

General Description

NOTION is a single-channel load switch with an external programmable start up time to control in-rush current.

NOTION contains an N-channel MOSFET that can operate over an input voltage range of 1 V to 5.5 V and can support a maximum continuous current of 2 A. The power switch is controlled by a logic input pin 'EN'.

NOTION has an external output discharge pin 'ODIS' that discharges the output through an external resistor when EN is low.

Initial prototype package is a 16 pin 3mm x3mm QFN <QFN1633>

Specification Targets

Input Range	1.0 to 5.5V
OUT current	3A
OUT Impedance	50mΩ@5V
In Rush Control	Configurable

Applications

Notebooks and Tablets
Medical Equipment
Telecom systems
Consumer portable electronics

Typical Application Circuit

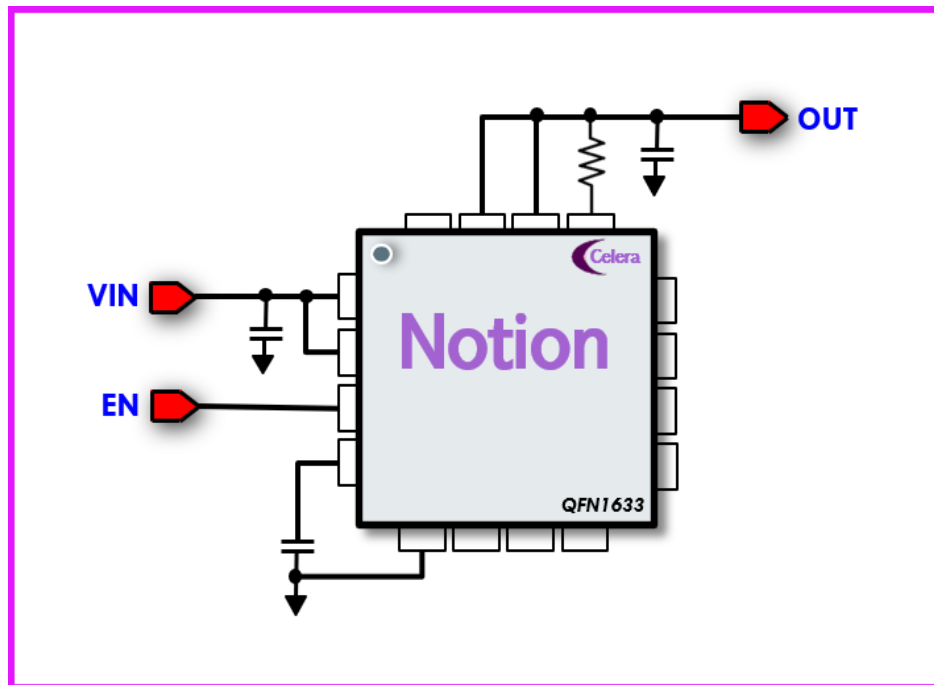
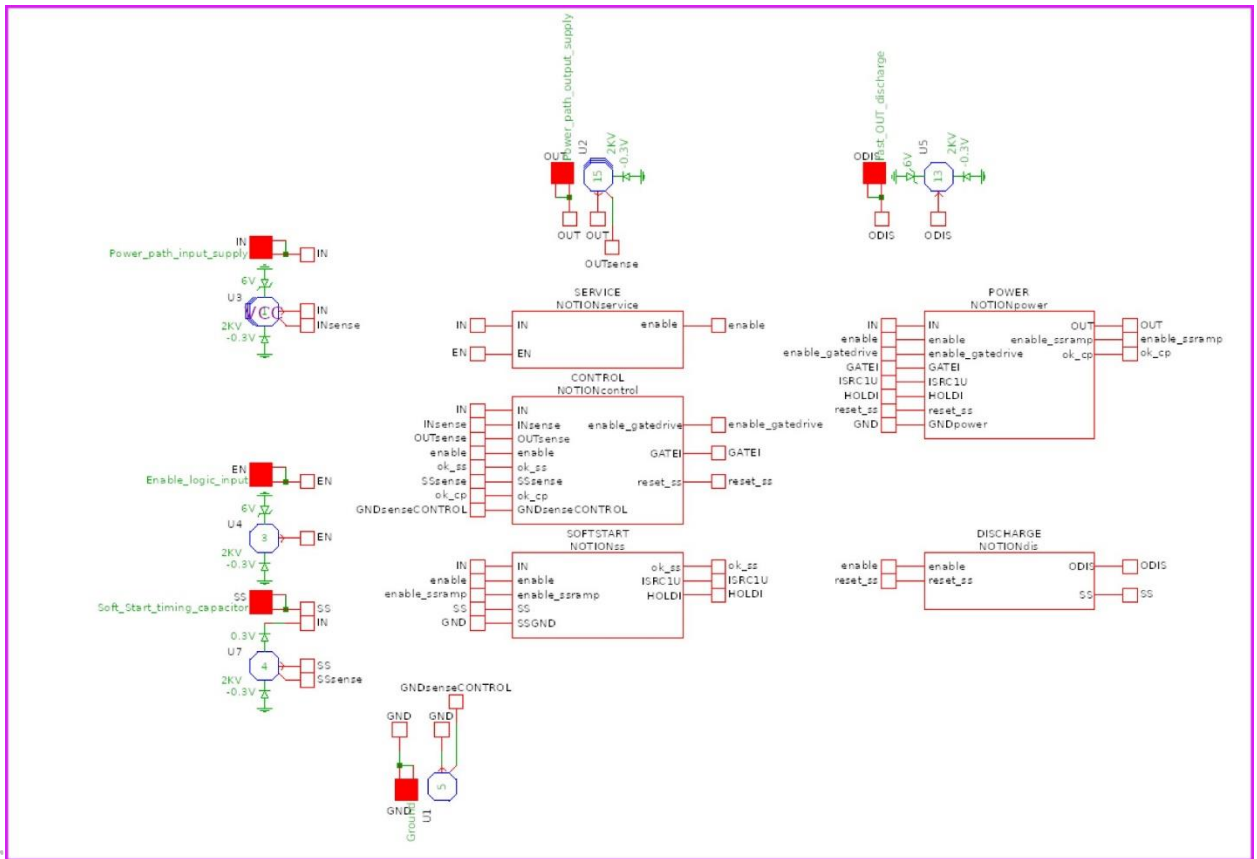
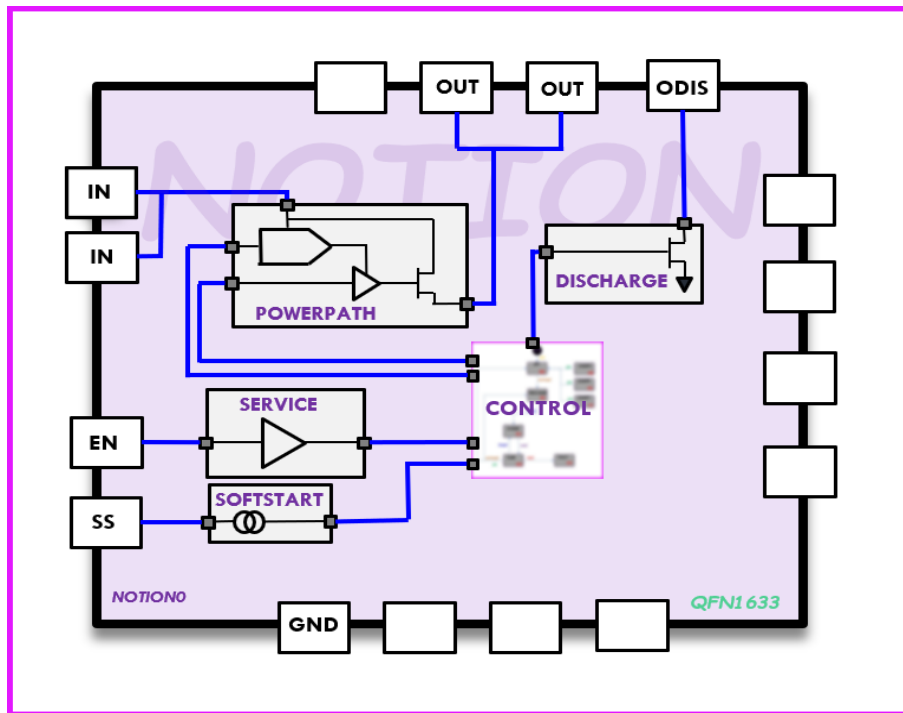


