

FDMA420NZ

Single N-Channel 2.5V Specified PowerTrench® MOSFET

20V, 5.7A, 30mΩ

General Description

This Single N-Channel MOSFET has been designed using Fairchild Semiconductor's advanced Power Trench process to optimize the $R_{DS(on)}$ @ $V_{GS}=2.5V$ on special MicroFET leadframe.

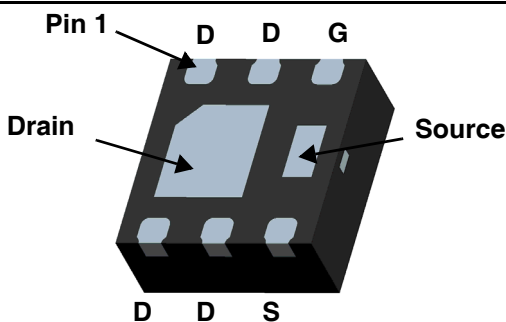
Applications

- Li-Ion Battery Pack

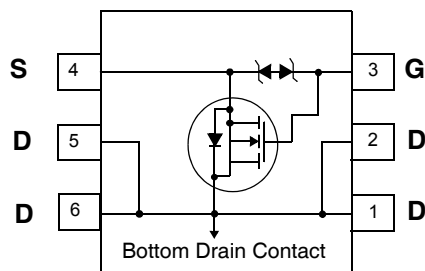


Features

- $R_{DS(on)} = 30m\Omega$ @ $V_{GS} = 4.5 V, I_D = 5.7A$
- $R_{DS(on)} = 40m\Omega$ @ $V_{GS} = 2.5 V, I_D = 5.0A$
- Low Profile-0.8mm maximum-in the new package MicroFET 2x2 mm
- RoHS Compliant



MicroFET Bottom View 2X2



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

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain-Source Voltage	20	V
V_{GSS}	Gate-Source Voltage	± 12	V
I_D	Drain Current -Continuous (Note 1a)	5.7	A
	-Pulsed	24	
P_D	Power dissipation (Steady State)	(Note 1a)	W
		(Note 1b)	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ C$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	145	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1b)	52	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
420	FDMA420NZ	7"	12mm	3000 units

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

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

Off Characteristics

B_{VDSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	20			V
$\frac{\Delta B_{VDSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25°C		12		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 16V, V_{GS} = 0V$,			1	μA
I_{GSS}	Gate-Body Leakage	$V_{GS} = \pm 12V, V_{DS} = 0V$			± 10	μA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	0.6	0.83	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25°C		-3.1		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 4.5V, I_D = 5.7A$		16.8	30	m Ω
		$V_{GS} = 4.0V, I_D = 5.7A$		17.3	31	
		$V_{GS} = 3.1V, I_D = 5.0A$		18.9	33	
		$V_{GS} = 2.5V, I_D = 5.0A$		21.2	40	
		$V_{GS} = 4.5V, I_D = 5.7A$, $T_J = 150^\circ\text{C}$		24.8	44	
g_{FS}	Forward Transconductance	$V_{DS} = 5V, I_D = 5.7A$		28.3		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 10V, V_{GS} = 0V$, $f = 1.0\text{MHz}$		701	935	pF
C_{oss}	Output Capacitance			163	220	pF
C_{rss}	Reverse Transfer Capacitance			125	190	pF
R_G	Gate Resistance	$f = 1.0\text{MHz}$		1.92		Ω

Switching Characteristics (Note 2)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 10V, I_D = 1A$ $V_{GS} = 4.5V, R_{GEN} = 6\Omega$		9.8	20	ns
t_r	Turn-On Rise Time			8.6	18	ns
$t_{d(off)}$	Turn-Off Delay Time			21.5	43	ns
t_f	Turn-Off Fall Time			8.6	18	ns
Q_g	Total Gate Charge		$V_{DS} = 10V, I_D = 5.7A$, $V_{GS} = 4.5V$		8.8	12
Q_{gs}	Gate-Source Charge			0.9	2	nC
Q_{gd}	Gate-Drain Charge			2.4	4	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current				2.0	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 2.0A$		0.69	1.2	V
t_{rr}	Diode Reverse Recovery Time	$I_F = 5.7A$,			20	ns
Q_{rr}	Diode Reverse Recovery Charge	$di/dt = 100A/\mu s$			5	nC

Notes:

- $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.
 - 145 $^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.
 - 52 $^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper.
- Pulse Test: Pulse Width < 300 μs , Duty Cycle < 2.0%.
- The diode connected between the gate and the source serves only as protection against ESD. No gate overvoltage rating is implied.

