FAIRCHILD SEMICONDUCTOR®

July 2006

FPF1003
IntelliMAX™ Advanced Load Management Products

Features

- 1.2 to 5.5V Input Voltage Range
- $R_{DS(ON)}$ = 30 mΩ @ V_{IN} = 5.5V
- $R_{DS(ON)}$ = 35 mΩ @ V_{IN} = 3.3V
- ESD Protected, above 2000V HBM

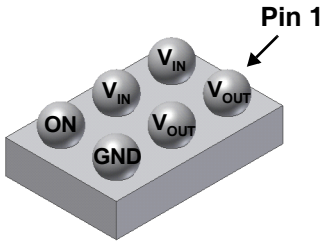
Applications

- PDAs
- Cell Phones
- GPS Devices
- MP3 Players
- Digital Cameras
- Peripheral Ports
- Hot Swap Supplies

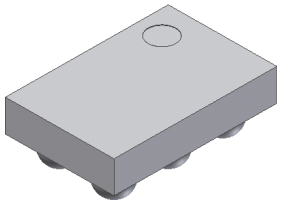
General Description

The FPF1003 is a low RDS P-Channel MOSFET load switch with controlled turn-on. The input voltage range operates from 1.2V to 5.5V to fulfill today's Ultra Portable Device's supply requirement. Switch control is by a logic input (ON) capable of interfacing directly with low voltage control signal.

FPF1003 is available in a space-saving 1.0x1.5 mm^2 chip scale package, 1.0X1.5CSP-6.