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Simplified Block Diagrams



Electrical Characteristics

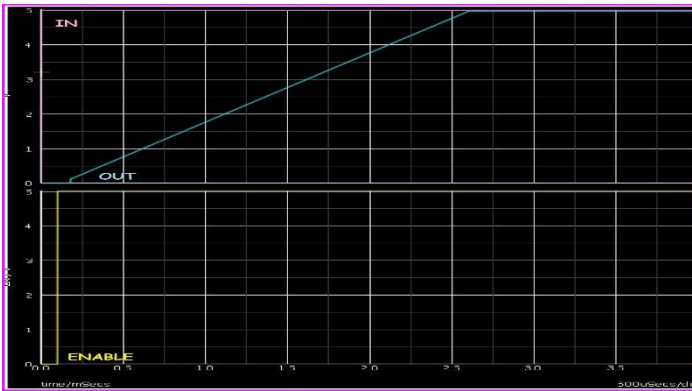
VIN=5.0V, C_{ss}=220pF, Ta operating range is -40C to 125C. Ta=25C unless otherwise stated

Parameter	Symbol	Conditions	min	typ	max	units
Operating Range						
Input Operating Range	IN		1		5.5	V
Temperature	Ta		-40		125	C
SOFTSTART						
Shutdown Current	I(INsd)	EN=0			1	uA
Supply Current	I(IN)	EN=1, I(OUT)=0A		10	15	uA
Input Bias Current	I(EN)	V(EN)=5.5V		5.5	100	nA
DISCHARGE						
SS Charge Current	I(SS)	SS=0V		1.0	1.5	uA
SS Gain	A(SS)	SS to OUT Voltage gain		2		V/V
SS Discharge Impedance	R(SS)	SS=1V		200	400	Ohm
CONTROL						
EN Threshold	VTHenr	EN rising		0.7	0.95	V
	VTHenf	EN falling	0.45	0.6		V
POWER						
OUT output Impedance	R(OUT)	I(OUT)=100mA		50	10	mOhm
OUT Turn on time	TON(OUT)	Circuit: Typical Application		2		ms
OUT Turn off time	TOFF(OUT)	Circuit: Typical Application		2		us
OUT Start up time	TD(OUT)	EN to OUT=10% of IN		0.7	1.0	ms

Top Level Verification Report

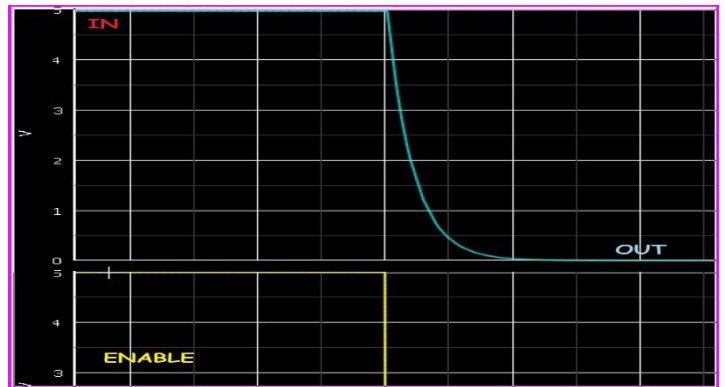
Parameter	Symbol	Conditions	Celera	Units
Start up at VIN=5V	toc0	IN=5V, CL=10uF, RL=100hm, EN rising	1950	us
Shutdown at VIN=5V	toc1	IN=5V, CL=10uF, RL=100hm, EN falling	2	us
Start up at VIN=3.3V	toc2	IN=3.3V, CL=10uF, RL=100hm, EN rising	2490	us
Shutdown at VIN=3.3V	toc3	IN=3.3V, CL=10uF, RL=100hm, EN falling	2	us
Start up at VIN=1.8V	toc4	IN=1.8V, CL=10uF, RL=100hm, EN rising	720	us
Shutdown at VIN=1.8V	toc5	IN=1.8V, CL=10uF, RL=100hm, EN falling	2	us
Start up at VIN=1.0V	toc6	IN=1V, CL=10uF, RL=100hm, EN rising	410	us
Shutdown at VIN=1.0V	toc7	IN=1V, CL=10uF, RL=100hm, EN falling	1	us
ODIS shutdown	toc8	IN=3.3V,EN falling R(ODIS)=float	pass	p/f
	toc8	IN=3.3V,EN falling R(ODIS)=5000hm	pass	p/f
Hard OUT short	toc10	IN=5V, Short=1ms	fail	p/f
	toc11	IN=5V, Short=10us	pass	p/f
In Rush Current	toc12	IN=5V, CL=10uF, C(SS)=Float	pass	p/f
	toc13	IN=5V, CL=10uF, C(SS)=220pF	TBD	p/f

