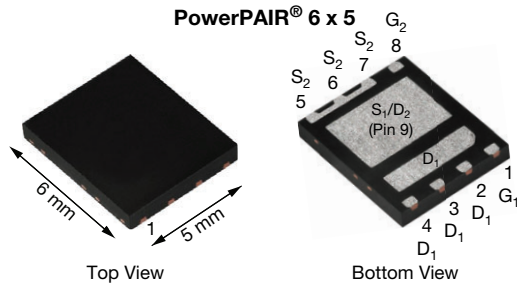


Dual N-Channel 30 V (D-S) MOSFET with Schottky Diode



FEATURES

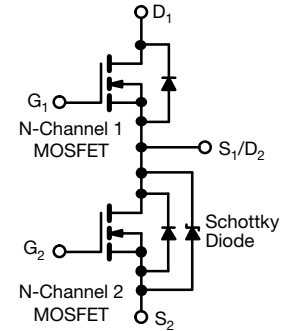
- TrenchFET® Gen IV power MOSFET
- SkyFET® low side MOSFET with integrated Schottky
- Very low $R_{DS(on)}$ x Q_g FOM improves efficiency
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- CPU core power
- Computer / server peripherals
- POL
- Synchronous buck converter
- Telecom DC/DC



| PRODUCT SUMMARY | | |
|--|--|-----------|
| | CHANNEL-1 | CHANNEL-2 |
| V_{DS} (V) | 30 | 30 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V | 0.00439 | 0.00106 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V | 0.00712 | 0.00172 |
| Q_g typ. (nC) | 5.7 | 24.2 |
| I_D (A) ^a | 54.8 | 197 |
| Configuration | Dual plus integrated Schottky (SkyFET) | |

| ORDERING INFORMATION | |
|---------------------------------|------------------|
| Package | PowerPAIR 6 x 5 |
| Lead (Pb)-free and halogen-free | SiZ980BDT-T1-GE3 |

| ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted) | | | | |
|---|----------------|---------------|----------------------|---------------------|
| PARAMETER | SYMBOL | CHANNEL-1 | CHANNEL-2 | UNIT |
| Drain-source voltage | V_{DS} | 30 | 30 | V |
| Gate-source voltage | V_{GS} | +20, -16 | +20, -16 | |
| Continuous drain current ($T_J = 150$ °C) | I_D | $T_C = 25$ °C | 54.8 | A |
| | | $T_C = 70$ °C | 43.8 | |
| | | $T_A = 25$ °C | 23.7 ^{b, c} | |
| | | $T_A = 70$ °C | 19 ^{b, c} | |
| Pulsed drain current ($t = 100$ μ s) | I_{DM} | 90 | 130 | A |
| Continuous source-drain diode current | I_S | $T_C = 25$ °C | 16.7 | |
| | | $T_A = 25$ °C | 3.2 ^{b, c} | 4.1 ^{b, c} |
| Single pulse avalanche current | I_{AS} | 15 | 25 | mJ |
| Single pulse avalanche energy | E_{AS} | 11.2 | 31 | |
| Maximum power dissipation | P_D | $T_C = 25$ °C | 20 | W |
| | | $T_C = 70$ °C | 12.9 | |
| | | $T_A = 25$ °C | 3.8 ^{b, c} | |
| | | $T_A = 70$ °C | 2.4 ^{b, c} | |
| Operating junction and storage temperature range | T_J, T_{stg} | -55 to +150 | | °C |
| Soldering recommendations (peak temperature) ^{c, d} | | 260 | | |

| THERMAL RESISTANCE RATINGS | | | | | | | |
|---|---------------|------------|------|-----------|------|------|------|
| PARAMETER | SYMBOL | CHANNEL-1 | | CHANNEL-2 | | UNIT | |
| | | TYP. | MAX. | TYP. | MAX. | | |
| Maximum junction-to-ambient ^{b, f} | $t \leq 10$ s | R_{thJA} | 26 | 33 | 20 | 25 | °C/W |
| Maximum junction-to-case (drain) | Steady state | R_{thJC} | 4.7 | 6.2 | 1.5 | 1.9 | |

Notes

- $T_C = 25$ °C
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s
- See solder profile (www.vishay.com/doc?73257). The PowerPAIR is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- Maximum under steady state conditions is 68 °C/W for channel-1 and 57 °C/W for channel-2



