December 2014

# FDZ1905PZ

## Common Drain P-Channel 1.5V PowerTrench® WL-CSP MOSFET
## –20V, –3A, 123mΩ

### Features

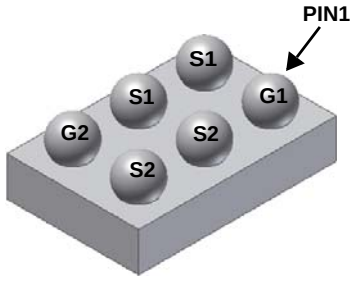
- Max $r_{S1S2(on)}$ = 126mΩ at $V_{GS}$ = –4.5V, $I_{S1S2}$ = –1A
- Max $r_{S1S2(on)}$ = 141mΩ at $V_{GS}$ = –2.5V, $I_{S1S2}$ = –1A
- Max $r_{S1S2(on)}$ = 198mΩ at $V_{GS}$ = –1.8V, $I_{S1S2}$ = –1A
- Max $r_{S1S2(on)}$ = 303mΩ at $V_{GS}$ = –1.5V, $I_{S1S2}$ = –1A
- Occupies only 1.5 $mm^2$ of PCB area, less than 50% of the area of 2 x 2 BGA
- Ultra-thin package: less than 0.65 mm height when mounted to PCB
- High power and current handling capability
- HBM ESD protection level > 4kV (Note 3)
- RoHS Compliant

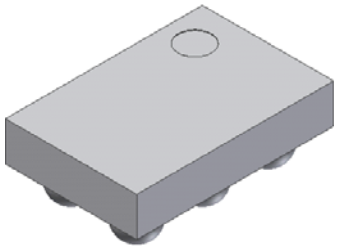
### General Description

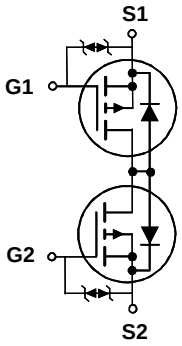
This device is designed specifically as a single package solution for the battery charge switch in cellular handset and other ultra-portable applications. It features two common drain P-channel MOSFETs, which enables bidirectional current flow, on Fairchild's advanced 1.5V PowerTrench® process with state of the art "low pitch" WL-CSP packaging process, the FDZ1905PZ minimizes both PCB space and $r_{S1S2(on)}$. This advanced WL-CSP MOSFET embodies a breakthrough in packaging technology which enables the device to combine excellent thermal transfer characteristics, ultra-low profile packaging, low gate charge, and low $r_{S1S2(on)}$ .

### Applications

- Battery management
- Load switch
- Battery protection




## MOSFET Maximum Ratings $T_A$ = 25°C unless otherwise noted

| Symbol | Parameter | | | Ratings | Units |
|---|---|---|---|---|---|
| $V_{S1S2}$ | Source1 to Source2 Voltage | | | –20 | V |
| $V_{GS}$ | Gate to Source Voltage | | | ±8 | V |
| $I_{S1S2}$ | Source1 to Source2 Current -Continuous | $T_A$ = 25°C | (Note 1a) | –3 | A |
| | -Pulsed | | | –15 | |
| $P_D$ | Power Dissipation (Steady State) | $T_A$ = 25°C | (Note 1a) | 1.5 | W |
| | Power Dissipation | $T_A$ = 25°C | (Note 1b) | 0.9 | |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | | | –55 to +150 | °C |

## Thermal Characteristics

| | | | | |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 83 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1b) | 140 | |

## Package Marking and Ordering Information

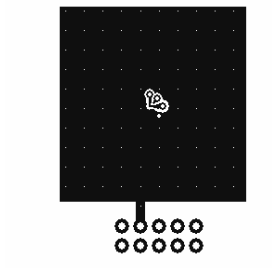
| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| **5** | FDZ1905PZ | WL-CSP 1.0X1.5 | 7" | 8mm | 5000 units |

