FAIRCHILD SEMICONDUCTOR®

July 2013

FDZ4010

Integrated Load Switch

Features

- Input Voltage Range from 2 V to 5 V
- 10 mA output current
- Ultra Thin and Small Package WL-CSP 0.8 X 1.2 mm^2, Height 0.5 mm
- RoHS Compliant

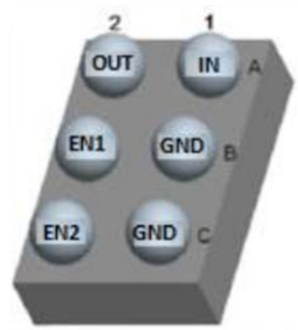
General Description

The FDZ4010 is a 10 mA high side Pch MOSFET switch that can be controlled by two enable signals. It is an AND function switch activated by asserting both enable signals high. Input voltage range operates from 2 V to 5 V to align with the requirement of portable devices power requirement. FDZ4010 is uniquely designed for optimized low power dissipation and precise driver requirement. FDZ4010 comes in a tiny 0.8 mm X 1.2 mm WLCSP, 6 bumps, with 0.4 mm pitch.

Application

- Smart Phone / Table Accessory

TOP View



BOTTOM View

6 Balls, 0.8 X 1.2 mm^2 WL-CSP

Package Marking and Ordering Information

Part Number	Device Marking	Ball Pitch	Package	Reel Size	Tape Width	Quantity
FDZ4010	Z5	0.4 mm	0.8 mm x 1.2 mm WL-CSP, 6 Bumps	7 ”	8 mm	3000

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

Application Diagram

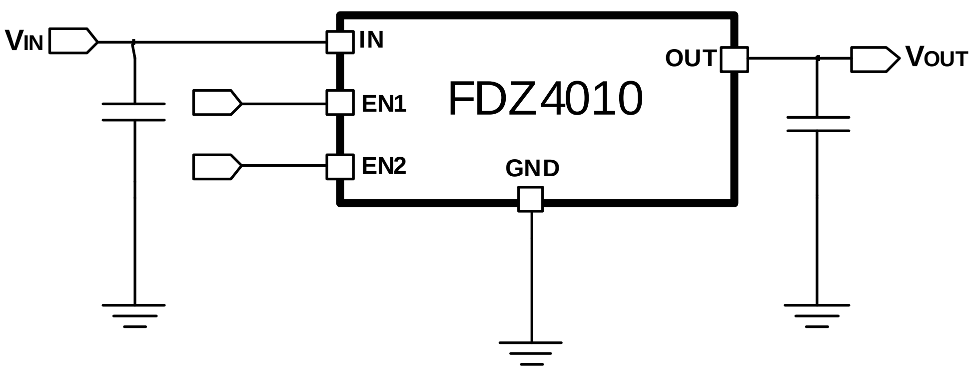


Figure 1. Typical Application

Block Diagram

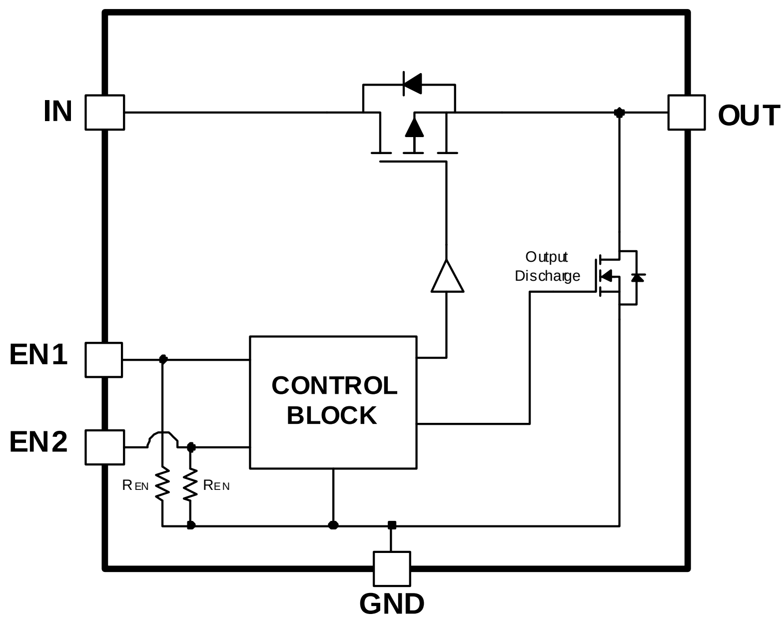


Figure 2. Functional Block Diagram

Truth Table

V_{IN} (2 V to 5 V)	EN1	EN2	PCH MOSFET Status	V_{OUT} Status
YES	HIGH	HIGH	ON	V_{IN}
YES	LOW	LOW	OFF	LOW
YES	HIGH	LOW	OFF	LOW
YES	LOW	HIGH	OFF	LOW

