

RU8590R-VB Datasheet

N-Channel 80 V (D-S) MOSFET

PRODUCT SUMMARY

| | | |
|--------------------------------------|--------|-----------|
| V_{DS} | 80 | V |
| $R_{DS(on)}$ $V_{GS} = 10\text{ V}$ | 7 | $m\Omega$ |
| $R_{DS(on)}$ $V_{GS} = 4.5\text{ V}$ | 9 | $m\Omega$ |
| I_D | 100 | A |
| Configuration | Single | |

FEATURES

- Trench Power MOSFET
- 100 % R_g and UIS Tested

APPLICATIONS

- Primary Side Switching
- Synchronous Rectification
- DC/AC Inverters
- LED Backlighting



RoHS
COMPLIANT

TO-220AB



Top View

G D S



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|--|----------------|----------------------------------|------------------|
| Drain-Source Voltage | V_{DS} | 80 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | |
| Continuous Drain Current ($T_J = 150\text{ }^\circ\text{C}$) | I_D | $T_C = 25\text{ }^\circ\text{C}$ | A |
| | | $T_C = 70\text{ }^\circ\text{C}$ | |
| | | $T_A = 25\text{ }^\circ\text{C}$ | |
| | | $T_A = 70\text{ }^\circ\text{C}$ | |
| Pulsed Drain Current ($t = 100\text{ }\mu\text{s}$) | I_{DM} | 350 | A |
| Continuous Source-Drain Diode Current | I_S | $T_C = 25\text{ }^\circ\text{C}$ | |
| | | $T_A = 25\text{ }^\circ\text{C}$ | |
| Single Pulse Avalanche Current | I_{AS} | 30 | mJ |
| Single Pulse Avalanche Energy | E_{AS} | 45 | |
| Maximum Power Dissipation | P_D | $T_C = 25\text{ }^\circ\text{C}$ | W |
| | | $T_C = 70\text{ }^\circ\text{C}$ | |
| | | $T_A = 25\text{ }^\circ\text{C}$ | |
| | | $T_A = 70\text{ }^\circ\text{C}$ | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | - 55 to 150 | $^\circ\text{C}$ |
| Soldering Recommendations (Peak Temperature) | | 260 | |

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Typical | Maximum | Unit |
|--|------------|---------|---------|--------------------|
| Maximum Junction-to-Ambient ^a | R_{thJA} | 15 | 18 | $^\circ\text{C/W}$ |
| | | 40 | 50 | |
| Maximum Junction-to-Case | R_{thJC} | 0.85 | 1.1 | |

Notes

- Package limited.
- Surface mounted on 1" x 1" FR4 board.
- $t = 10\text{ s}$.