## Electrical Characteristics $T_J$ = 25°C unless otherwise noted

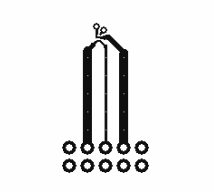
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $I_{S1S2}$ | Zero Gate Voltage Source1 to Source2 Current | $V_{S1S2}$ = –16V, $V_{GS}$ = 0V | | | –1 | μA |
| $I_{GSS}$ | Gate Body Leakage Current | $V_{GS}$ = ±8V, $V_{S1S2}$ = 0V | | | ±10 | uA |
| **On Characteristics** (Note 2) | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{S1S2}$, $I_{S1S2}$ = -250μA | –0.4 | –0.7 | –1.0 | V |
| $r_{S1S2(on)}$ | Static Source1 to Source2 On Resistance | $V_{GS}$ = –4.5V, $I_{S1S2}$ = –1A | | 99 | 126 | mΩ |
| | | $V_{GS}$ = –2.5V, $I_{S1S2}$ = –1A | | 112 | 141 | |
| | | $V_{GS}$ = –1.8V, $I_{S1S2}$ = –1A | | 132 | 198 | |
| | | $V_{GS}$ = –1.5V, $I_{S1S2}$ = –1A | | 164 | 303 | |
| | | $V_{GS}$ = –4.5V, $I_{S1S2}$ = –1A, $T_J$ = 125°C | | 135 | 195 | |
| $g_{FS}$ | Forward Transconductance | $V_{S1S2}$ = –5V, $I_{S1S2}$ = –1A | | 8 | | S |
| **Switching Characteristics** (Note 2) | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{S1S2}$ = –10V, $I_{S1S2}$ = –1A, $V_{GS}$ = –4.5V, $R_{GEN}$ = 6Ω | | 12 | 22 | ns |
| $t_r$ | Rise Time | | | 36 | 58 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 143 | 229 | ns |
| $t_f$ | Fall Time | | | 182 | 291 | ns |

**Notes:**

1. $R_{\theta JA}$ is determined with the device mounted on a 1in$^2$ 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. 83°C/W when mounted on a 1 in$^2$ pad of 2 oz copper



b.140°C/W when mounted on a minimum pad of 2 oz copper

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

3. The diode connected between the gate and source serves only protection against ESD. No gate overvoltage rating is implied.