| 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_{DS} | $V_{GS} = 0\text{ V}, I_D = 5\text{ mA}$ | Ch-1 | 30 | - | - | V | | |
| | | | Ch-2 | 30 | - | - | | | |
| Drain-source breakdown voltage (transient) ^c | V_{DSt} | $V_{GS} = 0\text{ V}, t_{transient} \leq 1\text{ }\mu\text{s}$ | Ch-1 | 36 | - | - | | | |
| | | | Ch-2 | 36 | - | - | | | |
| Gate-source threshold voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | Ch-1 | 1.2 | - | 2.2 | | | |
| | | | Ch-2 | 1.1 | - | 2.2 | | | |
| Gate-source leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = +20\text{ V}, -16\text{ V}$ | Ch-1 | - | - | ± 100 | nA | | |
| | | | Ch-2 | - | - | ± 100 | | | |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$ | Ch-1 | - | - | 1 | μA | | |
| | | | Ch-2 | - | 50 | 250 | | | |
| | | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$ | Ch-1 | - | - | 5 | | | |
| | | | Ch-2 | - | 250 | 2500 | | | |
| On-state drain current ^b | $I_{D(on)}$ | $V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$ | Ch-1 | 20 | - | - | A | | |
| | | | Ch-2 | 20 | - | - | | | |
| Drain-source on-state resistance ^b | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}$ | Ch-1 | - | 0.00338 | 0.00439 | Ω | | |
| | | | Ch-2 | - | 0.000817 | 0.00106 | | | |
| | | | $V_{GS} = 4.5\text{ V}, I_D = 12\text{ A}$ | Ch-1 | - | 0.00547 | | 0.00712 | |
| | | | | Ch-2 | - | 0.00133 | | 0.00172 | |
| Forward transconductance ^b | g_{fs} | $V_{DS} = 10\text{ V}, I_D = 15\text{ A}$ | Ch-1 | - | 55 | - | S | | |
| | | | Ch-2 | - | 230 | - | | | |
| Dynamic ^a | | | | | | | | | |
| Input capacitance | C_{iss} | Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | Ch-1 | - | 790 | - | pF | | |
| | | | Ch-2 | - | 3655 | - | | | |
| Output capacitance | C_{oss} | | Channel-2 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | Ch-1 | - | 390 | | - | |
| | | | | Ch-2 | - | 2290 | | - | |
| Reverse transfer capacitance | C_{rss} | | | Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | Ch-1 | - | | 38 | - |
| | | | | | Ch-2 | - | | 170 | - |
| C_{rss}/C_{iss} ratio | | Channel-2 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | | | Ch-1 | - | 0.046 | 0.092 | |
| | | | | | Ch-2 | - | 0.046 | 0.092 | |
| Total gate charge | Q_g | | $V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 19\text{ A}$ | | Ch-1 | - | 12 | 18 | nC |
| | | | | | Ch-2 | - | 52.2 | 79 | |
| | | | | $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 19\text{ A}$ | Ch-1 | - | 5.7 | 8.6 | |
| | | | | | Ch-2 | - | 24.2 | 37 | |
| Gate-source charge | Q_{gs} | Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 19\text{ A}$ | Ch-1 | - | 3 | - | | | |
| | | | Ch-2 | - | 11.7 | - | | | |
| Gate-drain charge | Q_{gd} | | Channel-2 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 19\text{ A}$ | Ch-1 | - | 1.4 | - | | |
| | | | | Ch-2 | - | 5.1 | - | | |
| Output charge | Q_{oss} | | | $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}$ | Ch-1 | - | 10 | - | |
| | | | | | Ch-2 | - | 70 | - | |
| Gate resistance | R_g | $f = 1\text{ MHz}$ | | | Ch-1 | 0.2 | 1.1 | 2.2 | Ω |
| | | | | | Ch-2 | 0.16 | 0.8 | 1.6 | |



| SPECIFICATIONS (T _J = 25 °C, unless otherwise noted) | | | | | | | |
|---|---------------------|--|---|------|------|------|----|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT | |
| Dynamic ^a | | | | | | | |
| Turn-on delay time | t _{d(on)} | Channel-1 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω | Ch-1 | - | 20 | 40 | ns |
| | | | Ch-2 | - | 35 | 70 | |
| Rise time | t _r | | Ch-1 | - | 100 | 200 | |
| | | | Ch-2 | - | 90 | 180 | |
| Turn-off delay time | t _{d(off)} | Channel-2 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω | Ch-1 | - | 15 | 30 | |
| | | | Ch-2 | - | 35 | 70 | |
| Fall time | t _f | | Ch-1 | - | 12 | 24 | |
| | | | Ch-2 | - | 20 | 40 | |
| Turn-on delay time | t _{d(on)} | Channel-1 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω | Ch-1 | - | 10 | 20 | |
| | | | Ch-2 | - | 10 | 20 | |
| Rise time | t _r | | Ch-1 | - | 20 | 40 | |
| | | | Ch-2 | - | 10 | 20 | |
| Turn-off delay time | t _{d(off)} | | Channel-2 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω | Ch-1 | - | 20 | 40 |
| | | | | Ch-2 | - | 35 | 70 |
| Fall time | t _f | | | Ch-1 | - | 10 | 20 |
| | | | | Ch-2 | - | 10 | 20 |
| Drain-Source Body Diode Characteristics | | | | | | | |
| Continuous source-drain diode current | I _S | T _C = 25 °C | Ch-1 | - | - | 16.7 | A |
| | | | Ch-2 | - | - | 85.4 | |
| Pulse diode forward current ^a | I _{SM} | | Ch-1 | - | - | 90 | |
| | | | Ch-2 | - | - | 130 | |
| Body diode voltage | V _{SD} | I _S = 10 A, V _{GS} = 0 V | Ch-1 | - | 0.8 | 1.2 | V |
| | | | Ch-2 | - | 0.51 | 0.77 | |
| Body diode reverse recovery time | t _{rr} | Channel-1 I _F = 10 A, di/dt = 100 A/μs, T _J = 25 °C | Ch-1 | - | 18 | 36 | ns |
| | | | Ch-2 | - | 42 | 84 | |
| Body diode reverse recovery charge | Q _{rr} | | Ch-1 | - | 18 | 36 | nC |
| | | | Ch-2 | - | 39 | 78 | |
| Reverse recovery fall time | t _a | Channel-2 I _F = 10 A, di/dt = 100 A/μs, T _J = 25 °C | Ch-1 | - | 10 | - | ns |
| | | | Ch-2 | - | 21 | - | |
| Reverse recovery Rise time | t _b | | Ch-1 | - | 8 | - | |
| | | | Ch-2 | - | 21 | - | |