TOC0 - Startup@5.0V



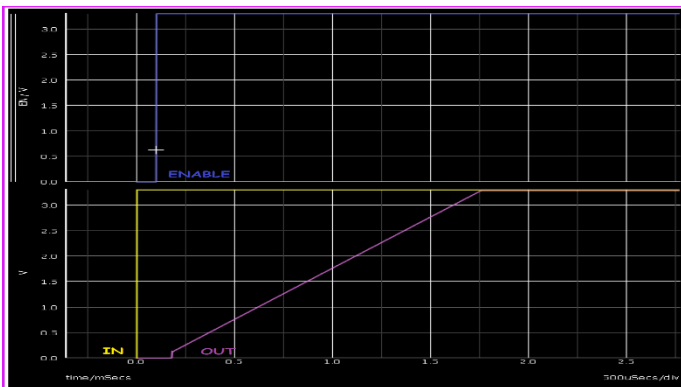
Cl=10uF, Rl=10 Ohm

TOC1 Shutdown@5.0V

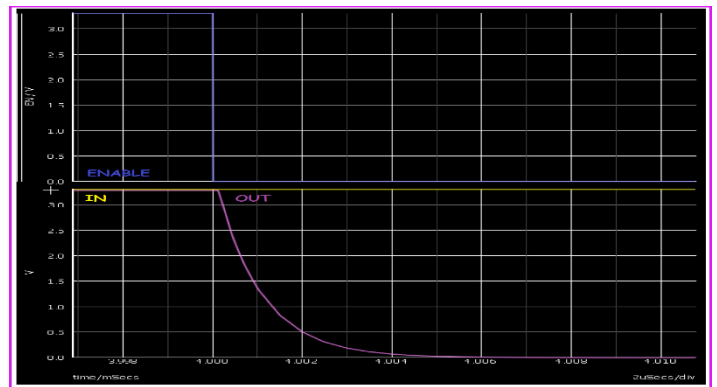


Cl=10uF, Rl=10 Ohm

TOC2 - Startup@3.3V

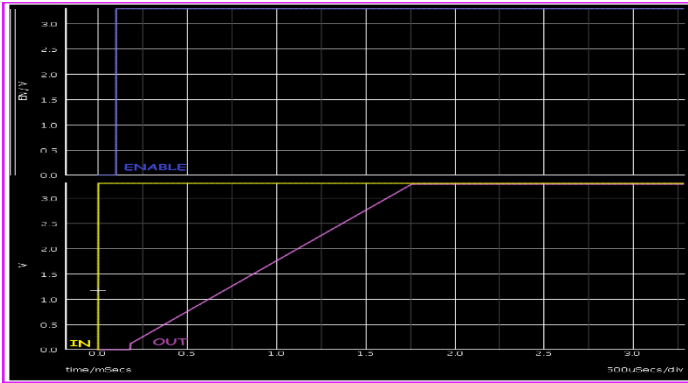


TOC3 Shutdown@3.3V



Cl=10uF, RI=10 Ohm

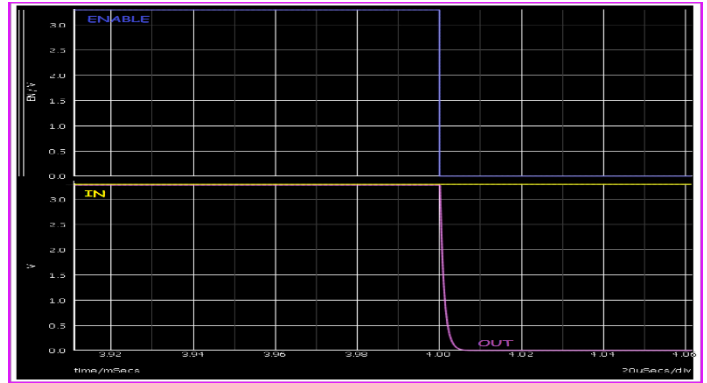
TOC4 - Startup@1.8V



Cl=10uF, RI=10 Ohm

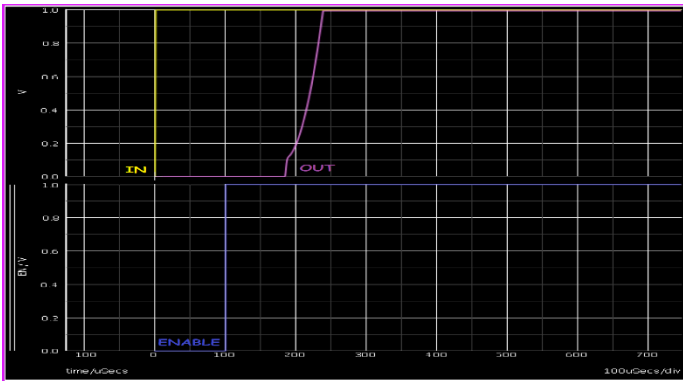
Cl=10uF, RI=10 Ohm

