1. General description

Logic level N-channel MOSFET in an LFPAK56 (Power SO8) package using TrenchMOS technology. This product is designed and qualified for use in a wide range of power supply & motor control equipment.

2. Features and benefits

- Advanced TrenchMOS provides low $R_{DSon}$ and low gate charge
- Logic level gate operation
- Avalanche rated, 100% tested
- LFPAK provides maximum power density in a Power SO8 package

3. Applications

- Synchronous rectification in power supply equipment
- Chargers & adaptors with $V_{out} < 10$ V
- Fast charge & USB-PD applications
- Battery powered motor control
- LED lighting & TV backlight

4. Quick reference data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{DS}$</td>
<td>drain-source voltage</td>
<td>$25 \ °C \leq T_j \leq 175 \ °C$</td>
<td>-</td>
<td>-</td>
<td>80</td>
<td>V</td>
</tr>
<tr>
<td>$I_D$</td>
<td>drain current</td>
<td>$V_{GS} = 5$ V; $T_{mb} = 25 \ °C$; Fig. 1</td>
<td>-</td>
<td>-</td>
<td>62</td>
<td>A</td>
</tr>
<tr>
<td>$P_{tot}$</td>
<td>total power dissipation</td>
<td>$T_{mb} = 25 \ °C$; Fig. 2</td>
<td>-</td>
<td>-</td>
<td>147</td>
<td>W</td>
</tr>
</tbody>
</table>

**Static characteristics**

- $R_{DSon}$ | drain-source on-state resistance | $V_{GS} = 5$ V; $I_D = 15$ A; $T_j = 25 \ °C$; Fig. 11 | - | 12.2 | 15 | mΩ |

**Dynamic characteristics**

- $Q_{GD}$ | gate-drain charge | $I_D = 15$ A; $V_{DS} = 64$ V; $V_{GS} = 5$ V; $T_j = 25 \ °C$; Fig. 13; Fig. 14 | - | 8.7 | - | nC |
5. Pinning information

Table 2. Pinning information

<table>
<thead>
<tr>
<th>Pin</th>
<th>Symbol</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S</td>
<td>source</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>S</td>
<td>source</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>S</td>
<td>source</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>G</td>
<td>gate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mb</td>
<td>D</td>
<td>mounting base; connected to drain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package Name</th>
<th>Description</th>
<th>Version</th>
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</thead>
<tbody>
<tr>
<td>PSMN014-80YL</td>
<td>LFPAK56; Power-SO8</td>
<td>Plastic single-ended surface-mounted package (LFPAK56; Power-SO8); 4 leads</td>
<td>SOT669</td>
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7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
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</thead>
<tbody>
<tr>
<td>PSMN014-80YL</td>
<td>014L80</td>
</tr>
</tbody>
</table>

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{DS}</td>
<td>drain-source voltage</td>
<td>25 °C ≤ T_j ≤ 175 °C</td>
<td>-</td>
<td>80</td>
<td>V</td>
</tr>
<tr>
<td>V_{DGR}</td>
<td>drain-gate voltage</td>
<td>R_{GS} = 20 kΩ</td>
<td>-</td>
<td>80</td>
<td>V</td>
</tr>
<tr>
<td>V_{GS}</td>
<td>gate-source voltage</td>
<td></td>
<td>-20</td>
<td>20</td>
<td>V</td>
</tr>
<tr>
<td>P_{tot}</td>
<td>total power dissipation</td>
<td>T_{mb} = 25 °C; Fig. 2</td>
<td>-</td>
<td>147</td>
<td>W</td>
</tr>
<tr>
<td>I_{D}</td>
<td>drain current</td>
<td>V_{GS} = 5 V; T_{mb} = 25 °C; Fig. 1</td>
<td>-</td>
<td>62</td>
<td>A</td>
</tr>
<tr>
<td>I_{DM}</td>
<td>peak drain current</td>
<td>V_{GS} = 5 V; T_{mb} = 100 °C; Fig. 1</td>
<td>-</td>
<td>44</td>
<td>A</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td>pulsed; t_{p} ≤ 10 µs; T_{mb} = 25 °C; Fig. 4</td>
<td>-55</td>
<td>250</td>
<td>A</td>
</tr>
</tbody>
</table>

In accordance with the Absolute Maximum Rating System (IEC 60134).
# PSMN014-80YL

## N-channel 80 V, 14 mΩ logic level MOSFET in LFPAK56

### Symbol | Parameter | Conditions | Min | Max | Unit
--- | --- | --- | --- | --- | ---
T<sub>j</sub> | junction temperature | | -55 | 175 | °C

