FDMC8032L

Dual N-Channel PowerTrench® MOSFET

40 V, 7 A, 20 mΩ

General Description
This device includes two 40 V N-Channel MOSFETs in a dual Power 33 (3 mm x 3 mm MLP) package. The package is enhanced for exceptional thermal performance.

Features
• Max $r_{DS(on)} = 20 \text{ mΩ}$ at $V_{GS} = 10 \text{ V}$, $I_D = 7 \text{ A}$
• Max $r_{DS(on)} = 27 \text{ mΩ}$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 6 \text{ A}$
• Low Inductance Packaging Shortens Rise/Fall Times
• Lower Switching Losses
• 100% $R_g$ Tested
• This Device is Pb-Free and is RoHS Compliant

Applications
• Battery Protection
• Load Switching
• Point of Load

MOSFET MAXIMUM RATINGS ($T_J = 25^\circ \text{C}$ unless otherwise noted)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Ratings</th>
<th>Units</th>
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<tbody>
<tr>
<td>VDS</td>
<td>Drain to Source Voltage</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>VGS</td>
<td>Gate to Source Voltage</td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>$I_D$</td>
<td>Continuous $T_J = 25^\circ \text{C}$</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Continuous $T_A = 25^\circ \text{C}$</td>
<td>7</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Pulsed (Note 4)</td>
<td>50</td>
<td>A</td>
</tr>
<tr>
<td>$E_{AS}$</td>
<td>Single Pulse Avalanche Energy</td>
<td>13</td>
<td>mJ</td>
</tr>
<tr>
<td>$P_D$</td>
<td>Power Dissipation $T_J = 25^\circ \text{C}$</td>
<td>12</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>Power Dissipation $T_A = 25^\circ \text{C}$</td>
<td>1.9</td>
<td>W</td>
</tr>
<tr>
<td>$T_J$, $T_{STG}$</td>
<td>Operating and Storage Junction Temperature Range</td>
<td>-55 to +150</td>
<td>°C</td>
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</table>

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

MARKING DIAGRAM

ORDERING INFORMATION
See detailed ordering and shipping information on page 2 of this data sheet.
### THERMAL CHARACTERISTICS

<table>
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<td>$R_{\text{jic}}$</td>
<td>Thermal Resistance, Junction to Case</td>
<td>9.7</td>
<td>°C/W</td>
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<td>$R_{\text{jua}}$</td>
<td>Thermal Resistance, Junction to Ambient (Note 1a)</td>
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### PACKAGE MARKING AND ORDERING INFORMATION

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<th>Quantity</th>
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<td>FDMC8032L</td>
<td>FDMC8032L</td>
<td>Power 33</td>
<td>13&quot;</td>
<td>12 mm</td>
<td>3000 Units</td>
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### ELECTRICAL CHARACTERISTICS (Ta = 25°C unless otherwise noted)

#### OFF CHARACTERISTICS

- **BVDSS**: Drain to Source Breakdown Voltage  
  - Symbol: $I_D = 250 \mu A, V_{GS} = 0 \text{ V}$  
  - Min.: 40 V  
  - Typ.: 1.0 V  
  - Max.: 3.0 V  
  - Unit: V

- **$\Delta V_{\text{BS(TH)}} / \Delta T_J$**: Gate to Source Threshold Voltage Temperature Coefficient  
  - Symbol: $I_D = 250 \mu A$, referenced to 25°C  
  - Min.: -5 mV/°C  
  - Typ.: 20 mV/°C  
  - Max.: 21 mV/°C  
  - Unit: mV/°C

- **$r_{DS(on)}$**: Static Drain to Source On Resistance  
  - Symbol: $V_{GS} = 10 \text{ V}, I_D = 7 \text{ A}$  
  - Min.: 16 Ω  
  - Typ.: 20 Ω  
  - Max.: 27 Ω  
  - Unit: Ω

- **$g_{FS}$**: Forward Transconductance  
  - Symbol: $V_{DD} = 5 \text{ V}, I_D = 7 \text{ A}$  
  - Min.: 23 S  
  - Typ.: 27 S  
  - Max.: 29 S  
  - Unit: S

#### DYNAMIC CHARACTERISTICS

- **$C_{iss}$**: Input Capacitance  
  - Symbol: $V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}$  
  - Min.: 513 pF  
  - Typ.: 720 pF  
  - Max.: 1.1 kF  
  - Unit: pF

- **$C_{oss}$**: Output Capacitance  
  - Min.: 137 pF  
  - Typ.: 15 pF  
  - Max.: 9.3 kF  
  - Unit: pF

- **$C_{rss}$**: Reverse Transfer Capacitance  
  - Min.: 9.3 pF  
  - Typ.: 15 pF  
  - Max.: 195 pF  
  - Unit: pF