Table 1. Truth Table for OUT Status

Pin Configuration

Figure 3. Pin Assignments

Pin Definitions

Pin #	Name	Description
A1	IN	Input of the Pch MOSFET Switch
A2	OUT	Output of the Pch MOSFET Switch. Internally, this pin is pulled down through an output discharge FET to Ground when EN pins are low and V_{IN} is present.
B1, C1	GND	Ground
B2	EN1	ON/OFF control input, Active High.
C2	EN2	ON/OFF control input, Active High.

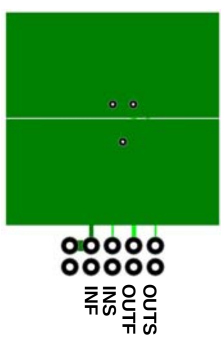
Absolute Maximum Ratings

Characteristics		Min.	Max.	Unit
V_{IN}, V_{OUT} to GND		-0.3	6	V
V_{EN1},V_{EN2} to GND		-0.3	6	V
Continuous Output Current			20	mA
Junction Temperature (T_J)			150	^oC
Storage Temperature Range (T_{STG})		-65	150	^oC
Thermal Resistance, Junction to Ambient (θ_{JA})	(Note 1b)		312	°C/W
Electrostatic Discharge	Human Body Model, ANSI/ESDA/ JEDEC JS-001-2012	5		kV
	Charged Device Model, JESD22-C101	2		

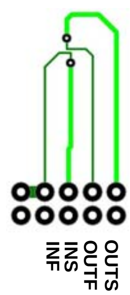
Recommended Operating Conditions

Characteristics	Symbol	Min.	Max.	Unit
IN Voltage	V_{IN}	2	5	V
OUT Current, V_{IN} = 3.3 V , V_{EN1} = V_{EN2} = 3.3 V	I_{OUT}		10	mA
EN1, EN2 Voltage	V_{EN1} ,V_{EN2}		5	V
Operating Temperature Range		-40	85	^oC

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 suface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. 115 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 312 °C/W when mounted on a minimum pad of 2 oz copper.

Electrical Characteristics V_{IN} = 2 V to 5 V, T_J = 25 °C , unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{IH}	Input High Voltage, EN1, EN2	V_{IN} = 2.5 V to 5 V and across temperature range	1.375			V
V_{IH}	Input High Voltage, EN1, EN2	V_{IN} = 2 V and across temperature range	1.525			V
V_{IL}	Input Low Voltage, EN1, EN2	V_{IN} = 2 V to 5 V and across temperature range			0.95	V
R_{EN}	Pull Down Resistance at EN1, EN2	V_{EN1} = V_{EN2} = 1 V and across temperature range	70	100	130	kΩ
C_{EN}	Input Capacitance of EN1, EN2	f = 1 MHz and across temperature range (Note 2)			10	pF
$R_{DS(ON)}$	On-Resistance of Pch MOSFET	I_{OUT} = 10 mA, V_{IN} = 2 V to 5 V			1.5	Ω
I_Q	Quiescent Current	V_{IN} = 5 V, V_{EN1} = V_{EN2} = 5 V, V_{OUT} floating (I_{OUT} = 0), Across temperature range			500	μA
I_{SD}	Shutdown Current	V_{IN} = 3.3 V, V_{EN1} = V_{EN2} = 0 V, V_{OUT} floating (I_{OUT} = 0), Across temperature range			1	μA
		V_{IN} = 3.3 V, V_{EN1} = 825 mV & V_{EN2} = 425 mV, V_{EN1} = 425 mV & V_{EN2} = 825 mV, V_{OUT} floating (I_{OUT} = 0), Across temperature range			10	μA
R_{OUT}	Pull Down Resistance at OUT Pin	V_{EN1} = V_{EN2} = 0 V		1	1.3	kΩ
t_{on}	Turn-On Time	Load Impedance, V_{IN} = 3.3 V, C_L = 50 pF, R_L = 500 Ω, V_{EN1} = V_{EN2} = 0 V to 2.3 V, (500 ns rise time)			1	μs
t_r	Turn-On Rise Time				0.95	μs
t_{off}	Turn-Off Time				2	μs
t_f	Turn-Off Fall Time				2	μs