## Typical Characteristics $T_J$ = 25°C unless otherwise noted

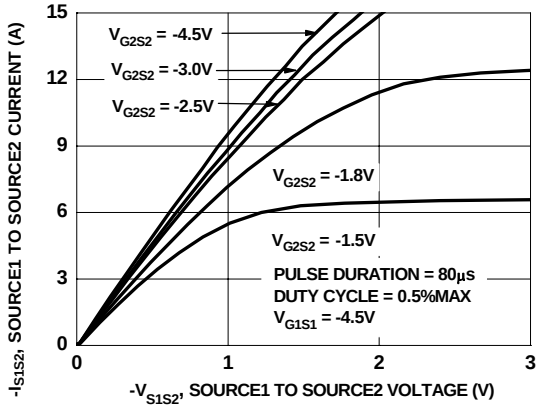



**Figure 1. On Region Characteristics**

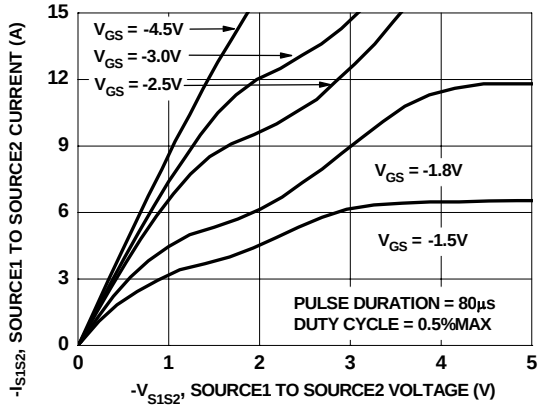



**Figure 2. On Region Characteristics**

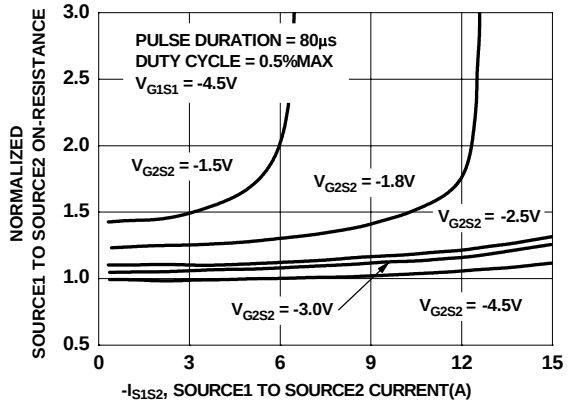



**Figure 3. Normalized On-Resistance vs Drain Current and Gate Voltage**

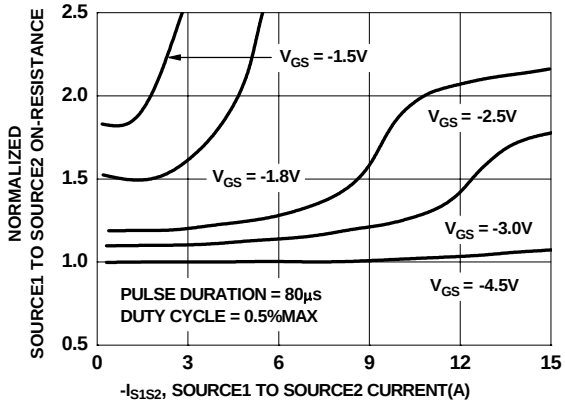



**Figure 4. Normalized On-Resistance vs Drain Current and Gate Voltage**

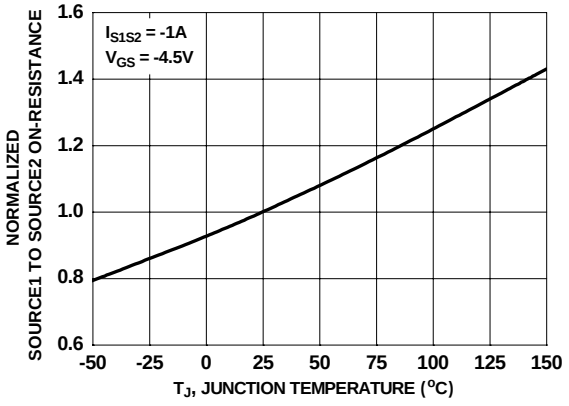



**Figure 5. Normalized On Resistance vs Junction Temperature**

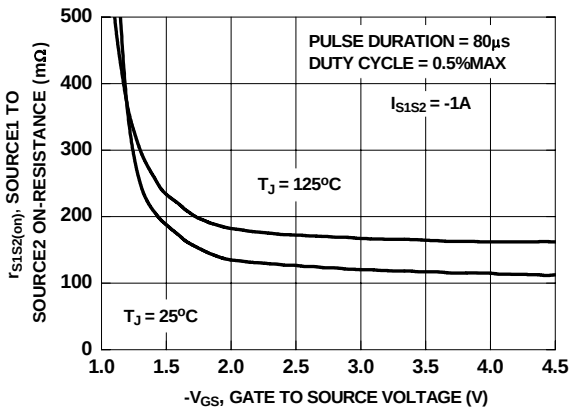



**Figure 6. On-Resistance vs Gate to Source Voltage**

## Typical Characteristics $T_J$ = 25°C unless otherwise noted

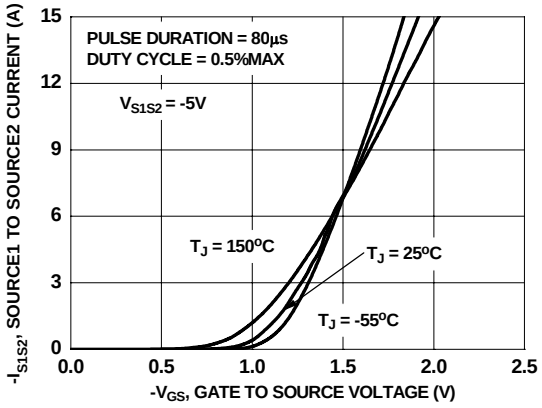



