May 2002

FAIRCHILD SEMICONDUCTOR®

FDC6901L

Integrated Load Switch

General Description

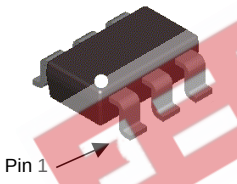
This device is particularly suited for compact power management. In portable electronic equipment where 2.5V to 6V input capability is needed. This load switch integrates a Slew Rate Control Driver that drives a P-Channel Power MOSFET in one tiny SuperSOT™-6 package. The integrated slew rate control driver is specifically designed to control the turn on of the P-Channel MOSFET in order to limit the inrush current in battery switching applications with high capacitance loads. For turn-off, the IC pulls the MOSFET gate up quickly.

Features

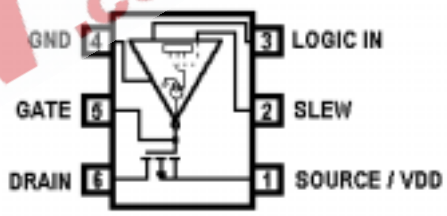
- Three programmable slew rates
- Reduces inrush current
- Minimizes EMI
- Normal turn-off speed
- Low-power CMOS operates over wide voltage range
- High performance trench technology for extremely low $R_{DS(ON)}$

Applications

- Load switch
- Power management



SuperSOT™-6



Absolute Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DD}	Supply Voltage	–0.5 to 10	V
V_{IN}	DC Input Voltage (Logic Inputs)	–0.7 to 6	V
P_D	Power Dissipation		
T_{STG}	Storage Junction Temperature Range	–55 to +150	°C

Recommended Operating Range

V_{DD}	Supply Voltage	–0.5 to 10	V
T_J	Operating Junction Temperature	–55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	180	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	60	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
.901	FDC6901L	7”	8mm	3000 units

Electrical Characteristics

T_A=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Logic Levels						
V_{IH}	Logic HIGH Input Voltage	V_{DD} = 2.7 V to 6.0 V	75%* V_{DD}			V
V_{IL}	Logic LOW Input Voltage	V_{DD} = 2.7 V to 6.0 V			25%* V_{DD}	V
OFF Characteristics – Slew Rate Control Driver						
BV_{DG}	Supply Input Breakdown Voltage	I_{DG} = 10 µA, V_{IN} = 0 V, V_{SLEW} = 0 V	9			V
BV_{SLEW}	Slew Input Breakdown Voltage	I_{SLEW} = 10 µA, V_{IN} = 0 V	9			V
BV_{IN}	Logic Input Breakdown Voltage	I_{IN} = 10 µA, V_{SLEW} = 0 V	9			V
IR_{DG}	Supply Input Leakage Current	V_{DG} = 8 V, V_{IN} = 0 V, V_{SLEW} = 0 V			100	nA
IR_{SLEW}	Slew Input Leakage Current	V_{SLEW} = 8 V, V_{IN} = 0 V			100	nA
IR_{IN}	Logic Input Leakage Current	V_{IN} = 8 V, V_{SLEW} = 0 V			100	nA
OFF Characteristics – Slew Rate Control Driver + P-Channel MOSFET						
BV_{IO}	IO Breakdown Voltage	I_D = –250 µA	9			V
IR_{IO}	IO Leakage Current	V_R = 16 V			100	nA
ON Characteristics – Slew Rate Control Driver						
I_G	Output/Gate Current	V_{IN} = 6V, V_{GATE} = 2V; Slew Pin = OPEN		90		µA
		Slew Pin = GROUND		1		µA
		Slew Pin = V_{DD}		10		nA
ON Characteristics – P-Channel MOSFET						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} , I_D = –250 µA	–0.6	–1.0	–1.5	V
$R_{DS(ON)}$	Static Drain-Source On Resistance	V_{GS} = –4.5 V, I_D = –1.5 A		120	145	mΩ
		V_{GS} = –2.5 V, I_D = –1.2 A		170	210	mΩ
ON Characteristics – Slew Rate Control Driver + P-Channel MOSFET						
V_{DROP}	Dropout Voltage	V_{DD} = 6V, V_{IN} = 2.5V to 6V, I_L = 1.5 A		160	300	mV
		V_{DD} = 6V, V_{IN} = 2.5V to 6V, I_L = 1.2 A		130	300	mV
R_{ON}	Load switch On Resistance	V_{DD} = 6V, V_{IN} = 2.5V to 6V, I_L = 1.5 A		105	180	mΩ
		V_{DD} = 6V, V_{IN} = 2.5V to 6V, I_L = 1.2 A		110	210	mΩ
I_{LOAD}	Load Current	V_{GS} = 2.5 V, V_{DS} = 6 V	3			A

