FAIRCHILD SEMICONDUCTOR®

September 2012

FDZ2040L
Integrated Load Switch

Features

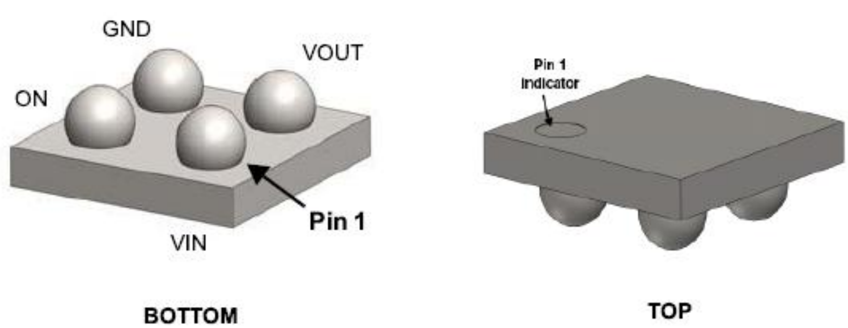
- Optimized for low-voltage core ICs in portable systems
- Very small package dimension: WL-CSP 0.8X0.8X0.5 mm^3
- Current = 1.2 A, V_{IN} max = 4 V
- Current = 2 A, V_{IN} max = 4 V (Pulsed)
- $R_{DS(ON)}$ = 80 mΩ at V_{ON} = 0 V, V_{IN} = 4 V
- $R_{DS(ON)}$ = 85 mΩ at V_{ON} = 0 V, V_{IN} = 3.6 V
- $R_{DS(ON)}$ = 90 mΩ at V_{ON} = 0 V, V_{IN} = 3 V
- RoHS Compliant

General Description

This device is particularly suited for compact power management in portable application where 1.6V to 4V input and 1.2A output current capability are needed. This load switch integrates a level shifting function that drives a P-Channel Power MOSFET in the very small 0.8X0.8X0.5 mm^3 WL-CSP package.

Applications

- Load switch
- Power management in portable applications



Ordering Information

Part Number	Device Marking	Ball Pitch	Operating Temperature Range	Switch	Eco Status	Package	Packing Method
FDZ2040L	ZL	0.4 mm	-25 to 75℃	80 mΩ, P-ch FET	RoHS	0.8x0.8x0.5 mm^3 WL-CSP	Tape and Reel

For Fairchild's definition of Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.

