



September 2014

## FDMC2674

### N-Channel UltraFET Trench MOSFET

220V, 7.0A, 366mΩ

#### Features

- Max  $r_{DS(on)}$  = 366mΩ at  $V_{GS} = 10V$ ,  $I_D = 1.0A$
- Typ  $Q_g = 12.7nC$  at  $V_{GS} = 10V$
- Low Miller charge
- Low  $Q_{rr}$  Body Diode
- Optimized efficiency at high frequencies
- UIS Capability ( Single Pulse and Repetitive Pulse)
- RoHS Compliant

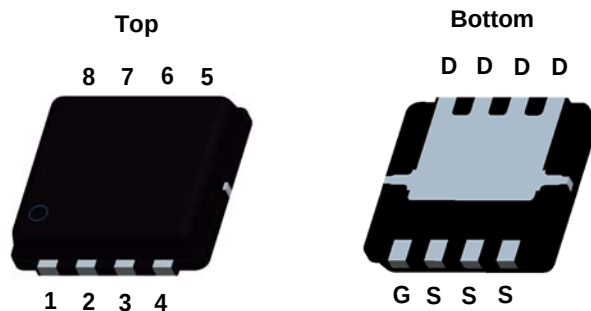


#### General Description

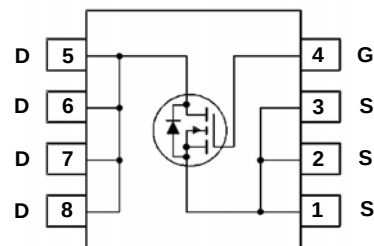
UltraFET device combines characteristics that enable benchmark efficiency in power conversion applications. Optimized for  $r_{DS(on)}$ , low ESR, low total and Miller gate charge, these devices are ideal for high frequency DC to DC converters.

#### Application

- DC/DC converters and Off-Line UPS
- Distributed Power Architectures



MLP 3.3x3.3



#### MOSFET Maximum Ratings $T_A = 25^\circ C$ unless otherwise noted

| Symbol         | Parameter                                                      | Ratings     | Units      |
|----------------|----------------------------------------------------------------|-------------|------------|
| $V_{DS}$       | Drain to Source Voltage                                        | 220         | V          |
| $V_{GS}$       | Gate to Source Voltage                                         | $\pm 20$    | V          |
| $I_D$          | Drain Current -Continuous (Silicon limited) $T_C = 25^\circ C$ | 7.0         | A          |
|                | -Continuous $T_A = 25^\circ C$ (Note 1b)                       | 1.0         |            |
|                | -Pulsed                                                        | 13.8        |            |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 3)                         | 11          | mJ         |
| $P_D$          | Power Dissipation $T_C = 25^\circ C$                           | 42          | W          |
|                | Power Dissipation $T_A = 25^\circ C$ (Note 1a)                 | 2.1         |            |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range               | -55 to +150 | $^\circ C$ |

#### Thermal Characteristics

|                 |                                                   |     |              |
|-----------------|---------------------------------------------------|-----|--------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case (Note 1)     | 3.0 | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 60  |              |

#### Package Marking and Ordering Information

| Device Marking | Device   | Package     | Reel Size | Tape Width | Quantity   |
|----------------|----------|-------------|-----------|------------|------------|
| FDMC2674       | FDMC2674 | MLP 3.3X3.3 | 13 "      | 12 mm      | 3000 units |

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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

**Off Characteristics**

|                                      |                                           |                                                           |     |     |           |                      |
|--------------------------------------|-------------------------------------------|-----------------------------------------------------------|-----|-----|-----------|----------------------|
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$             | 220 |     |           | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$ |     | 248 |           | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 176\text{V}$ , $V_{GS} = 0\text{V}$             |     |     | 1         | $\mu\text{A}$        |
| $I_{GSS}$                            | Gate to Source Leakage Current            | $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$          |     |     | $\pm 100$ | nA                   |

**On Characteristics**

|                                        |                                                          |                                                                         |   |       |     |                      |
|----------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------|---|-------|-----|----------------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$                              | 2 | 3.4   | 4   | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$               |   | -10.2 |     | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance                     | $V_{GS} = 10\text{V}$ , $I_D = 1.0\text{A}$                             |   | 305   | 366 | m $\Omega$           |
|                                        |                                                          | $V_{GS} = 10\text{V}$ , $I_D = 1.0\text{A}$ , $T_J = 150^\circ\text{C}$ |   | 678   | 814 |                      |

