

SM4040DSK-TRG-VB Datasheet

Dual N-Channel 30 V (D-S) MOSFET

PRODUCT SUMMARY

| V_{DS} (V) | $R_{DS(on)}$ (Ω) | I_D (A) ^a | Q_g (Typ.) |
|--------------|---------------------------|------------------------|--------------|
| 30 | 0.016 at $V_{GS} = 10$ V | 8.5 | 7.1 |
| | 0.020 at $V_{GS} = 4.5$ V | 7.6 | |

FEATURES

- Trench Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC


RoHS
 COMPLIANT

APPLICATIONS

- Notebook System Power
- Low Current DC/DC



N-Channel MOSFET



N-Channel MOSFET

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

| Parameter | Symbol | Limit | Unit |
|--|----------------|--------------------------|------------------|
| Drain-Source Voltage | V_{DS} | 30 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | |
| Continuous Drain Current ($T_J = 150^\circ\text{C}$) | I_D | $T_C = 25^\circ\text{C}$ | A |
| | | $T_C = 70^\circ\text{C}$ | |
| | | $T_A = 25^\circ\text{C}$ | |
| | | $T_A = 70^\circ\text{C}$ | |
| Pulsed Drain Current | I_{DM} | 30 | A |
| Source-Drain Current Diode Current | I_S | $T_C = 25^\circ\text{C}$ | |
| | | $T_A = 25^\circ\text{C}$ | |
| Pulsed Source-Drain Current | I_{SM} | 30 | |
| Single Pulse Avalanche Current | I_{AS} | 10 | W |
| Single Pulse Avalanche Energy | E_{AS} | $L = 0.1$ mH | |
| | | | |
| Maximum Power Dissipation | P_D | $T_C = 25^\circ\text{C}$ | |
| | | $T_C = 70^\circ\text{C}$ | |
| | | $T_A = 25^\circ\text{C}$ | |
| | | $T_A = 70^\circ\text{C}$ | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | - 55 to 150 | $^\circ\text{C}$ |

THERMAL RESISTANCE RATINGS

| Parameter | | Symbol | Typ. | Max. | Unit |
|---|---------------|------------|------|------|--------------------|
| Maximum Junction-to-Ambient ^{b, d} | $t \leq 10$ s | R_{thJA} | 52 | 62.5 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Foot (Drain) | Steady-State | R_{thJF} | 30 | 40 | |

Notes:

a. Based on $T_C = 25^\circ\text{C}$.

b. Surface mounted on 1" x 1" FR4 board.

c. $t = 10$ s.d. Maximum under steady state conditions is 110°C/W .

| 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 | 30 | | | V |
| V _{DS} Temperature Coefficient | ΔV _{DS} /T _J | I _D = 250 μA | | 3.0 | | mV/°C |
| V _{GS(th)} Temperature Coefficient | ΔV _{GS(th)} /T _J | I _D = 250 μA | | - 5.2 | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | 1.2 | | 2.5 | V |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | | | 100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = 30 V, V _{GS} = 0 V | | | 1 | μA |
| | | V _{DS} = 30 V, V _{GS} = 0 V, T _J = 55 °C | | | 10 | |
| On -State Drain Current ^b | I _{D(on)} | V _{DS} = 5 V, V _{GS} = 10 V | 20 | | | A |
| Drain-Source On-State Resistance ^b | R _{DS(on)} | V _{GS} = 10 V, I _D = 8 A | | 0.016 | | Ω |
| | | V _{GS} = 4.5 V, I _D = 5 A | | 0.020 | | |
| Forward Transconductance ^b | g _{fs} | V _{DS} = 15 V, I _D = 8 A | | 27 | | S |
| Dynamic ^a | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} = 15 V, V _{GS} = 0 V, I _D = 1 MHz | | 660 | | pF |
| Output Capacitance | C _{oss} | | | 140 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 86 | | |
| Total Gate Charge | Q _g | V _{DS} = 15 V, V _{GS} = 10 V, I _D = 8 A | | 14.5 | 22 | nC |
| | | V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 8 A | | 7.1 | 11 | |
| Gate-Source Charge | Q _{gs} | | | 1.9 | | |
| Gate-Drain Charge | Q _{gd} | | | 2.7 | | |
| Gate Resistance | R _g | f = 1 MHz | 0.5 | 2.6 | 5.2 | Ω |
| Turn-On Delay Time | t _{d(on)} | V _{DD} = 15 V, R _L = 3 Ω I _D ≅ 5 A, V _{GEN} = 4.5 V, R _g = 1 Ω | | 14 | 28 | ns |
| Rise Time | t _r | | | 45 | 80 | |
| Turn-Off Delay Time | t _{d(off)} | | | 18 | 35 | |
| Fall Time | t _f | | | 12 | 24 | |
| Turn-On Delay Time | t _{d(on)} | V _{DD} = 15 V, R _L = 3 Ω I _D ≅ 5 A, V _{GEN} = 10 V, R _g = 1 Ω | | 7 | 14 | |
| Rise Time | t _r | | | 10 | 20 | |
| Turn-Off Delay Time | t _{d(off)} | | | 15 | 30 | |
| Fall Time | t _f | | | 7 | 14 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Source-Drain Diode Current | I _S | T _C = 25 °C | | | 2.8 | A |
| Pulse Diode Forward Current ^a | I _{SM} | | | | 30 | |
| Body Diode Voltage | V _{SD} | I _S = 2 A | | 0.77 | 1.1 | V |
| Body Diode Reverse Recovery Time | t _{rr} | I _F = 5 A, dI/dt = 100 A/μs, T _J = 25 °C | | 17 | 34 | ns |
| Body Diode Reverse Recovery Charge | Q _{rr} | | | 9 | 18 | nC |
| Reverse Recovery Fall Time | t _a | | | 10 | | nS |
| Reverse Recovery Rise Time | t _b | | | 7 | | |