Application Diagram and Block Diagram

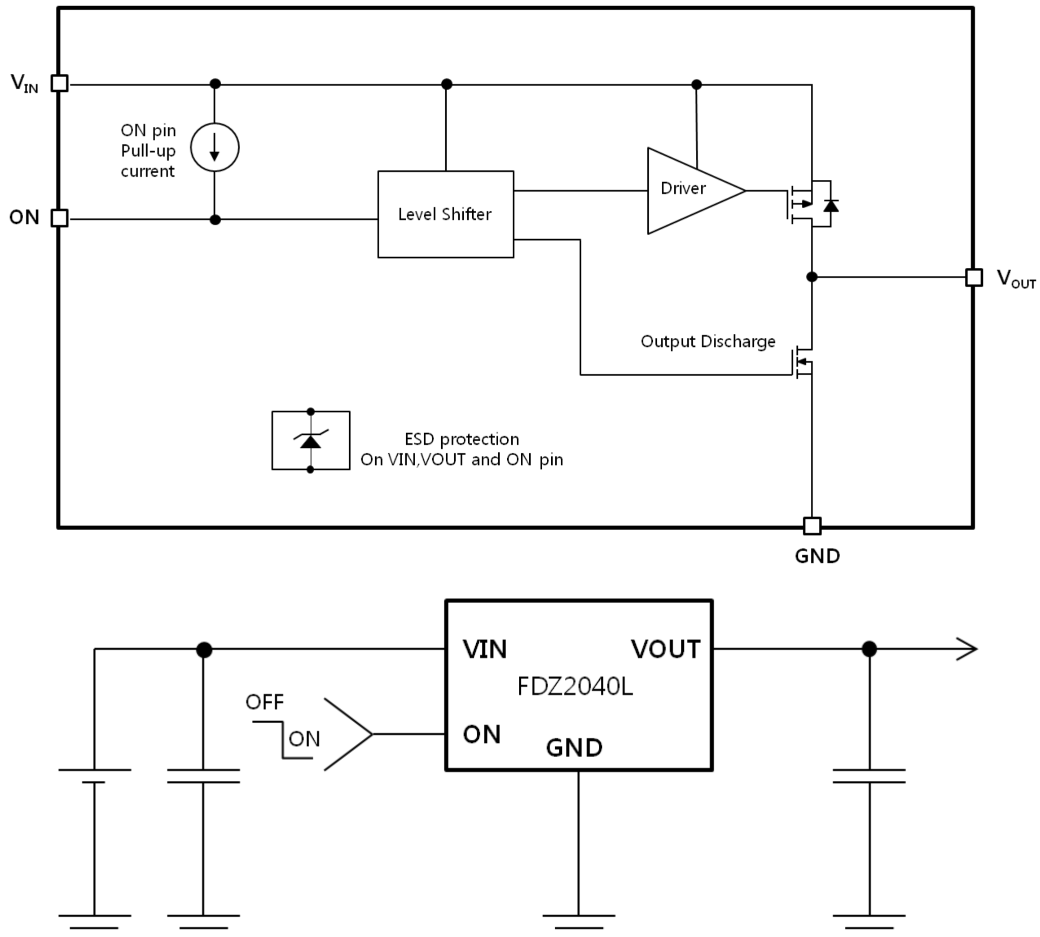


Figure 1. Block Diagram and Typical Application Pin Configuration

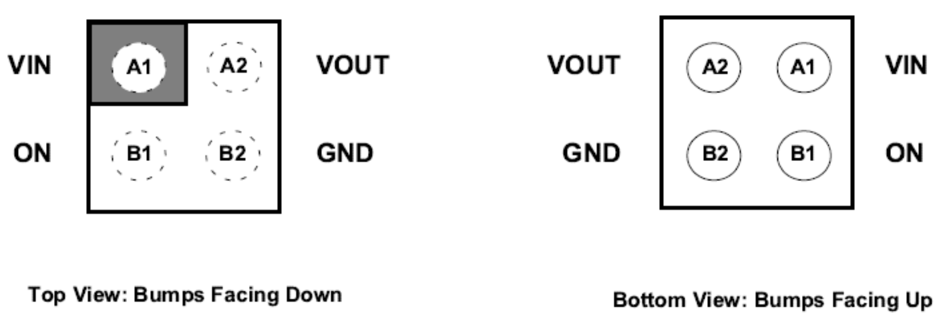


Figure 2. Pin Assignment

Pin Definitions

Pin #	Name	Description
A1	V_{IN}	Supply Input: Input to the load switch
A2	V_{OUT}	Switch Output: Output of the load switch
B1	ON	ON/OFF Control Input, active LOW
B2	GND	Ground

Absolute Maximum Ratings

Parameter		Min.	Max.	Unit
V_{IN}, V_{OUT}, ON to GND		-0.3	4.2	V
I_{OUT} – Load Current (Continuous)	(Note 1a)		1.2	A
I_{OUT} – Load Current (Pulsed)	(Note 2)		2	A
Power Dissipation @ T_A = 25℃	(Note 1a)		0.9	W
Operating Temperature Range		-40	105	℃
Storage Temperature		-65	150	℃
Electrostatic Discharge Capability	Human Body Model, JESD22-A114	8		kV
	Charged Device Model, JESD22-C101	2		

Thermal Characteristics

Thermal Resistance, Junction to Ambient	(Note 1a)		117	℃/W

Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Unit
V_{IN}	1.6		4	V
Ambient Operating Temperature, T_A	-25		75	℃

Electrical Characteristics

T_J = 25 °C unless otherwise noted

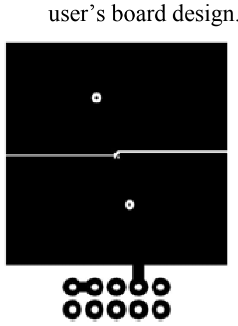
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{IN}	Operation Voltage		1.6		4	V
V_{IL}	ON Input Logic Low Voltage	V_{IN} = 1.6V, Ramp down V_{ON} from 1V to 0V, V_{OUT} Low to High, T_J = -25 to 75 °C	0.35			V
		V_{IN} = 4V, Ramp down V_{ON} from 1V to 0V, V_{OUT} Low to High, T_J = -25 to 75 °C	0.35			V
V_{IH}	ON Input Logic High Voltage	V_{IN} = 1.6V, Ramp up V_{ON} from 0V to 1V, V_{OUT} High to Low, T_J = -25 to 75 °C			1.35	V
		V_{IN} = 4V, Ramp up V_{ON} from 0V to 1V, V_{OUT} High to Low, T_J = -25 to 75 °C			1.35	V
I_Q	Quiescent Current	V_{IN} = 3V, V_{ON} = 0.35V, I_{OUT} = 0A, T_J = -25 to 75 °C		1.55	2.5	µA
I_{Q_off}	Off Supply Current	V_{IN} = 3V, V_{ON} = 1.3V, I_{OUT} = 0A, T_J = -25 to 75 °C		2.4	6.5	µA
I_{SD_off}	Off Switch Current	V_{IN} = 3V, V_{ON} = 1.3V, V_{OUT} = 0V, T_J = -25 to 75 °C		0.1	3.5	µA
I_{Q_off} (VON float)	Off Supply Current with ON pin floating	V_{IN} = 3V, V_{ON} = floating, I_{OUT} = 0A,		1.6	2.3	µA
		V_{IN} = 3V, V_{ON} = floating, I_{OUT} = 0A, T_J = -25 to 75 °C		1.6	4	µA
$R_{DS(ON)}$	On Resistance	V_{IN} = 1.6V, V_{ON} = 0V, I_{OUT} = 300mA V_{IN} = 3V, V_{ON} = 0V, I_{OUT} = 300mA V_{IN} = 3.6V, V_{ON} = 0V, I_{OUT} = 300mA V_{IN} = 4V, V_{ON} = 0V, I_{OUT} = 300mA, T_J = -25 to 75 °C		68 50 48 47	120 90 85 80	mΩ
$C_{V\text{-}ON(INP)}$	ON Input Capacitance	T_J = -25 to 75 °C			5	pF
$I_{ON(PULL\text{-}UP)}$	ON Pull Up Current	V_{IN} = 3V, V_{ON} = 0V, T_J = -25 to 75 °C	0.3	0.76	1.2	µA