- **$R_g$**: Gate Resistance  
  - Min.: 0.1 Ω  
  - Typ.: 2.6 Ω  
  - Max.: 3.6 Ω  
  - Unit: Ω

#### SWITCHING CHARACTERISTICS

- **$t_{d(on)}$**: Turn-On Delay Time  
  - Symbol: $V_{DD} = 20 \text{ V}, I_D = 7 \text{ A}$  
  - Min.: 5.5 ns  
  - Typ.: 11 ns  
  - Max.: 24 ns  
  - Unit: ns

- **$I_f$**: Rise Time  
  - Min.: 1.2 ns  
  - Typ.: 10 ns  
  - Max.: 24 ns  
  - Unit: ns

- **$t_{d(off)}$**: Turn-Off Delay Time  
  - Min.: 1.3 ns  
  - Typ.: 10 ns  
  - Max.: 24 ns  
  - Unit: ns

- **$Q_{g(TOT)}$**: Total Gate Charge  
  - Symbol: $V_{GS} = 0 \text{ V to } 10 \text{ V}$  
  - Min.: 7.6 nC  
  - Typ.: 11 nC  
  - Max.: 24 nC  
  - Unit: nC

- **$Q_{gs}$**: Gate to Source Charge  
  - Symbol: $V_{DD} = 20 \text{ V}, I_D = 7 \text{ A}$  
  - Min.: 1.5 nC  
  - Typ.: 1.5 nC  
  - Max.: 1.5 nC  
  - Unit: nC

- **$Q_{gd}$**: Gate to Drain “Miller” Charge  
  - Min.: 1.0 nC  
  - Typ.: 1.0 nC  
  - Max.: 1.0 nC  
  - Unit: nC
### ELECTRICAL CHARACTERISTICS (TA = 25°C unless otherwise noted) (continued)

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<tr>
<th>Parameter</th>
<th>Test Conditions</th>
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<th>Max.</th>
<th>Unit</th>
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<td>DRAIN–SOURCE DIODE CHARACTERISTICS</td>
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<td>VSD</td>
<td>Source to Drain Diode Forward Voltage</td>
<td>VGS = 0 V, IS = 7 A  (Note 2)</td>
<td>0.85</td>
<td>1.3</td>
<td></td>
<td>V</td>
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<tr>
<td></td>
<td></td>
<td>VGS = 0 V, IS = 1.4 A  (Note 2)</td>
<td>0.75</td>
<td>1.2</td>
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<td>V</td>
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<tr>
<td>tr</td>
<td>Reverse Recovery Time</td>
<td>IF = 7 A, di/dt = 100 A/μs</td>
<td>16</td>
<td>29</td>
<td>ns</td>
<td></td>
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<tr>
<td>Qrr</td>
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<td></td>
<td>3.9</td>
<td>10</td>
<td>nC</td>
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Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

1. RthJA is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR–4 material. RthJC is guaranteed by design while RthCA is determined by the user’s board design.

   a. 65°C/W when mounted on a 1 in² pad of 2 oz copper

   b. 155°C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

3. EAS of 13 mJ is based on starting TJ = 25°C, L = 3 mH, IAS = 3 A, VDD = 40 V, VGS = 10 V. 100% tested at L = 0.1 mH, IAS = 11 A.

4. Pulse Id refers to Figure.11 Forward Bias Safe Operation Area.
TYPICAL CHARACTERISTICS

Figure 1. On−Region Characteristics

Figure 2. Normalized On−Resistance vs Drain Current and Gate Voltage

Figure 3. Normalized On−Resistance vs Junction Temperature

Figure 4. On−Resistance vs Gate to Source Voltage

Figure 5. Transfer Characteristics

Figure 6. Source to Drain Diode Forward Voltage vs Source Current

ID, DRAIN CURRENT (A)

VDS, DRAIN TO SOURCE VOLTAGE (V)

NORMALIZED DRAIN TO SOURCE ON−RESISTANCE

VGS = 4.5 V
VGS = 4 V
VGS = 6 V
VGS = 10 V

PULSE DURATION = 80 μs
DUTY CYCLE = 0.5% MAX

TJ, JUNCTION TEMPERATURE (°C)

ID, DRAIN CURRENT (A)

VGS, GATE TO SOURCE VOLTAGE (V)

rDS(on), DRAIN TO SOURCE ON−RESISTANCE (mW)

ID = 7 A
VGS = 10 V

TJ = 125°C
TJ = 25°C

PULSE DURATION = 80 μs
DUTY CYCLE = 0.5% MAX

ID = 7 A

VGS = 4.5 V
VGS = 4 V
VGS = 6 V
VGS = 10 V

PULSE DURATION = 80 μs
DUTY CYCLE = 0.5% MAX

Isc, REVERSE DRAIN CURRENT (A)

VSD, BODY DIODE FORWARD VOLTAGE (V)