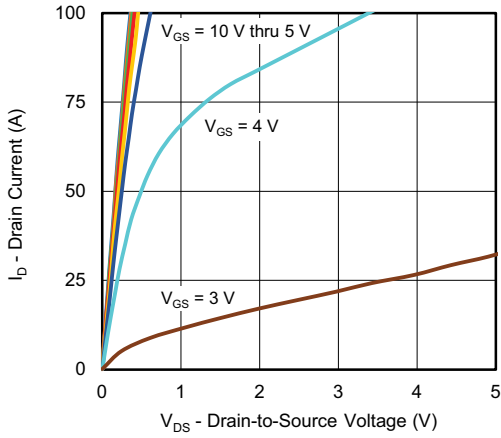
Notes

- a. Guaranteed by design, not subject to production testing
- b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
- c. Derived from UIS characterization data at time of product release. Production data log is not available

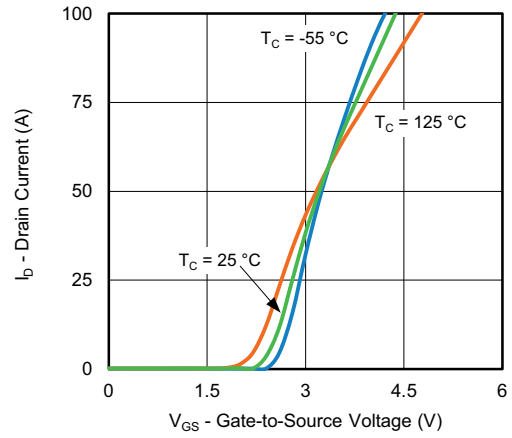
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



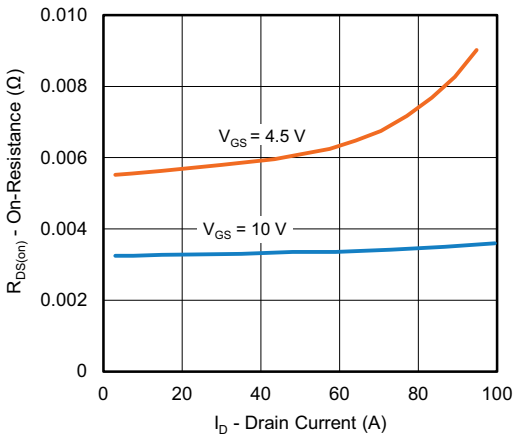
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