**Dynamic Characteristics**

|           |                              |                                                                      |  |     |      |    |
|-----------|------------------------------|----------------------------------------------------------------------|--|-----|------|----|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 100\text{V}$ , $V_{GS} = 0\text{V}$ ,<br>$f = 1\text{MHz}$ |  | 880 | 1180 | pF |
| $C_{oss}$ | Output Capacitance           |                                                                      |  | 70  | 95   | pF |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                      |  | 11  | 20   | pF |

**Switching Characteristics**

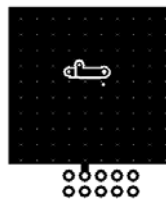
|              |                               |                                                                                               |                                              |      |    |    |
|--------------|-------------------------------|-----------------------------------------------------------------------------------------------|----------------------------------------------|------|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = 100\text{V}$ , $I_D = 1.0\text{A}$<br>$V_{GS} = 10\text{V}$ , $R_{GEN} = 2.4\Omega$ |                                              | 9    | 18 | ns |
| $t_r$        | Rise Time                     |                                                                                               |                                              | 13   | 23 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time           |                                                                                               |                                              | 15   | 27 | ns |
| $t_f$        | Fall Time                     |                                                                                               |                                              | 21   | 34 | ns |
| $Q_{g(TOT)}$ | Total Gate Charge at 10V      | $V_{GS} = 0\text{V}$ to $10\text{V}$                                                          | $V_{DD} = 15\text{V}$<br>$I_D = 1.0\text{A}$ | 12.7 | 18 | nC |
| $Q_{gs}$     | Gate to Source Gate Charge    |                                                                                               |                                              | 3.8  |    | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |                                                                                               |                                              | 2.9  |    | nC |

**Drain-Source Diode Characteristics**

|          |                                       |                                                         |  |     |     |    |
|----------|---------------------------------------|---------------------------------------------------------|--|-----|-----|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{V}$ , $I_S = 2.2\text{A}$ (Note 2)     |  | 0.8 | 1.5 | V  |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = 1.0\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$ |  |     | 60  | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |                                                         |  |     | 109 | nC |

**Notes:**

- 1:  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.  
 (a)  $R_{\theta JA} = 60^\circ\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper, 1.5x1.5x0.062" thick PCB.  
 (b)  $R_{\theta JA} = 135^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper.



a.  $60^\circ\text{C/W}$  when mounted on a  
1 in<sup>2</sup> pad of 2 oz copper



b.  $135^\circ\text{C/W}$  when mounted on a  
minimum pad of 2 oz copper

2: Pulse Test: Pulse Width < 300 $\mu\text{s}$ , Duty cycle < 2.0%.

3: Starting  $T_J = 25^\circ\text{C}$ ; N-ch:  $L = 1\text{mH}$ ,  $I_{AS} = 4.7\text{A}$ ,  $V_{DD} = 25\text{V}$ ,  $V_{GS} = 10\text{V}$ .