ID, DRAIN CURRENT (A)

VGS, GATE TO SOURCE VOLTAGE (V)

NORMALIZED DRAIN TO SOURCE ON−RESISTANCE

VGS = 4.5 V
VGS = 4 V
VGS = 6 V
VGS = 10 V

PULSE DURATION = 80 μs
DUTY CYCLE = 0.5% MAX

Isc, REVERSE DRAIN CURRENT (A)

VSD, BODY DIODE FORWARD VOLTAGE (V)

ID, DRAIN CURRENT (A)

VGS, GATE TO SOURCE VOLTAGE (V)

NORMALIZED DRAIN TO SOURCE ON−RESISTANCE

VGS = 4.5 V
VGS = 4 V
VGS = 6 V
VGS = 10 V

PULSE DURATION = 80 μs
DUTY CYCLE = 0.5% MAX

Isc, REVERSE DRAIN CURRENT (A)

VSD, BODY DIODE FORWARD VOLTAGE (V)

ID, DRAIN CURRENT (A)

VGS, GATE TO SOURCE VOLTAGE (V)

NORMALIZED DRAIN TO SOURCE ON−RESISTANCE

VGS = 4.5 V
VGS = 4 V
VGS = 6 V
VGS = 10 V

PULSE DURATION = 80 μs
DUTY CYCLE = 0.5% MAX

Isc, REVERSE DRAIN CURRENT (A)

VSD, BODY DIODE FORWARD VOLTAGE (V)
## TYPICAL CHARACTERISTICS (continued)

**Figure 7. Gate Charge Characteristics**

- $V_{GS}$, GATE TO SOURCE VOLTAGE (V)
- $Q_g$, GATE CHARGE (nC)

**Figure 8. Capacitance vs Drain to Source Voltage**

- $C_{iss}$, Input capacitance
- $C_{oss}$, Output capacitance
- $C_{rss}$, Reverse transfer capacitance

**Figure 9. Unclamped Inductive Switching Capability**

- $I_{AV}$, TIME IN AVALANCHE (ms)
- $T_J = 25^\circ C$
- $T_J = 100^\circ C$
- $T_J = 125^\circ C$

**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

- $I_D$, DRAIN CURRENT (A)
- $V_{DS}$, DRAIN TO SOURCE VOLTAGE (V)
- $T_J = 100^\circ C$
- $T_J = 25^\circ C$
- $T_J = 125^\circ C$

**Figure 11. Forward Bias Safe Operating Area**

- $I_D$, DRAIN CURRENT (A)
- $V_{DS}$, DRAIN TO SOURCE VOLTAGE (V)
- $P_{PK}$, PEAK TRANSIENT POWER (W)

**Figure 12. Single Pulse Maximum Power Dissipation**

- $t$, PULSE WIDTH (sec)
- $R_{JC} = 9.7^\circ C/W$
- $T_J = 25^\circ C$
FDMC8032L

TYPICAL CHARACTERISTICS (continued)

Figure 13. Transient Thermal Response Curve

![Graph showing transient thermal response curve]

- **Duty Cycle**: $D = t_1 / t_2$
- **$Z/C_0J(t)$**: $r(t) \times RC/W$
- **$JC(t)$**: $RC/W$
- **Peak $T_J$**: $P_{DM} \times Z/C_0J(t) + TC$

**NOTES:**
- $RC/W = 9.7°C/W$
- $Z/C_0J(t)$ = $r(t) \times RC/W$
- $P_{DM} = P_{DM} \times Z/C_0J(t) + TC$

**DUTY CYCLE - DESCENDING ORDER**

**SINGLE PULSE**

1. RECTANGULAR PULSE DURATION (sec)

---

**Figure 13. Transient Thermal Response Curve**
**MECHANICAL CASE OUTLINE**

**PACKAGE DIMENSIONS**

**WDFN8 3x3, 0.65P**

**CASE 511DG**

**ISSUE A**

**DATE 12 FEB 2019**

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**NOTES:**

1. **DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.**

2. **CONTROLLING DIMENSION MILLIMETERS**

3. **DIMENSION ** applies to plated terminals and is measured between 0.15 and 0.30 mm from the terminal tip.

4. **COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.**

---

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**NOTE:**

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, “G” or microdot “*”, may or may not be present. Some products may not follow the Generic Marking.

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**GENERAL INFORMATION:**

- **NOTES:**
  - **XXX:** Specific Device Code
  - **A:** Assembly Location
  - **Y:** Year
  - **WW:** Work Week
  - **Pb-Free Package**

**NOTES:**

- **GENERAL:**
  - **Note:** Microdot may be in either location.

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<th align="center">North American Technical Support:</th>
<th align="center">Europe, Middle East and Africa Technical Support:</th>
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<td align="center">Phone: 00421 33 790 2910</td>
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