

# FS50UMJ-3

HIGH-SPEED SWITCHING USE

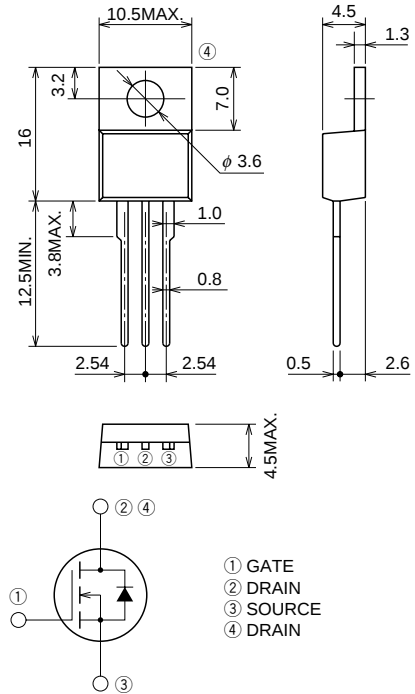
## FS50UMJ-3



- 4V DRIVE
- $V_{DS}$  ..... 150V
- $r_{DS(ON)}$  (MAX) ..... 30m $\Omega$
- $I_D$  ..... 50A
- Integrated Fast Recovery Diode (TYP.) ..... 125ns

## OUTLINE DRAWING

Dimensions in mm



## APPLICATION

Motor control, Lamp control, Solenoid control  
DC-DC converter, etc.

## MAXIMUM RATINGS (T<sub>c</sub> = 25°C)

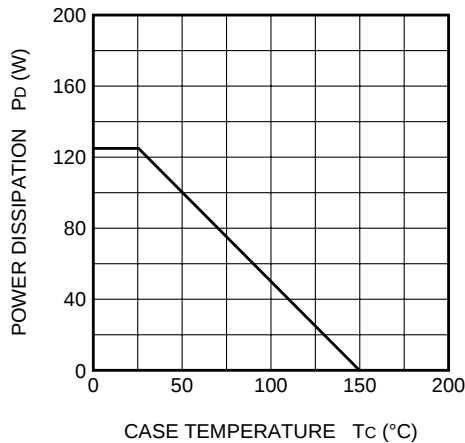
| Symbol    | Parameter                        | Conditions     | Ratings    | Unit |
|-----------|----------------------------------|----------------|------------|------|
| $V_{DS}$  | Drain-source voltage             | $V_{GS} = 0V$  | 150        | V    |
| $V_{GS}$  | Gate-source voltage              | $V_{DS} = 0V$  | $\pm 20$   | V    |
| $I_D$     | Drain current                    |                | 50         | A    |
| $I_{DM}$  | Drain current (Pulsed)           |                | 200        | A    |
| $I_{DA}$  | Avalanche drain current (Pulsed) | $L = 100\mu H$ | 50         | A    |
| $I_S$     | Source current                   |                | 50         | A    |
| $I_{SM}$  | Source current (Pulsed)          |                | 200        | A    |
| $P_D$     | Maximum power dissipation        |                | 125        | W    |
| $T_{ch}$  | Channel temperature              |                | -55 ~ +150 | °C   |
| $T_{stg}$ | Storage temperature              |                | -55 ~ +150 | °C   |
| —         | Weight                           | Typical value  | 2.0        | g    |

ELECTRICAL CHARACTERISTICS (T<sub>ch</sub> = 25°C)