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

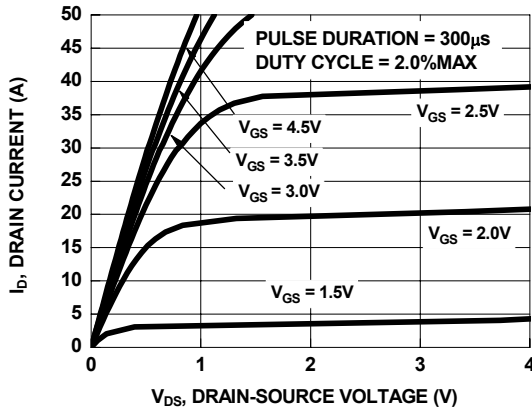


Figure 1. On Region Characteristics

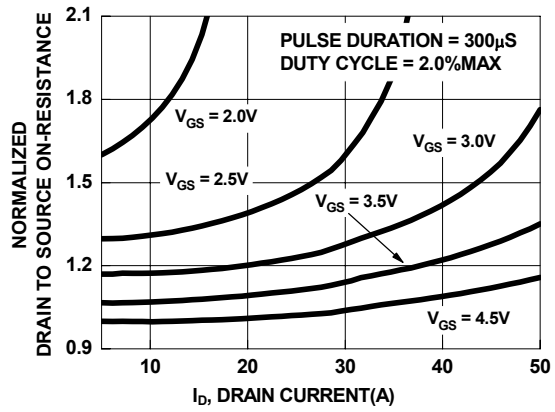


Figure 2. On-Resistance vs Drain Current and Gate Voltage

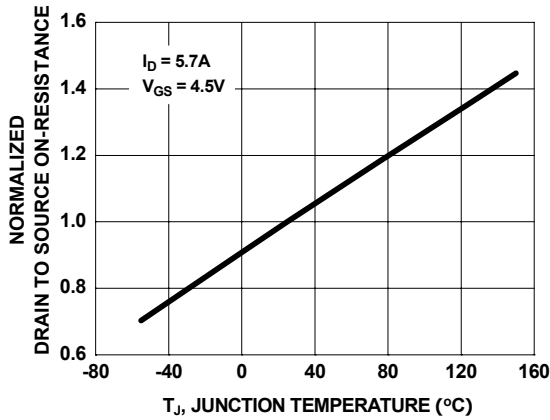


Figure 3. Normalized On Resistance vs Junction Temperature

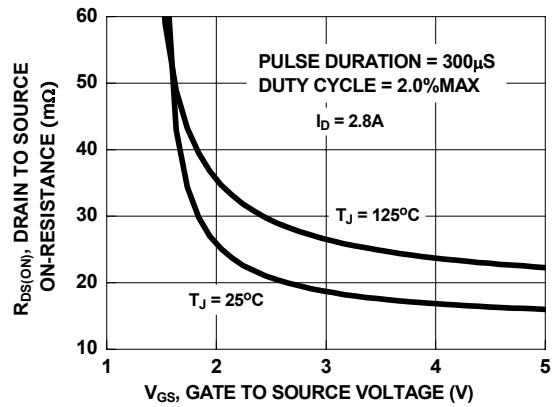