TOC5 Shutdown@1.8V



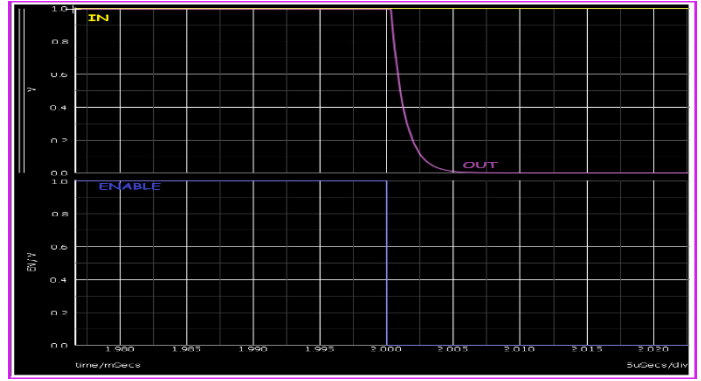
Cl=10uF, RI=10 Ohm

TOC6 - Startup@1.0V



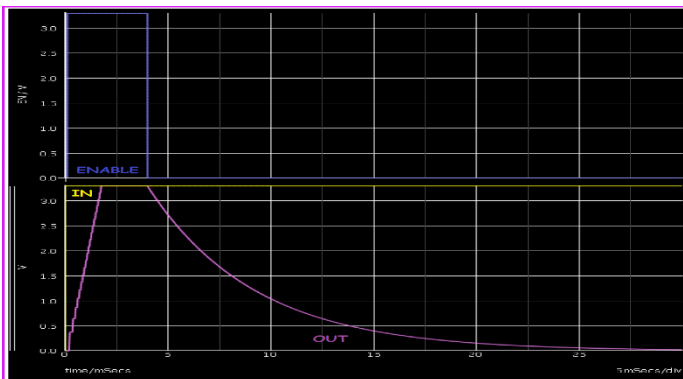
Cl=10uF, RI=10 Ohm

TOC7 Shutdown@1.0V



Cl=10uF, RI=10 Ohm

TOC8 - ODIS Shutdown@3.3V



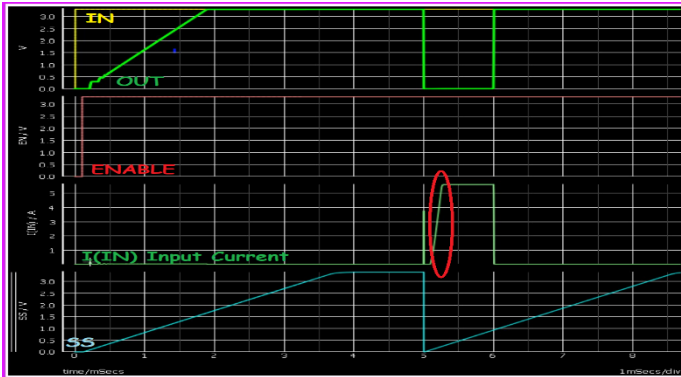
Cl=1uF, R(ODIS)=float

TOC9 - ODIS Shutdown@3.3V



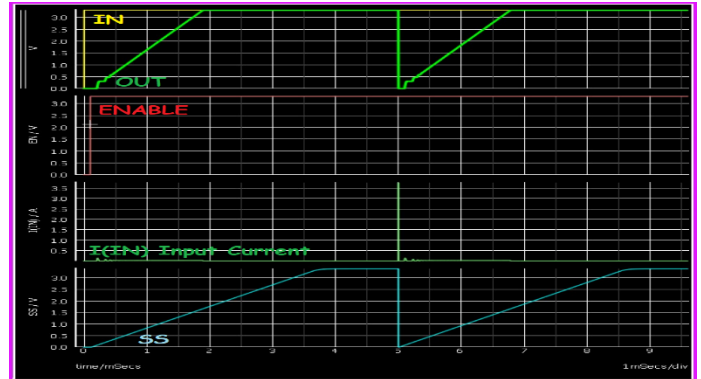
Cl=1uF, R(ODIS)=500Ohm - Missing TOC

TOC10 - Hard Short (1ms)



