



N-Channel 40-V (D-S) 175 °C MOSFET

| PRODUCT SUMMARY | | |
|-------------------|---------------------------|------------------|
| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ (Ω) | I_D (A) |
| 40 | 0.0023 at $V_{GS} = 10$ V | 110 ^a |
| | 0.003 at $V_{GS} = 4.5$ V | |

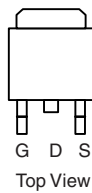
FEATURES

- TrenchFET[®] Power MOSFET
- 100 % R_g Tested

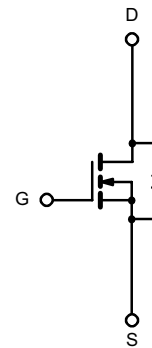


RoHS COMPLIANT

TO-263



Ordering Information: SUM110N04-2m3L-E3 (Lead (Pb)-free)



N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted | | | | |
|--|----------------|----------------|------------------|------|
| Parameter | | Symbol | Limit | Unit |
| Drain-Source Voltage | | V_{DS} | 40 | V |
| Gate-Source Voltage | | V_{GS} | ± 20 | |
| Continuous Drain Current ($T_J = 175$ °C) | $T_C = 25$ °C | I_D | 110 ^a | A |
| | $T_C = 125$ °C | | 110 ^a | |
| Pulsed Drain Current | | I_{DM} | 440 | |
| Avalanche Current, Single Pulse | | I_{AS} | 75 | |
| Repetitive Avalanche Energy, Single Pulse | $L = 0.1$ mH | E_{AS} | 280 | mJ |
| Maximum Power Dissipation | $T_C = 25$ °C | P_D | 375 ^b | W |
| | $T_A = 25$ °C | | 3.75 | |
| Operating Junction and Storage Temperature Range | | T_J, T_{stg} | - 55 to 175 | °C |

| THERMAL RESISTANCE RATINGS | | | | |
|----------------------------|------------------------|------------|---------|------|
| Parameter | | Symbol | Typical | Unit |
| Junction-to-Ambient | PCB Mount ^c | R_{thJA} | 40 | °C/W |
| Junction-to-Case (Drain) | | R_{thJC} | 0.4 | |

Notes:

- a. Package limited.
- b. See SOA curve for voltage derating.
- c. When Mounted on 1" square PCB (FR-4 material).

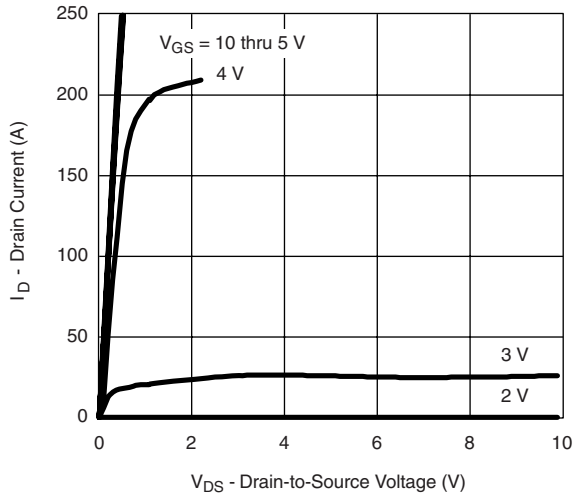
| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | |
|---|---------------|--|------|--------|--------|---------------|
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 40 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 1 | | 3 | |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| | | $V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | | 50 | |
| | | $V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$ | | | 10 | mA |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$ | 120 | | | A |
| Drain-Source On-State Resistance ^a | $r_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 30\text{ A}$ | | 0.0019 | 0.0023 | Ω |
| | | $V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$ | | 0.0024 | 0.003 | |
| | | $V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | | | 0.0035 | |
| | | $V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$ | | | 0.0044 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = 15\text{ V}, I_D = 30\text{ A}$ | 30 | | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$ | | 13600 | | μF |
| Output Capacitance | C_{oss} | | | 1420 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 1040 | | |
| Total Gate Charge ^c | Q_g | $V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 110\text{ A}$ | | 240 | 360 | nC |
| Gate-Source Charge ^c | Q_{gs} | | | 53 | | |
| Gate-Drain Charge ^c | Q_{gd} | | | 55 | | |
| Gate Resistance | R_g | $f = 1.0\text{ MHz}$ | 0.65 | 1.3 | 2 | Ω |
| Turn-On Delay Time ^c | $t_{d(on)}$ | $V_{DD} = 30\text{ V}, R_L = 0.27\text{ }\Omega$ $I_D \cong 110\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$ | | 25 | 40 | ns |
| Rise Time ^c | t_r | | | 100 | 150 | |
| Turn-Off Delay Time ^c | $t_{d(off)}$ | | | 125 | 190 | |
| Fall Time ^c | t_f | | | 200 | 300 | |
| Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^\circ\text{C}$ ^b | | | | | | |
| Continuous Current | I_S | | | | 110 | A |
| Pulsed Current | I_{SM} | | | | 240 | |
| Forward Voltage ^a | V_{SD} | $I_F = 85\text{ A}, V_{GS} = 0\text{ V}$ | | 1.1 | 1.5 | V |
| Reverse Recovery Time | t_{rr} | $I_F = 85\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | | 56 | 85 | ns |
| Peak Reverse Recovery Charge | $I_{RM(REC)}$ | | | 3.1 | 4.7 | A |
| Reverse Recovery Charge | Q_{rr} | | | 0.087 | 0.2 | μC |