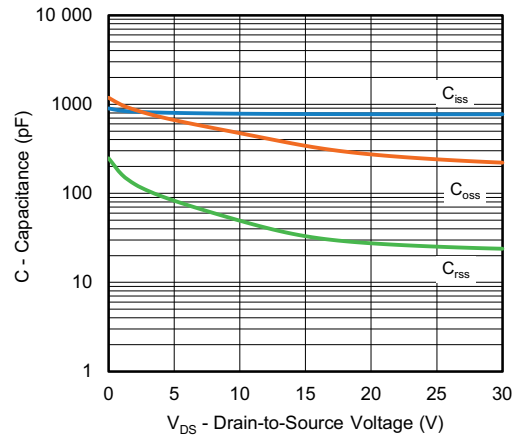
Output Characteristics



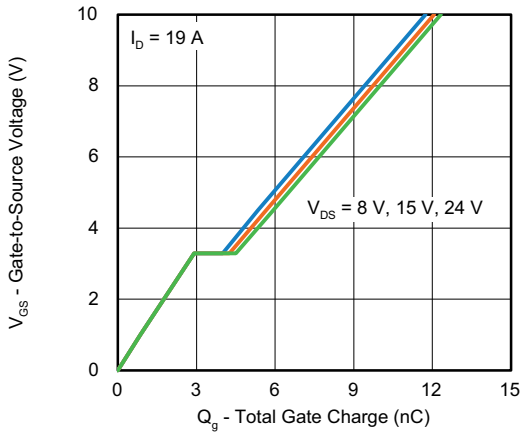
Transfer Characteristics



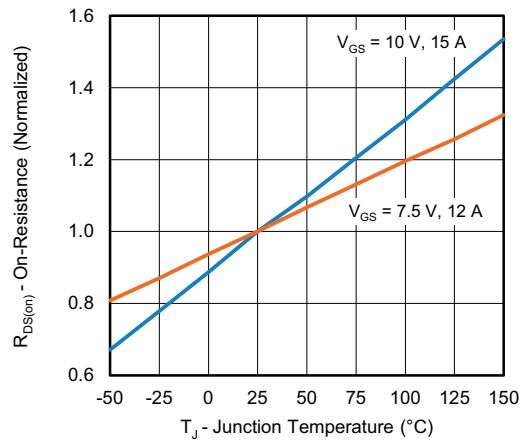
On-Resistance vs. Drain Current



Capacitance



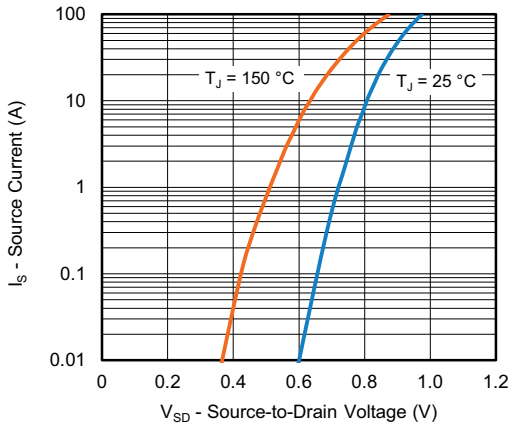
Gate Charge



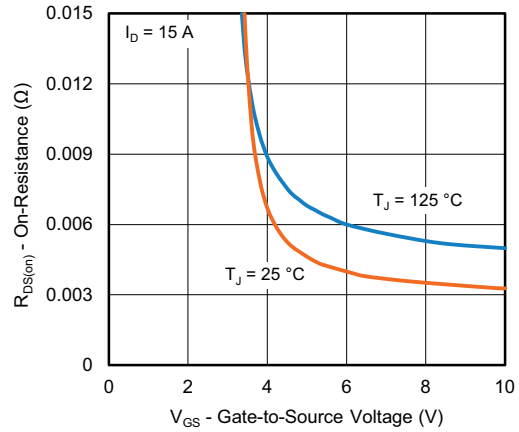
On-Resistance vs. Junction Temperature



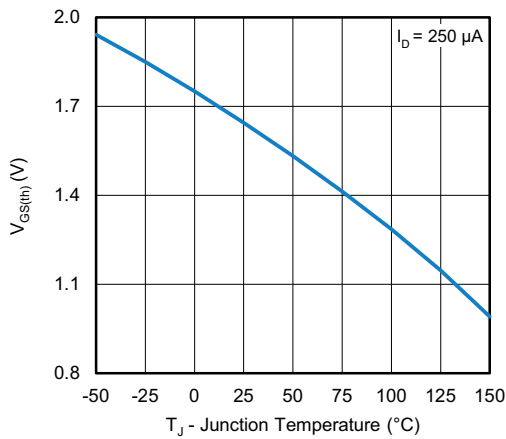
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



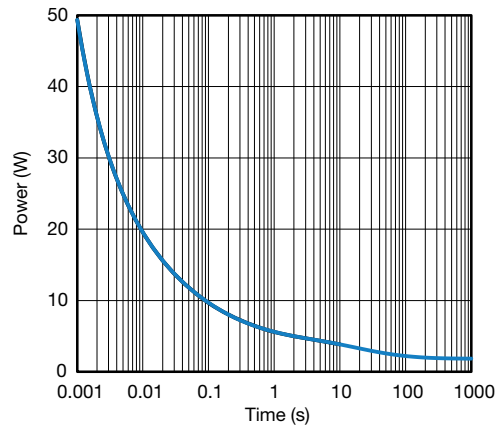
Source-Drain Diode Forward Voltage



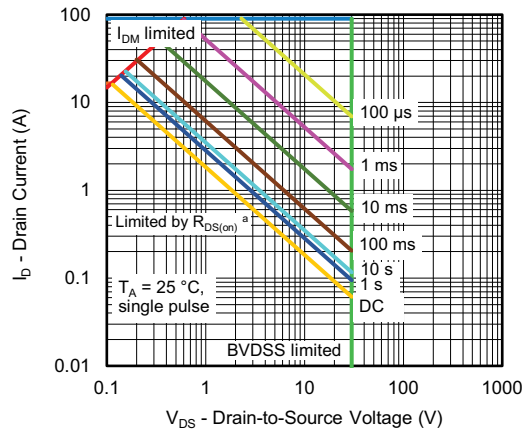
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



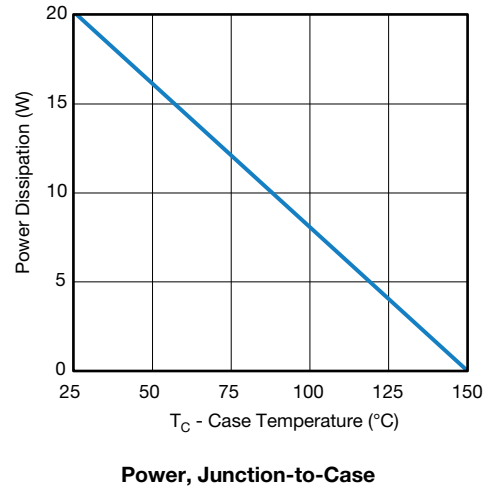
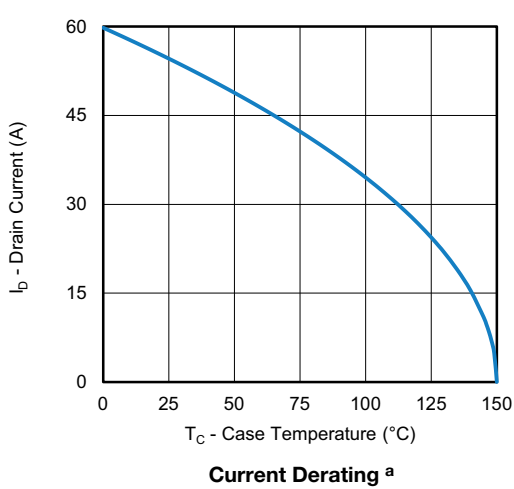
Safe Operating Area, Junction-to-Ambient