Figure 4. On-Resistance vs Gate to Source Voltage

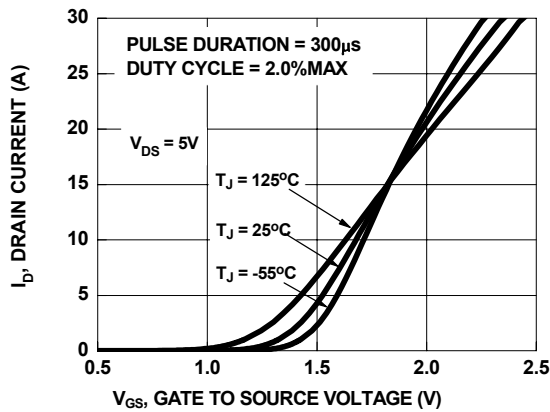


Figure 5. Transfer Characteristics

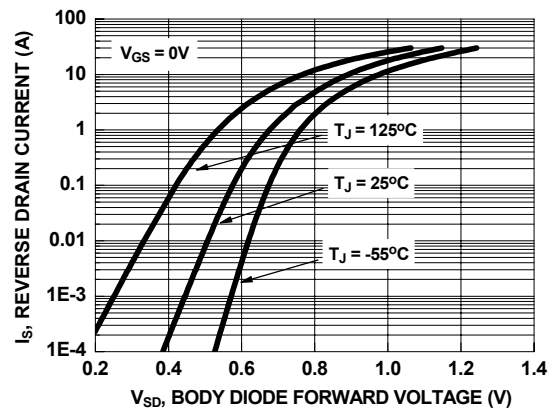


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

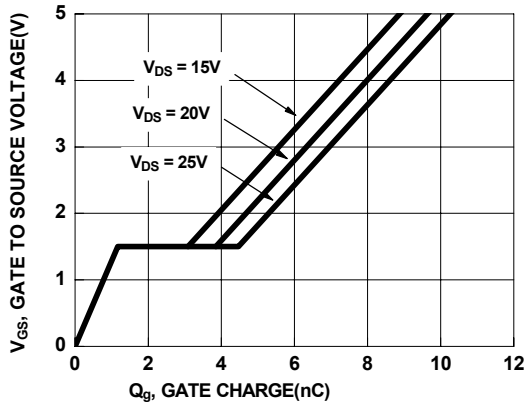


Figure 7. Gate Charge Characteristics

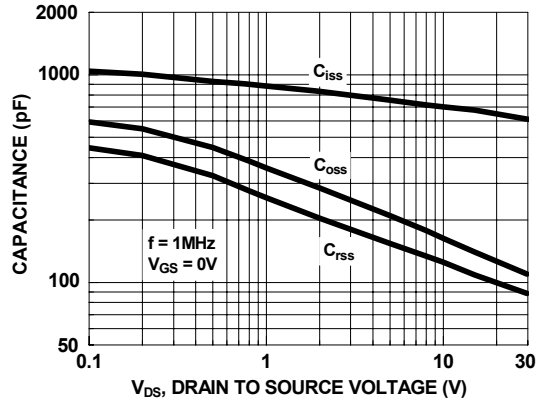


Figure 8. Capacitance vs Drain to Source Voltage