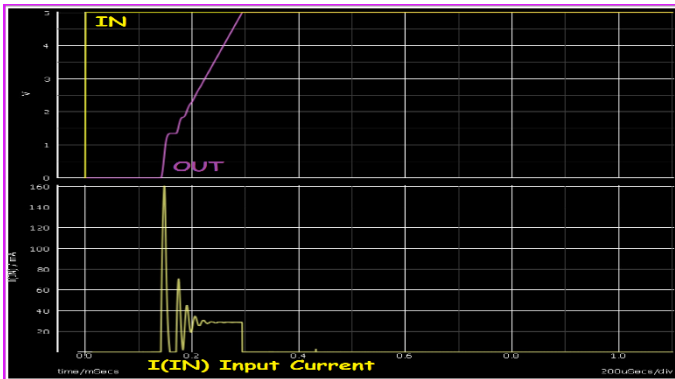
IN=5V, OUT=1mOhm

TOC11 - hard Short (10us)



IN=5V, OUT=1mOhm Load

TOC12 - In Rush Current



CL=22uF C_{ss}=Float

TOC13 - In Rush Current



CL=22uF C_{ss}=220pF IPOTT model review

Detailed Description

Control

The EN pin controls the state of the power FET. EN is active high and has a low threshold, making it capable of interfacing with low-voltage signals. EN has a passive 1M Ω pull down, so if floating NOTION will be disabled. There is a small deglitch filter (5 μ s) to protect against runt input pulses.

Discharge

The ODIS pin will discharge the OUT pin when EN is low.

When EN=0, ODIS has an active open drain 200 Ω pull down. This can be connected directly to OUT when EN is set low.

If this discharge rate is too high, and external resistor between ODIS and OUT can be added.

If ODIS is floated, OUT has no active discharge and will be high impedance when EN=0.

Power Removal

When the IN source is removed, the input filter cap C(IN) will start to discharge. Past a certain V(IN) level, the strength of the ODIS pull down switch will be reduced. If there is still remaining charge on OUT, this will result in longer discharge times.

In Rush Current

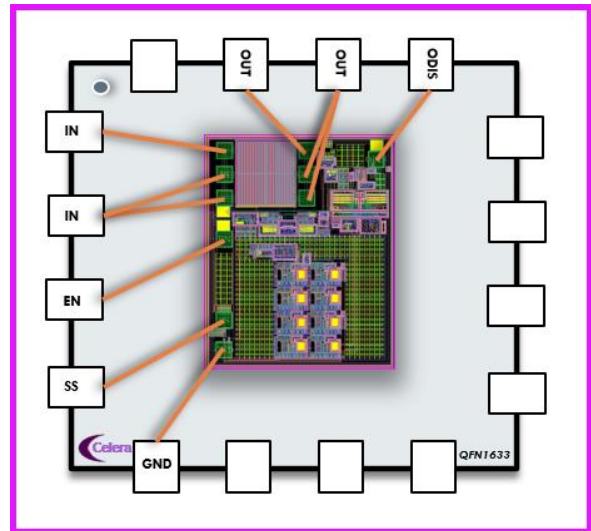
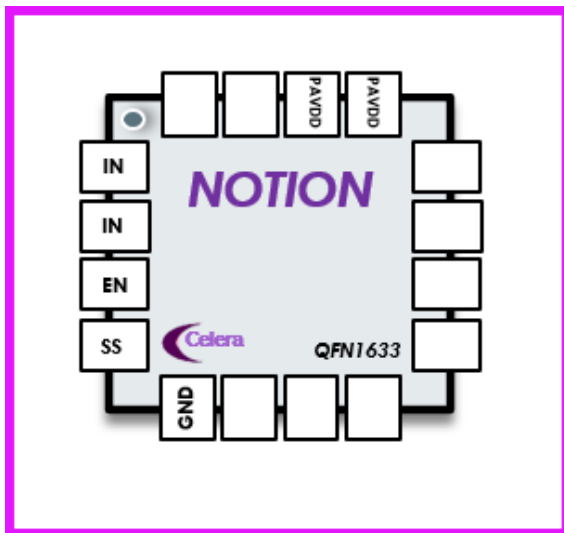
The SS pin sets the slew rate of OUT when EN is active. The SS capacitor will charge up from Ground to IN when the part is enabled. When OUT is equal to IN, the soft start phase is complete, The SS charge current (1 μ A) defines the required slew rate for the system.

If SS is left floating, the minimum internal slew rate is 100 μ s (typical).

If there is a hard fault on OUT and OUT drops quickly, the SS pin is quickly discharged, and NOTION will restart through the soft start process.