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

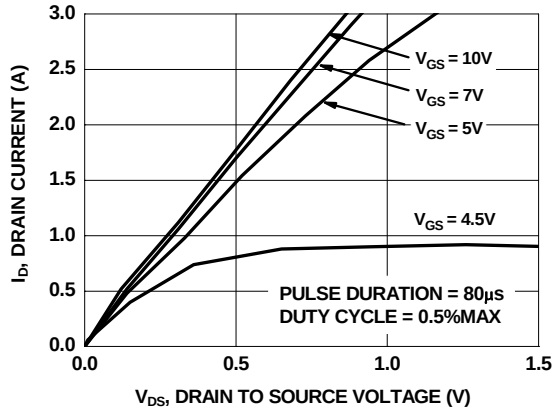


Figure 1. On-Region Characteristics

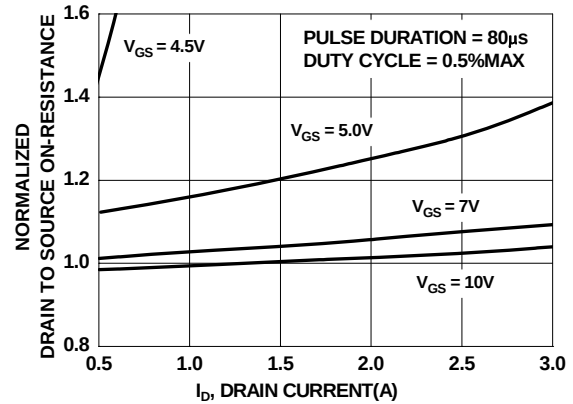


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

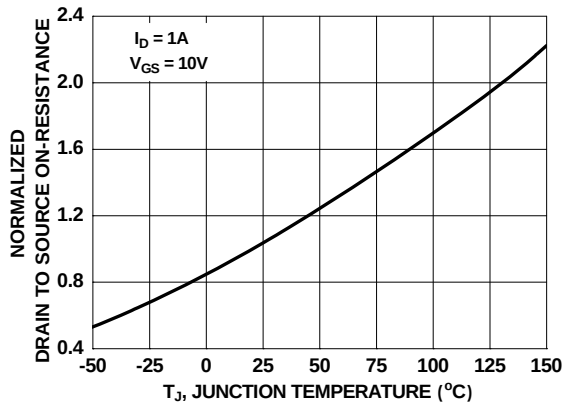


Figure 3. Normalized On-Resistance vs Junction Temperature

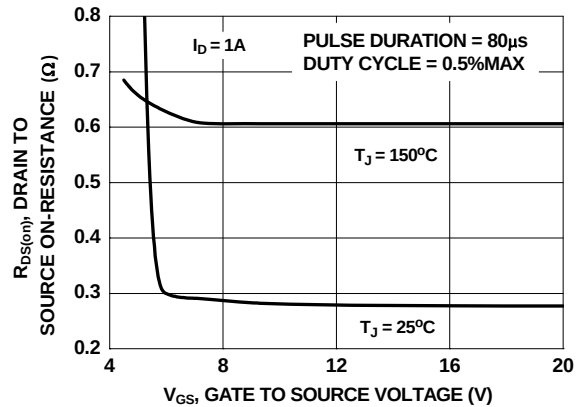