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 and Gate Voltage



Capacitance

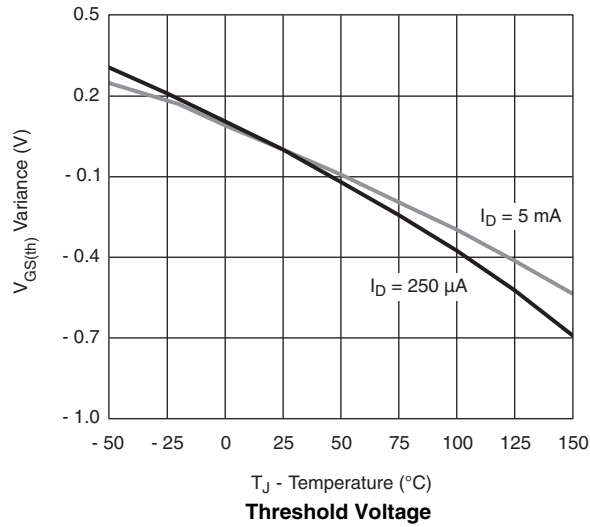
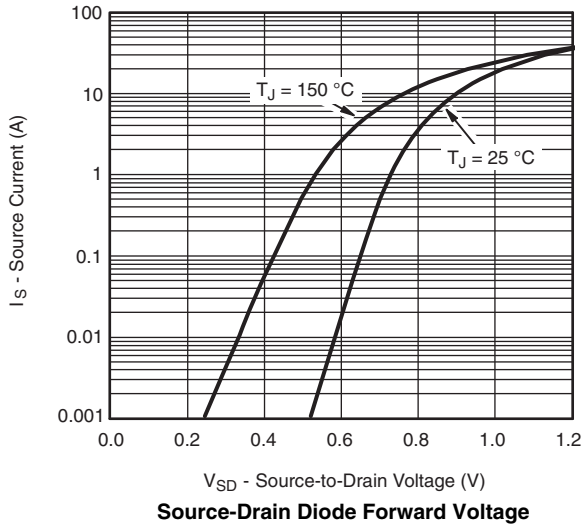


