

FS50KMJ-3-VB Datasheet

N-Channel 150 V (D-S) MOSFET

PRODUCT SUMMARY

| $V_{(BR)DSS}$ (V) | $R_{DS(on)}$ (Ω) | I_D (A) |
|-------------------|---------------------------|-----------------|
| 150 | 0.017 at $V_{GS} = 10$ V | 50 ^a |

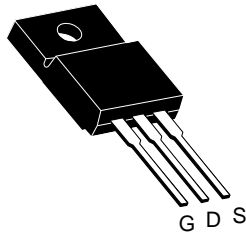
FEATURES

- Trench Power MOSFET
- 175 °C Junction Temperature
- Low Thermal Resistance Package
- 100 % R_g Tested

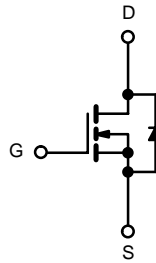

RoHS
 COMPLIANT

APPLICATIONS

- Isolated DC/DC Converters

TO-220 FULLPAK


Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted

| Parameter | Symbol | Limit | Unit |
|--|----------------|------------------|------|
| Drain-Source Voltage | V_{DS} | 150 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | |
| Continuous Drain Current ($T_J = 175$ °C) | I_D | 50 | A |
| | | 40 | |
| Pulsed Drain Current | I_{DM} | 140 | |
| Avalanche Current | I_{AS} | 35 | mJ |
| Single Pulse Avalanche Energy ^b | E_{AS} | 610 | |
| Maximum Power Dissipation ^b | P_D | 105 ^c | W |
| | | 3.75 | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | - 55 to 175 | °C |

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Limit | Unit |
|--------------------------|------------|-------|------|
| Junction-to-Ambient | R_{thJA} | 40 | °C/W |
| Junction-to-Case (Drain) | R_{thJC} | 0.4 | |

Notes:

a. Package limited.

 b. Duty cycle ≤ 1 %.

c. See SOA curve for voltage derating.

d. When Mounted on 1" square PCB (FR-4 material).

| SPECIFICATIONS T _J = 25 °C, unless otherwise noted | | | | | | |
|--|----------------------|---|------|-------|-------|------|
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V _{(BR)DSS} | V _{DS} = 0 V, I _D = 250 μA | 150 | | | V |
| Gate-Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | 1 | | 4 | |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = 100 V, V _{GS} = 0 V | | | 1 | μA |
| | | V _{DS} = 100 V, V _{GS} = 0 V, T _J = 125 °C | | | 50 | |
| | | V _{DS} = 100 V, V _{GS} = 0 V, T _J = 175 °C | | | 250 | |
| On-State Drain Current ^a | I _{D(on)} | V _{DS} ≥ 5 V, V _{GS} = 10 V | 120 | | | A |
| Drain-Source On-State Resistance ^a | R _{DS(on)} | V _{GS} = 10 V, I _D = 30 A | | 0.017 | | Ω |
| | | V _{GS} = 10 V, I _D = 30 A, T _J = 125 °C | | 0.023 | | |
| | | V _{GS} = 10 V, I _D = 30 A, T _J = 175 °C | | 0.034 | | |
| Forward Transconductance ^a | g _{fs} | V _{DS} = 15 V, I _D = 30 A | 25 | | | S |
| Dynamic ^b | | | | | | |
| Input Capacitance | C _{iss} | V _{GS} = 0 V, V _{DS} = 25 V, f = 1 MHz | | 5100 | | pF |
| Output Capacitance | C _{oss} | | | 480 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 210 | | |
| Total Gate Charge ^c | Q _g | V _{DS} = 100 V, V _{GS} = 10 V, I _D = 65 A | | 90 | 130 | nC |
| Gate-Source Charge ^c | Q _{gs} | | | 23 | | |
| Gate-Drain Charge ^c | Q _{gd} | | | 34 | | |
| Gate Resistance | R _g | | 0.5 | 1.7 | 3.3 | Ω |
| Turn-On Delay Time ^c | t _{d(on)} | V _{DD} = 100 V, R _L = 1.5 Ω I _D ≅ 65 A, V _{GEN} = 10 V, R _g = 2.5 Ω | | 24 | 35 | ns |
| Rise Time ^c | t _r | | | 220 | 330 | |
| Turn-Off Delay Time ^c | t _{d(off)} | | | 45 | 70 | |
| Fall Time ^c | t _f | | | 200 | 300 | |
| Source-Drain Diode Ratings and Characteristics T _C = 25 °C ^b | | | | | | |
| Continuous Current | I _S | | | | 65 | A |
| Pulsed Current | I _{SM} | | | | 140 | |
| Forward Voltage ^a | V _{SD} | I _F = 65 A, V _{GS} = 0 V | | 1.0 | 1.5 | V |
| Reverse Recovery Time | t _{rr} | I _F = 50 A, di/dt = 100 A/μs | | 130 | 200 | ns |
| Peak Reverse Recovery Current | I _{RM(REC)} | | | 8 | 12 | A |
| Reverse Recovery Charge | Q _{rr} | | | | 0.52 | 1.2 |

Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

b. Guaranteed by design, not subject to production testing.

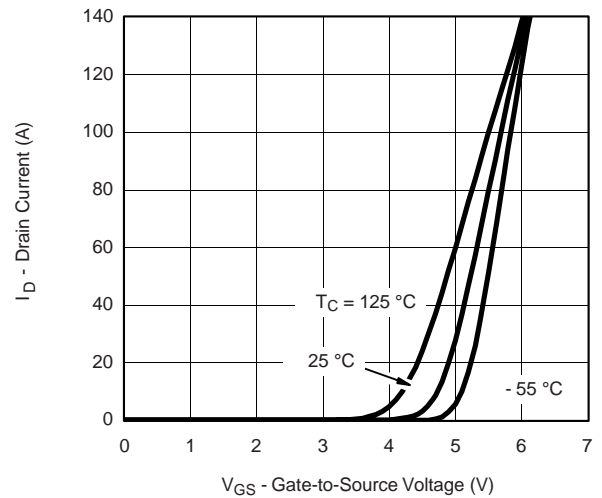
c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

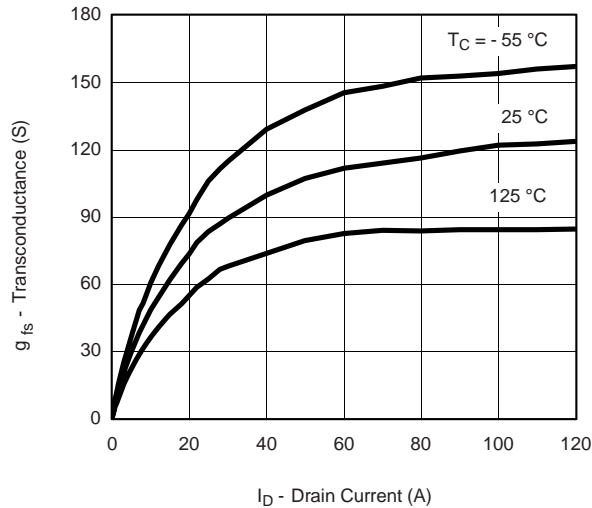
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