Switching Characteristics

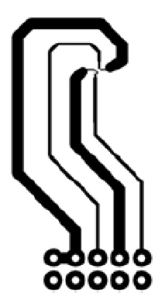
T_{on}	Turn on time (V_{ON} 50% to V_{OUT} 90%)	V_{IN}=3V, V_{ON} = 0V as logic low and 1.3V as logic high, C_{OUT} = 1nF, R_L = 30Ω, T_J = -25 to 75 °C		45	150	ns
T_{don}	Turn on delay time (V_{ON} 50% to V_{OUT} 10%)			35	100	ns
T_{rise}	Turn on rise time (V_{OUT} 10% to 90%)			10	50	ns
T_{off}	Turn off time (V_{ON} 50% to V_{OUT} 10%)			60	150	ns
T_{doff}	Turn off delay time (V_{ON} 50% to V_{OUT} 90%)			25	100	ns
T_{fall}	Turn off fall time (V_{OUT} 90% to 10%)			35	65	ns
$T_{don} - T_{doff}$	Turn on Turn off Delay Delta time				50	ns

Notes:

1. $R_{\Theta JA}$ 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. $R_{\Theta JC}$ is guaranteed by design while $R_{\Theta JA}$ is determined by the user's board design.



a. 117 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 277 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300µs, Duty Cycle < 2.0%.

