Complementary 30 V (G-S) MOSFET

**FEATURES**
- TrenchFET® Power MOSFET
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### PRODUCT SUMMARY

<table>
<thead>
<tr>
<th>Feature</th>
<th>Symbol</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDS (V)</td>
<td>N-Channel</td>
<td>0.480 at VGS = 10 V</td>
<td>0.700 at VGS = 4.5 V</td>
</tr>
<tr>
<td>RoS(on) (Ω)</td>
<td>- 30</td>
<td>0.940 at VGS = - 10 V</td>
<td>1.700 at VGS = - 4.5 V</td>
</tr>
<tr>
<td>ID (A)</td>
<td>N-Channel</td>
<td>0.63</td>
<td>- 0.45</td>
</tr>
<tr>
<td></td>
<td>- 30</td>
<td>- 0.45</td>
<td>- 0.33</td>
</tr>
</tbody>
</table>

### ABSOLUTE MAXIMUM RATINGS (TA = 25 °C, unless otherwise noted)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>N-Channel</th>
<th>P-Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-Source Voltage</td>
<td>VDS</td>
<td>30</td>
<td>- 30</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>VGS</td>
<td>± 20</td>
<td>± 20</td>
</tr>
<tr>
<td>Continuous Drain Current (TA = 150 °C)a</td>
<td>IDM</td>
<td>0.63</td>
<td>- 0.45</td>
</tr>
<tr>
<td>(TA = 85 °C)</td>
<td></td>
<td>0.45</td>
<td>- 0.32</td>
</tr>
<tr>
<td>Pulsed Drain Current</td>
<td>IS</td>
<td>0.25</td>
<td>- 0.25</td>
</tr>
<tr>
<td>Continuous Source Current (Diode Conduction)a</td>
<td>IS</td>
<td>0.23</td>
<td>- 0.23</td>
</tr>
<tr>
<td>Maximum Power Dissipationa</td>
<td>PD</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td>(TA = 25 °C)</td>
<td></td>
<td>0.27</td>
<td>0.27</td>
</tr>
<tr>
<td>(TA = 85 °C)</td>
<td></td>
<td>0.16</td>
<td>0.14</td>
</tr>
<tr>
<td>Operating Junction and Storage Temperature Range</td>
<td>TJ, Tstg</td>
<td>- 55 to 150 °C</td>
<td></td>
</tr>
</tbody>
</table>

### THERMAL RESISTANCE RATINGS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Junction-to-Ambienta</td>
<td>RthJA</td>
<td>360</td>
<td>415</td>
</tr>
<tr>
<td>t ≤ 5 s</td>
<td>Steady State</td>
<td>400</td>
<td>460</td>
</tr>
<tr>
<td>Maximum Junction-to-Foot (Drain)</td>
<td>RthJF</td>
<td>300</td>
<td>350</td>
</tr>
</tbody>
</table>