Notes:

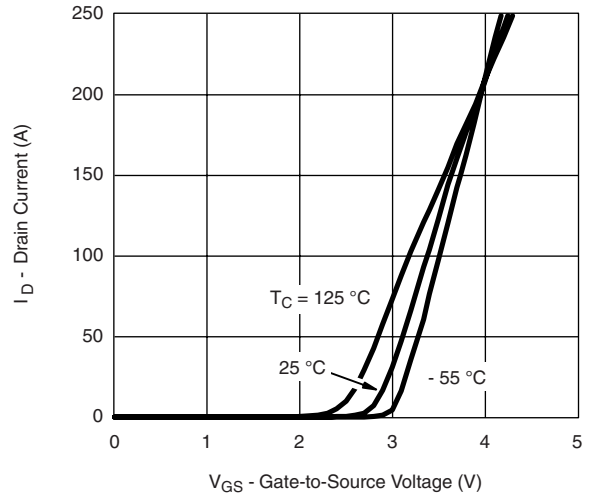
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

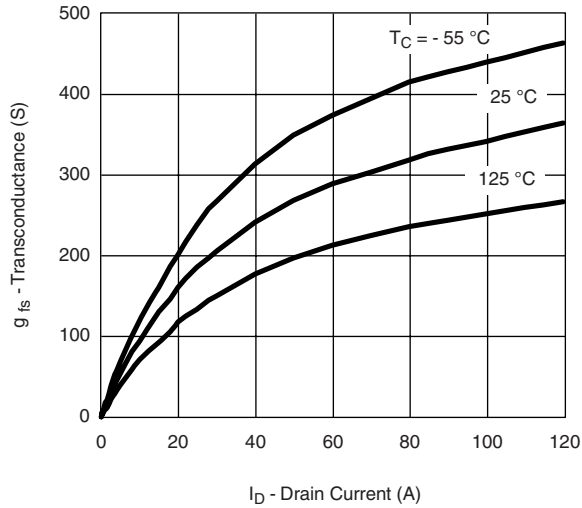
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