Notes:
2. Guaranteed by characterization and design

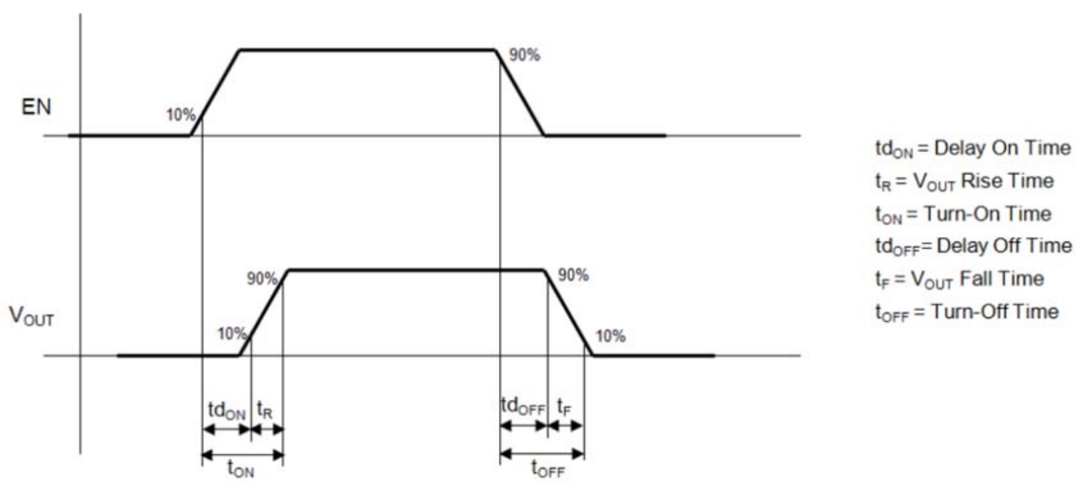


Figure 4. Timing Diagram

Typical Characteristics (Continued)