Figure 4. On-Resistance vs Gate to Source Voltage

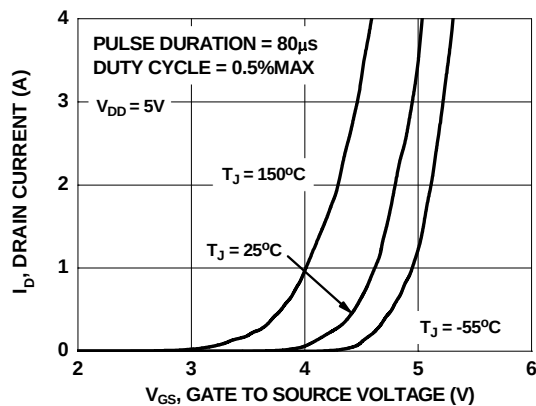


Figure 5. Transfer Characteristics

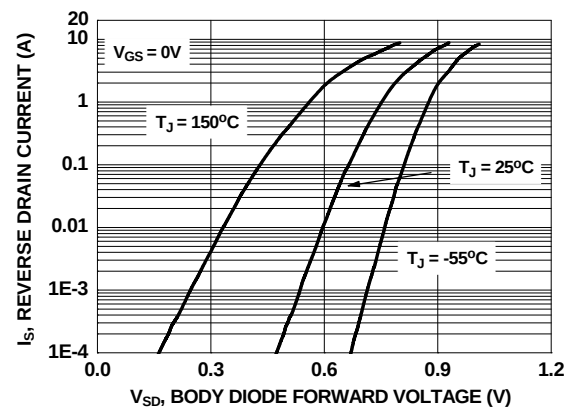


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

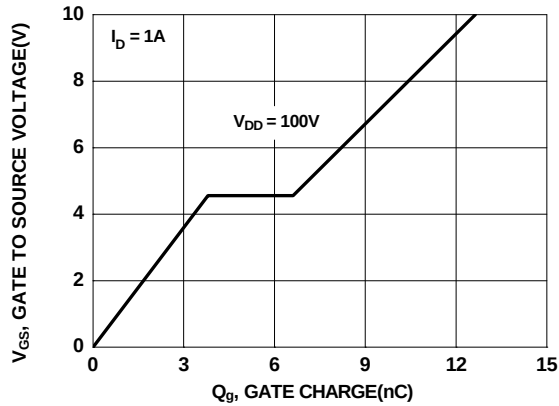


Figure 7. Gate Charge Characteristics

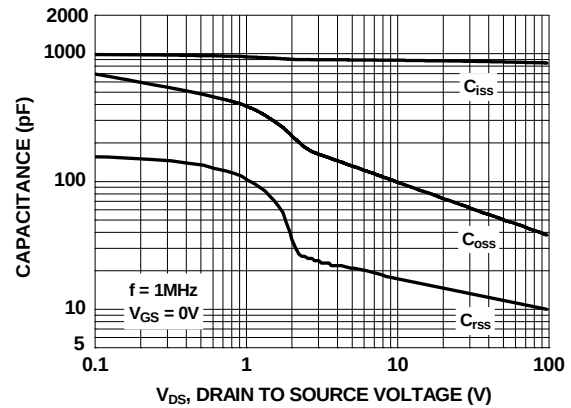


Figure 8. Capacitance vs Drain to Source Voltage

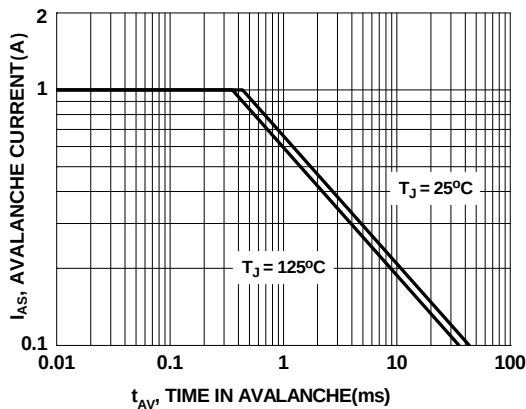