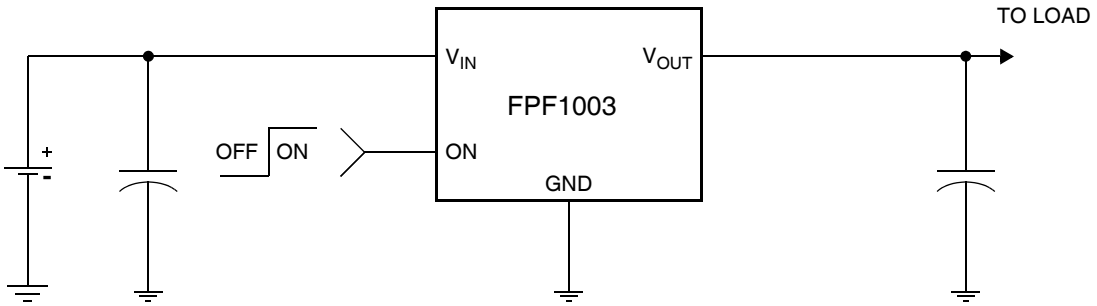


BOTTOM



TOP

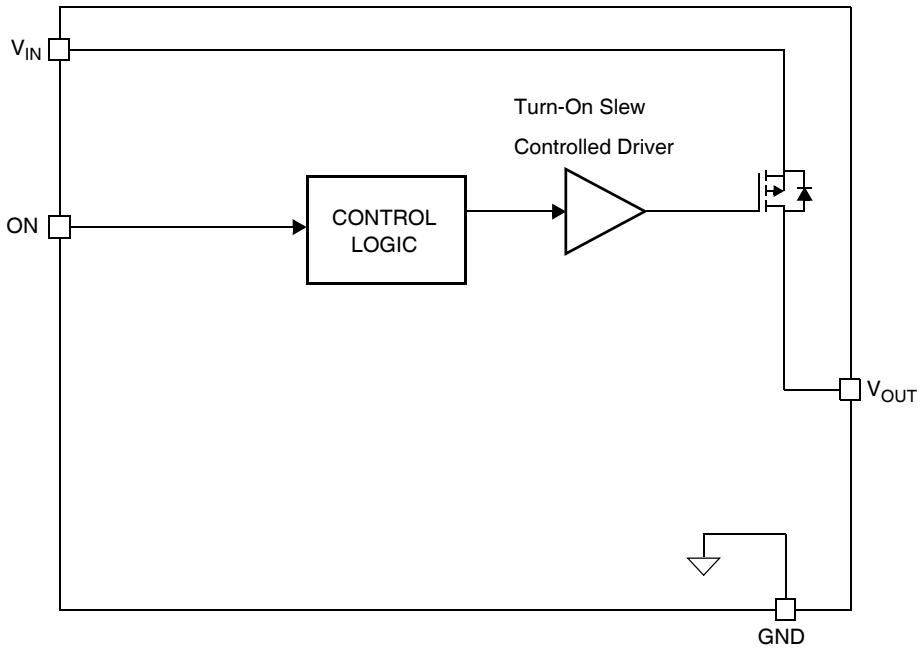
Typical Application Circuit



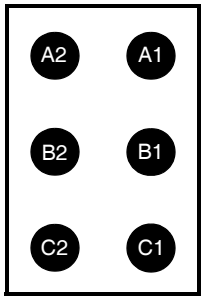
Ordering Information

Part	Switch	Input buffer	Output Discharge	ON Pin Activity	Top Mark
FPF1003	30mΩ, PMOS	Schmitt	NA	Active HI	3

Functional Block Diagram



Pin Configuration



1.0 x 1.5 CSP Bottom View

Pin Description

Pin	Name	Function
A2, B2	V_{IN}	Supply Input: Input to the power switch and the supply voltage for the IC
C2	ON	ON Control Input
A1, B1	V_{OUT}	Switch Output: Output of the power switch
C1	GND	Ground

Absolute Maximum Ratings

Parameter		Min.	Max.	Unit
V_{IN}, V_{OUT}, to GND		-0.3	6	V
Power Dissipation @ T_A = 25°C			1.2	W
Maximum Continuous Switch Current			2.0	A
Operating Temperature Range		-40	125	°C
Storage Temperature		-65	150	°C
Thermal Resistance, Junction to Ambient			85	°C/W
Electrostatic Discharge Protection	HBM	2000		V
	MM	200		V

Recommended Operating Range

Parameter	Min.	Max.	Unit
V_{IN}	1.2	5.5	V
Ambient Operating Temperature, T_A	-40	85	°C

Electrical Characteristics

V_{IN} = 1.2 to 5.5V, T_A = -40 to +85°C unless otherwise noted. Typical values are at V_{IN} = 3.3V and T_A = 25°C.

Parameter	Symbol	Conditions	Min.	Typ.	Max	Units
Basic Operation						
Operating Voltage	V_{IN}		1.2		5.5	V
Quiescent Current	I_Q	I_{OUT} = 0mA, V_{IN} = Von			1	µA
Off Supply Current	$I_{Q(off)}$	Von = GND, OUT = open			1	µA
Off Switch Current	$I_{SD(off)}$	Von = GND, V_{OUT}= 0			1	µA
On-Resistance	R_{ON}	V_{IN} = 5.5V, T_A = 25°C		20	30	mΩ
		V_{IN} = 3.3V, T_A = 25°C		25	35	
		V_{IN} = 1.5V, T_A = 25°C		50	75	
		V_{IN} = 1.2V, T_A = 25°C		95	150	
ON Input Logic High Voltage	V_{IH}	V_{IN} = 2.7V to 5.5V	2			V
		V_{IN} = 1.2V	0.8			
ON Input Logic Low Voltage	V_{IL}	V_{IN} = 2.7V to 5.5V			0.8	V
		V_{IN} = 1.2V			0.35	
ON Input Leakage		V_{ON} = V_{IN} or GND			1	µA
Dynamic						
Turn on delay	t_{ON}	V_{IN} = 3.3V, R_L=500Ω, C_L=0.1uF, T_A = 25°C		13		µs
Turn off delay	t_{OFF}	V_{IN} = 3.3V, R_L=500Ω, C_L=0.1uF, T_A = 25°C		45		µs
V_{OUT} Rise Time	t_R	V_{IN} = 3.3V, R_L=500Ω, C_L=0.1uF, T_A = 25°C		13		µs
V_{OUT} Fall Time	t_F	V_{IN} = 3.3V, R_L=500Ω, C_L=0.1uF, T_A = 25°C		113		µs