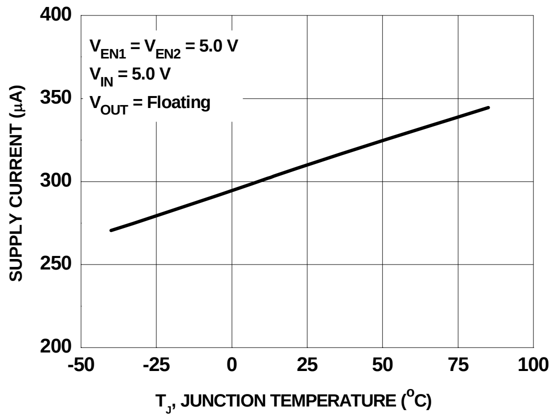


Figure 5. Quiescent Current vs Temperature

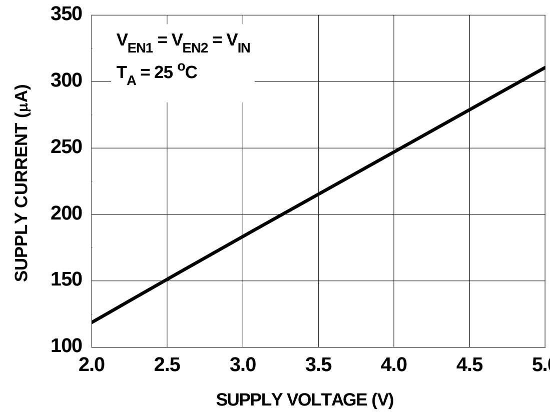


Figure 6. Quiescent Current vs Supply Voltage

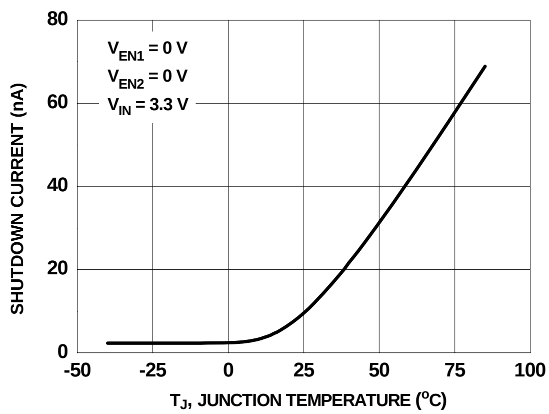


Figure 7. Shutdown Current vs Temperature

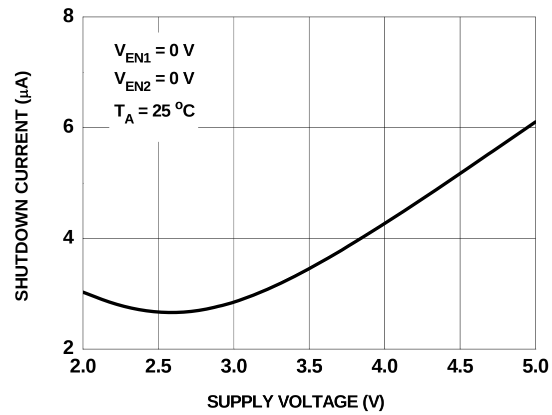


Figure 8. Shutdown Current vs Supply Voltage

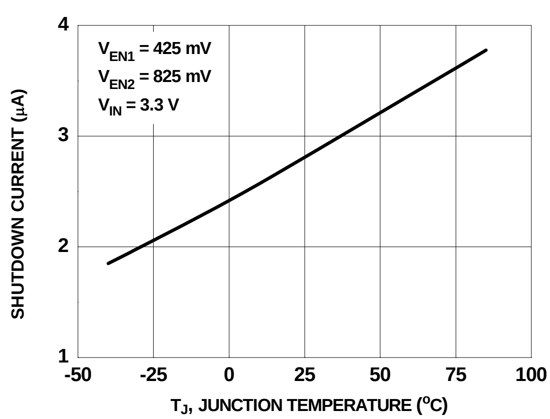


Figure 9. Shutdown Current vs Temperature

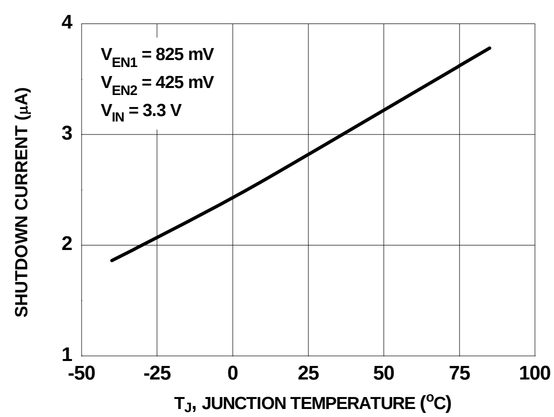


Figure 10. Shutdown Current vs Temperature

Typical Characteristics (Continued)

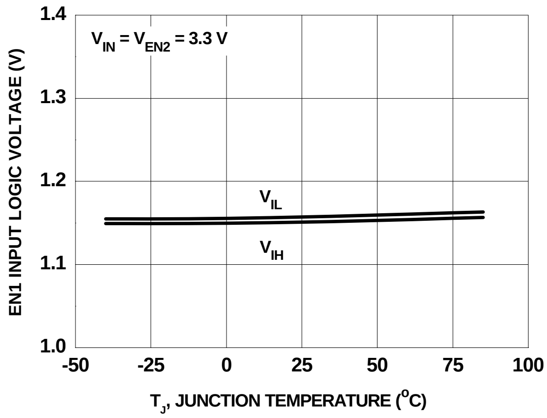


Figure 11. EN1 Logic Voltage vs Temperature

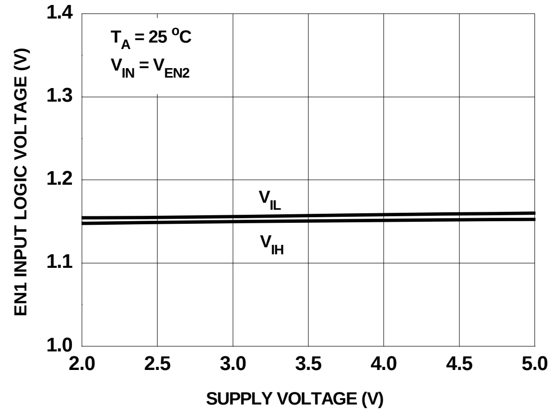


Figure 12. EN1 Logic Voltage vs Supply Voltage (V_{IN})