### Source-drain diode

| Symbol | Parameter | Conditions | Min | Max | Unit |
--- | --- | --- | --- | --- | ---
I<sub>S</sub> | source current | T<sub>mb</sub> = 25 °C | - | 62 | A |
I<sub>SM</sub> | peak source current | pulsed; t<sub>p</sub> ≤ 10 µs; T<sub>mb</sub> = 25 °C | - | 250 | A |

### Avalanche ruggedness

| Symbol | Parameter | Conditions | Min | Max | Unit |
--- | --- | --- | --- | --- | ---
E<sub>DS(Al)S</sub> | non-repetitive drain-source avalanche energy | I<sub>D</sub> = 62 A; V<sub>sup</sub> ≤ 80 V; R<sub>GS</sub> = 50 Ω; V<sub>GS</sub> = 5 V; T<sub>j(init)</sub> = 25 °C; unclamped; | [1][2] | 79.6 | mJ |

---

[1] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.

[2] Refer to application note AN10273 for further information.

---

**Fig. 1.** Continuous drain current as a function of mounting base temperature

\[ V_{GS} \geq 5V \]

**Fig. 2.** Normalized total power dissipation as a function of mounting base temperature

\[
P_{der} = \frac{P_{tot}}{P_{tot(25^\circ C)}} \times 100 \%
\]
Fig. 3. **Avalanche rating; avalanche current as a function of avalanche time**

\[ T_{j}^{\text{(init)}} = 25^\circ\text{C}, \quad T_{j}^{\text{(init)}} = 150^\circ\text{C}, \quad \text{(3) Repetitive Avalanche} \]

Fig. 4. **Safe operating area; continuous and peak drain currents as a function of drain-source voltage**

\[ T_{mb} = 25^\circ\text{C}; \quad I_{DM} \text{ is a single pulse} \]

### 9. Thermal characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th(j-mb)}$</td>
<td>thermal resistance from junction to mounting base</td>
<td>Fig. 5</td>
<td>-</td>
<td>-</td>
<td>1.02</td>
<td>K/W</td>
</tr>
</tbody>
</table>

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10. Characteristics

Table 7. Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{(BR)DSS}$</td>
<td>drain-source breakdown voltage</td>
<td>$I_D = 250 \mu A; V_{GS} = 0 V; T_j = 25 \degree C$</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_{(BR)DSS}$</td>
<td>drain-source breakdown voltage</td>
<td>$I_D = 250 \mu A; V_{GS} = 0 V; T_j = -55 \degree C$</td>
<td>72</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_{GS(th)}$</td>
<td>gate-source threshold voltage</td>
<td>$I_D = 1 mA; V_{DS}=V_{GS}; T_j = 25 \degree C; \text{Fig. 9; Fig. 10}$</td>
<td>1.4</td>
<td>1.7</td>
<td>2.1</td>
<td>V</td>
</tr>
<tr>
<td>$V_{GS(th)}$</td>
<td>gate-source threshold voltage</td>
<td>$I_D = 1 mA; V_{DS}=V_{GS}; T_j = -55 \degree C; \text{Fig. 9}$</td>
<td>-</td>
<td>-</td>
<td>2.45</td>
<td>V</td>
</tr>
<tr>
<td>$V_{GS(th)}$</td>
<td>gate-source threshold voltage</td>
<td>$I_D = 1 mA; V_{DS}=V_{GS}; T_j = 175 \degree C; \text{Fig. 9}$</td>
<td>0.5</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$I_{DSS}$</td>
<td>drain leakage current</td>
<td>$V_{DS} = 80 V; V_{GS} = 0 V; T_j = 25 \degree C$</td>
<td>-</td>
<td>0.25</td>
<td>10</td>
<td>µA</td>
</tr>
<tr>
<td>$I_{DSS}$</td>
<td>drain leakage current</td>
<td>$V_{DS} = 80 V; V_{GS} = 0 V; T_j = 175 \degree C$</td>
<td>-</td>
<td>-</td>
<td>500</td>
<td>µA</td>
</tr>
<tr>
<td>$I_{GSS}$</td>
<td>gate leakage current</td>
<td>$V_{GS} = 16 V; V_{DS} = 0 V; T_j = 25 \degree C$</td>
<td>-</td>
<td>2</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>$I_{GSS}$</td>
<td>gate leakage current</td>
<td>$V_{GS} = -16 V; V_{DS} = 0 V; T_j = 25 \degree C$</td>
<td>-</td>
<td>2</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>$R_{DS(on)}$</td>
<td>drain-source on-state resistance</td>
<td>$V_{GS} = 5 V; I_D = 15 A; T_j = 25 \degree C; \text{Fig. 11}$</td>
<td>-</td>
<td>12.2</td>
<td>15</td>
<td>mΩ</td>
</tr>
<tr>
<td>$R_{DS(on)}$</td>
<td>drain-source on-state resistance</td>
<td>$V_{GS} = 10 V; I_D = 15 A; T_j = 25 \degree C; \text{Fig. 11}$</td>
<td>-</td>
<td>11.3</td>
<td>14</td>
<td>mΩ</td>
</tr>
<tr>
<td>$R_{DS(on)}$</td>
<td>drain-source on-state resistance</td>
<td>$V_{GS} = 5 V; I_D = 15 A; T_j = 175 \degree C; \text{Fig. 11; Fig. 12}$</td>
<td>-</td>
<td>-</td>
<td>38</td>
<td>mΩ</td>
</tr>
<tr>
<td>$Q_{G(tot)}$</td>
<td>total gate charge</td>
<td>$I_D = 15 A; V_{DS} = 64 V; V_{GS} = 5 V; T_j = 25 \degree C; \text{Fig. 13; Fig. 14}$</td>
<td>-</td>
<td>28.9</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td>$Q_{G(tot)}$</td>
<td>total gate charge</td>
<td>$I_D = 15 A; V_{DS} = 64 V; V_{GS} = 10 V; T_j = 25 \degree C; \text{Fig. 13; Fig. 14}$</td>
<td>-</td>
<td>56.9</td>
<td>-</td>
<td>nC</td>
</tr>
</tbody>
</table>

Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

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## Symbol | Parameter | Conditions | Min | Typ | Max | Unit
---|---|---|---|---|---|---
Q_{GS} | gate-source charge | I_D = 15 A; V_{DS} = 64 V; V_{GS} = 5 V; T_J = 25 °C; [Fig. 13; Fig. 14] | - | 8.1 | - | nC
Q_{GD} | gate-drain charge | - | 8.7 | - | nC
C_{iss} | input capacitance | V_{DS} = 25 V; V_{GS} = 0 V; f = 1 MHz; T_J = 25 °C; [Fig. 15] | - | 3479 | 4640 | pF
C_{oss} | output capacitance | - | 236 | 283 | pF
C_{rss} | reverse transfer capacitance | - | 114 | 156 | pF
\( t_{d(on)} \) | turn-on delay time | V_{DS} = 60 V; R_L = 4 Ω; V_{GS} = 5 V; R_G(ext) = 5 Ω; T_J = 25 °C | - | 15.3 | - | ns
\( t_r \) | rise time | - | 24.6 | - | ns
\( t_{d(off)} \) | turn-off delay time | - | 45.3 | - | ns
\( t_f \) | fall time | - | 24.7 | - | ns

### Source-drain diode

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit
---|---|---|---|---|---|---
V_{SD} | source-drain voltage | I_S = 15 A; V_{GS} = 0 V; T_J = 25 °C; [Fig. 16] | - | 0.8 | 1.2 | V
\( t_{rr} \) | reverse recovery time | I_S = 20 A; dI_S/dt = -100 A/μs; V_{GS} = 0 V; V_{DS} = 25 V; T_J = 25 °C | - | 25.8 | - | ns
Q_r | recovered charge | - | 29.3 | - | nC

---

![Fig. 6. Output characteristics; drain current as a function of drain-source voltage; typical values](003aa794)

\( T_J = 25 °C; t_p = 300 \mu s \)

![Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values](003aa795)

\( T_J = 25 °C; I_D = 15A \)
Fig. 8. Transfer characteristics; drain current as a function of gate-source voltage; typical values

$$V_{DS} = 10\text{V}$$

Fig. 9. Gate-source threshold voltage as a function of junction temperature

$$I_D = 1\text{ mA}; V_{DS} = V_{GS}$$

Fig. 10. Sub-threshold drain current as a function of gate-source voltage

$$T_J = 25^\circ\text{C}; V_{DS} = 5\text{V}$$

Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

$$T_J = 25^\circ\text{C}; t_p = 300\ \mu\text{s}$$
Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

\[ a = \frac{R_{DS\text{on}}}{R_{DS\text{on}}(25^\circ C)} \]

Fig. 13. Gate charge waveform definitions

Fig. 14. Gate-source voltage as a function of gate charge; typical values

\[ T_j = 25^\circ C; \quad I_D = 15A \]

Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

\[ V_{GS} = 0V; \quad f = 1MHz \]
Fig. 16. Source-drain (diode forward) current as a function of source-drain (diode forward) voltage; typical values

\[ V_{GS} = 0V \]
11. Package outline

Plastic single-ended surface-mounted package (LFPAK56; Power-SO8); 4 leads

Fig. 17. Package outline LFPAK56; Power-SO8 (SOT669)
12. Legal information

12.1 Data sheet status

<table>
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<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective [short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary [short] data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

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