Note

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



CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

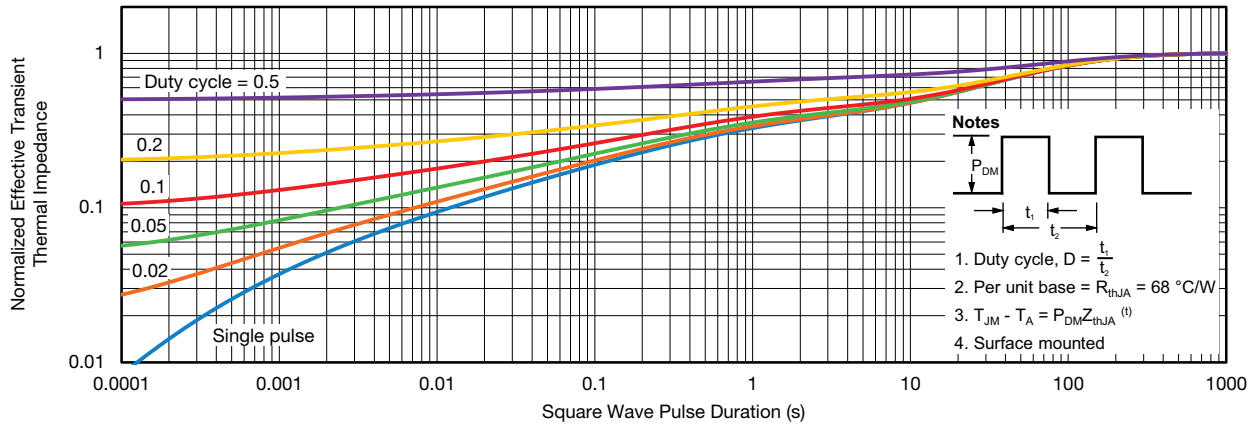


Note

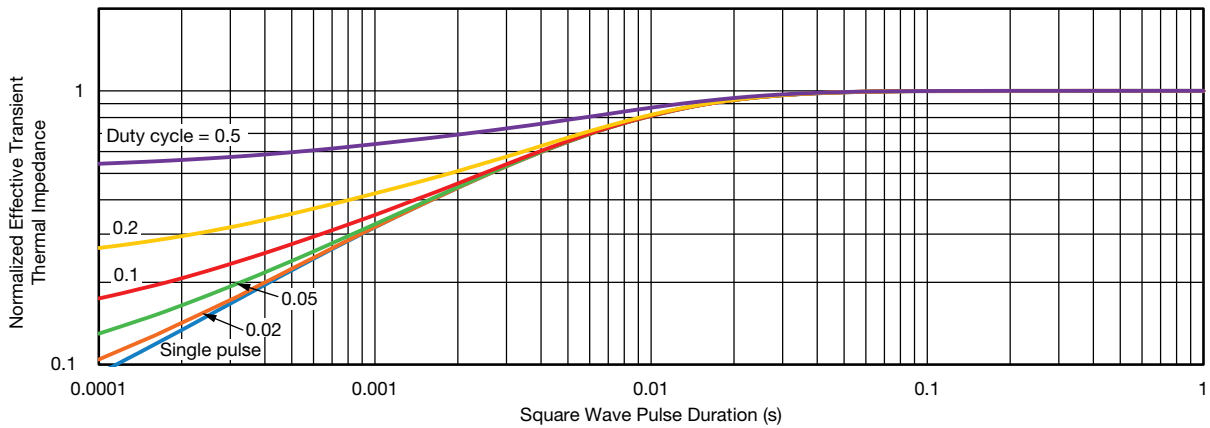
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