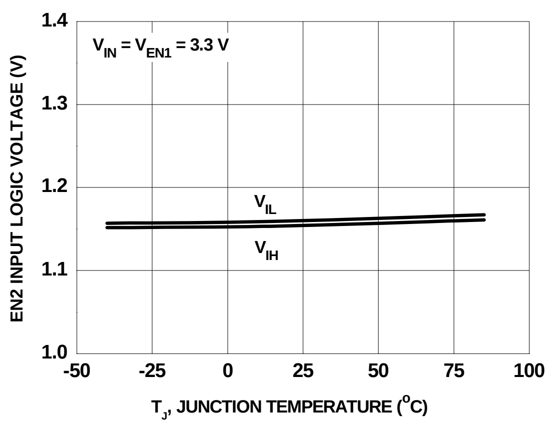


Figure 13. EN2 Logic Voltage vs Temperature

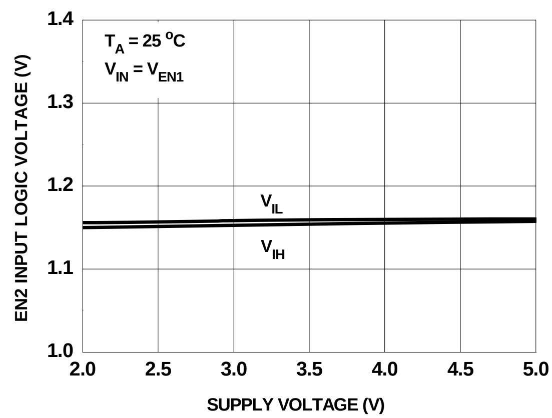


Figure 14. EN2 Logic Voltage vs Supply Voltage (V_{IN})

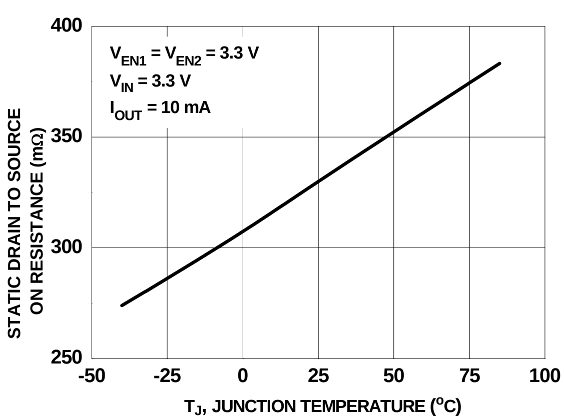


Figure15. Static Drain to Source ON Resistance vs Temperature

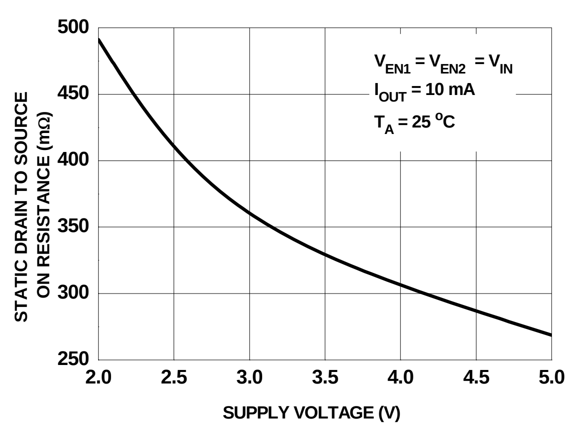


Figure 16. Static Drain to Source ON Resistance vs Supply Voltage

Typical Characteristics (Continued)