Typical Characteristics

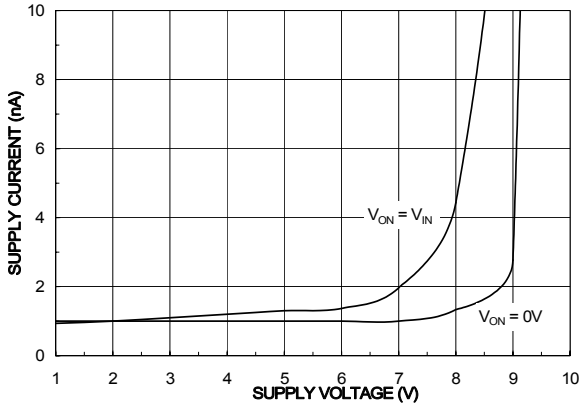


Figure 1. Quiescent Current vs.V_{IN}

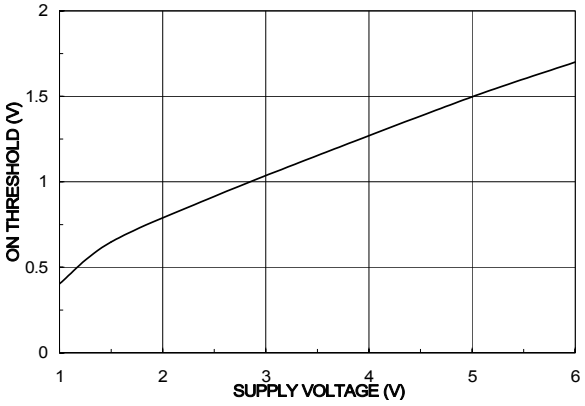


Figure 2. ON Threshold vs. V_{IN}

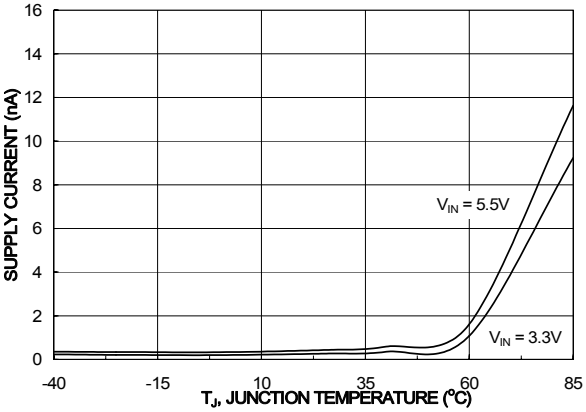


Figure 3. Quiescent Current vs. Temperature

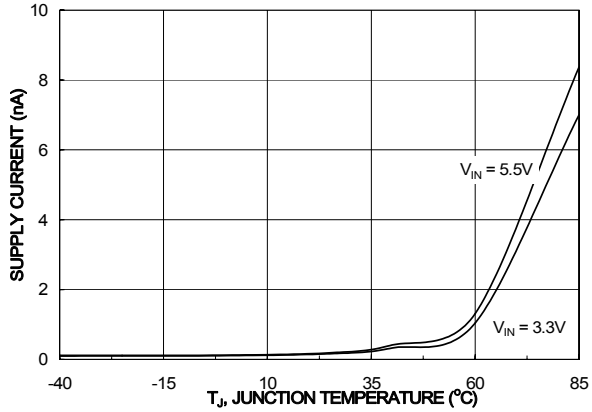


Figure 4. Quiescent Current (off) vs. Temperature

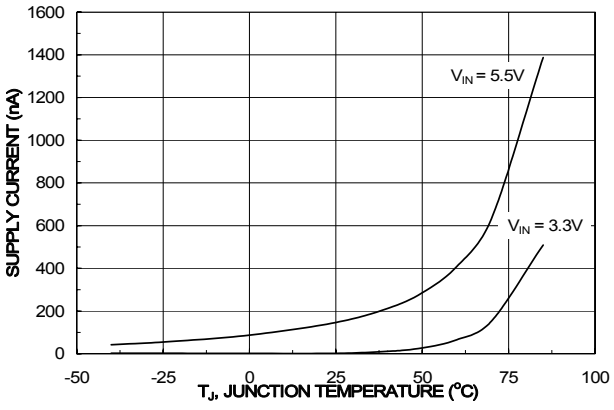


Figure 5. $I_{SWITCH-OFF}$ Current vs. Temperature

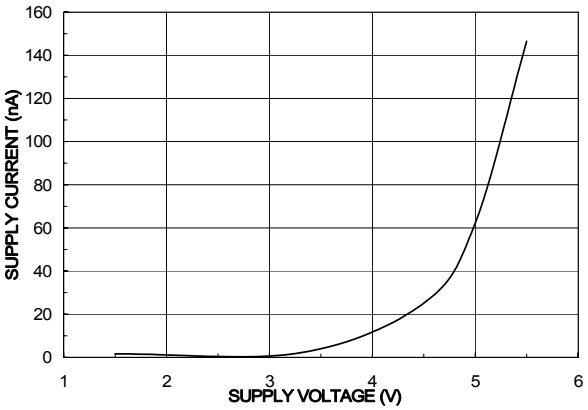


Figure 6. $I_{SWITCH-OFF}$ Current vs. V_{IN}