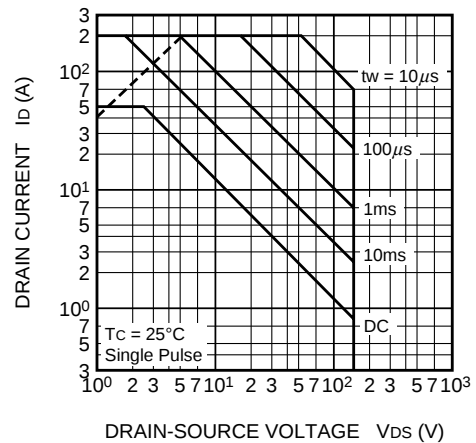
| Symbol                | Parameter                        | Test conditions                                                                                              | Limits |      |      | Unit |
|-----------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------|--------|------|------|------|
|                       |                                  |                                                                                                              | Min.   | Typ. | Max. |      |
| V <sub>(BR)DSS</sub>  | Drain-source breakdown voltage   | I <sub>D</sub> = 1mA, V <sub>GS</sub> = 0V                                                                   | 150    | —    | —    | V    |
| I <sub>GSS</sub>      | Gate-source leakage current      | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                                                                 | —      | —    | ±0.1 | μA   |
| I <sub>DSS</sub>      | Drain-source leakage current     | V <sub>DS</sub> = 150V, V <sub>GS</sub> = 0V                                                                 | —      | —    | 0.1  | mA   |
| V <sub>GS(th)</sub>   | Gate-source threshold voltage    | I <sub>D</sub> = 1mA, V <sub>DS</sub> = 10V                                                                  | 1.0    | 1.5  | 2.0  | V    |
| r <sub>DS(on)</sub>   | Drain-source on-state resistance | I <sub>D</sub> = 25A, V <sub>GS</sub> = 10V                                                                  | —      | 23   | 30   | mΩ   |
| r <sub>DS(on)</sub>   | Drain-source on-state resistance | I <sub>D</sub> = 25A, V <sub>GS</sub> = 4V                                                                   | —      | 24   | 31   | mΩ   |
| V <sub>DS(on)</sub>   | Drain-source on-state voltage    | I <sub>D</sub> = 25A, V <sub>GS</sub> = 10V                                                                  | —      | 0.58 | 0.75 | V    |
| y <sub>fs</sub>       | Forward transfer admittance      | I <sub>D</sub> = 25A, V <sub>DS</sub> = 10V                                                                  | —      | 62   | —    | S    |
| C <sub>iss</sub>      | Input capacitance                | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V, f = 1MHz                                                        | —      | 8200 | —    | pF   |
| C <sub>oss</sub>      | Output capacitance               |                                                                                                              | —      | 870  | —    | pF   |
| C <sub>rss</sub>      | Reverse transfer capacitance     |                                                                                                              | —      | 440  | —    | pF   |
| t <sub>d(on)</sub>    | Turn-on delay time               | V <sub>DD</sub> = 80V, I <sub>D</sub> = 25A, V <sub>GS</sub> = 10V, R <sub>GEN</sub> = R <sub>GS</sub> = 50Ω | —      | 54   | —    | ns   |
| t <sub>r</sub>        | Rise time                        |                                                                                                              | —      | 110  | —    | ns   |
| t <sub>d(off)</sub>   | Turn-off delay time              |                                                                                                              | —      | 850  | —    | ns   |
| t <sub>f</sub>        | Fall time                        |                                                                                                              | —      | 340  | —    | ns   |
| V <sub>SD</sub>       | Source-drain voltage             | I <sub>S</sub> = 25A, V <sub>GS</sub> = 0V                                                                   | —      | 1.0  | 1.5  | V    |
| R <sub>th(ch-c)</sub> | Thermal resistance               | Channel to case                                                                                              | —      | —    | 1.00 | °C/W |
| t <sub>rr</sub>       | Reverse recovery time            | I <sub>S</sub> = 50A, di <sub>S</sub> /dt = -100A/μs                                                         | —      | 125  | —    | ns   |