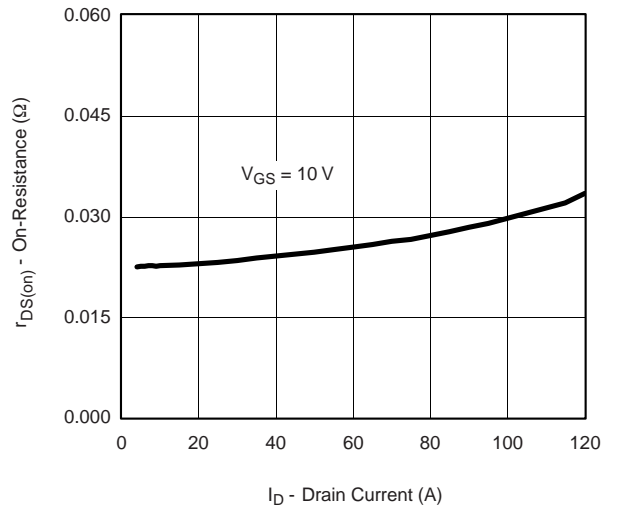
Output Characteristics



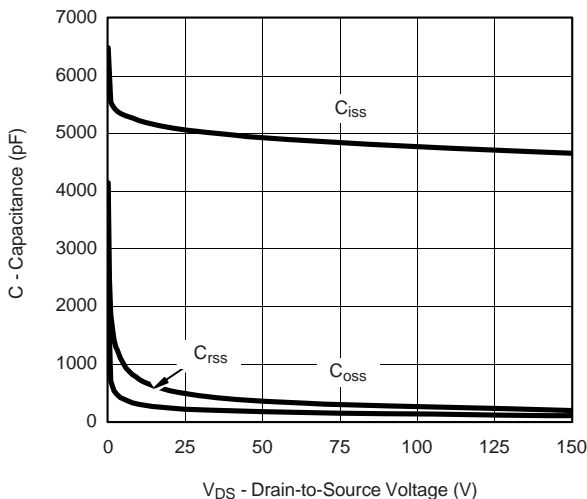
Transfer Characteristics



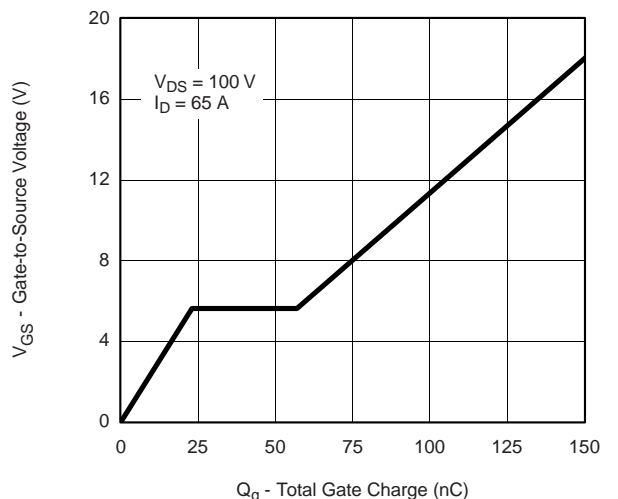
Transconductance



On-Resistance vs. Drain Current



Capacitance



Gate Charge

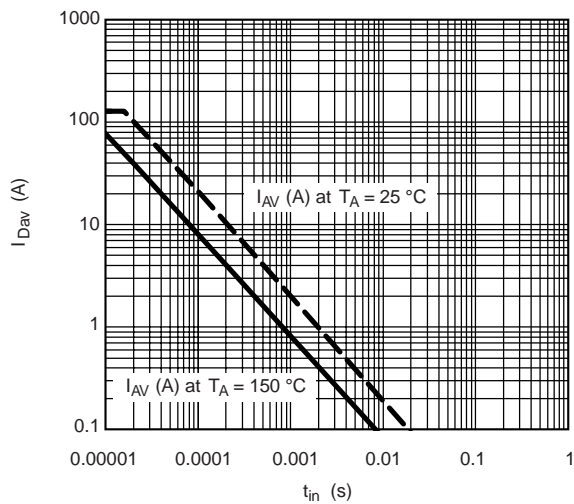
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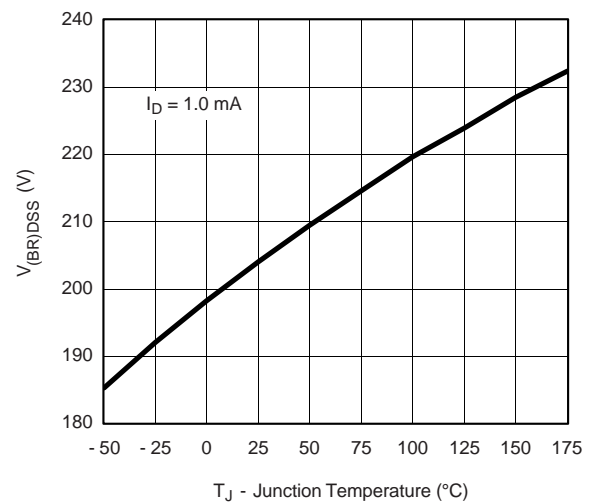
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