Figure 9. Unclamped Inductive Switching Capability

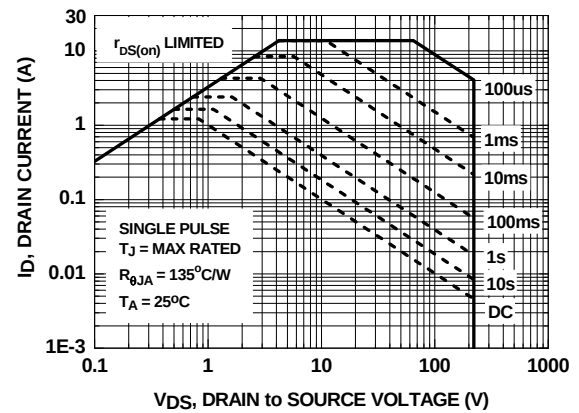


Figure 10. Forward Bias Safe Operating Area

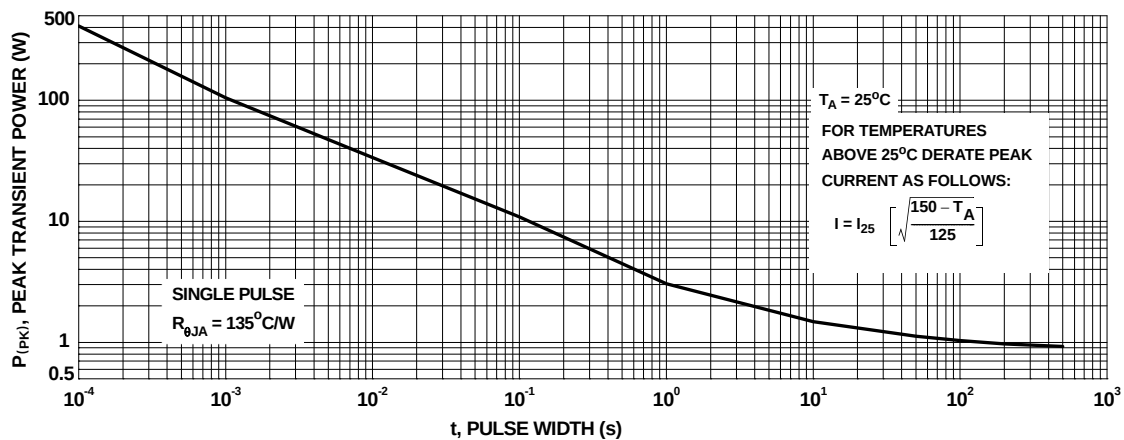
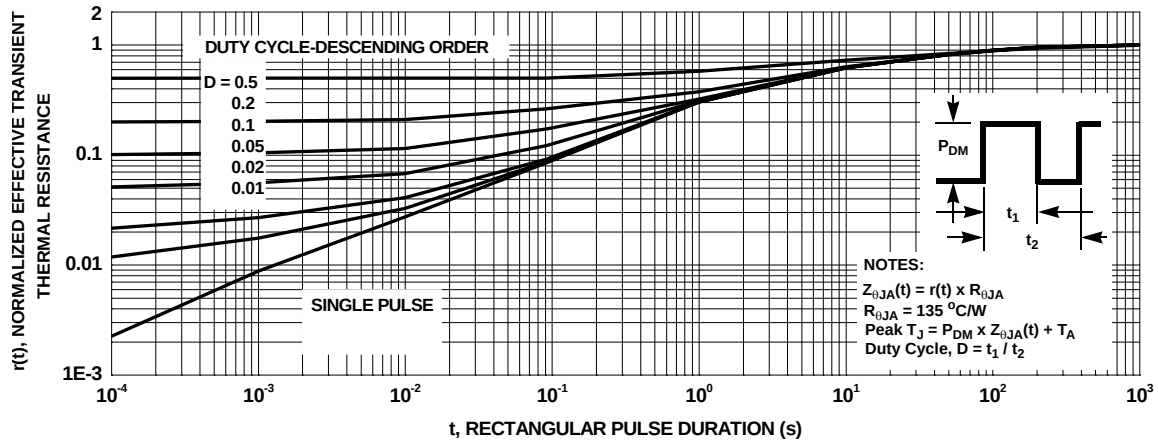
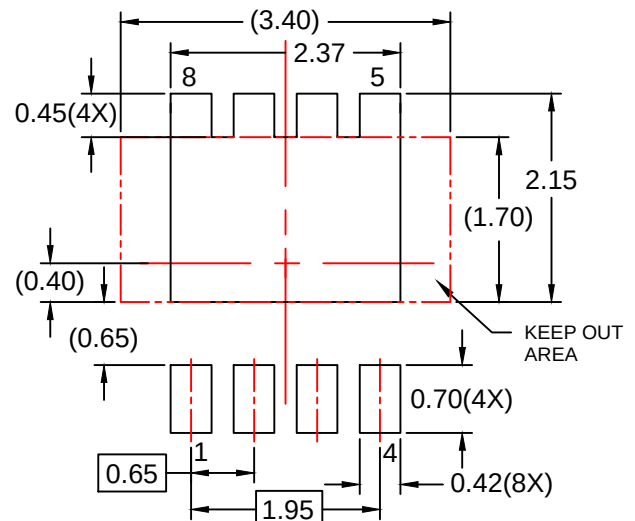
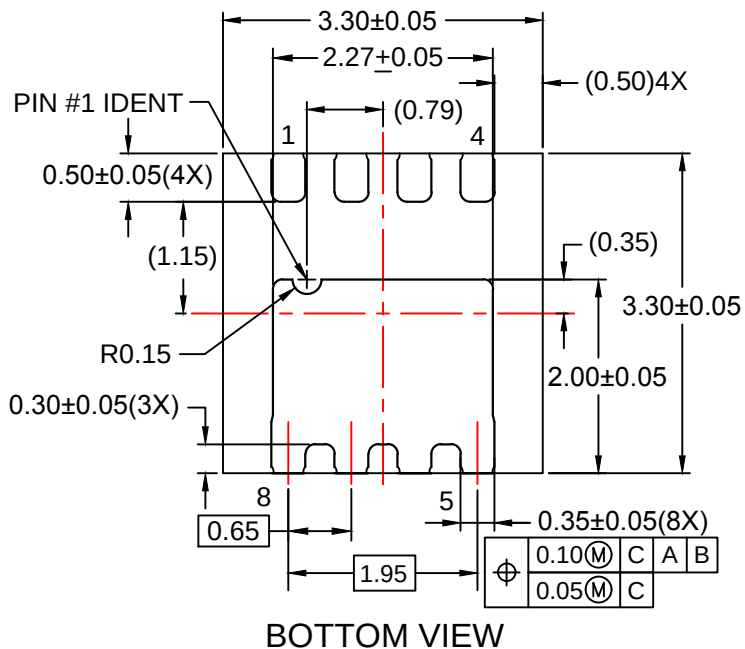
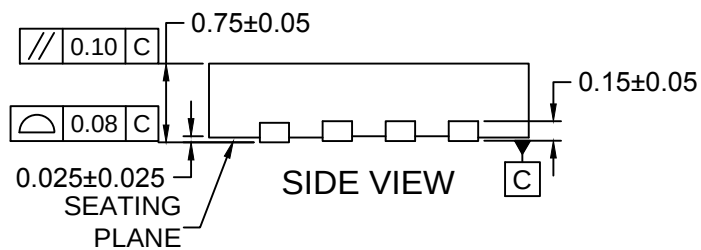
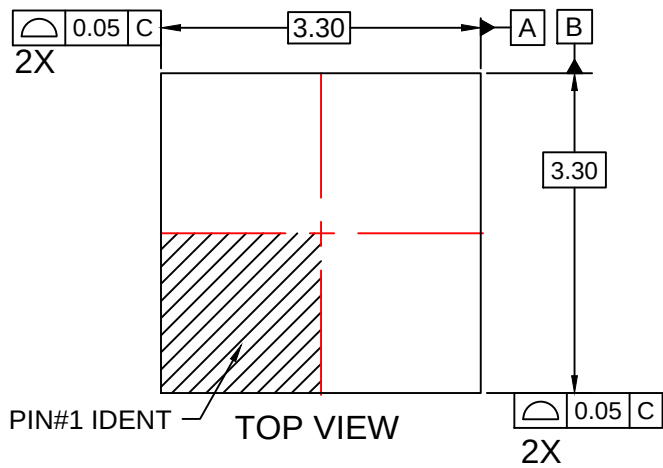