| SPECIFICATIONS (T _J = 25 °C, unless otherwise noted) | | | | | | |
|---|--------------------------------------|---|------|-------|-------|-------|
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V _{DS} | V _{GS} = 0 V, I _D = 250 μA | 80 | | | V |
| V _{DS} Temperature Coefficient | ΔV _{DS} /T _J | I _D = 250 μA | | 37 | | mV/°C |
| V _{GS(th)} Temperature Coefficient | ΔV _{GS(th)} /T _J | | | - 6.1 | | |
| Gate-Source Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | 2.0 | | 3.5 | V |
| Gate-Source Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = 80 V, V _{GS} = 0 V | | | 1 | μA |
| | | V _{DS} = 80 V, V _{GS} = 0 V, T _J = 55 °C | | | 10 | |
| On-State Drain Current ^a | I _{D(on)} | V _{DS} ≥ 5 V, V _{GS} = 10 V | 85 | | | A |
| Drain-Source On-State Resistance ^a | R _{DS(on)} | V _{GS} = 10 V, I _D = 20 A | | 7 | | mΩ |
| | | V _{GS} = 6 V, I _D = 15 A | | 7.5 | | |
| | | V _{GS} = 4.5 V, I _D = 10 A | | 9 | | |
| Forward Transconductance ^a | g _{fs} | V _{DS} = 10 V, I _D = 20 A | | 60 | | S |
| Dynamic ^b | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} = 40 V, V _{GS} = 0 V, f = 1 MHz | | 3855 | | pF |
| Output Capacitance | C _{oss} | | | 1120 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 376 | | |
| Total Gate Charge | Q _g | V _{DS} = 40 V, V _{GS} = 10 V, I _D = 10 A | | 35.5 | | nC |
| | | V _{DS} = 40 V, V _{GS} = 6 V, I _D = 10 A | | 22 | | |
| | | V _{DS} = 40 V, V _{GS} = 4.5 V, I _D = 10 A | | 18 | | |
| Gate-Source Charge | Q _{gs} | | | 5.3 | | |
| Gate-Drain Charge | Q _{gd} | | | 7.3 | | |
| Output Charge | Q _{oss} | V _{DS} = 40 V, V _{GS} = 0 V | | 57 | 86 | |
| Gate Resistance | R _g | f = 1 MHz | 0.5 | 1.3 | 2 | Ω |
| Turn-On Delay Time | t _{d(on)} | V _{DD} = 40 V, R _L = 4 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω | | 12 | 24 | ns |
| Rise Time | t _r | | | 8 | 16 | |
| Turn-Off DelayTime | t _{d(off)} | | | 32 | 64 | |
| Fall Time | t _f | | | 7 | 14 | |
| Turn-On Delay Time | t _{d(on)} | V _{DD} = 40 V, R _L = 4 Ω I _D ≅ 10 A, V _{GEN} = 6.0 V, R _g = 1 Ω | | 14 | 28 | |
| Rise Time | t _r | | | 11 | 22 | |
| Turn-Off DelayTime | t _{d(off)} | | | 30 | 60 | |
| Fall Time | t _f | | | 8 | 16 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Source-Drain Diode Current | I _S | T _C = 25 °C | | | 75 | A |
| Pulse Diode Forward Current (t = 100 μs) | I _{SM} | | | | 150 | |
| Body Diode Voltage | V _{SD} | I _S = 5 A | | 0.76 | 1.1 | V |
| Body Diode Reverse Recovery Time | t _{rr} | I _F = 10 A, dI/dt = 100 A/μs, T _J = 25 °C | | 38 | 75 | ns |
| Body Diode Reverse Recovery Charge | Q _{rr} | | | 36 | 70 | nC |
| Reverse Recovery Fall Time | t _a | | | 19 | | ns |
| Reverse Recovery Rise Time | t _b | | | 19 | | |

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.

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.

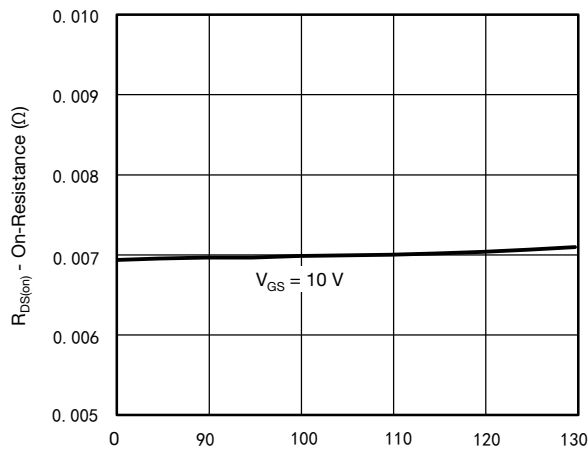
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Output Characteristics