P-Channel MOSFET Switching Times

Vsupply = 5.5V, VDD = 5.5V, Logic IN = 5.5V, I_{LOAD} = 1.5A

t_{don}	Output Turn-On Delay Time	Slew Pin = OPEN		6.20		µs
		Slew Pin = GROUND		42		µs
		Slew Pin = V_{DD}		115		µs
t_{rise}	Output Rise Time	Slew Pin = OPEN		6.75		µs
		Slew Pin = GROUND		124		µs
		Slew Pin = V_{DD}		162		µs
dv/dt	Output Slew Rate	Slew Pin = OPEN		600		V/ms
		Slew Pin = GROUND		41		V/ms
		Slew Pin = V_{DD}		24		V/ms

Typical Characteristics

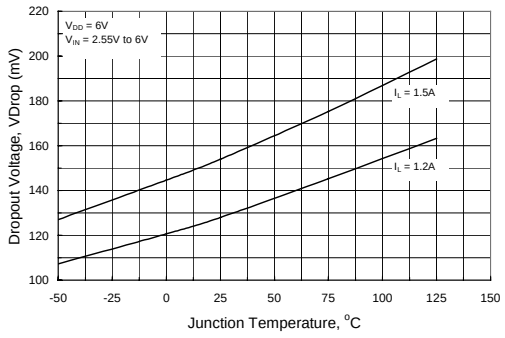


Figure 1. Dropout Voltage vs. Temperature. SLEW = OPEN

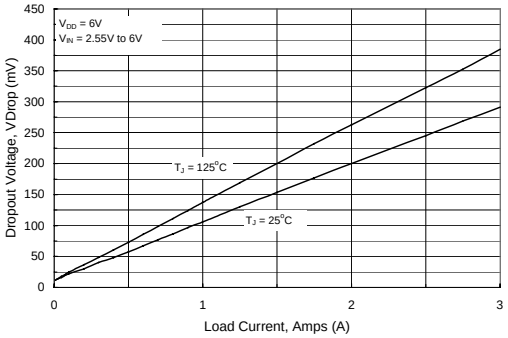


Figure 2. Dropout Voltage vs. Load Current. SLEW = OPEN

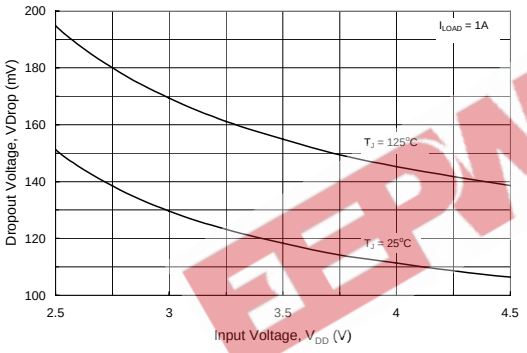


Figure 3. Dropout Voltage vs. Input Voltage. SLEW = OPEN

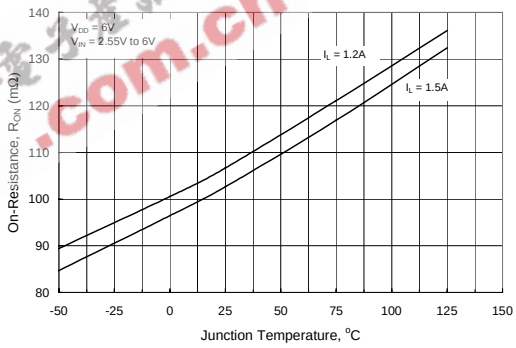


Figure 4. On-Resistance vs. Temperature. SLEW = OPEN

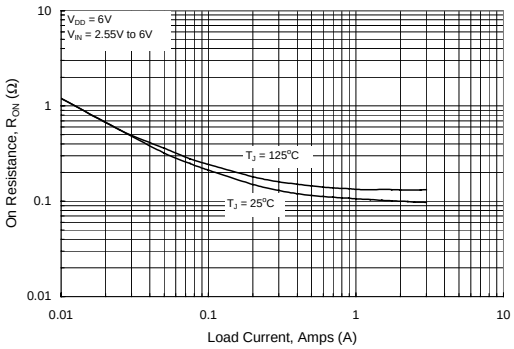


Figure 5. On-Resistance vs. Load Current. SLEW = OPEN

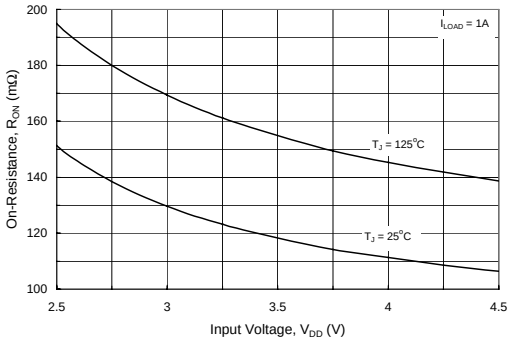


Figure 6. . On-Resistance vs. Input Voltage. SLEW = OPEN

Typical Characteristics

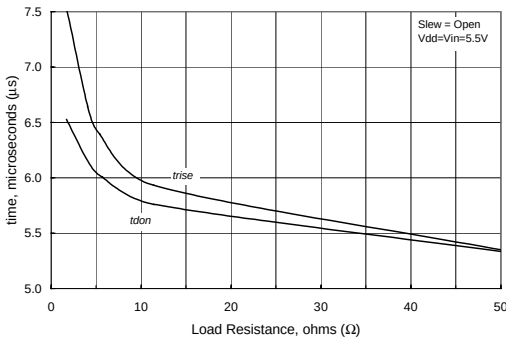


Figure 7. Switching Time vs. Load Resistance. SLEW = OPEN