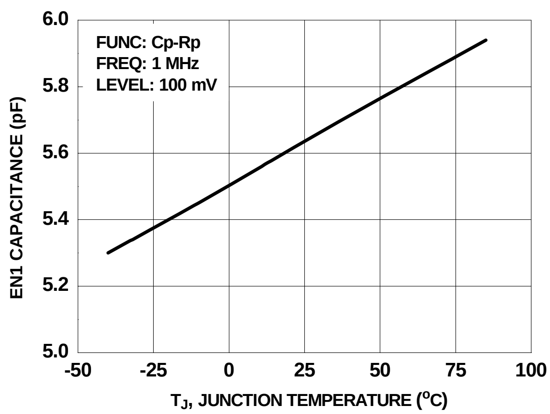


Figure 17. EN1 Capacitance vs Temperature

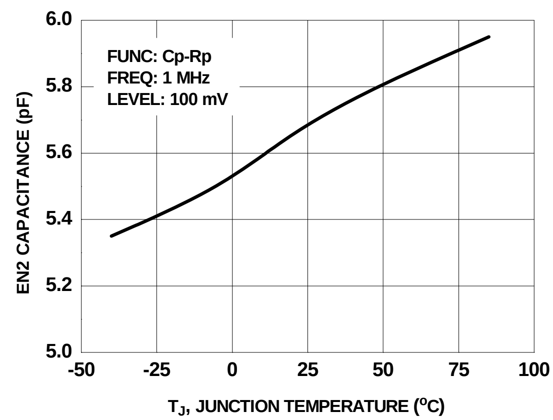


Figure 18. EN2 Capacitance vs Temperature

Typical Characteristics (Continued)

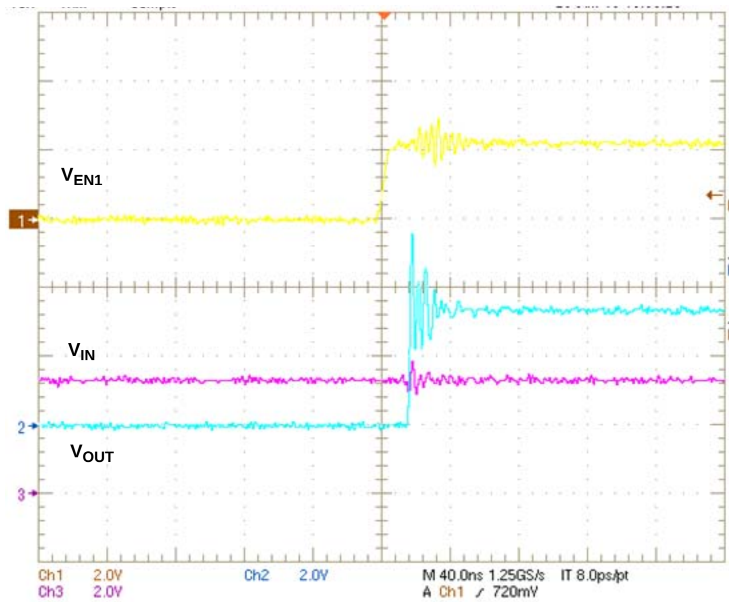


Figure 19. Turn-On Time (V_{IN} = 3.3 V, V_{EN2} = 2.3 V, V_{EN1}= 0 to 2.3 V, C_{OUT} = 50 pF, R_L= 500 Ω, timescale = 40 us/div)