PERFORMANCE CURVES

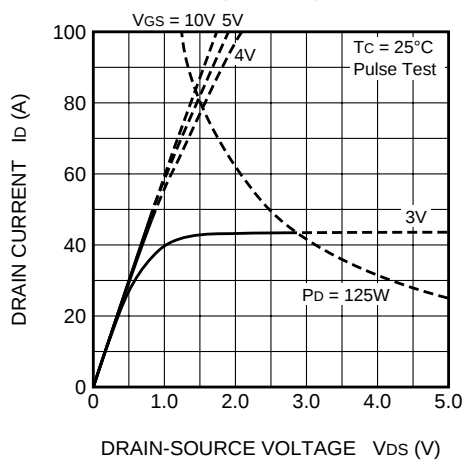
POWER DISSIPATION DERATING CURVE



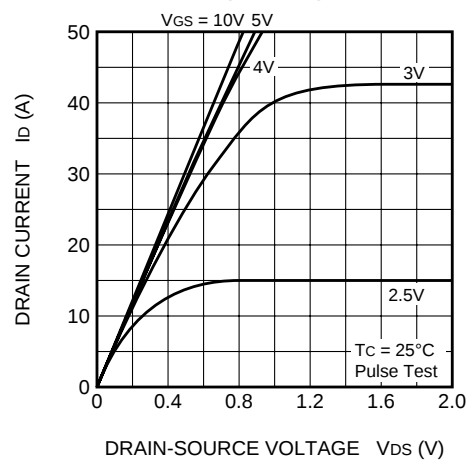
MAXIMUM SAFE OPERATING AREA

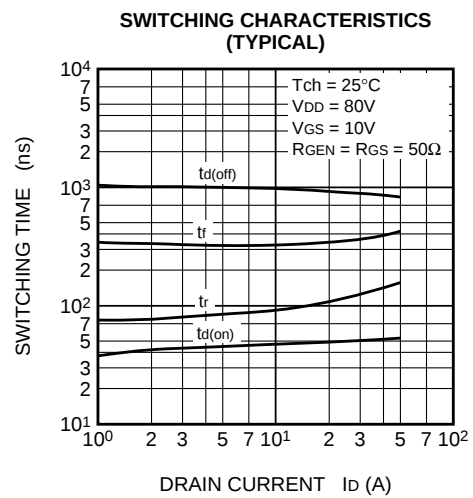
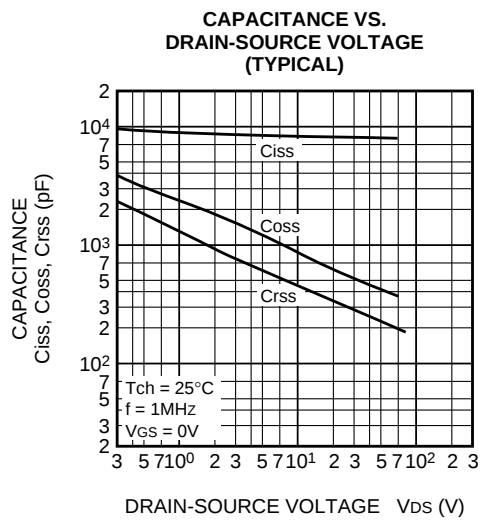
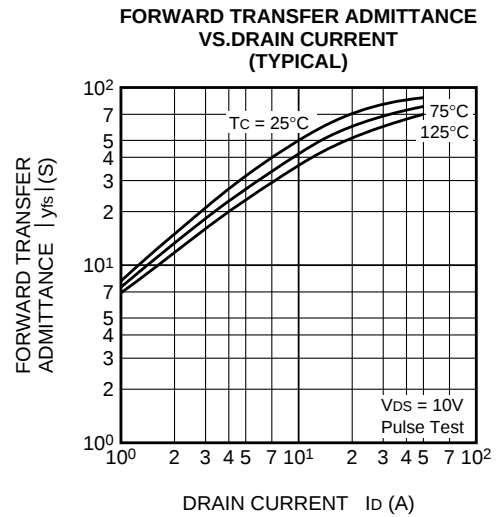
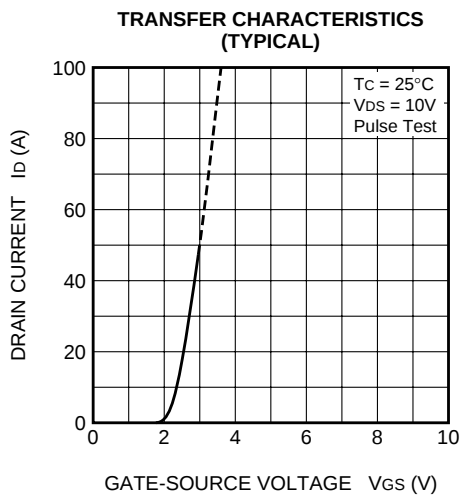
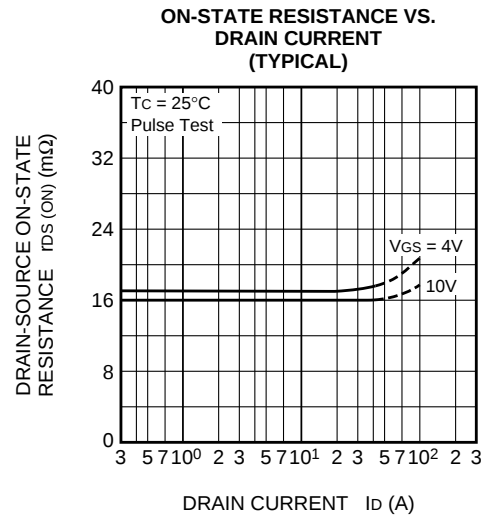
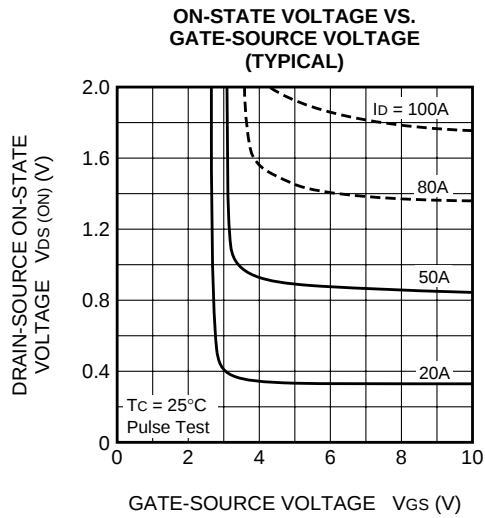