Typical Performance Characteristics

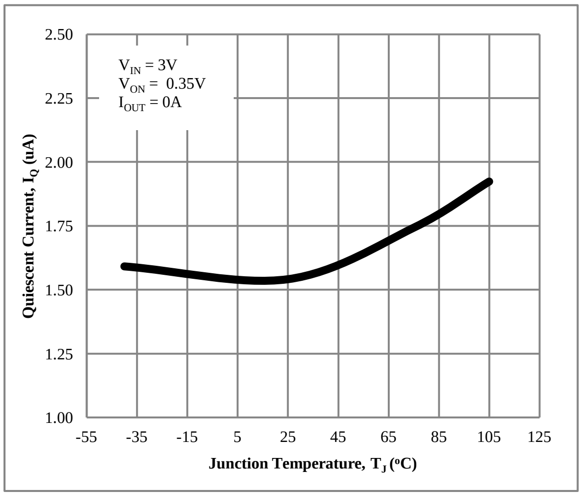


Figure 3. Quiescent Current vs. Temperature

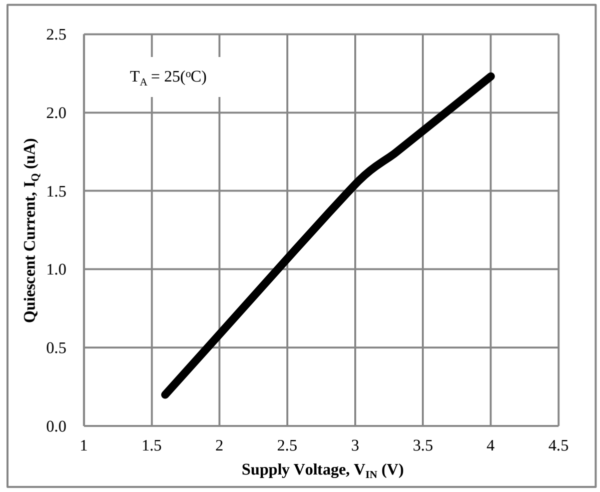


Figure 4. Quiescent Current vs. Supply Voltage

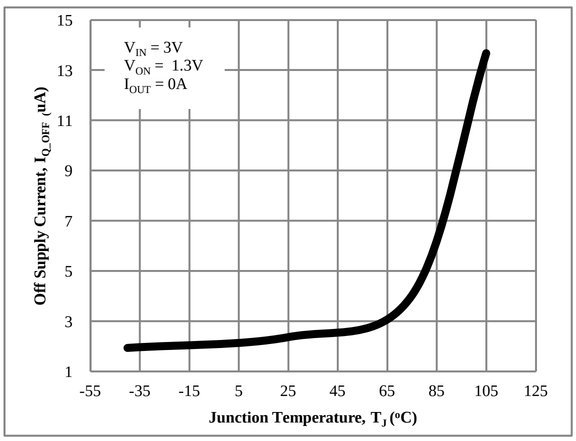


Figure 5. Off Supply Current vs. Temperature

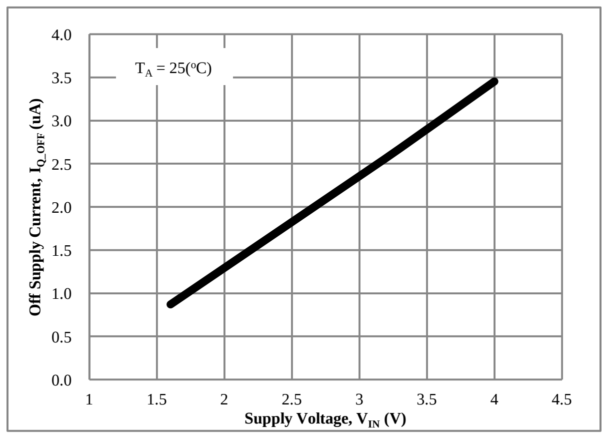


Figure 6. Off Supply Current vs. Supply Voltage

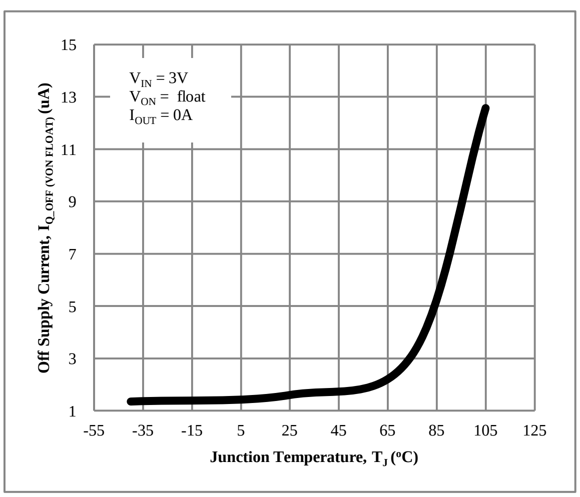


Figure 7. Off Supply Current(V_{ON} Float) vs. Temperature

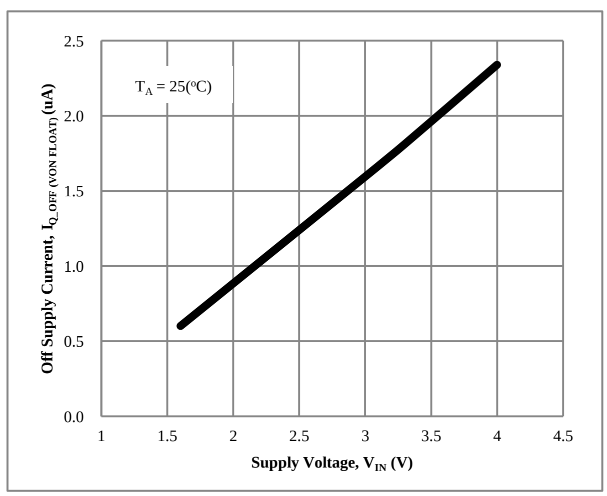


Figure 8. Off Supply Current(V_{ON} Float) vs. Supply Voltage

Typical Performance Characteristics (Continued)