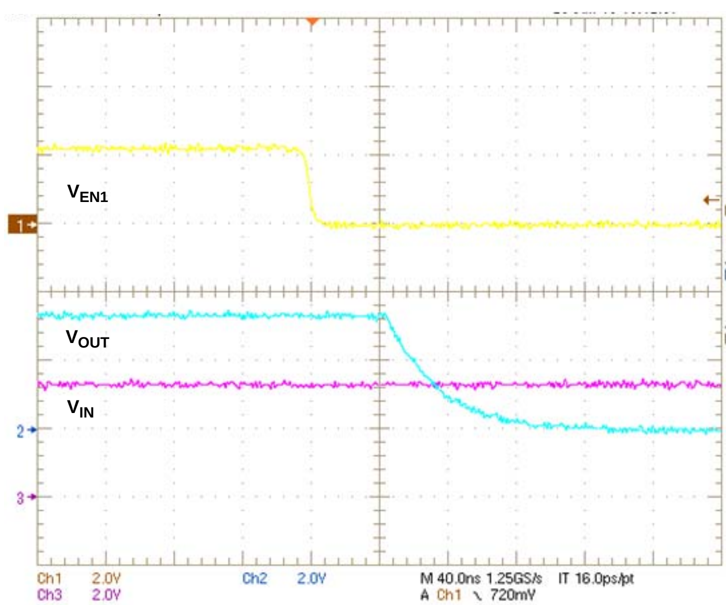


Figure 20. Turn-Off Time (V_{IN} = 3.3 V, V_{EN2} = 2.3 V, V_{EN1}= 2.3 to 0 V, C_{OUT} = 50 pF, R_L= 500 Ω, timescale = 40 us/div)

Typical Characteristics (Continued)

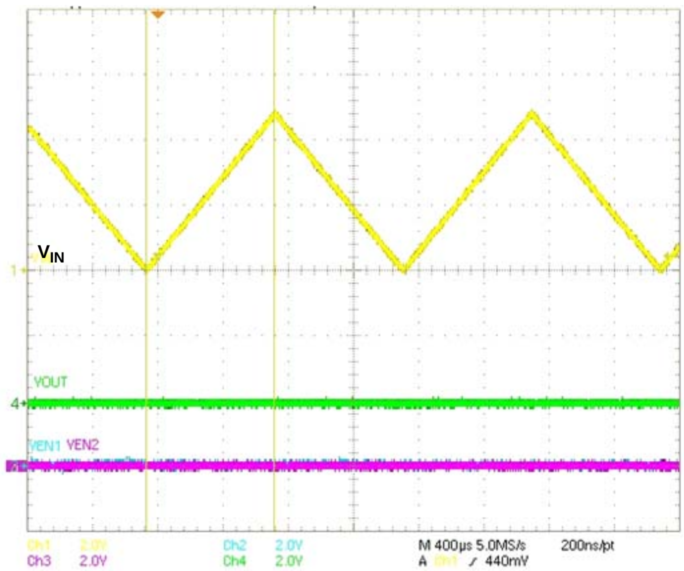


Figure 21. V_{IN} Ramp Up and Down (V_{IN} = 0 to 4.8 V (6100 V/sec), EN1 and EN2 are floating(Internally GND), C_{OUT} = 50 pF, R_L= 500 Ω, timescale = 400 us/div)

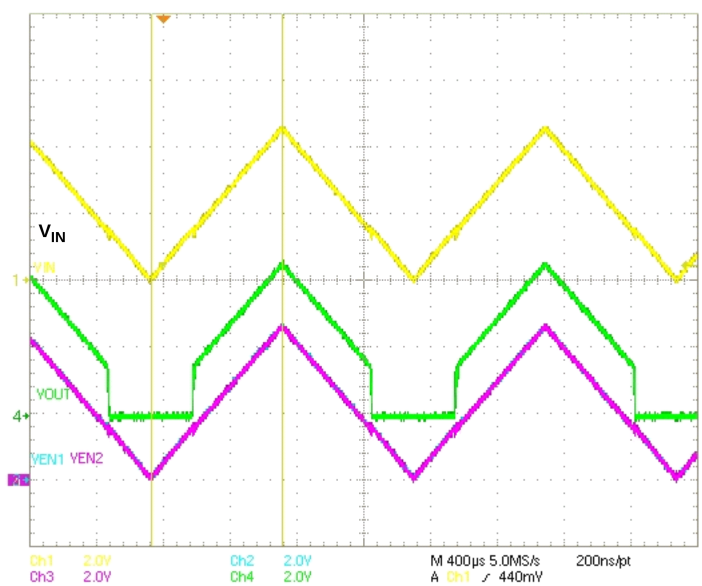


Figure 22. V_{IN} Ramp Up and Down (EN1 = EN2 = V_{IN} = 0 to 4.8 V (6100 V/sec), C_{OUT} = 50 pF, R_L= 500 Ω, timescale = 400 us/div)

