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November 2013

FDMC8878

N-Channel Power Trench® MOSFET

30V, **16.5A**, **14m**Ω

Features

- Max $r_{DS(on)}$ = 14m Ω at V_{GS} = 10V, I_D = 9.6A
- Max $r_{DS(on)}$ = 17m Ω at V_{GS} = 4.5V, I_D = 8.7A
- Low Profile 0.8 mm max in MLP 3.3X3.3
- RoHS Compliant

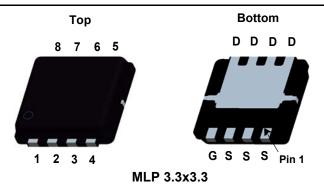


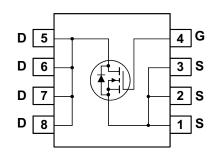
General Description

This N-Channel MOSFET is a rugged gate version of Fairchild Semiconductor's advanced Power Trench process. It has been optimized for power management applications.

Application

■ DC - DC Conversion





MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

| Symbol | Parameter | | | Ratings | Units | |
|-----------------------------------|---|-----------------------|-----------|-------------------------|-------|--|
| V_{DS} | Drain to Source Voltage | | | 30 | V | |
| V_{GS} | Gate to Source Voltage | | | ±20 | V | |
| | Drain Current -Continuous (Package limited) | T _C = 25°C | | 16.5 | | |
| | -Continuous (Silicon limited) | T _C = 25°C | | 38 | ^ | |
| 'D | -Continuous | T _A = 25°C | (Note 1a) | 9.6 | Α | |
| | -Pulsed | | | 30 ±20 16.5 38 | | |
| L | Power Dissipation | T _C = 25°C | | 31 | W | |
| P_{D} | Power Dissipation | T _A = 25°C | (Note 1a) | 2.1 | VV | |
| T _J , T _{STG} | Operating and Storage Junction Temperature Ra | inge | | -55 to +150 | °C | |

Thermal Characteristics

| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | | 4 | °CAM |
|-----------------|---|-----------|----|------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 60 | °C/W |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|----------|-------------|-----------|------------|------------|
| FDMC8878 | FDMC8878 | MLP 3.3X3.3 | 13 " | 12 mm | 3000 units |

Electrical Characteristics $T_J = 25^{\circ}C$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Тур | Max | Units |
|--|--|---|-----|-----|------|-------|
| Off Chara | acteristics | | | | | |
| BV_{DSS} | Drain to Source Breakdown Voltage | $I_D = 250 \mu A, V_{GS} = 0 V$ | 30 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_{J}}$ | Breakdown Voltage Temperature Coefficient | I _D = 250μA, referenced to 25°C | | 20 | | mV/°C |
| | Zero Gate Voltage Drain Current | V _{DS} = 24V, | | | 1 | |
| Zero Gate Voltage Drain Currer | Zero Gate voltage Drain Current | $V_{DS} = 24V,$ $V_{GS} = 0V$ $T_{J} = 125^{\circ}C$ | | | 100 | μΑ |
| I _{GSS} | Gate to Source Leakage Current | V _{GS} = ±20V, V _{DS} = 0V | | | ±100 | nA |

On Characteristics

| V _{GS(th)} | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_{D} = 250 \mu A$ | 1 | 1.7 | 3 | V |
|--|--|--|---|------|------|-------|
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | I _D = 250μA, referenced to 25°C | | -5.7 | | mV/°C |
| | | $V_{GS} = 10V, I_D = 9.6A$ | | 9.6 | 14.0 | |
| r _{DS(on)} | Drain to Source On Resistance | $V_{GS} = 4.5V, I_D = 8.7A$ | | 12.1 | 17.0 | mΩ |
| , , | | $V_{GS} = 10V$, $I_D = 9.6A$, $T_J = 125$ °C | | 13.5 | 20.0 | |
| g_{FS} | Forward Transconductance | V _{DS} = 5V, I _D = 9.6A | | 35 | | S |

Dynamic Characteristics

| C _{iss} | Input Capacitance | 45)/ // 0)/ | 1000 | 1230 | pF |
|------------------|------------------------------|--|------|------|----|
| C _{oss} | Output Capacitance | V _{DS} = 15V, V _{GS} = 0V, f = 1MHz | 183 | 255 | pF |
| C _{rss} | Reverse Transfer Capacitance | 1 - 1101112 | 118 | 180 | pF |
| R_{α} | Gate Resistance | f = 1MHz | 1.1 | | Ω |