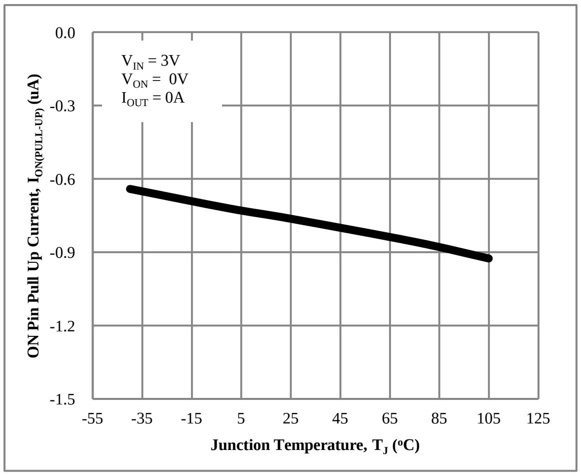


Figure 9. ON Pin Pull Up Current vs. Temperature

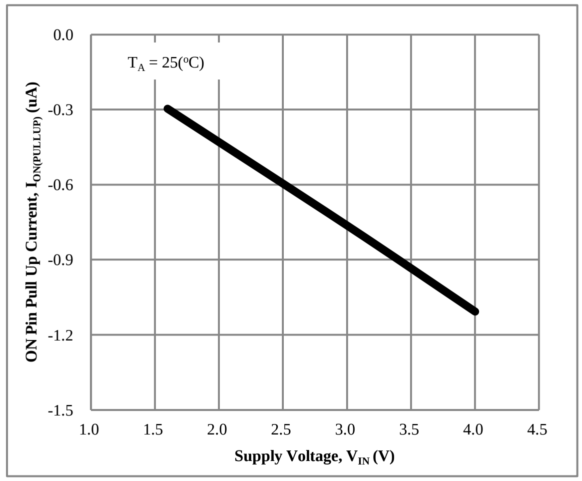


Figure 10. ON Pin Pull Up Current vs. Supply Voltage

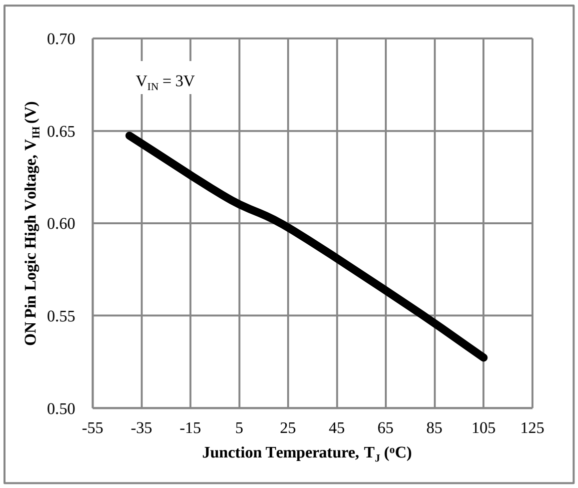


Figure 11. ON Pin Logic High Voltage vs. Temperature

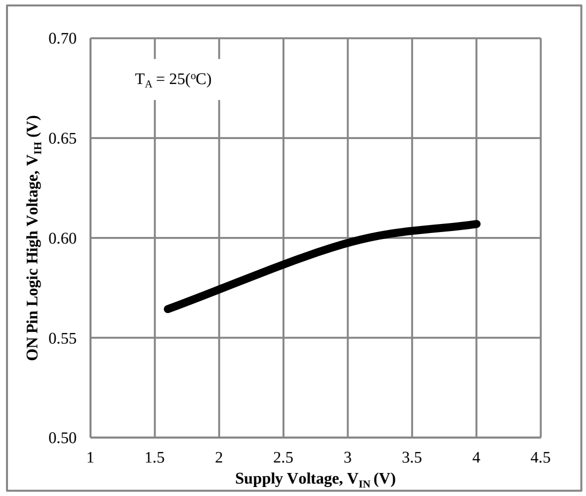


Figure 12. ON Pin Logic High Voltage vs. Supply Voltage

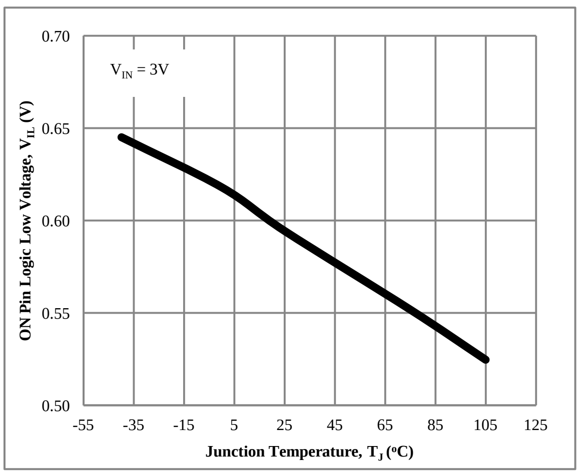


Figure 13. ON Pin Logic Low Voltage vs. Temperature

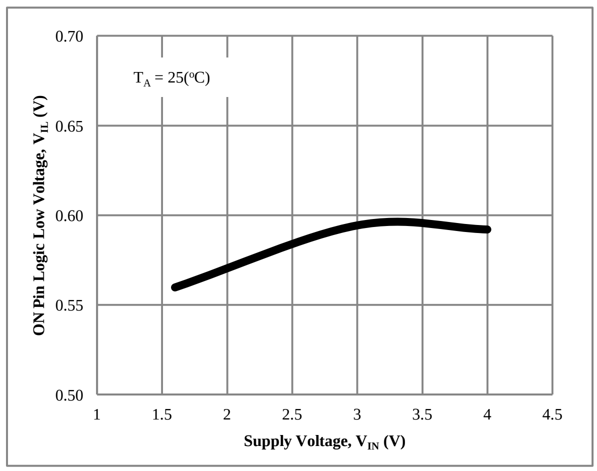


Figure 14. ON Pin Logic Low Voltage vs. Supply Voltage

Typical Performance Characteristics (Continued)