Notes:
- a. Surface mounted on 1" x 1" FR4 board.
## SPECIFICATIONS (T_{J} = 25 °C, unless otherwise noted)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate Threshold Voltage</td>
<td>V_{GS(th)}</td>
<td>V_{DS} = V_{GS}, I_{D} = 250 µA</td>
<td>N-Ch</td>
<td>1</td>
<td>2.6</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{DS} = V_{GS}, I_{D} = -250 µA</td>
<td>P-Ch</td>
<td>-1</td>
<td>-2.6</td>
<td>V</td>
</tr>
<tr>
<td>Gate-Body Leakage</td>
<td>I_{GSS}</td>
<td>V_{DS} = 0 V, V_{GS} = ± 20 V</td>
<td>N-Ch</td>
<td>±100</td>
<td>±100</td>
<td>nA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{DS} = 24 V, V_{GS} = 0 V</td>
<td>N-Ch</td>
<td>1</td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{DS} = -24 V, V_{GS} = 0 V</td>
<td>P-Ch</td>
<td>1</td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>Zero Gate Voltage Drain Current</td>
<td>I_{DS}</td>
<td>V_{DS} = 24 V, V_{GS} = 0 V</td>
<td>N-Ch</td>
<td>5</td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{DS} = 24 V, V_{GS} = 0 V, T_{J} = 85 °C</td>
<td>P-Ch</td>
<td>-5</td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>On-State Drain Currentb</td>
<td>I_{D(on)}</td>
<td>V_{DS} ≥ 5 V, V_{GS} = 10 V</td>
<td>N-Ch</td>
<td>1</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{DS} ≤ - 5 V, V_{GS} = - 10 V</td>
<td>P-Ch</td>
<td>-1</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Drain-Source On-State Resistancea</td>
<td>R_{DS(on)}</td>
<td>V_{GS} = 10 V, I_{D} = 0.59 A</td>
<td>N-Ch</td>
<td>0.410</td>
<td>0.480</td>
<td>Ω</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{GS} = - 10 V, I_{D} = - 0.42 A</td>
<td>P-Ch</td>
<td>0.800</td>
<td>0.940</td>
<td>Ω</td>
</tr>
<tr>
<td>Forward Transconductancea</td>
<td>g_{fs}</td>
<td>V_{DS} = 15 V, I_{D} = 0.59 A</td>
<td>N-Ch</td>
<td>0.75</td>
<td></td>
<td>S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{DS} = - 15 V, I_{D} = - 0.42 A</td>
<td>P-Ch</td>
<td>0.5</td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>Diode Forward Voltagea</td>
<td>V_{SD}</td>
<td>I_{S} = 0.23 A, V_{GS} = 0 V</td>
<td>N-Ch</td>
<td>0.80</td>
<td>1.2</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{S} = - 0.23 A, V_{GS} = 0 V</td>
<td>P-Ch</td>
<td>-0.86</td>
<td>-1.2</td>
<td>V</td>
</tr>
<tr>
<td>Dynamicb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Gate Charge</td>
<td>Q_{g}</td>
<td>N-Channel V_{DS} = 15 V, V_{GS} = 10 V, I_{D} = 0.59 A</td>
<td>N-Ch</td>
<td>0.86</td>
<td>1.4</td>
<td>nC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P-Channel V_{DS} = - 15 V, V_{GS} = - 10 V, I_{D} = - 0.42 A</td>
<td>P-Ch</td>
<td>0.90</td>
<td>1.4</td>
<td>nC</td>
</tr>
<tr>
<td>Gate-Source Charge</td>
<td>Q_{gs}</td>
<td>N-Channel V_{DS} = 15 V, V_{GS} = 10 V, I_{D} = 0.59 A</td>
<td>N-Ch</td>
<td>0.24</td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P-Channel V_{DS} = - 15 V, V_{GS} = - 10 V, I_{D} = - 0.42 A</td>
<td>P-Ch</td>
<td>0.21</td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Gate-Drain Charge</td>
<td>Q_{gd}</td>
<td>N-Channel V_{DS} = 15 V, V_{GS} = 10 V, I_{D} = 0.59 A</td>
<td>N-Ch</td>
<td>0.08</td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P-Channel V_{DS} = - 15 V, V_{GS} = - 10 V, I_{D} = - 0.42 A</td>
<td>P-Ch</td>
<td>0.17</td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Turn-On Delay Time</td>
<td>t_{d(on)}</td>
<td>N-Channel V_{DD} = 15 V, R_{L} = 30 Ω</td>
<td>N-Ch</td>
<td>5</td>
<td>10</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P-Channel I_{D} = 0.5 A, V_{GEN} = 10 V, R_{g} = 6 Ω</td>
<td>N-Ch</td>
<td>4</td>
<td>10</td>
<td>ns</td>
</tr>
<tr>
<td>Rise Time</td>
<td>t_{r}</td>
<td>N-Channel V_{DD} = 15 V, R_{L} = 30 Ω</td>
<td>N-Ch</td>
<td>8</td>
<td>15</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P-Channel I_{D} = 0.5 A, V_{GEN} = 10 V, R_{g} = 6 Ω</td>
<td>N-Ch</td>
<td>8</td>
<td>15</td>
<td>ns</td>
</tr>
<tr>
<td>Turn-Off Delay Time</td>
<td>t_{d(off)}</td>
<td>N-Channel V_{DD} = 15 V, R_{L} = 30 Ω</td>
<td>N-Ch</td>
<td>7</td>
<td>15</td>
<td>ns</td>
</tr>
<tr>
<td>Fall Time</td>
<td>t_{f}</td>
<td>N-Channel I_{D} = 0.5 A, V_{GEN} = 10 V, R_{g} = 6 Ω</td>
<td>N-Ch</td>
<td>7</td>
<td>15</td>
<td>ns</td>
</tr>
<tr>
<td>Source-Drain Reverse Recovery Time</td>
<td>t_{rr}</td>
<td>I_{F} = 0.23 A, dI/dt = 100 A/µs</td>
<td>N-Ch</td>
<td>15</td>
<td>30</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{F} = - 0.23 A, dI/dt = 100 A/µs</td>
<td>P-Ch</td>
<td>20</td>
<td>40</td>
<td>ns</td>
</tr>
</tbody>
</table>