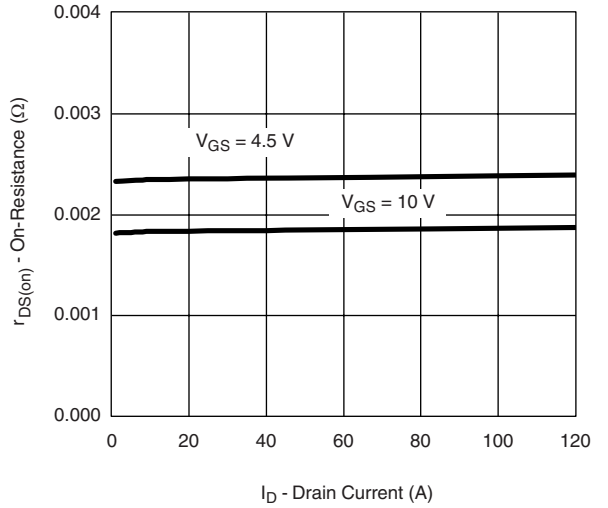
Output Characteristics



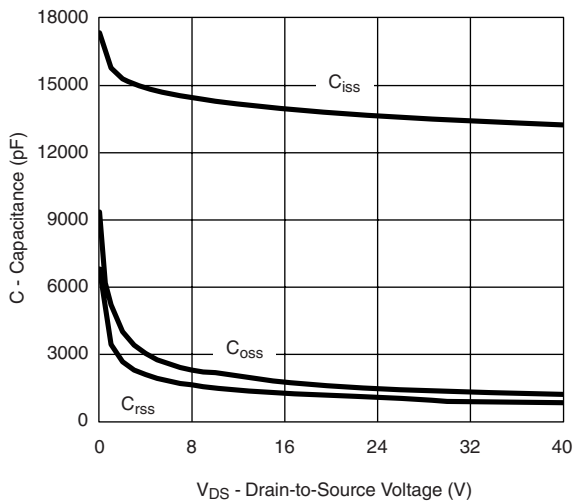
Transfer Characteristics



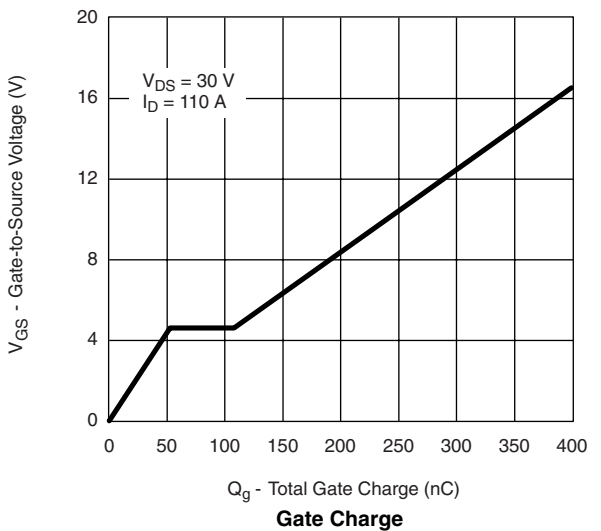
Transconductance



On-Resistance vs. Drain Current

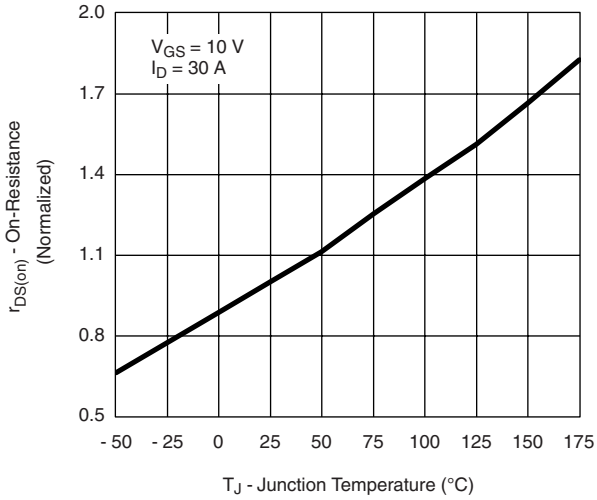


Capacitance

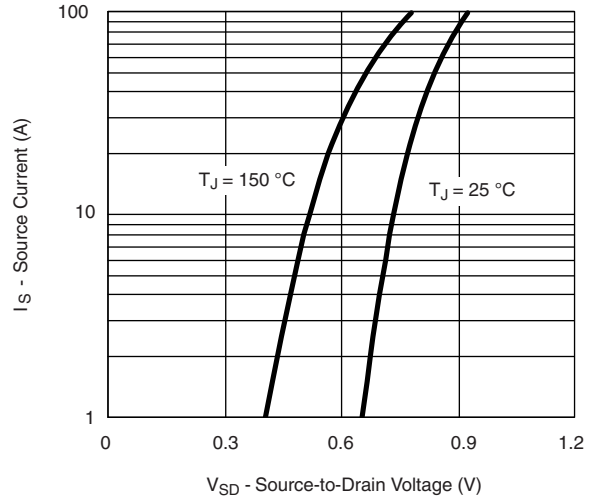


Gate Charge

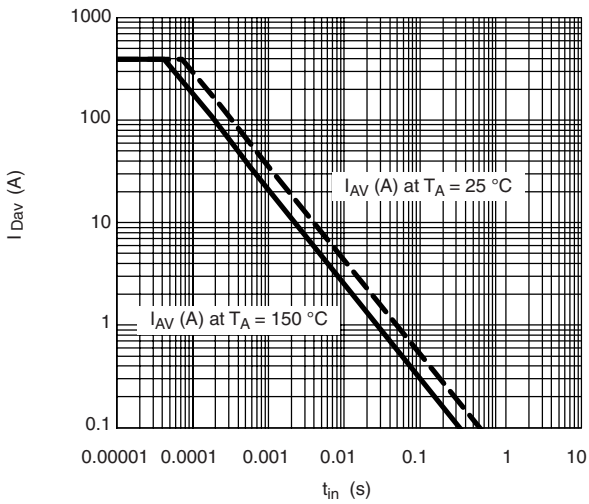
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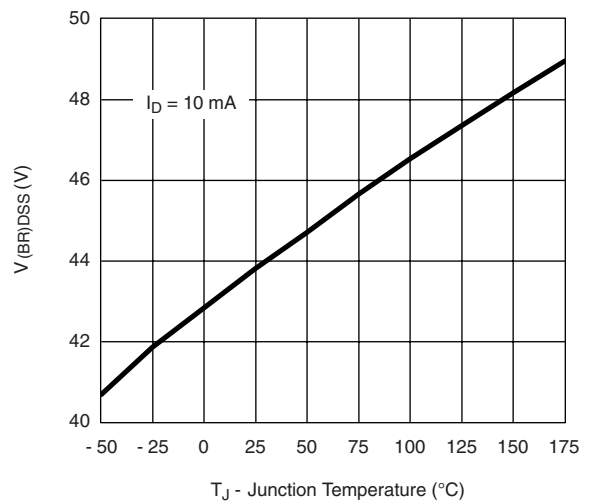
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