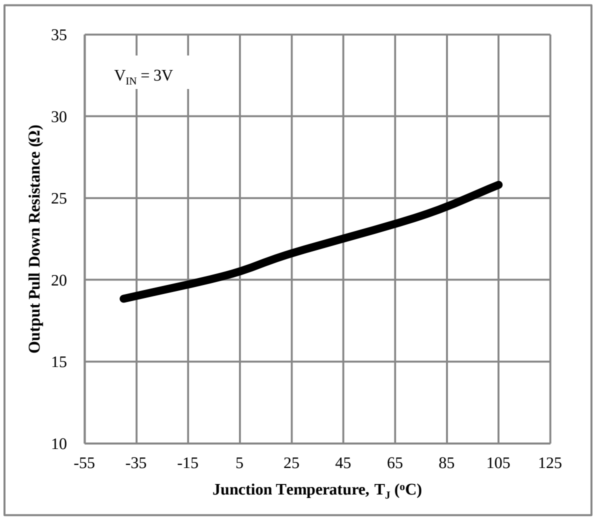


Figure 15. Output Pull Down Resistance vs. Temperature

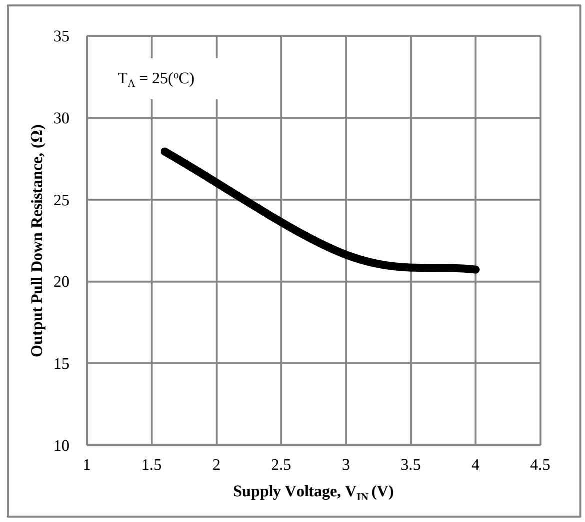


Figure 16. Output Pull Down Resistance vs. Supply Voltage

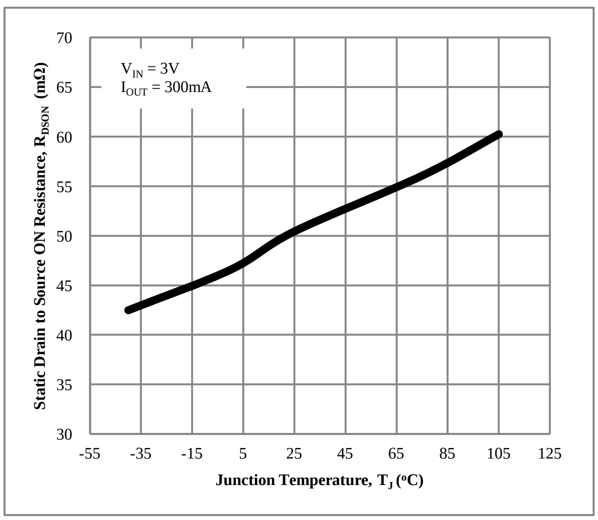


Figure 17. Static Drain to Source ON Resistance vs. Temperature

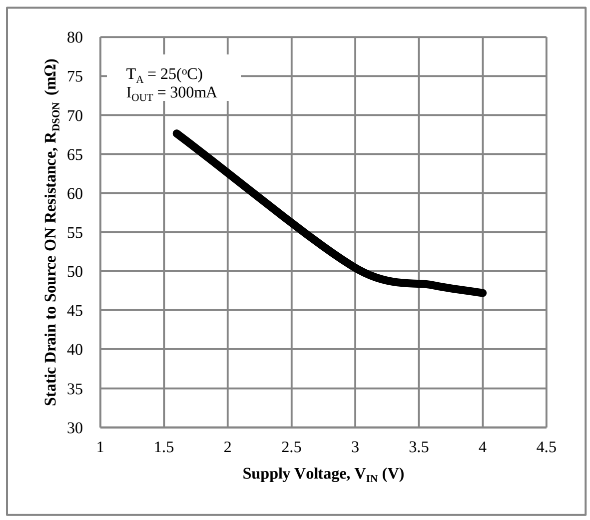
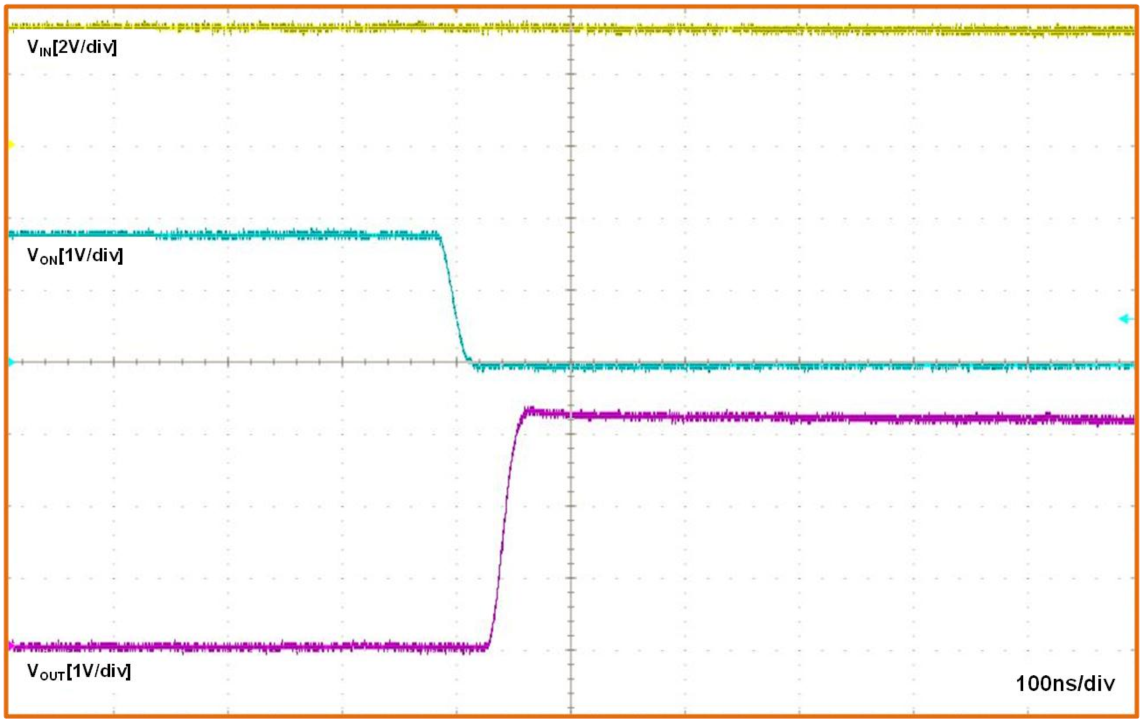


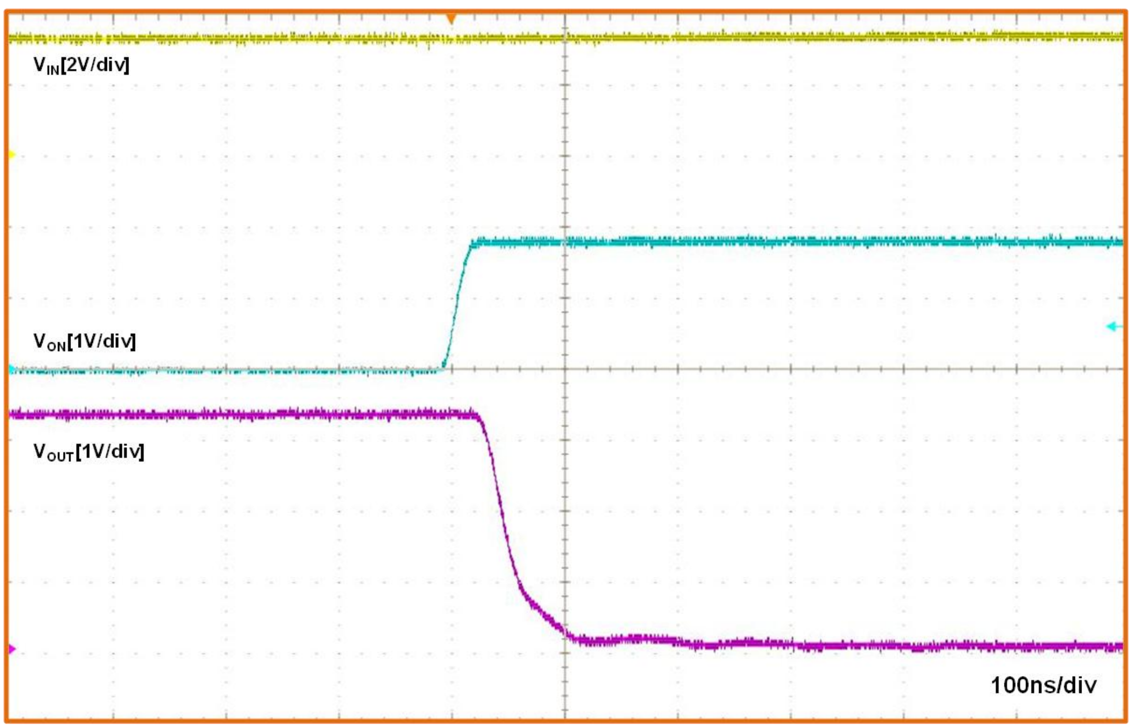
Figure 18. Static Drain to Source ON Resistance vs. Supply Voltage