Gate Charge



On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



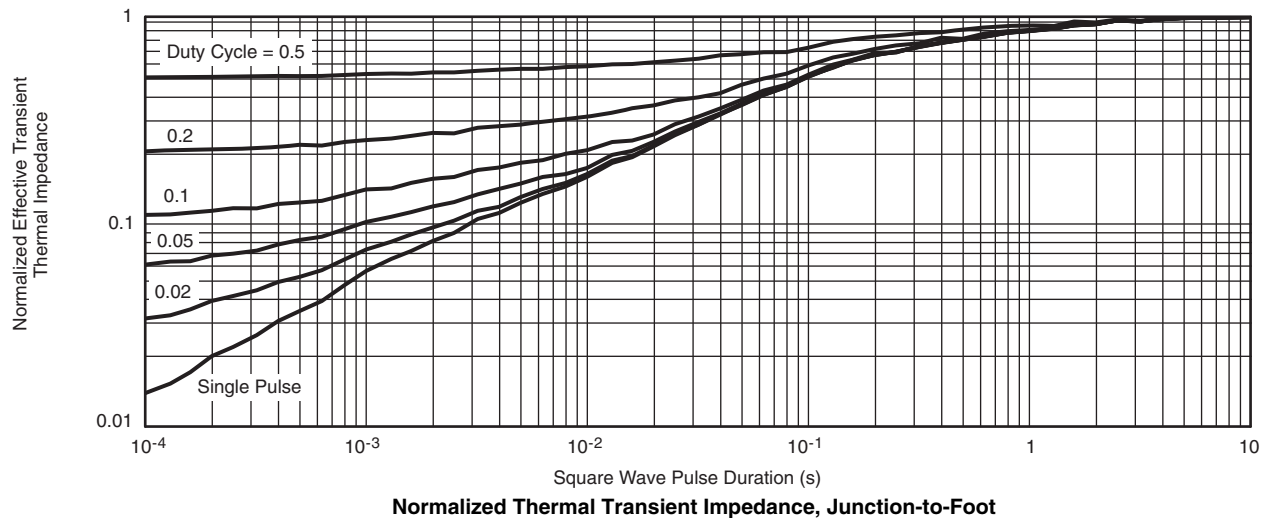
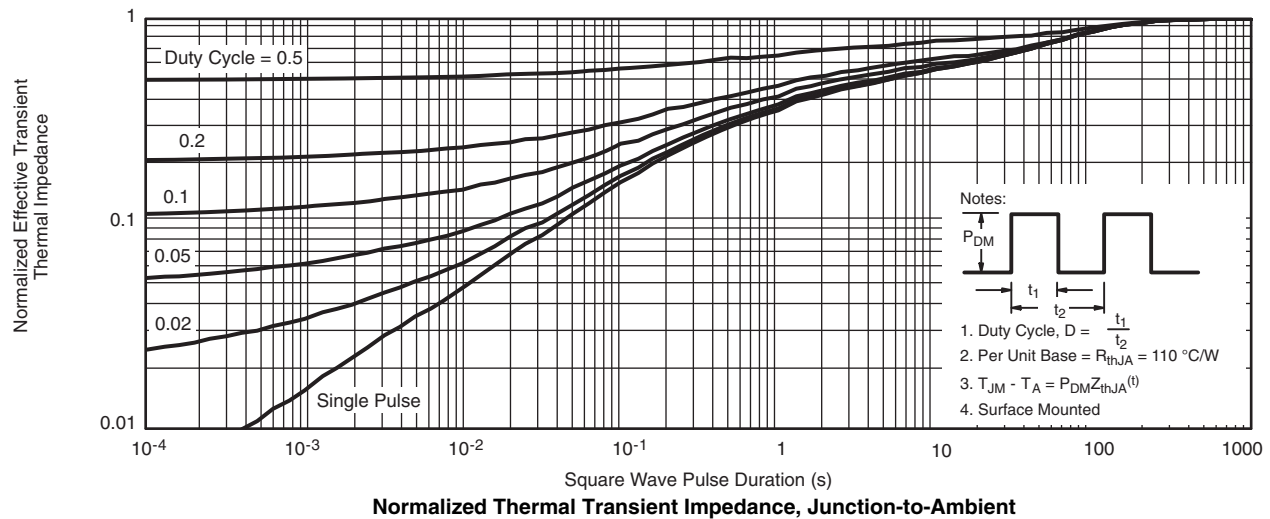
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)**Current Derating*****Power Derating, Junction-to-Foot****Power Derating, 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)



SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



| DIM | MILLIMETERS | | INCHES | |
|----------------|-------------|------|-----------|-------|
| | Min | Max | Min | Max |
| A | 1.35 | 1.75 | 0.053 | 0.069 |
| A ₁ | 0.10 | 0.20 | 0.004 | 0.008 |
| B | 0.35 | 0.51 | 0.014 | 0.020 |
| C | 0.19 | 0.25 | 0.0075 | 0.010 |
| D | 4.80 | 5.00 | 0.189 | 0.196 |
| E | 3.80 | 4.00 | 0.150 | 0.157 |
| e | 1.27 BSC | | 0.050 BSC | |
| H | 5.80 | 6.20 | 0.228 | 0.244 |
| h | 0.25 | 0.50 | 0.010 | 0.020 |
| L | 0.50 | 0.93 | 0.020 | 0.037 |
| q | 0° | 8° | 0° | 8° |
| S | 0.44 | 0.64 | 0.018 | 0.026 |

ECN: C-06527-Rev. I, 11-Sep-06
DWG: 5498

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

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