Notes:
- a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 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.
N-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature

VGS = 10 V thru 4 V

VGS = 4.5 V

VGS = 10 V

VGS = 10 V

VGS = 10 V

ID = 0.59 A

ID = 0.59 A

TC = 125 °C

TC = 25 °C

25 °C

-55 °C

Qg - Total Gate Charge (nC)

RDS(on) - On-Resistance (Ω)

Cgs - Capacitance (pF)

Ciss - Capacitance (pF)

Crds - Capacitance (pF)

Rds, on - On-Resistance (Ω)

Rdson - On-Resistance (Ω)

Rdson - On-Resistance (Ω)

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Rdson - On-Resistance (Ω)
N-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Source-Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage

Threshold Voltage

Single Pulse Power

Normalized Thermal Transient Impedance, Junction-to-Ambient

Notes:
1. Duty Cycle, $D = \frac{t_1}{t_2}$
2. Per Unit Base = $R_{thJA} = 400 \degree C/W$
3. $TJM - TA = P_{DM} \frac{t_2}{t_1}$
4. Surface Mounted
N-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

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

- **Gate Charge**
  - $V_{DS} = 15\,V$
  - $I_D = 0.42\,A$
  - $Q_g$ - Total Gate Charge (nC)

- **On-Resistance vs. Junction Temperature**
  - $V_{GS} = 10\,V$
  - $I_D = 0.42\,A$
  - $R_{DS(on)}$ - On-Resistance (Normalized)

- **Source-Drain Diode Forward Voltage**
  - $T_J = 150\,^\circ C$
  - $T_J = 25\,^\circ C$
  - $V_{SD}$ - Source-to-Drain Voltage (V)
  - $I_S$ - Source Current (A)

- **On-Resistance vs. Gate-to-Source Voltage**
  - $I_D = 0.42\,A$
  - $R_{DS(on)}$ - On-Resistance ($\Omega$)
  - $V_{GS}$ - Gate-to-Source Voltage (V)

- **Threshold Voltage**
  - $I_D = 250\,\mu A$
  - $V_{GS(th)}$ - Variance (V)
  - $T_J$ - Temperature (°C)

- **Single Pulse Power**
  - Power (W)
  - Time (s)
**P-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

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Notes:
1. Duty Cycle, \( D = \frac{t_1}{T_D} \)
2. Per Unit Base = \( R_{thJA} = 400 \, ^\circ \text{C/W} \)
3. \( T_{JM} - T_A = PDM \cdot R_{thJA}(t) \)
4. Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Foot
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