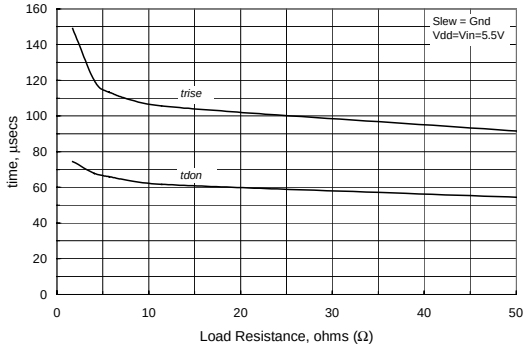


Figure 8. Switching Time vs. Load Resistance. SLEW = GROUND

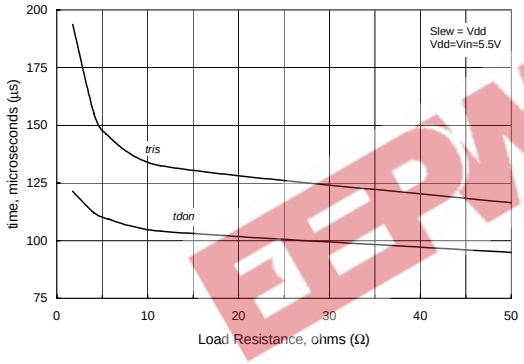


Figure 9. Switching Time vs. Load Resistance. SLEW = V_{DD}

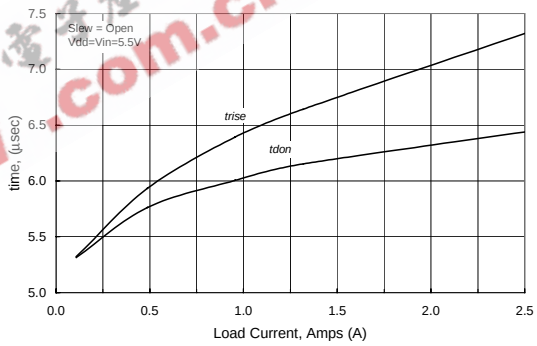


Figure 10. Switching time vs. Load Current. SLEW = OPEN

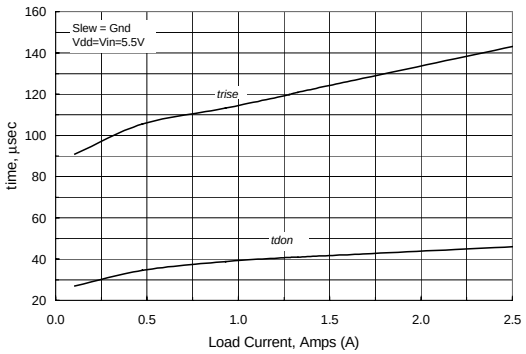


Figure 11. Switching time vs. Load Current. SLEW = GROUND

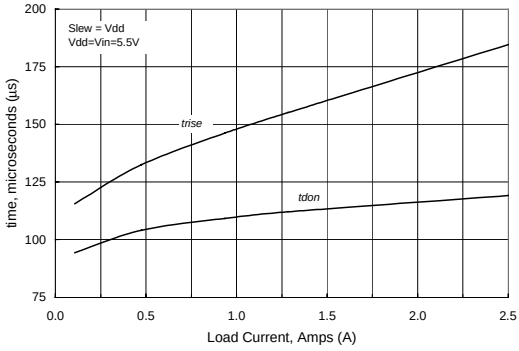


Figure 12. Switching time vs. Load Current. SLEW = V_{DD}

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™	FAST ®	MICROWIRE™	SILENT SWITCHER ®	UHC™
Bottomless™	FASTr™	OPTOLOGIC ®	SMART START™	UltraFET ®
CoolFET™	FRFET™	OPTOPLANAR™	SPM™	VCX™
CROSSVOLT™	GlobalOptoisolator™	PACMAN™	STAR*POWER™	
DenseTrench™	GTO™	POP™	Stealth™	
DOME™	HiSeC™	Power247™	SuperSOT™-3	
EcoSPARK™	I^2C™	PowerTrench ®	SuperSOT™-6	
E^2CMOS^{TM}	ISOPLANAR™	QFET™	SuperSOT™-8	
EnSigna™	LittleFET™	QS™	SyncFET™	
FACT™	MicroFET™	QT Optoelectronics™	TinyLogic™	
FACT Quiet Series™	MicroPak™	Quiet Series™	TruTranslation™	

STAR*POWER is used under license

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.

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.