**Figure 7. Transfer Characteristics**

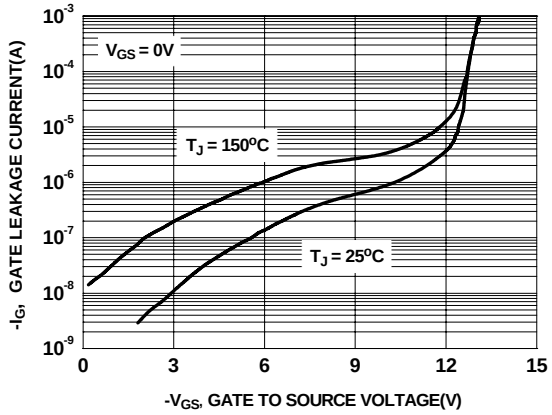



**Figure 8. Gate Leakage vs Gate to Source Voltage**

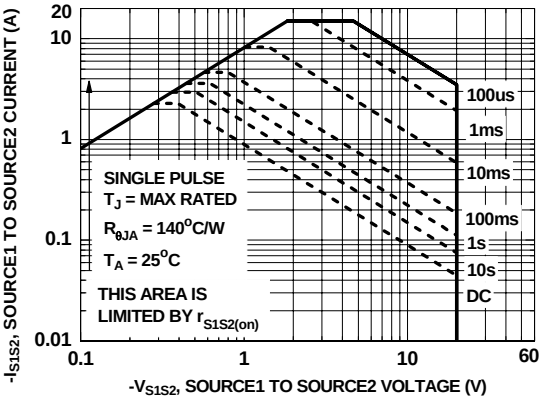



**Figure 9. Forward Bias Safe Operating Area**

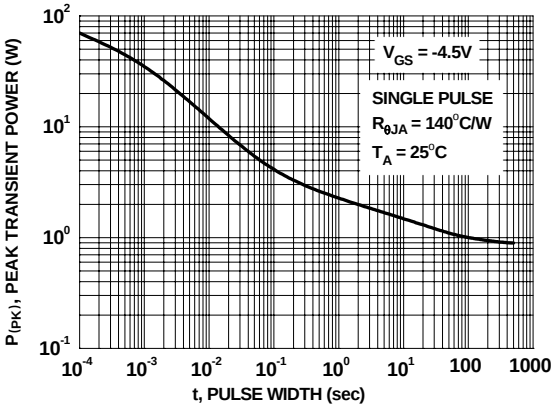



**Figure 10. Single Pulse Maximum Power Dissipation**

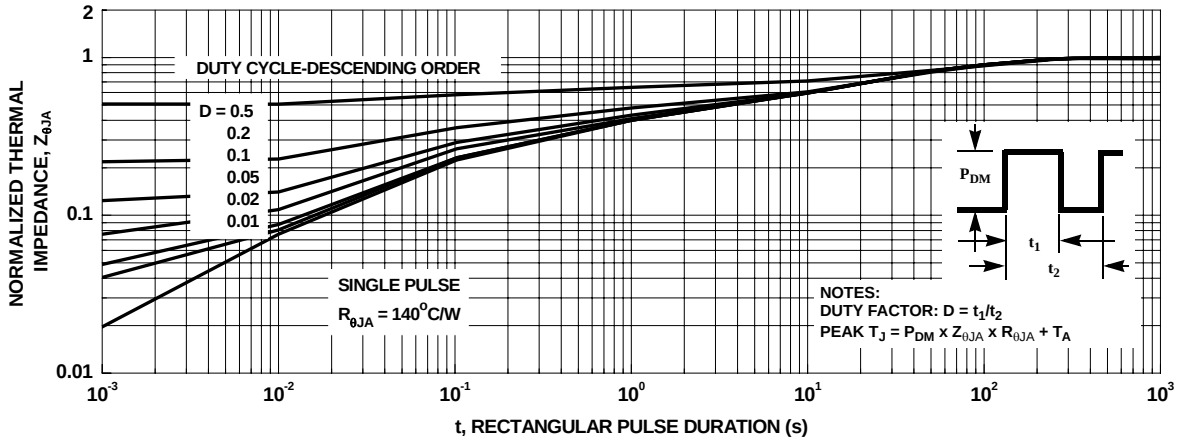
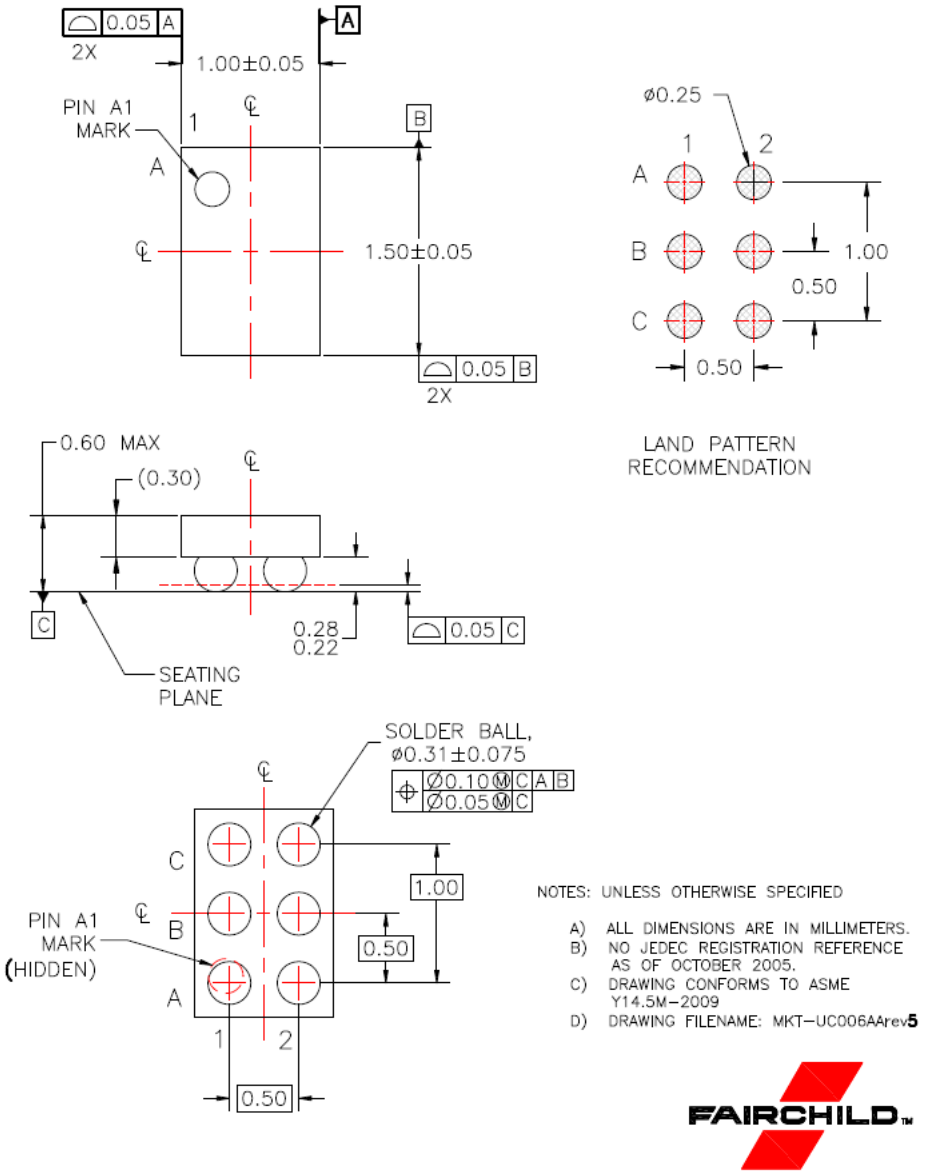



**Figure 11. Transient Thermal Response Curve**

## Dimensional Outline and Pad Layout




**Pin Defanations:**

| Gate1 | Source1 | Gate2 | Source2 |
|---|---|---|---|
| A1 | A2,B2 | C2 | B1,C1 |

*Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.*

*Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:*
*http://www.fairchildsemi.com/package/packageDetails.html?id=PN_UCBAU-006*

FAIRCHILD

## 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®
FAST®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource SM
GreenBridge™
Green FPS™
Green FPS™ e-Series™
G*max*™
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®
®
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. T

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.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## 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, under Sales Support.

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. I73

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Fairchild Semiconductor:

FDZ1905PZ