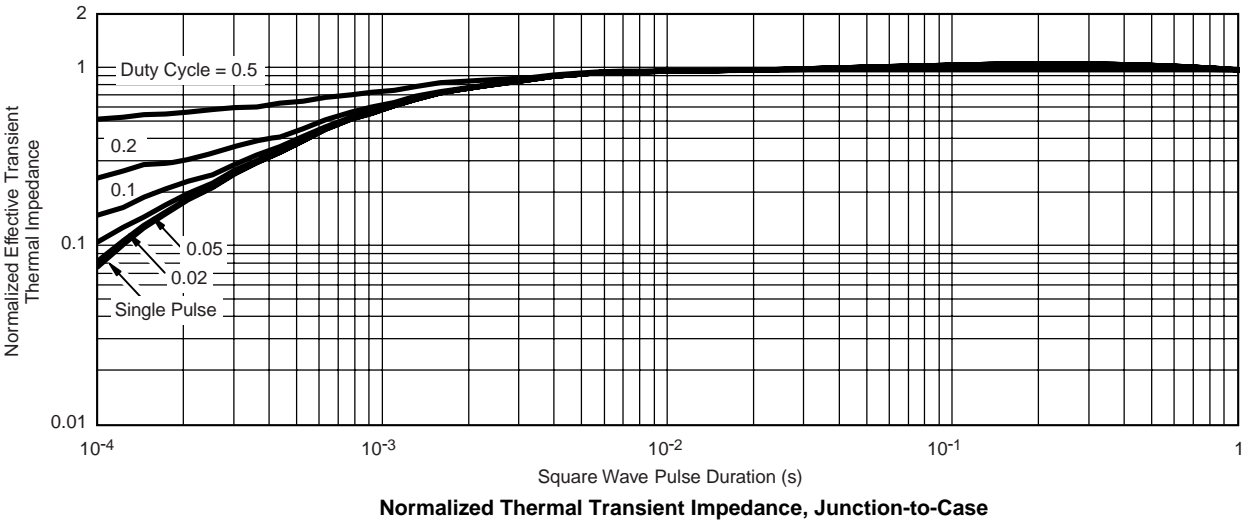
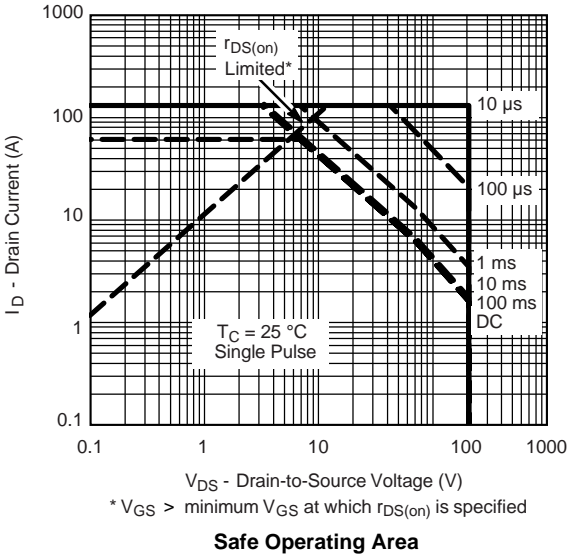
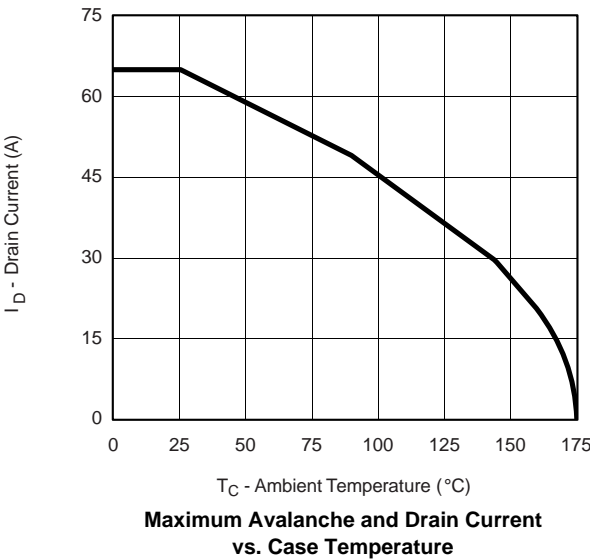