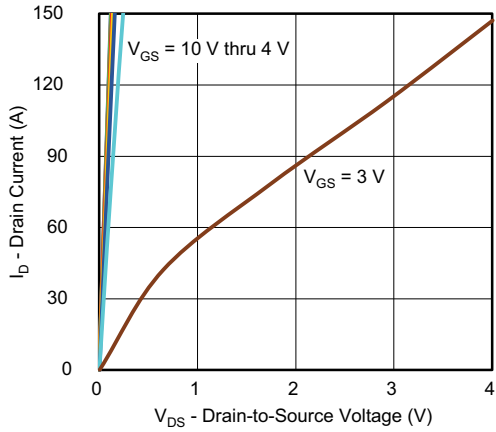


Normalized Thermal Transient Impedance, Junction-to-Ambient

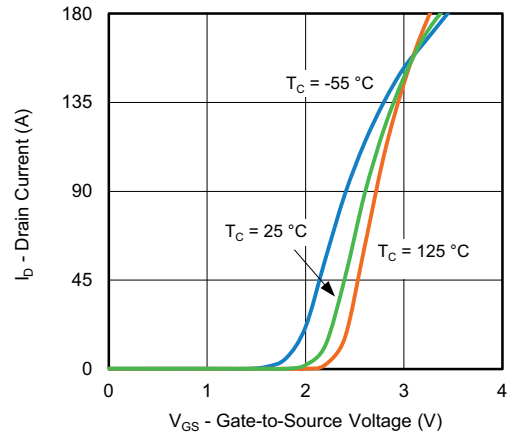


Normalized Thermal Transient Impedance, Junction-to-Case

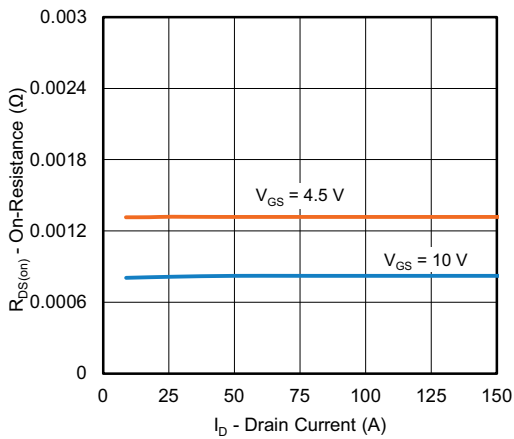
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



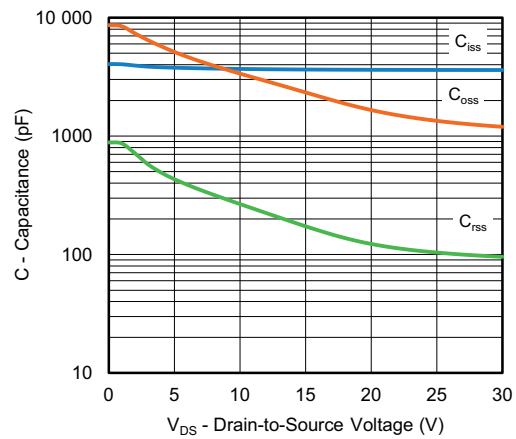
Output Characteristics



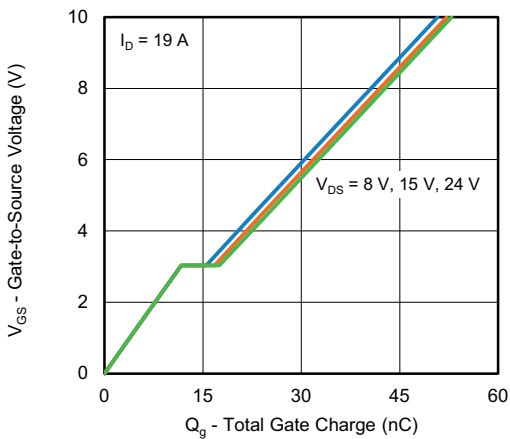
Transfer Characteristics



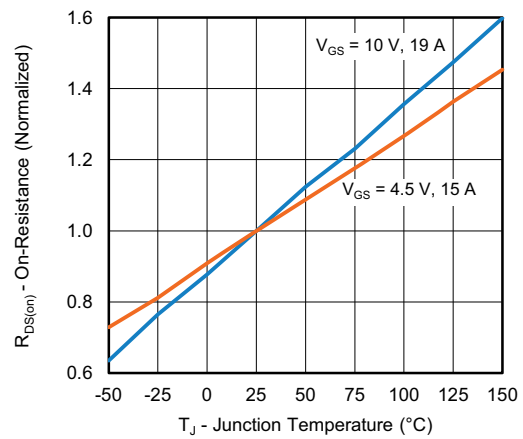
On-Resistance vs. Drain Current



Capacitance



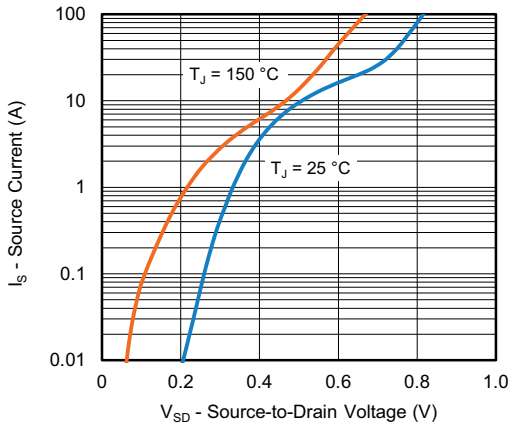
Gate Charge



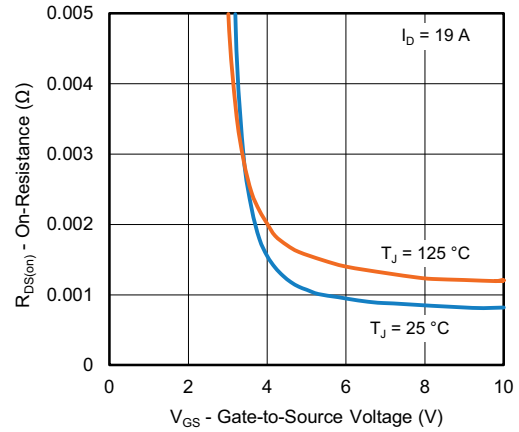
On-Resistance vs. Junction Temperature



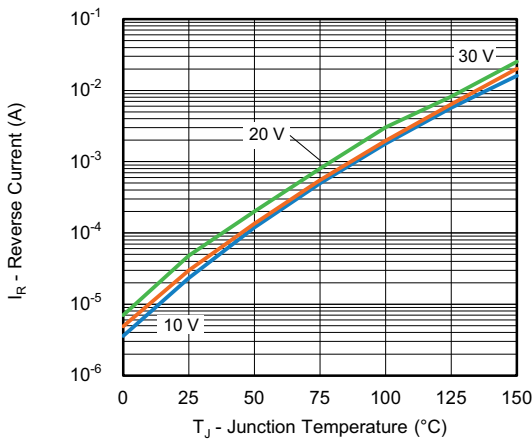
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