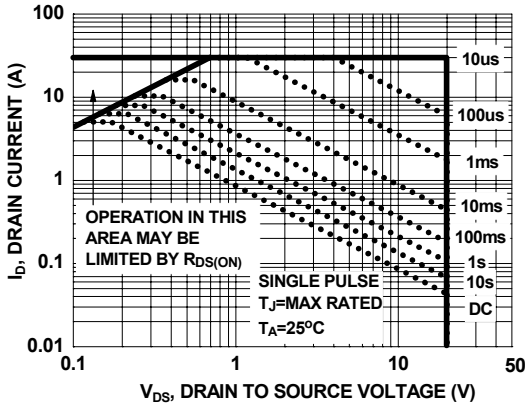


Figure 9. Forward Bias Safe Operating Area

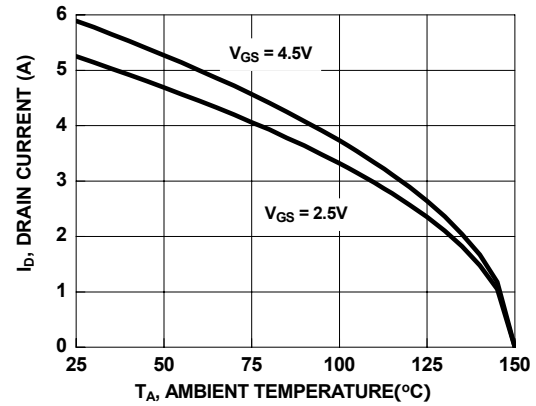


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

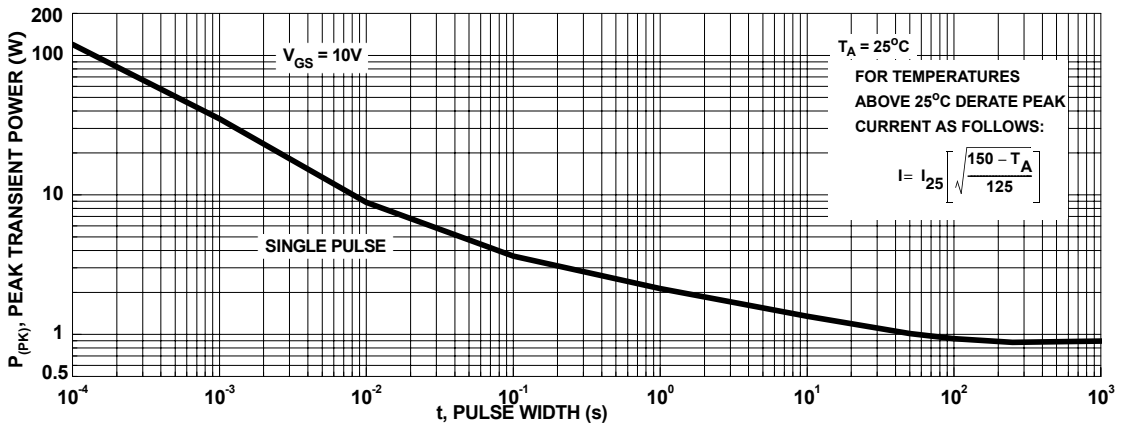


Figure 11. Single Pulse Maximum Power Dissipation

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

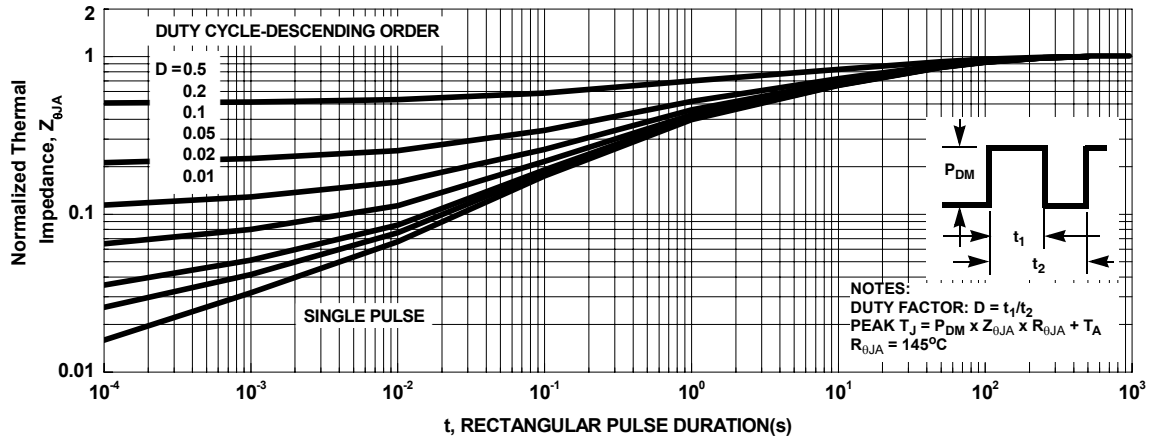
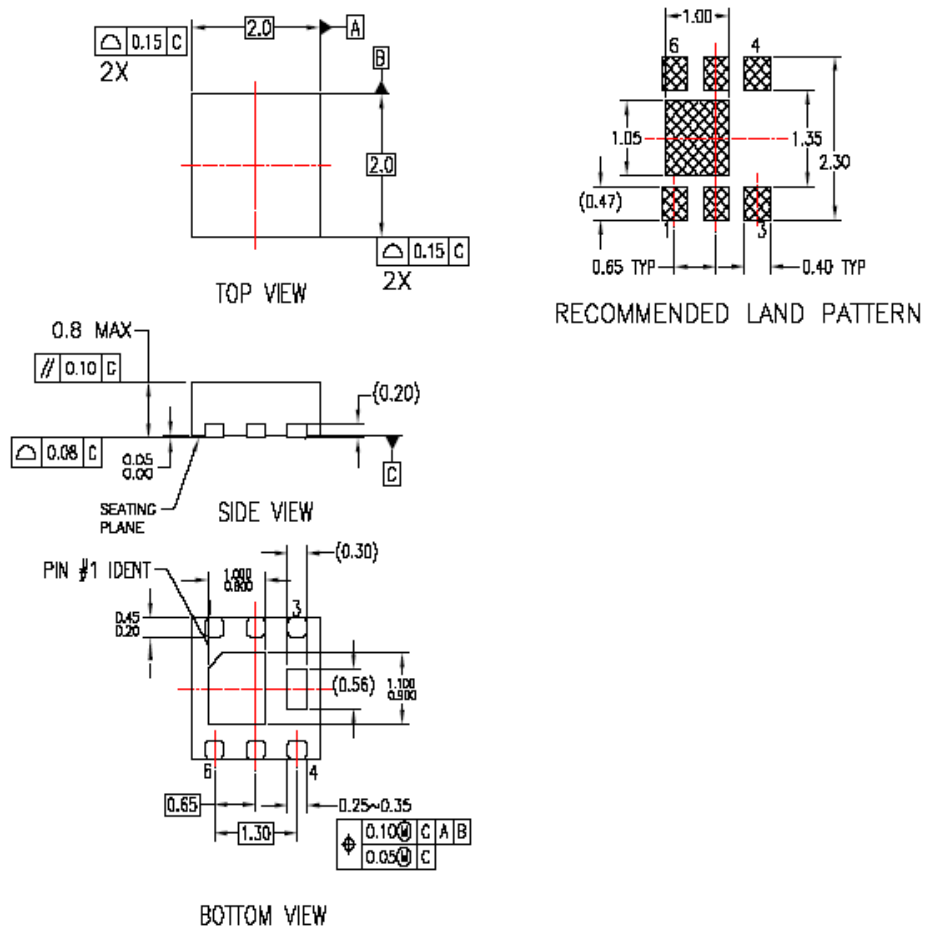