Typical Characteristics

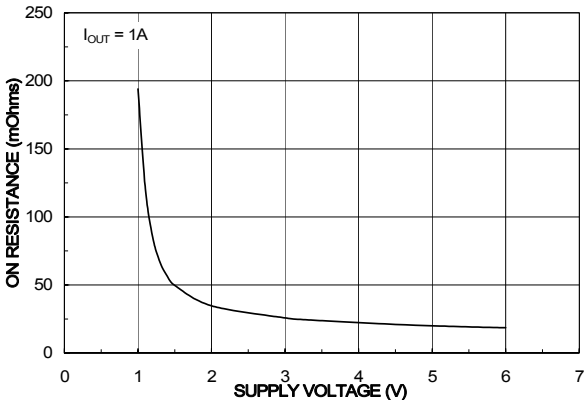


Figure 7. R_{ON} vs. V_{IN}

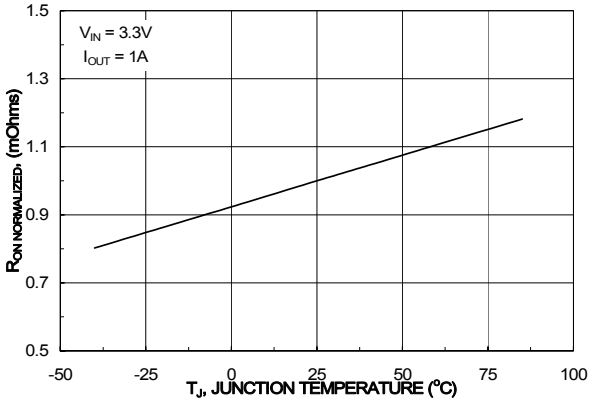


Figure 8. R_{ON} vs. Temperature

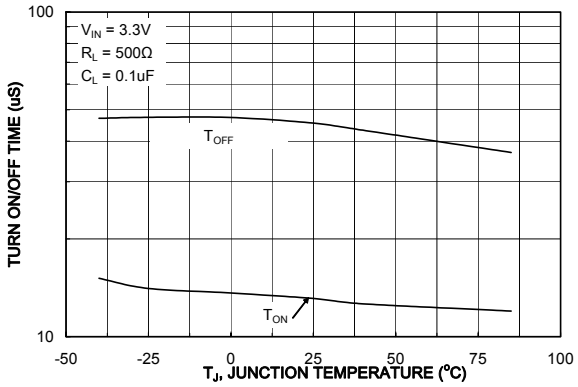


Figure 9. T_{ON}/T_{Off} vs. Temperature

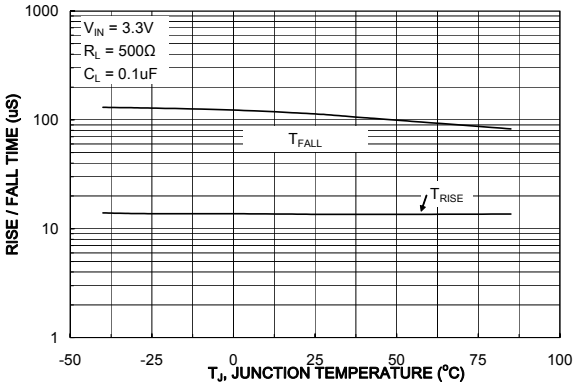


Figure 10. T_{RISE}/T_{FALL} vs. Temperature

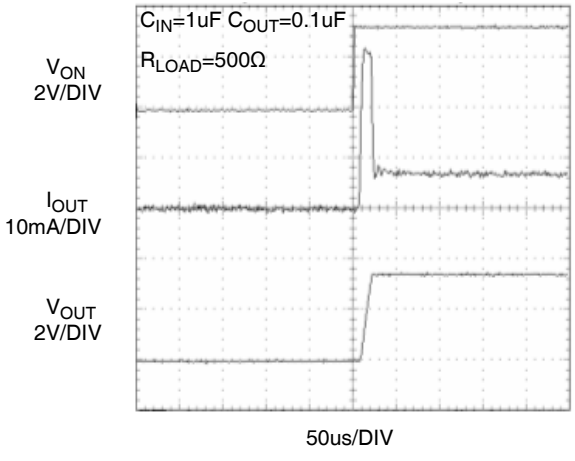


Figure 11. T_{ON} Response

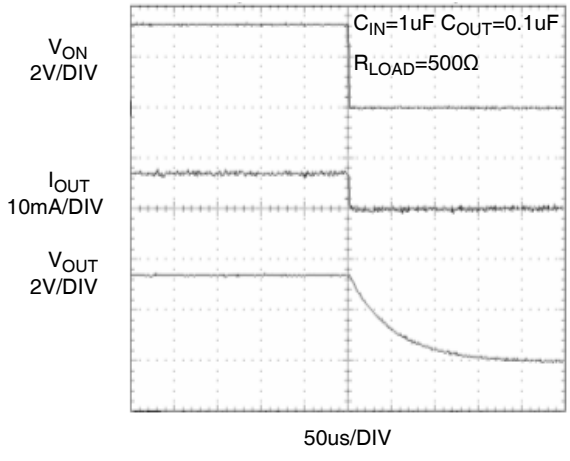


Figure 12. T_{OFF} Response

Typical Characteristics