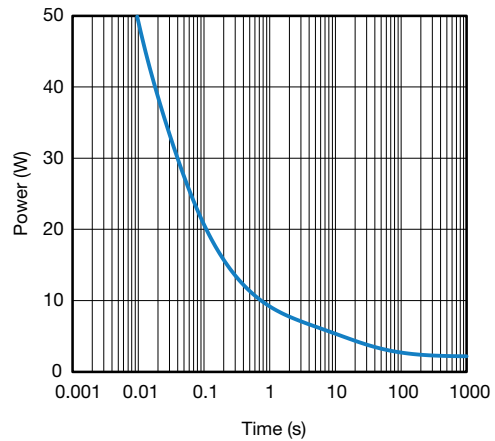
Source-Drain Diode Forward Voltage



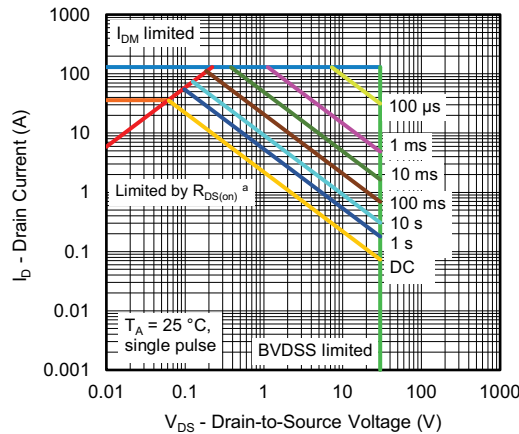
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



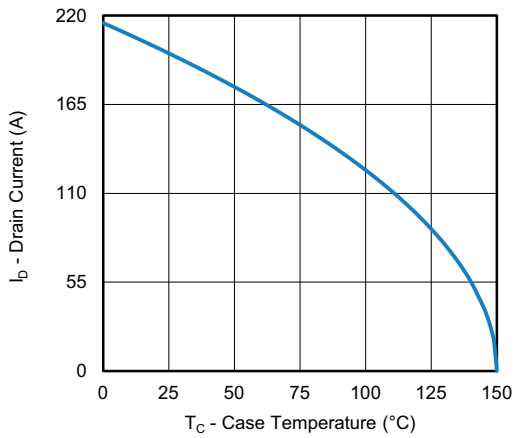
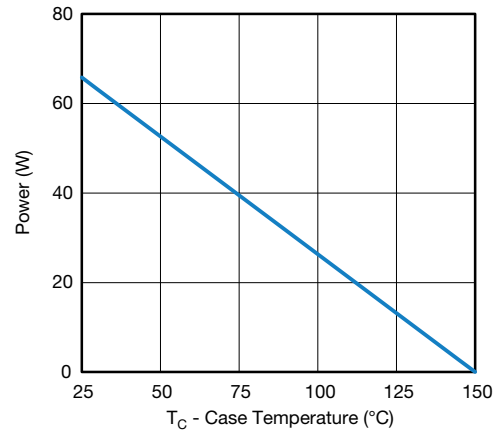
Single Pulse Power, Junction-to-Ambient



Safe Operating Area, Junction-to-Ambient

Note

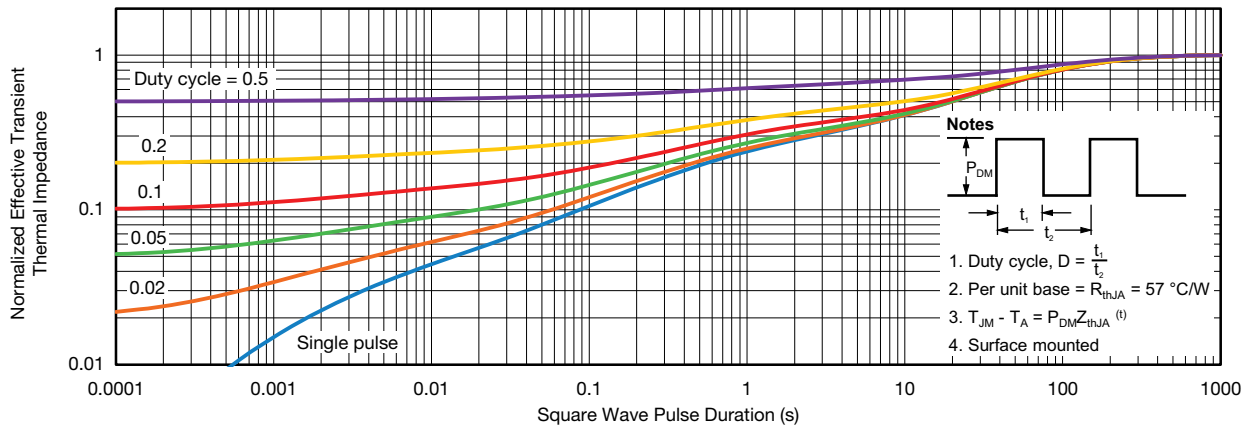
a. $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Current Derating ^a