Figure 12. Transient Thermal Response Curve

Dimensional Outline and Pad Layout



- NOTES:**
- A. NOT FULLY CONFORM TO JEDEC REGISTRATION MO-229 DATED AUG/2003.
 - B. DIMENSIONS ARE IN MILLIMETERS.
 - C. DIMENSIONS AND TOLERANCES PER ASMEY14.5M, 1994

MLP06LrevA

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FACT Quiet Series™	OCX™	SILENT SWITCHER®	UniFET™
ActiveArray™	GlobalOptoisolator™	OCXPro™	SMART START™	UltraFET®
Bottomless™	GTO™	OPTOLOGIC®	SPM™	VCX™
Build it Now™	HiSeC™	OPTOPLANAR™	Stealth™	Wire™
CoolFET™	i ² C™	PACMAN™	SuperFET™	
CROSSVOLT™	i-Lo™	POP™	SuperSOT™-3	
DOME™	ImpliedDisconnect™	Power247™	SuperSOT™-6	
EcoSPARK™	IntelliMAX™	PowerEdge™	SuperSOT™-8	
E ² CMOST™	ISOPLANAR™	PowerSaver™	SyncFET™	
EnSigna™	LittleFET™	PowerTrench®	TCM™	
FACT™	MICROCOUPLER™	QFET®	TinyBoost™	
FAST®	MicroFET™	QS™	TinyBuck™	
FASTr™	MicroPak™	QT Optoelectronics™	TinyPWM™	
FPST™	MICROWIRE™	Quiet Series™	TinyPower™	
FRFET™	MSX™	RapidConfigure™	TinyLogic®	
	MSXPro™	RapidConnect™	TINYOPTO™	
Across the board. Around the world.™		μSerDes™	TruTranslation™	
The Power Franchise®		ScalarPump™	UHC™	
Programmable Active Droop™				

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. 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, or (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 significant injury to the user.
2. A critical component is 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.

PRODUCT STATUS DEFINITIONS

Definition of Terms

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

Rev. I20