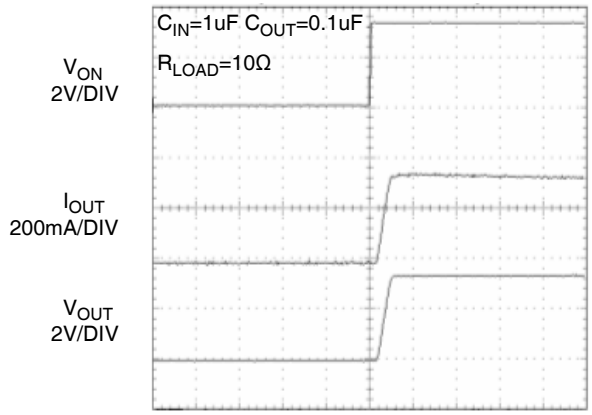


Figure 13. T_{ON} Response

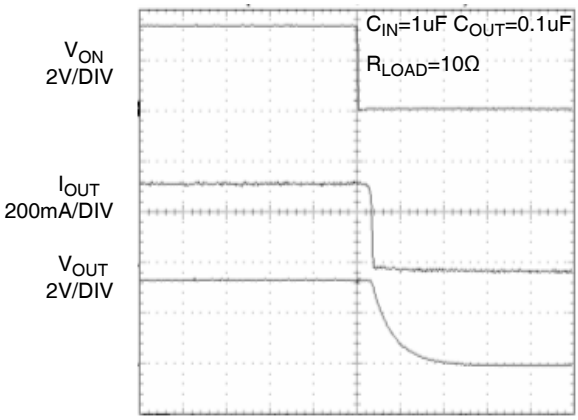


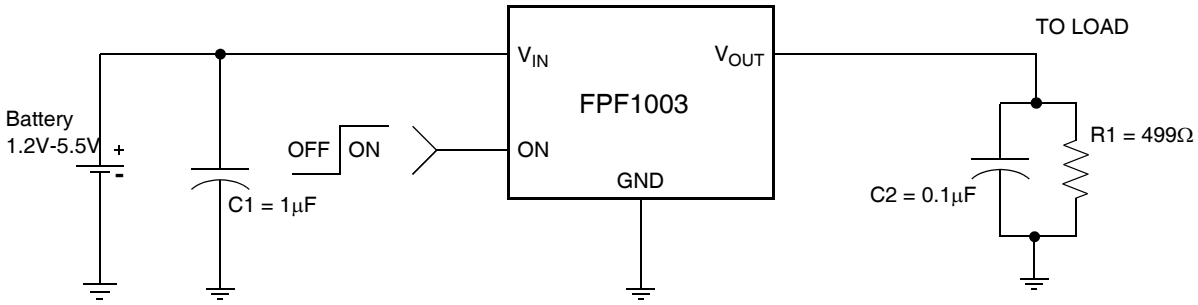
Figure 14. T_{OFF} Response

Description of Operation

The FPF1003 is a low $R_{DS(ON)}$ P-Channel load switch with controlled turn-on. The core of each device is a 30mΩ P-Channel MOSFET and a controller capable of functioning over a wide input operating range of 1.2-5.5V. Switch control is by a logic input (ON) capable of interfacing directly with low voltage control signal.