Application Information

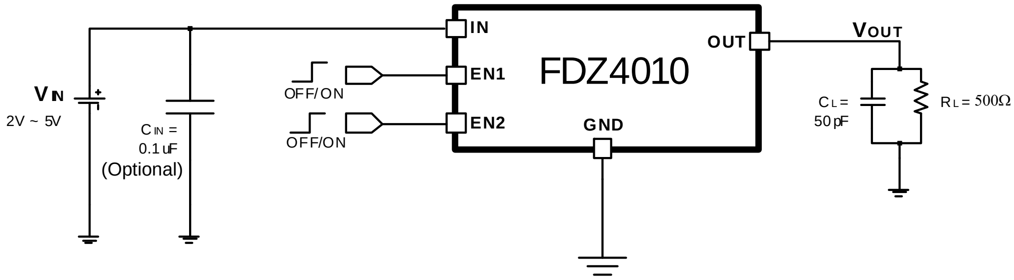


Figure 23. Typical Application Circuit

Input Voltage

Input Voltage (V_{IN}) is set from 2 V to 5 V.

Input Capacitor

To prevent the input voltage being pulled below the minimum operating voltage, a reservoir capacitor can be connected from IN to GND. 0.1 μF ceramic type is suitable.

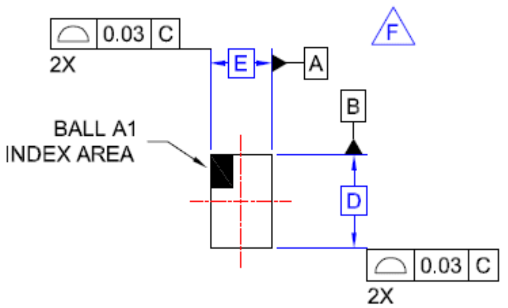
Enable/Shutdown Operation

To turn on the switch, both the EN pins need to be asserted high. To ensure proper operation, Enable signals must be able to swing above and below the specified turn-on/off voltage threshold described in the Electrical Charateristics table under VIL and VIH for the selected input voltage.

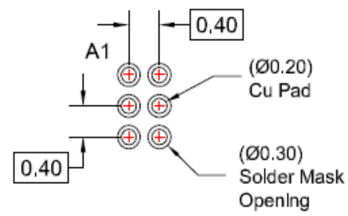
Power up Sequence

Turn on input voltage (V_{IN}) within range from 2 V to 5 V then turn on EN1 or/and EN2 signal. V_{OUT} status changed by EN1 or/and EN2 signal input and defined the status in Table 1 Truth Table.

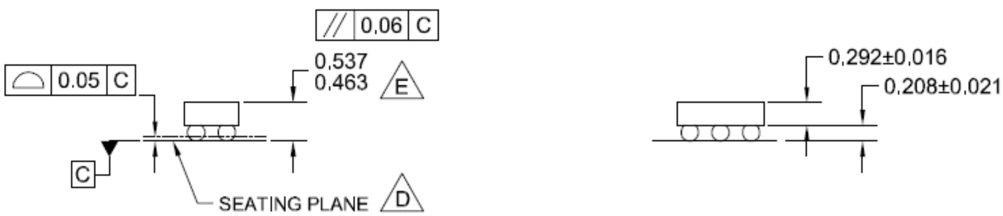
Dimensional Outline and Pad Layout



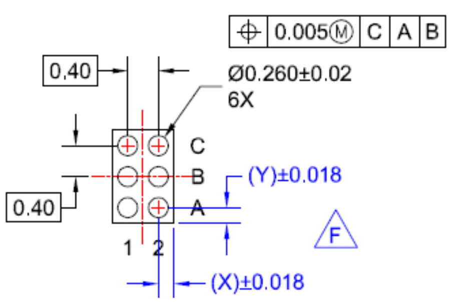
TOP VIEW



RECOMMENDED LAND PATTERN
(NSMD PAD TYPE)



SIDE VIEWS



BOTTOM VIEW

NOTES:

A. NO JEDEC REGISTRATION APPLIES.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASMEY14.5M, 1994.

D. DATUM C, THE SEATING PLANE IS DEFINED BY THE SPHERICAL CROWNS OF THE BALLS.

E. PACKAGE TYPICAL HEIGHT IS 463 MICRONS ±37 MICRONS (463-537 MICRONS).

F. FOR DIMENSIONS D, E, X, AND Y SEE PRODUCT DATASHEET.

Product-Specific Dimensions

Product	D	E	X	Y
FDZ4010	1.16 mm	0.76 mm	0.18 mm	0.18 mm

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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.

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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.

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