Preliminary Pinout

Pin	Pin Name	Description
1	IN	Input Supply. Connect 1uF to Ground. Power Path Input
2	IN	Input Supply. Connect 1uF to Ground. Power Path Input
3	EN	Logic Input enable. Connect to IN to enable NOTION
4	SS	Soft Start Timer. Connect C(SS) to Ground to define startup timing
5	GND	Ground
8	NC	No Internal Connection
9	NC	No Internal Connection
10	NC	No Internal Connection
11	NC	No Internal Connection
12	NC	No Internal Connection
13	ODIS	Output Discharge. Connect R(ODIS) to discharge OUT when EN=0V
14	OUT	Power Path Output
15	OUT	Power Path Output
16	NC	No Internal Connection

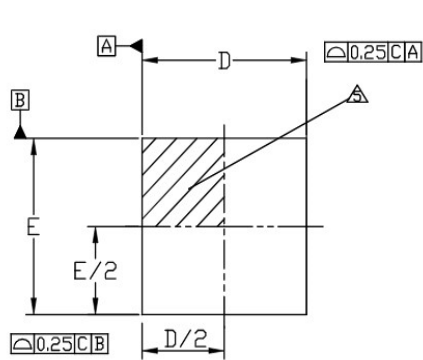


Absolute maximum Rating

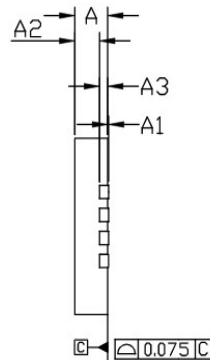
Pin	Pin Name	AbsMin	AbsMax	Units	ESD
1	IN	-0.3	+6	V	+/-2KV
2	IN	-0.3	+6	V	+/-2KV
3	EN	-0.3	+6	V	+/-2KV
4	SS	-0.3	IN+0.3	V	+/-2KV
5	GND	-	-	-	-
13	ODIS	-0.3	+6	V	+/-2KV
14	OUT	-0.3	+6	V	+/-2KV
15	OUT	-0.3	+6	V	+/-2KV

Package Details QFN1633

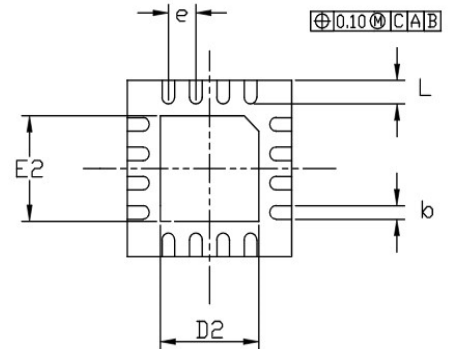
N	b			D2			E2			e	L		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.
16	0.18	0.23	0.30	1.50	1.60	1.70	1.50	1.60	1.70	0.50 BSC	0.35	0.40	0.45