Typical Performance Characteristics(Continued)



V_{IN} = 3.3V, V_{ON} = 0V, C_{IN} = 1uF, C_{OUT} = 1nF, R_L = 30Ω

Figure 19. T_{ON} Response



V_{IN} = 3.3V, V_{ON} = 0V, C_{IN} = 1uF, C_{OUT} = 1nF, R_L = 30Ω

Figure 20. T_{OFF} Response

Operation Description

The FDZ2040L is a low $R_{DS(ON)}$ P-Channel load switch packaged in space saving 0.8x0.8 WL-CSP.
The core of the device is a 80mΩ P-Channel MOSFET and capable of functioning over a wide input operating range of 1.6-4 V.

Applications Information

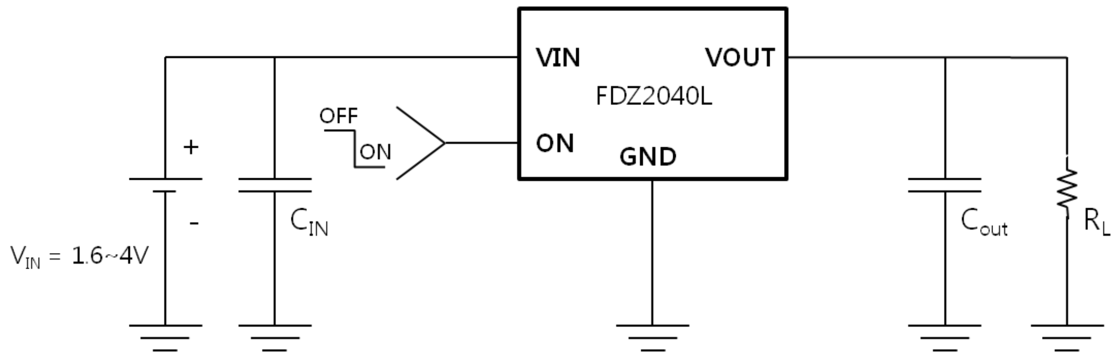


Figure 21. Typical Application

Input Capacitor

To reduce device inrush current effect, a 0.1uF ceramic capacitor, C_{IN} is recommended close to V_{IN} pin. A higher value of C_{IN} can be used to further reduce the voltage drop experienced as the switch is turned on into a large capacitive load.

Output Capacitor

FDZ2040L switch works without an output capacitor. However, if parasitic board inductance forces Vout below GND when switching off, a 1nF capacitor, C_{OUT}, should be placed between Vout and GND.

Notes: The intrinsic diode for P-Channel load switch would conduct if V_{OUT} is greater than V_{IN}, by a diode drop