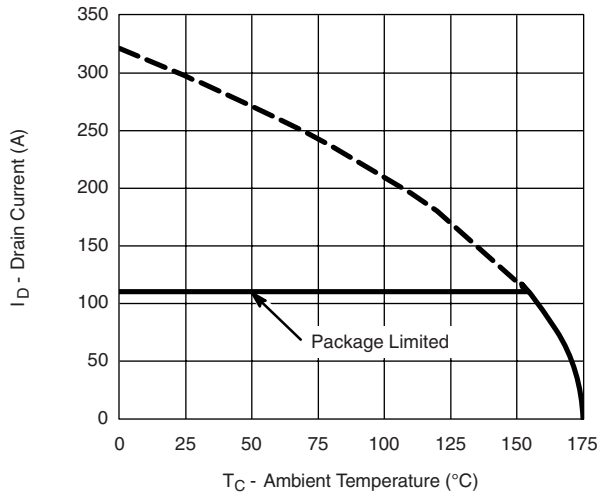


Avalanche Current vs. Time

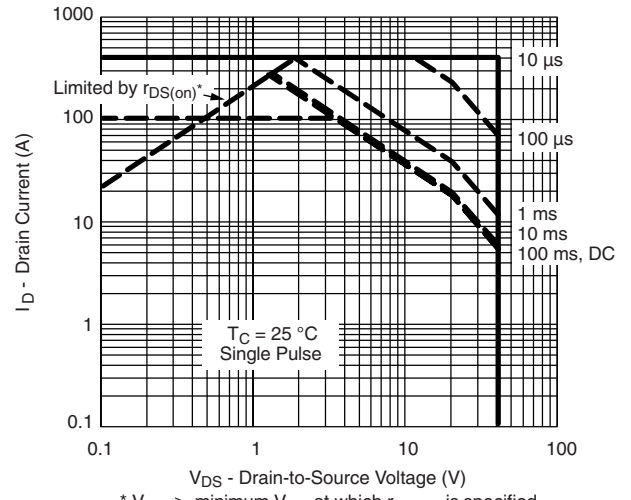


Drain Source Breakdown vs. Junction Temperature

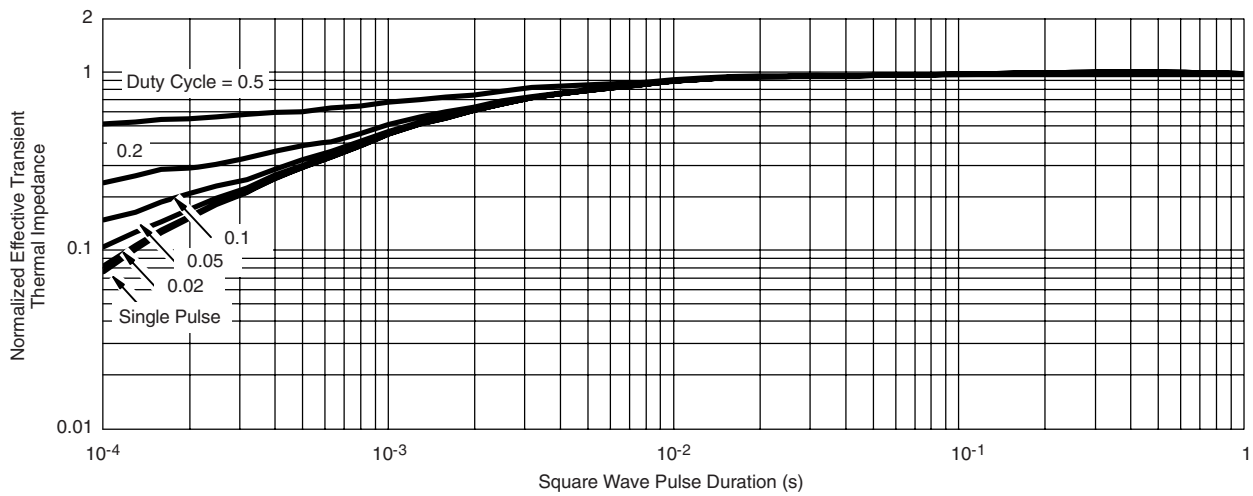
THERMAL RATINGS



Maximum Drain Current vs. Case Temperature



Safe Operating Area
* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified



Normalized Thermal Transient Impedance, Junction-to-Case

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