TOP VIEW



SIDE VIEW



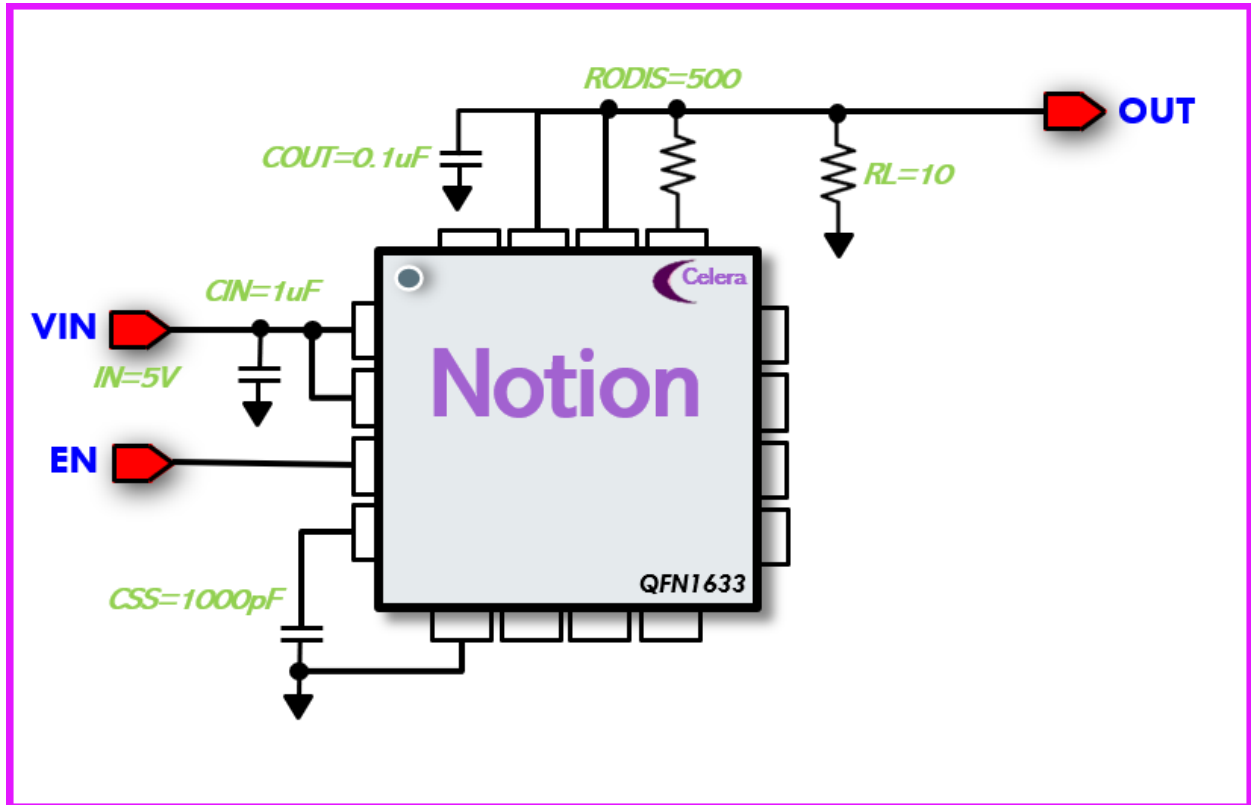
BOTTOM VIEW

SYMBOL	THICKNESS - OPTION 1						THICKNESS - OPTION 2					
	DIMENSION IN MM			DIMENSION IN INCH			DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.80	0.90	0.028	0.031	0.035	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.00	0.02	0.04	0.0075	0.0008	0.0015	0.00	0.02	0.04	0.0075	0.0008	0.0015
A2	0.55	0.60	0.65	0.022	0.024	0.026	0.75	0.80	0.85	0.030	0.032	0.033
A3	0.20 REF.			0.008 REF.			0.20 REF.			0.008 REF.		
D	3.00 BSC			0.118 BSC			3.00 BSC			0.118 BSC		
E	3.00 BSC			0.118 BSC			3.00 BSC			0.118 BSC		
JEDEC	MO-220						MO-220					

NOTES:

1. CONTROLLING DIMENSIONS IN MM.
2. DIMENSION TOLERANCES ARE ±0.1 (ANGULAR TOLERANCE ±3°) UNL OTHERWISE SPECIFIED.
3. ALL DIMENSIONS AND TOLERANCES CONFORM TO ANSI Y14.5M-1994.
4. COPLANARITY APPLIES TO EXPOSED PAD AS WELL AS TERMINALS.
5. PIN 1 LOCATION MAY BE IDENTIFIED BY A MARKED FEATURE.
6. JEDEC REFERENCE MO-220.

Typical Application Circuit



Application Notes

Input Capacitance

To limit any voltage drop on the input supply caused by transient in-rush currents when the Power FET turns on, an input capacitor needs to be placed between VIN and GND. CIN should be placed as close to the pins as possible.

Output Capacitance

Standard recommendation is to have an input capacitor CIN that is ten times higher than the output capacitor to avoid excessive voltage drop.

Safe Operating Region

The Safe Operating Area (SOA) defines the safe operating conditions of the load switch. Operation outside of this region can degrade the performance, reliability, and lifetime of the device, and can potentially damage other components within the system. The load switch must have a continuous current rating greater than the maximum load current of the application.

The integrated Power FET must not be operated outside of the maximum VDS and VGS specifications. The device datasheet specifies the absolute maximum ratings

The application must evaluate whether the device will operate within its specified SOA. The outer boundaries of the safe operating area are determined by the R(OUT) at maximum junction temperature, the maximum OUT current I(OUT), and the rated breakdown voltage V(OUT)max of the device. The maximum operating DC current is limited by the package, source wires, gate wires and die characteristics.

Register Map Summary

<<Not Inserted>>

RegisterMap Detailed Description

<<Not Inserted>>

Factory "Functional" Summary

//**Celera:** <<Not Inserted>>

Factory "Functional" Detailed Description

<<Not Inserted>>

Accuracy Summary

<<Not Inserted>>

Accuracy Detailed Description

<<Not Inserted>>

DFT Summary

<<Not Inserted>>

DFT Detailed Description

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