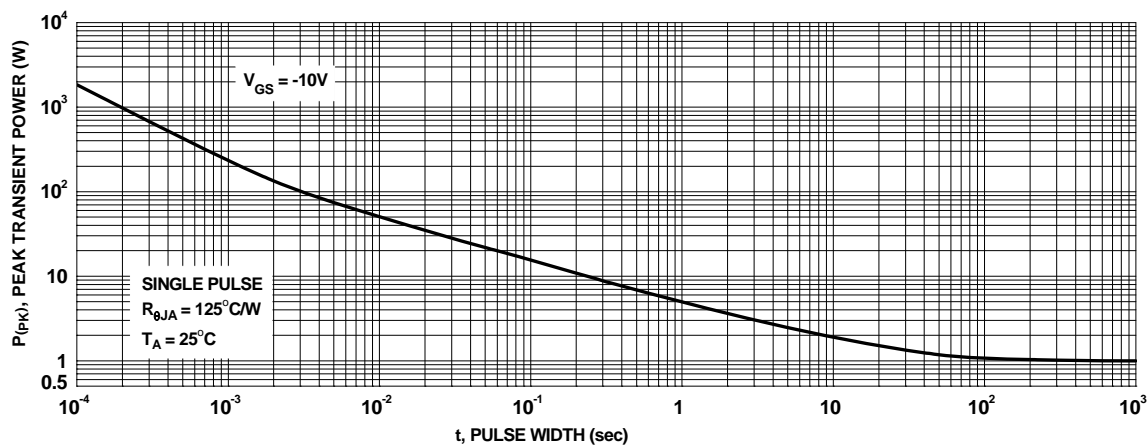


Figure 13. Junction-to-Case Transient Thermal Response Curve

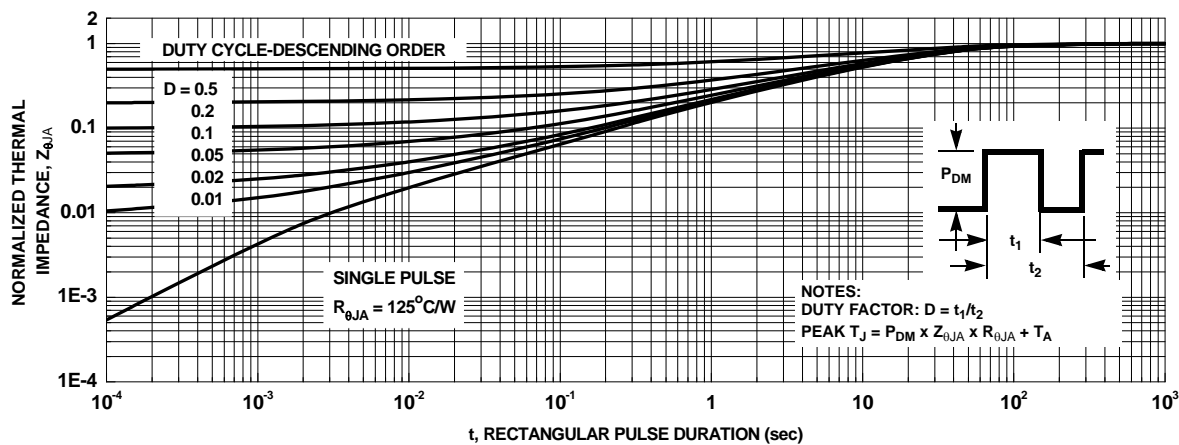


Figure 14. Junction-to-Ambient Transient Thermal Response Curve

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