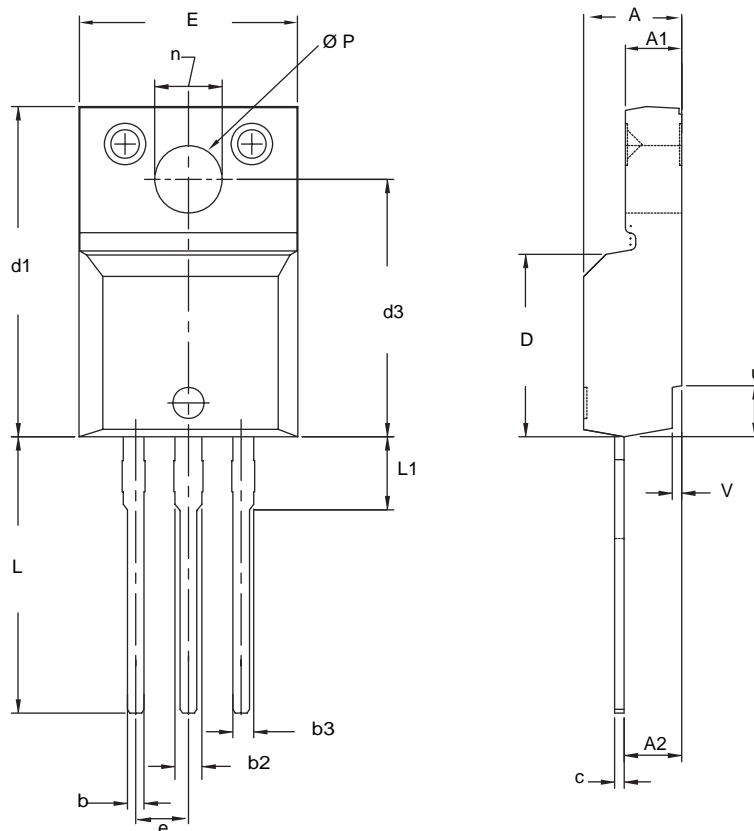
Avalanche Current vs. Time



Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS



TO-220 FULLPAK

| DIM. | MILLIMETERS | | INCHES | |
|------|-------------|--------|-----------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 4.570 | 4.830 | 0.180 | 0.190 |
| A1 | 2.570 | 2.830 | 0.101 | 0.111 |
| A2 | 2.510 | 2.850 | 0.099 | 0.112 |
| b | 0.622 | 0.890 | 0.024 | 0.035 |
| b2 | 1.229 | 1.400 | 0.048 | 0.055 |
| b3 | 1.229 | 1.400 | 0.048 | 0.055 |
| c | 0.440 | 0.629 | 0.017 | 0.025 |
| D | 8.650 | 9.800 | 0.341 | 0.386 |
| d1 | 15.88 | 16.120 | 0.622 | 0.635 |
| d3 | 12.300 | 12.920 | 0.484 | 0.509 |
| E | 10.360 | 10.630 | 0.408 | 0.419 |
| e | 2.54 BSC | | 0.100 BSC | |
| L | 13.200 | 13.730 | 0.520 | 0.541 |
| L1 | 3.100 | 3.500 | 0.122 | 0.138 |
| n | 6.050 | 6.150 | 0.238 | 0.242 |
| Ø P | 3.050 | 3.450 | 0.120 | 0.136 |
| u | 2.400 | 2.500 | 0.094 | 0.098 |
| v | 0.400 | 0.500 | 0.016 | 0.020 |

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 DWG: 5972

Notes

1. To be used only for process drawing.
2. These dimensions apply to all TO-220, FULLPAK leadframe versions 3 leads.
3. All critical dimensions should C meet $C_{pk} > 1.33$.
4. All dimensions include burrs and plating thickness.
5. No chipping or package damage.

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