Figure 11. Single Pulse Maximum Power Dissipation

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





## RECOMMENDED LAND PATTERN

### NOTES:

- DOES NOT CONFORM TO JEDEC REGISTRATION MO-229
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
- DRAWING FILENAME: MKT-MLP08Srev3.





## TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™  
AttitudeEngine™  
Awinda®  
AX-CAP®\*  
BitSiC™  
Build it Now™  
CorePLUS™  
CorePOWER™  
CROSSVOLT™  
CTL™  
Current Transfer Logic™  
DEUXPEED®  
Dual Cool™  
EcoSPARK®  
EfficientMax™  
ESBC™  
F®  
Fairchild®  
Fairchild Semiconductor®  
FACT Quiet Series™  
FACT®  
FastvCore™  
FETBench™  
FPS™

F-PFS™  
FRFET®  
Global Power Resource<sup>SM</sup>  
GreenBridge™  
Green FPS™  
Green FPS™ e-Series™  
Gmax™  
GTO™  
IntelliMAX™  
ISOPLANAR™  
Making Small Speakers Sound Louder  
and Better™  
MegaBuck™  
MICROCOUPLER™  
MicroFET™  
MicroPak™  
MicroPak2™  
MillerDrive™  
MotionMax™  
MotionGrid®  
MTI®  
MTX®  
MVN®  
mWSaver®  
OptoHit™  
OPTOLOGIC®

OPTOPLANAR®  
Power Supply WebDesigner™  
PowerTrench®  
PowerXS™  
Programmable Active Droop™  
QFET®  
QS™  
Quiet Series™  
RapidConfigure™  
Saving our world, 1mW/W/kW at a time™  
SignalWise™  
SmartMax™  
SMART START™  
Solutions for Your Success™  
SPM®  
STEALTH™  
SuperFET®  
SuperSOT™-3  
SuperSOT™-6  
SuperSOT™-8  
SupreMOS®  
SyncFET™  
Sync-Lock™

SYSTEM  
GENERAL®\*  
TinyBoost®  
TinyBuck®  
TinyCalc™  
TinyLogic®  
TINYOPTO™  
TinyPower™  
TinyPWM™  
TinyWire™  
TranSiC™  
TriFault Detect™  
TRUECURRENT®\*  
μSerDes™  
SerDes®  
UHC®  
Ultra FRFET™  
UniFET™  
VCX™  
VisualMax™  
VoltagePlus™  
XS™  
Xsens™  
仙童®

\* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

## AUTHORIZED USE

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

## ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, [www.fairchildsemi.com](http://www.fairchildsemi.com), under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

| Datasheet Identification | Product Status        | Definition                                                                                                                                                                                          |
|--------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advance Information      | Formative / In Design | Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.                                                                       |
| Preliminary              | First Production      | Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production       | Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.                                               |
| Obsolete                 | Not In Production     | Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.                                                    |

Rev. I77