Demo Board Layout

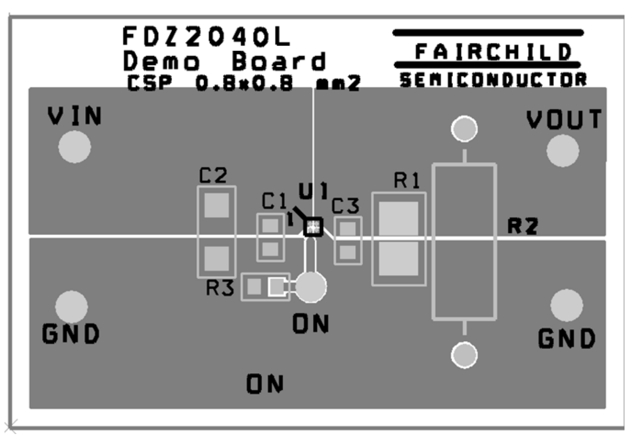


Figure 22. Top View

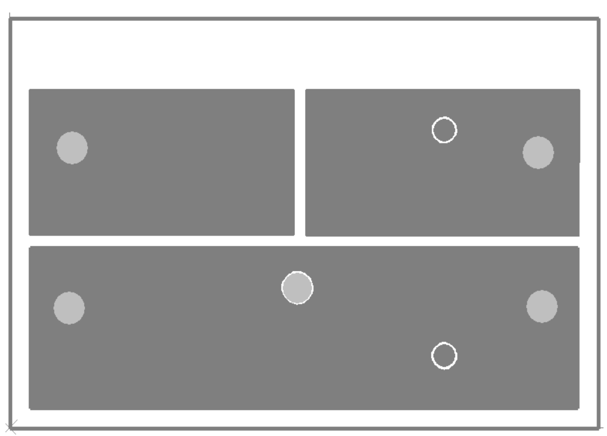


Figure 23. Bottom View

Dimensional Outline and Pad Layout

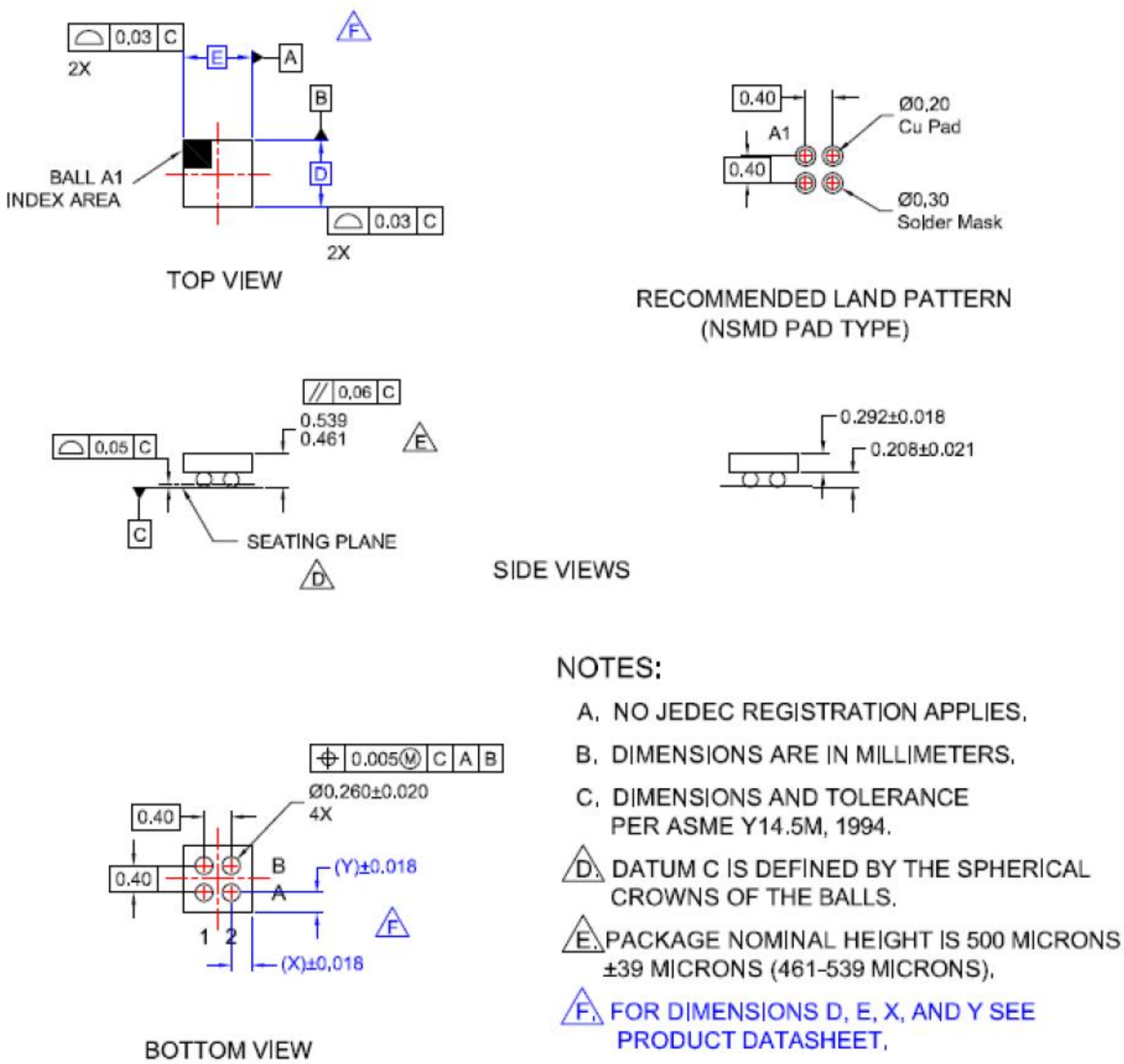


Figure 24. Official FSC Drawings

Product-Specific Dimensions

Product	D	E	X	Y
FDZ2040L	0.8 ± 0.03 mm	0.8 ± 0.03 mm	0.21 mm	0.21 mm

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/packaging/.

For current tape and reel specifications, visit Fairchild Semiconductor's online packaging area: http://www.fairchildsemi.com/products/analog/pdf/mlp_tr.pdf (XXX This link should be SPECIFIC to the package!)

FAIRCHILD SEMICONDUCTOR®

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.

Auto-SPM™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
EcoSPARK®
EfficentMax™
EZSWITCH™*
™*
®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FlashWriter®*
FPS™
F-PFS™
FRFET®
Global Power Resource℠
Green FPS™
Green FPS™ e-Series™
G*max*™
GTO™
IntelliMAX™
ISOPLANAR™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MillerDrive™
MotionMax™
Motion-SPM™
OPTOLOGIC®
OPTOPLANAR®
®
PDP SPM™
Power-SPM™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SmartMax™
SMART START™
SPM®
STEALTH™
SuperFET™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS™
SyncFET™
Sync-Lock™
SYSTEM GENERAL®*
The Power Franchise®
the power franchise
TinyBoost™
TinyBuck™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TriFault Detect™
TRUECURRENT™*
µSerDes™
SerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
XS™

* 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. 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. I40