OUTPUT CHARACTERISTICS (TYPICAL)

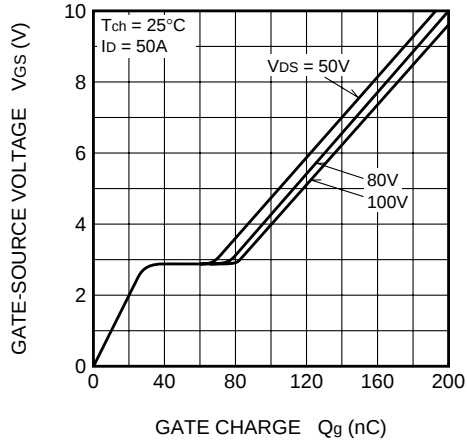


OUTPUT CHARACTERISTICS (TYPICAL)

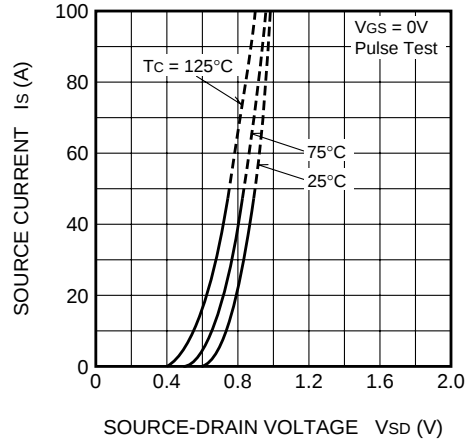




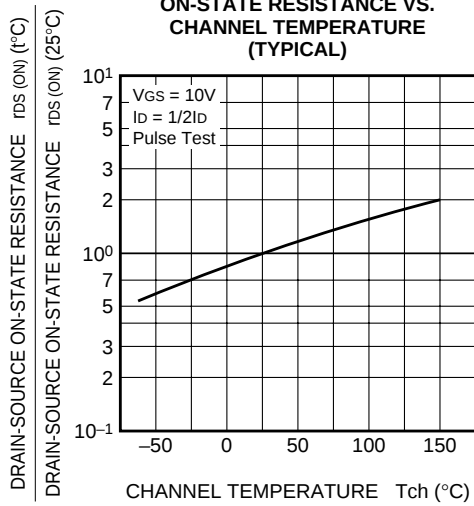
GATE-SOURCE VOLTAGE  
VS. GATE CHARGE  
(TYPICAL)



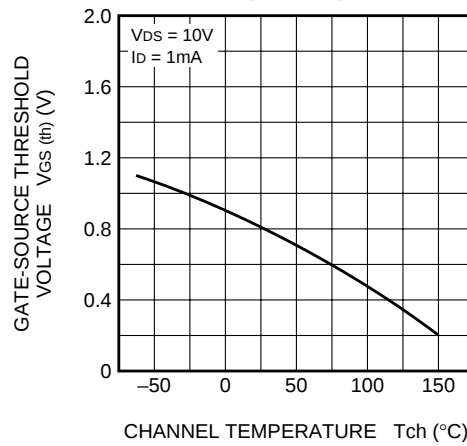
SOURCE-DRAIN DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



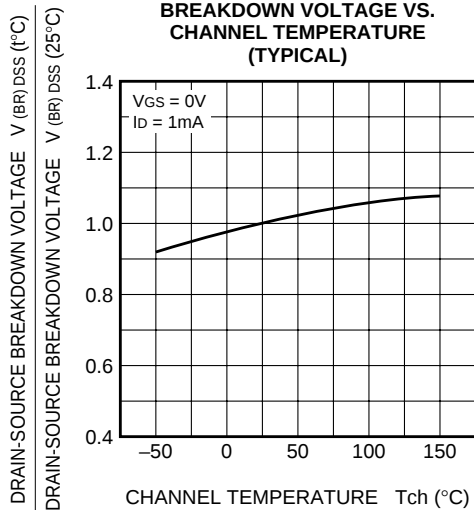
ON-STATE RESISTANCE VS.  
CHANNEL TEMPERATURE  
(TYPICAL)



THRESHOLD VOLTAGE VS.  
CHANNEL TEMPERATURE  
(TYPICAL)



BREAKDOWN VOLTAGE VS.  
CHANNEL TEMPERATURE  
(TYPICAL)



TRANSIENT THERMAL IMPEDANCE  
CHARACTERISTICS

