

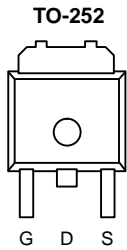
| PRODUCT SUMMARY | | |
|-----------------|----------------------------|------------------------|
| V_{DS} (V) | $r_{DS(on)}$ (Ω) | I_D (A) ^d |
| -40 | 0.0094 @ $V_{GS} = -10$ V | -50 |
| | 0.0145 @ $V_{GS} = -4.5$ V | -50 |

FEATURES

- TrenchFET® Power MOSFET
- 175 °C Junction Temperature

APPLICATIONS

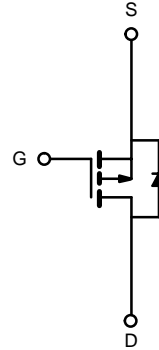
- Automotive 12-V Boardnet



Drain Connected to Tab

Top View

Ordering Information: SUD50P04-09L



P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) | | | | |
|---|----------------|---------------------------|-------------------|---|
| Parameter | Symbol | Limit | Unit | |
| Drain-Source Voltage | V_{DS} | -40 | V | |
| Gate-Source Voltage | V_{GS} | ± 20 | | |
| Continuous Drain Current ($T_J = 175^\circ\text{C}$) | I_D | $T_C = 25^\circ\text{C}$ | -50 ^d | A |
| | | $T_C = 125^\circ\text{C}$ | -50 ^d | |
| Pulsed Drain Current | I_{DM} | -100 | | |
| Avalanche Current | I_{AR} | -50 | | |
| Repetitive Avalanche Energy ^a | E_{AR} | 125 | mJ | |
| Power Dissipation | P_D | $T_C = 25^\circ\text{C}$ | 136 ^c | W |
| | | $T_A = 25^\circ\text{C}$ | 3 ^{b, c} | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to 175 | $^\circ\text{C}$ | |

| THERMAL RESISTANCE RATINGS | | | | | |
|----------------------------------|------------|-----------------|---------|------|--------------------|
| Parameter | Symbol | Typical | Maximum | Unit | |
| Junction-to-Ambient ^b | R_{thJA} | $t \leq 10$ sec | 15 | 18 | $^\circ\text{C/W}$ |
| | | Steady State | 40 | 50 | |
| Junction-to-Case | R_{thJC} | 0.82 | 1.1 | | |

Notes:

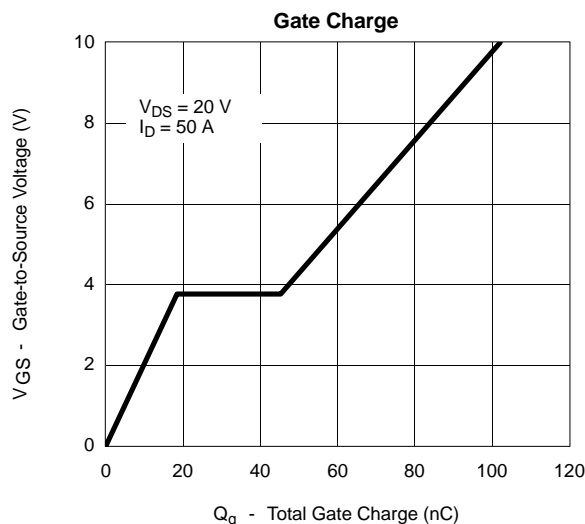
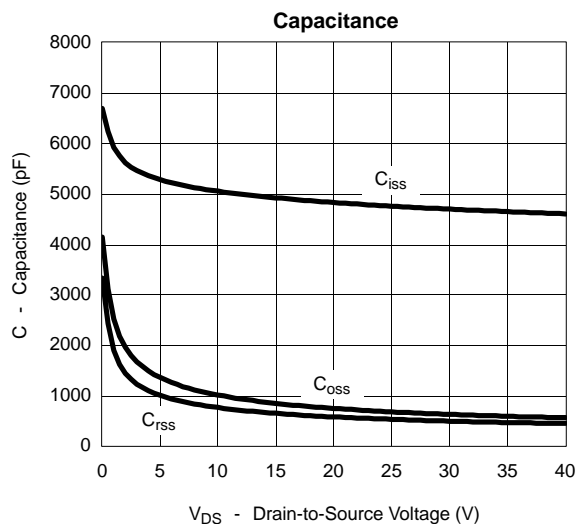
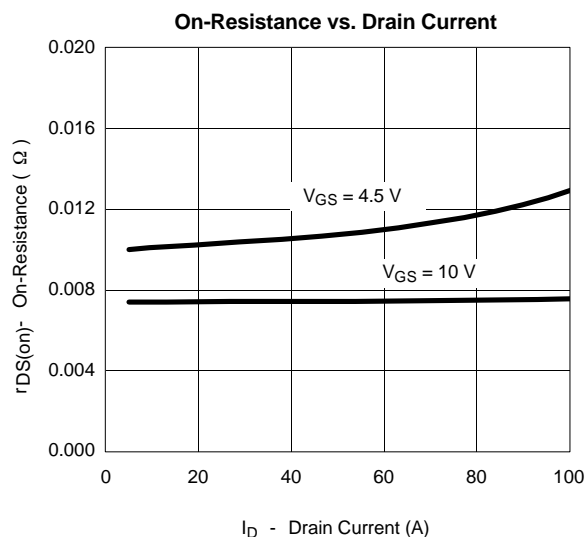
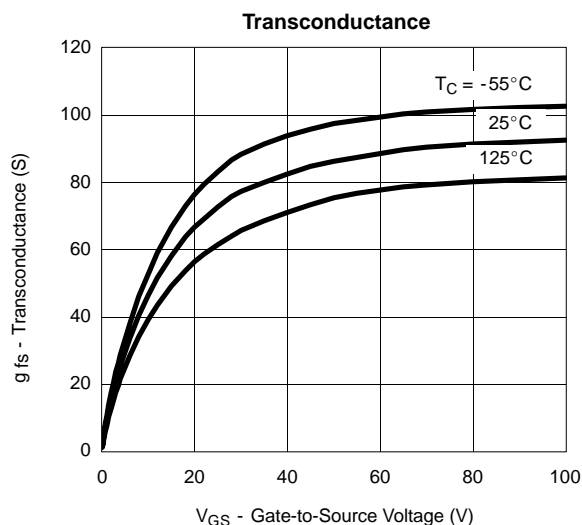
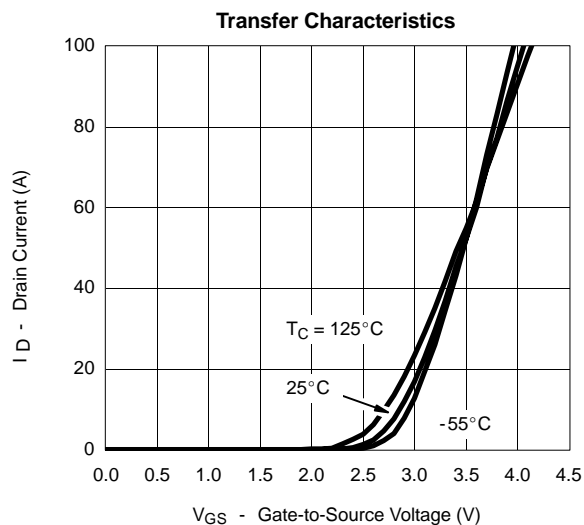
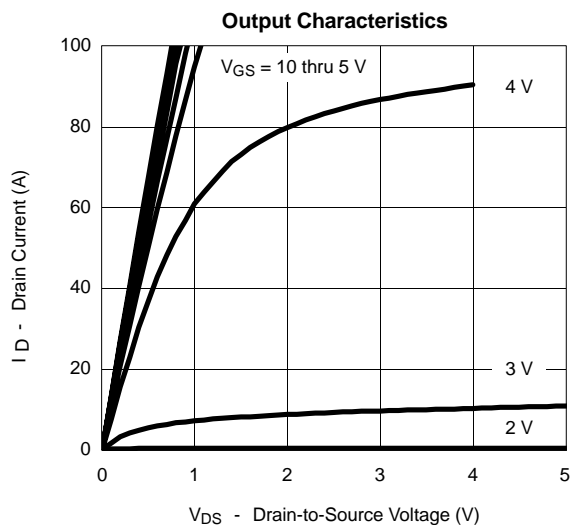
- Duty cycle $\leq 1\%$.
- When mounted on 1" square PCB (FR-4 material).
- See SOA curve for voltage derating.
- Package limited.

| SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED) | | | | | | |
|---|----------------------|---|-----|--------|--------|------|
| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} = 0 V, I _D = -250 μA | -40 | | | V |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = -250 μA | -1 | | -3 | |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±20 V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = -32 V, V _{GS} = 0 V | | | -1 | μA |
| | | V _{DS} = -32 V, V _{GS} = 0 V, T _J = 125 °C | | | -50 | |
| | | V _{DS} = -32 V, V _{GS} = 0 V, T _J = 175 °C | | | -150 | |
| On-State Drain Current ^a | I _{D(on)} | V _{DS} = -5 V, V _{GS} = -10 V | -50 | | | A |
| Drain-Source On-State Resistance ^a | r _{DS(on)} | V _{GS} = -10 V, I _D = -24 A | | 0.0075 | 0.0094 | Ω |
| | | V _{GS} = -10 V, I _D = -50 A, T _J = 125 °C | | | 0.014 | |
| | | V _{GS} = -10 V, I _D = -50 A, T _J = 175 °C | | | 0.017 | |
| | | V _{GS} = -4.5 V, I _D = -18 A | | 0.0115 | 0.0145 | |
| Forward Transconductance ^a | g _{fs} | V _{DS} = -5 V, I _D = -24 A | | 73 | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C _{iss} | V _{GS} = 0 V, V _{DS} = -25 V, f = 1 MHz | | 4800 | | pF |
| Output Capacitance | C _{oss} | | | 700 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 550 | | |
| Total Gate Charge ^c | Q _g | V _{DS} = -20 V, V _{GS} = -10 V, I _D = -50 A | | 102 | 150 | nC |
| Gate-Source Charge ^c | Q _{gs} | | | 18.5 | | |
| Gate-Drain Charge ^c | Q _{gd} | | | 27 | | |
| Turn-On Delay Time ^c | t _{d(on)} | V _{DD} = -20 V, R _L = 0.4 Ω I _D ≈ -50 A, V _{GEN} = -10 V, R _G = 6 Ω | | 10 | 15 | ns |
| Rise Time ^c | t _r | | | 60 | 90 | |
| Turn-Off Delay Time ^c | t _{d(off)} | | | 145 | 220 | |
| Fall Time ^c | t _f | | | 140 | 220 | |
| Source-Drain Diode Ratings and Characteristics (T_C = 25 °C)^b | | | | | | |
| Continuous Current | I _s | | | | -50 | A |
| Pulsed Current | I _{SM} | | | | -100 | |
| Forward Voltage ^a | V _{SD} | I _F = -50 A, V _{GS} = 0 V | | -1.0 | -1.5 | V |
| Reverse Recovery Time | t _{rr} | I _F = -50 A, di/dt = 100 A/μs | | 55 | 85 | ns |

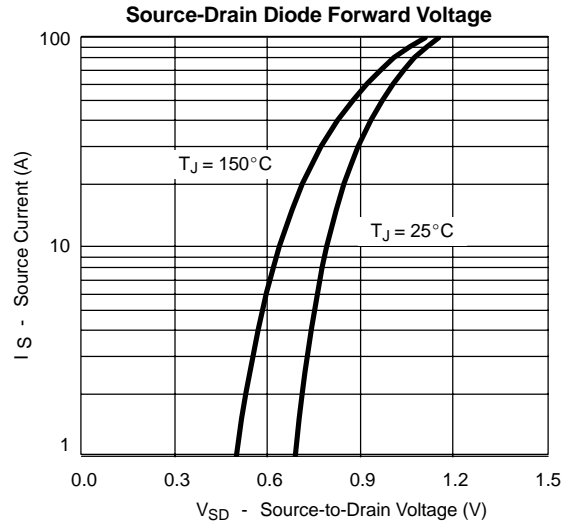
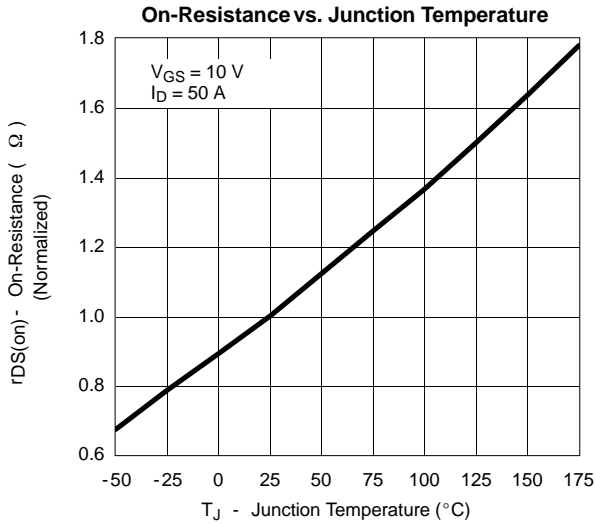
Notes:

- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

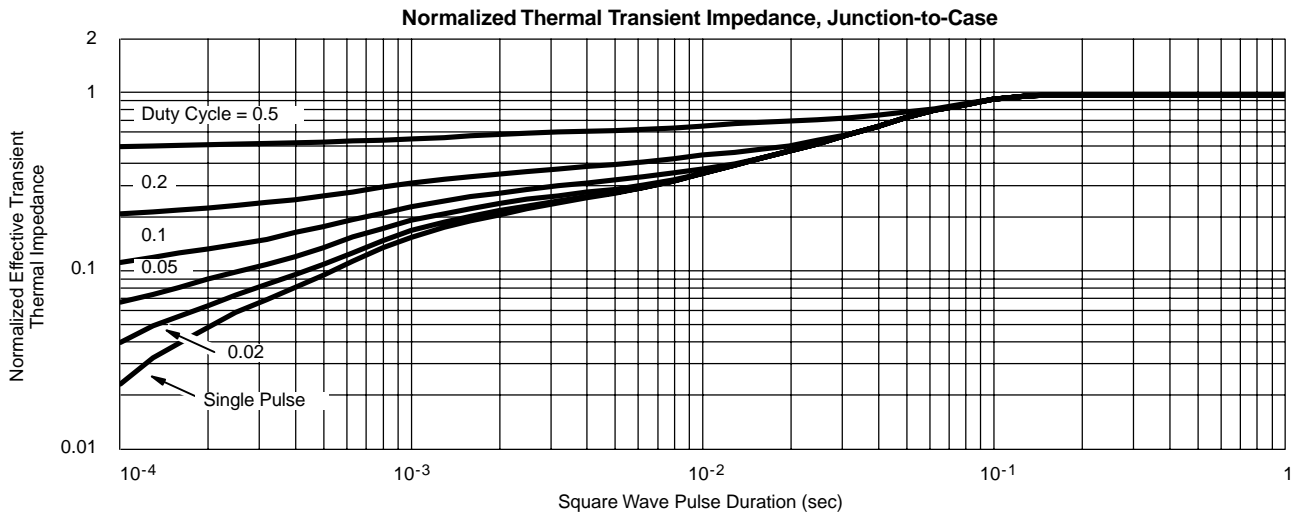
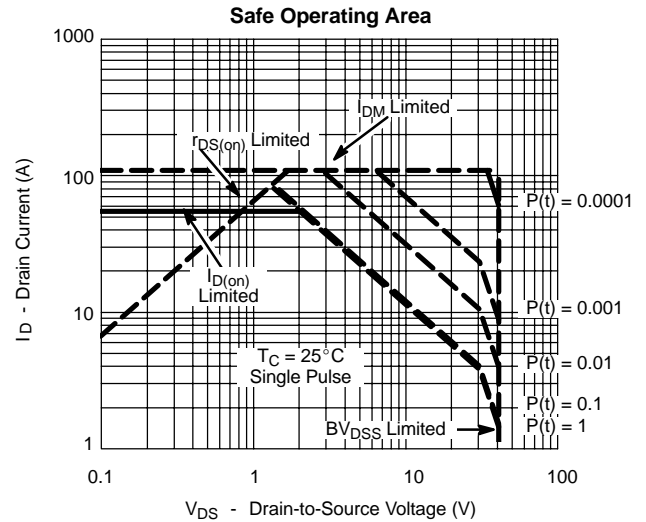
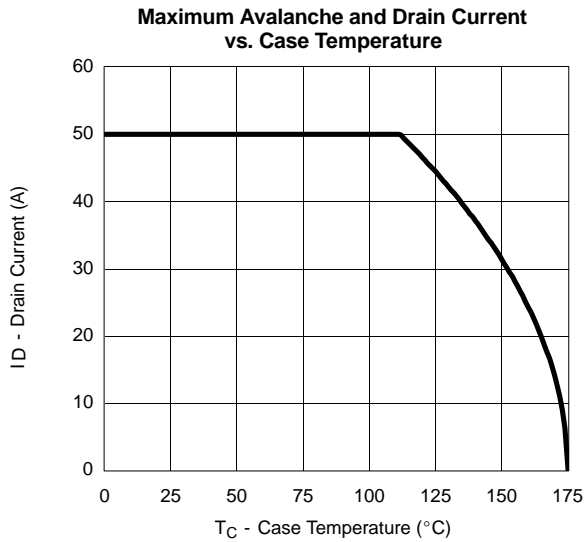
TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)



TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)



THERMAL RATINGS



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

freestyle Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "freestyle"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

freestyle makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Freestyle disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on freestyle's knowledge of typical requirements that are often placed on freestyle products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify freestyle's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, freestyle products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the freestyle product could result in personal injury or death. Customers using or selling freestyle products not expressly indicated for use in such applications do so at their own risk and agree to fully indemnify and hold freestyle and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Freestyle

Material Category Policy

freestyle Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some freestyle documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.