Switching Characteristics

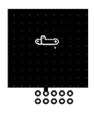
| t _{d(on)} | Turn-On Delay Time | | 8 | 16 | ns |
|---------------------|-------------------------------|---|-----|----|----|
| t _r | Rise Time | $V_{DD} = 15V, I_D = 9.6A$ | 4 | 10 | ns |
| t _{d(off)} | Turn-Off Delay Time | $V_{GS} = 10V$, $R_{GEN} = 6\Omega$ | 20 | 36 | ns |
| t _f | Fall Time | | 3 | 10 | ns |
| $Q_{g(TOT)}$ | Total Gate Charge | V _{GS} = 10V , V _{DD} = 15V , | 18 | 26 | nC |
| Q_{gs} | Gate to Source Gate Charge | I _D = 9.6A | 2.8 | | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | 3.9 | | nC |

Drain-Source Diode Characteristics

| V_{SD} | Source to Drain Diode Forward Voltage | V _{GS} = 0V, I _S = 9.6A (Note 2) | | 8.0 | 1.2 | V |
|-----------------|---------------------------------------|--|----|-----|-----|----|
| t _{rr} | Reverse Recovery Time | I _E = 9.6A, di/dt = 100A/μs | 23 | 35 | ns | |
| Q _{rr} | Reverse Recovery Charge | - 1 _F = 9.6A, αι/αι = 100A/μs | | 14 | 21 | nC |

Notes:

1. $R_{\theta,JA}$ is determined with the device mounted on a 1in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta,JC}$ is guaranteed by design while $R_{\theta,CA}$ is determined by the user's board design.



a. 60°C/W when mounted on a 1 in² pad of 2 oz copper

b. 135°C/W when mounted on a minimum pad of 2 oz copper



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

Typical Characteristics T_J = 25°C unless otherwise noted

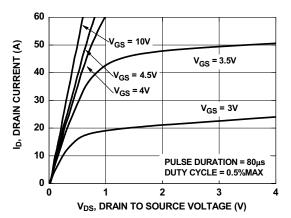


Figure 1. On-Region Characteristics

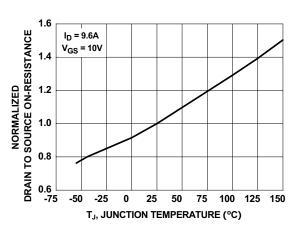


Figure 3. Normalized On-Resistance vs Junction Temperature

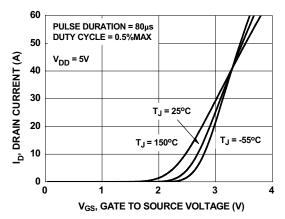


Figure 5. Transfer Characteristics

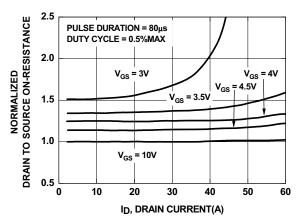


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

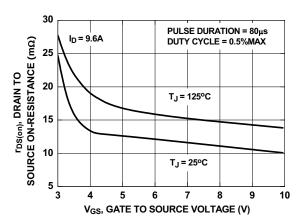


Figure 4. On-Resistance vs Gate to Source Voltage

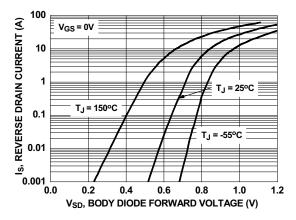


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25^{\circ}C$ unless otherwise noted