Power, Junction-to-Case
Note

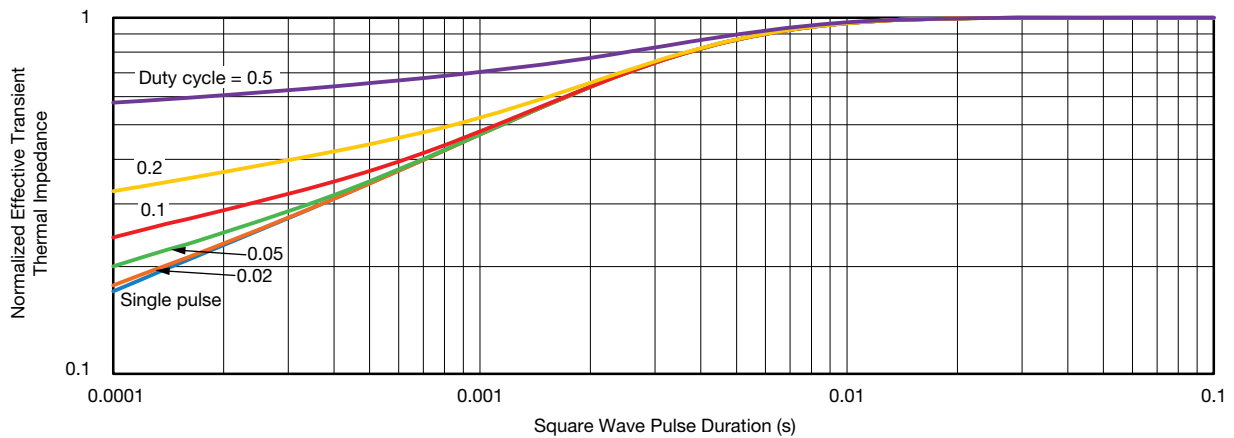
- a. The power dissipation P_D is based on $T_J \text{ max.} = 150 \text{ }^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package / tape drawings, part marking, and reliability data, see www.vishay.com/ppg?77251.

PowerPAIR® 6 x 5 F Case Outline



| DIMENSION | MILLIMETERS | | | INCHES | | |
|-----------------------------------|-------------|------|------|------------|-------|-------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.70 | 0.75 | 0.80 | 0.028 | 0.030 | 0.031 |
| A1 | 0.00 | - | 0.10 | 0.000 | - | 0.004 |
| b | 0.35 | 0.41 | 0.46 | 0.014 | 0.016 | 0.018 |
| b1 | 0.38 ref. | | | 0.015 ref. | | |
| c | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| D | 4.90 | 5.00 | 5.10 | 0.193 | 0.197 | 0.201 |
| D1 | 3.26 | 3.31 | 3.36 | 0.128 | 0.130 | 0.132 |
| D2 | 4.20 | 4.30 | 4.40 | 0.165 | 0.169 | 0.173 |
| D3 | 4.15 | 4.20 | 4.25 | 0.163 | 0.165 | 0.167 |
| E | 5.90 | 6.00 | 6.10 | 0.232 | 0.236 | 0.240 |
| E1 | 2.50 | 2.55 | 2.60 | 0.098 | 0.100 | 0.102 |
| E2 | 0.87 | 0.92 | 0.97 | 0.034 | 0.036 | 0.038 |
| e | 1.27 BSC | | | 0.050 BSC | | |
| e1 | 3.81 BSC | | | 0.150 BSC | | |
| K | 0.52 | 0.57 | 0.62 | 0.020 | 0.022 | 0.024 |
| K1 | 0.69 | 0.74 | 0.79 | 0.027 | 0.029 | 0.031 |
| K2 | 0.60 | 0.65 | 0.70 | 0.024 | 0.026 | 0.028 |
| K3 | 0.39 BSC | | | 0.015 BSC | | |
| K4 | 0.50 | 0.55 | 0.60 | 0.020 | 0.022 | 0.024 |
| K5 | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 |
| K6 | 0.40 | 0.45 | 0.50 | 0.016 | 0.018 | 0.020 |
| K7 | 0.35 | 0.40 | 0.45 | 0.014 | 0.016 | 0.018 |
| K8 | 0.30 | 0.35 | 0.40 | 0.012 | 0.014 | 0.016 |
| L | 0.33 | 0.43 | 0.53 | 0.013 | 0.017 | 0.021 |
| L1 | 1.31 | 1.36 | 1.41 | 0.052 | 0.054 | 0.056 |
| L2 | 0.20 ref. | | | 0.008 ref. | | |
| ECN: T20-0097-Rev. C, 25-Feb-2020 | | | | | | |
| DWG: 6043 | | | | | | |

Note

- Millimeters will govern

Recommended Minimum PAD for PowerPAIR® 6 x 5



Dimensions in millimeters (inch)

Note

- Linear dimensions are in black, the same information is provided in ordinate dimensions which are in blue.



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