Transfer Characteristics



On-Resistance vs. Drain Current



Capacitance

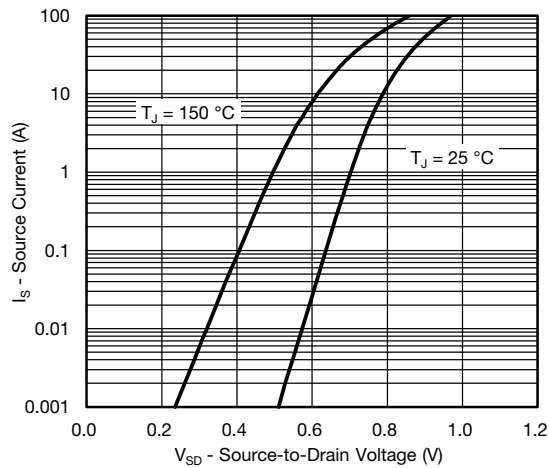


Gate Charge

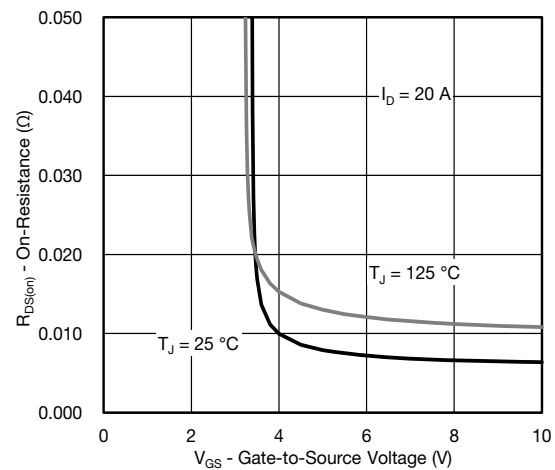


On-Resistance vs. Junction Temperature

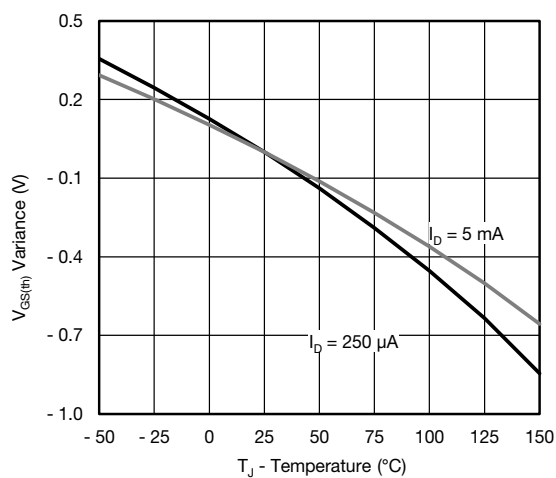
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



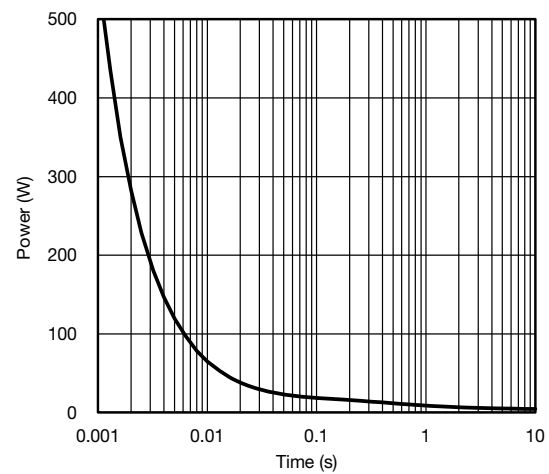
Source-Drain Diode Forward Voltage



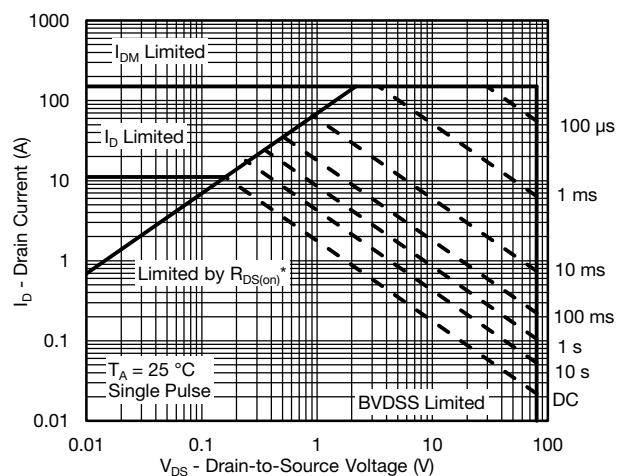
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



Power, Junction-to-Case



Power, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

TO-220AB



| DIM. | MILLIMETERS | | INCHES | |
|-----------------|-------------|-------|--------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 4.25 | 4.65 | 0.167 | 0.183 |
| b | 0.69 | 1.01 | 0.027 | 0.040 |
| b(1) | 1.20 | 1.73 | 0.047 | 0.068 |
| c | 0.36 | 0.61 | 0.014 | 0.024 |
| D | 14.85 | 15.49 | 0.585 | 0.610 |
| E | 10.04 | 10.51 | 0.395 | 0.414 |
| e | 2.41 | 2.67 | 0.095 | 0.105 |
| e(1) | 4.88 | 5.28 | 0.192 | 0.208 |
| F | 1.14 | 1.40 | 0.045 | 0.055 |
| H(1) | 6.09 | 6.48 | 0.240 | 0.255 |
| J(1) | 2.41 | 2.92 | 0.095 | 0.115 |
| L | 13.35 | 14.02 | 0.526 | 0.552 |
| L(1) | 3.32 | 3.82 | 0.131 | 0.150 |
| $\varnothing P$ | 3.54 | 3.94 | 0.139 | 0.155 |
| Q | 2.60 | 3.00 | 0.102 | 0.118 |

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DWG: 5471

Notes

* M = 1.32 mm to 1.62 mm (dimension including protrusion)
Heatsink hole for HVM

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