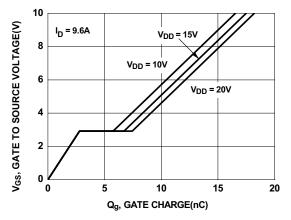


Figure 7. Gate Charge Characteristics

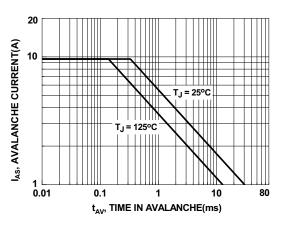


Figure 9. Unclamped Inductive Switching Capability

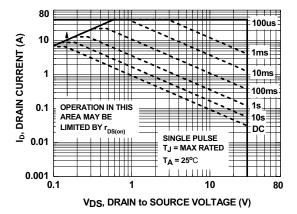


Figure 11. Forward Bias Safe Operating Area

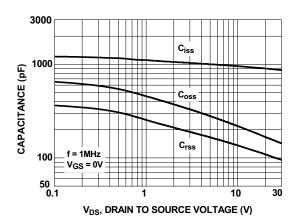


Figure 8. Capacitance vs Drain to Source Voltage

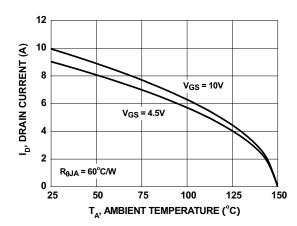


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

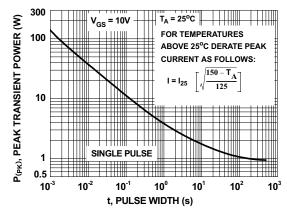


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

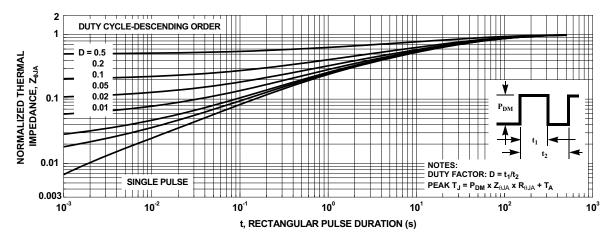
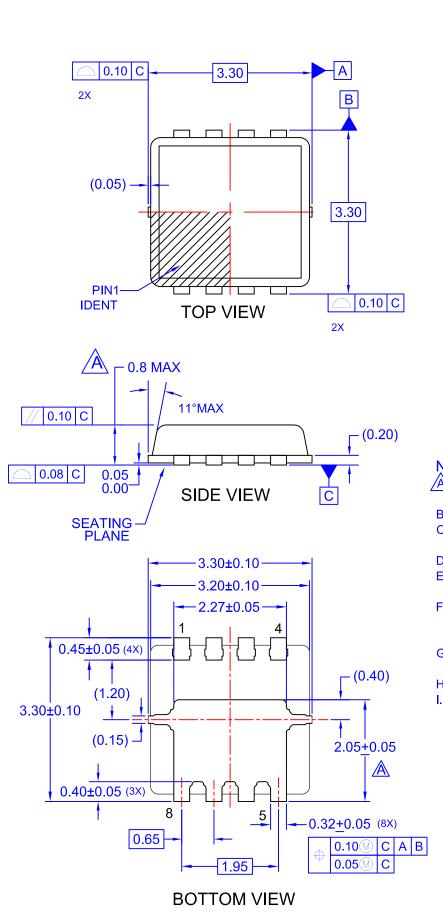
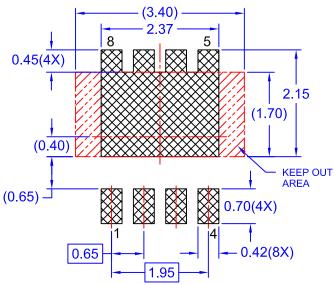


Figure 13. Transient Thermal Response Curve





RECOMMENDED LAND PATTERN

NOTES:

- A EXCEPT AS NOTED, PACKAGE CONFORMS TO JEDEC REGISTRATION MO-240 VARIATION BA.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. SEATING PLANE IS DEFINED BY TERMINAL TIPS ONLY
- E. BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH PROTRUSIONS NOR GATE BURRS.
- F. FLANGE DIMENSIONS INCLUDE INTERTERMINAL FLASH OR PROTRUSION. INTERTERMINAL FLASH OR PROTRUSION SHALL NOT EXCEED 0.25MM PER SIDE.
- G. IT IS RECOMMENDED TO HAVE NO TRACES OR VIA WITHIN THE KEEP OUT AREA.
- H. DRAWING FILENAME: MKT-MLP08Trev4.
- GENERAL RADII FOR ALL CORNERS SHALL BE 0.20MM MAX.



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