Application Information

Typical Application



Input Capacitor

To limit the voltage drop on the input supply caused by transient in-rush currents when the switch turns-on into a discharged load capacitor or short-circuit, a capacitor needs to be placed between V_{IN} and GND. A 1µF ceramic capacitor, C_{IN}, placed close to the pins is usually sufficient. Higher values of C_{IN} can be used to further reduce the voltage drop.

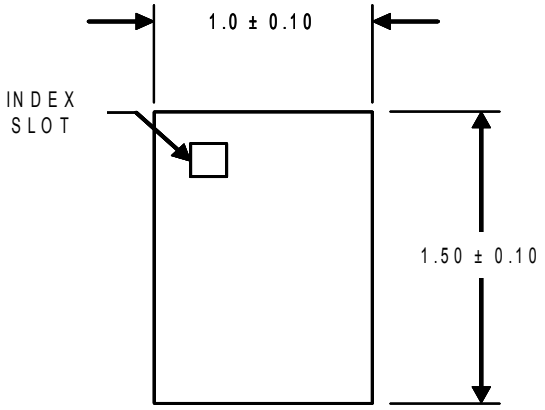
Output Capacitor

A 0.1µF capacitor, C_{OUT}, should be placed between V_{OUT} and GND. This capacitor will prevent parasitic board inductance from forcing V_{OUT} below GND when the switch turns-off. Due to the integral body diode in the PMOS switch, a C_{IN} greater than C_{OUT} is highly recommended. A C_{OUT} greater than C_{IN} can cause V_{OUT} to exceed V_{IN} when the system supply is removed. This could result in current flow through the body diode from V_{OUT} to V_{IN}.

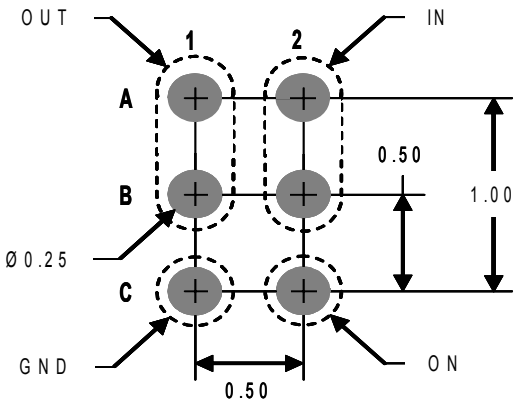
Board Layout

For best performance, all traces should be as short as possible. To be most effective, the input and output capacitors should be placed close to the device to minimize the effects that parasitic trace inductances may have on normal and short-circuit operation. Using wide traces for V_{IN}, V_{OUT} and GND will help minimize the parasitic electrical effects along with minimizing the case to ambient thermal impedance.

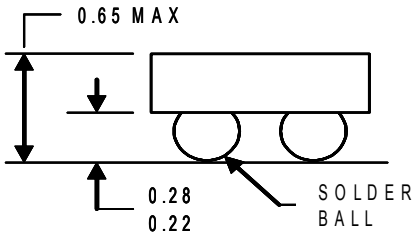
Dimensional Outline and Pad Layout



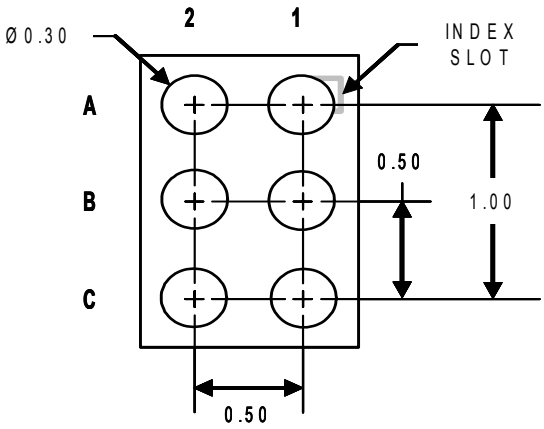
TOP VIEW



RECOMMENDED
LAND PATTERN



SIDE VIEW



BOTTOM VIEW

NOTES:

A) ALL DIMENSIONS ARE IN MILLIMETERS.

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
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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.
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