

General Description

The SY20806G is a small, low R_{ON} , single channel load switch with controlled slew rate. The device contains an N-channel MOSFET that can operate over an input voltage range of 1.05V to 5.5V and can support a maximum continuous current of 2A. The switch is controlled by an on and off input (Active low), which is capable of interfacing directly with low-voltage control signals.

The small size and low R_{ON} make the device ideal for being used in space constrained, battery powered applications. The wide input voltage range of the switch makes it a versatile solution for many different voltage rails. The controlled rise time of the device greatly reduces inrush current caused by large bulk load capacitances, thereby reducing or eliminating power supply droop.

The SY20806G further reduces the total solution size by integrating a 143Ω pull-down resistor for quick output discharge when the switch is turned off.

The SY20806G is available in a small, space-saving $0.78\text{mm} \times 0.78\text{mm}$, 0.4-mm pitch, 0.5-mm height 4-pin CSP package. The device is characterized for operation over the free-air temperature range of -40°C to $+105^\circ\text{C}$.

Ordering Information

SY20806 $\square(\square\square)\square$

- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package Type	Note
SY20806GPAC	CSP0.78×0.78– 4	----

Features

- Wide Input Voltage Range: 1.05V to 5.5V
- Ultra-low R_{ON} :
 - $37\text{m}\Omega(\text{typ})$ at $V_{IN} = 5\text{V}$
 - $38\text{m}\Omega(\text{typ})$ at $V_{IN} = 3.3\text{V}$
 - $43\text{m}\Omega(\text{typ})$ at $V_{IN} = 1.8\text{V}$
- 2A Maximum Continuous Switch Current
- Low Quiescent Current: $9.7\mu\text{A}$ at $V_{IN}=3.3\text{V}$
- Controlled Slew Rate:
 - $1200\mu\text{s}$ rise time at $V_{IN}=3.3\text{V}$
- Package: CSP0.78mm x 0.78mm – 4

Applications

- Note Book
- Cell Phone

Typical Applications

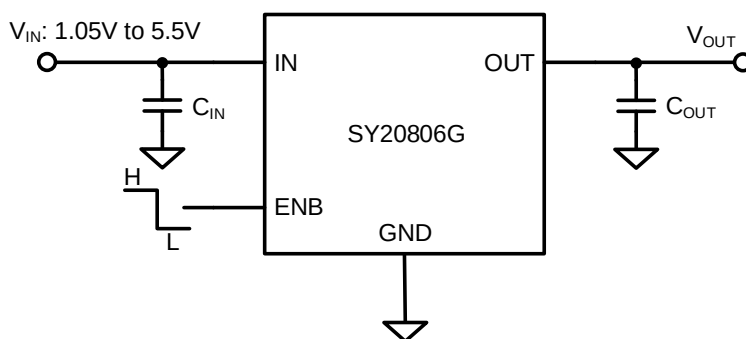
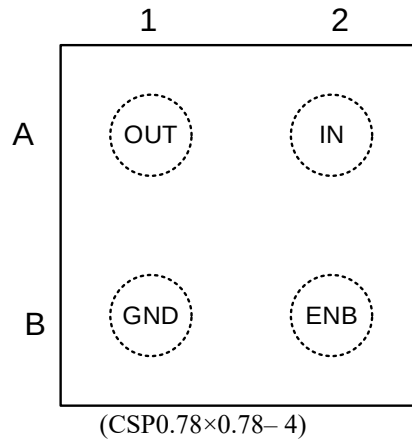


Figure 1. Schematic Diagram

Pinout(Top view)



Top Mark: **r3xyz**(Device code: **r3**; **x**=year code, **y**=week code, **z**= lot number code)

Pin Name	Pin number	Pin Description
IN	A2	Input pin, decoupled with at least a 1μF MLCC capacitor to GND.
GND	B1	Ground pin.
OUT	A1	Output pin, decoupled with a 2.2μF MLCC capacitor to GND.
ENB	B2	ON/OFF control, active low. Do not leave it floating.

Block Diagram

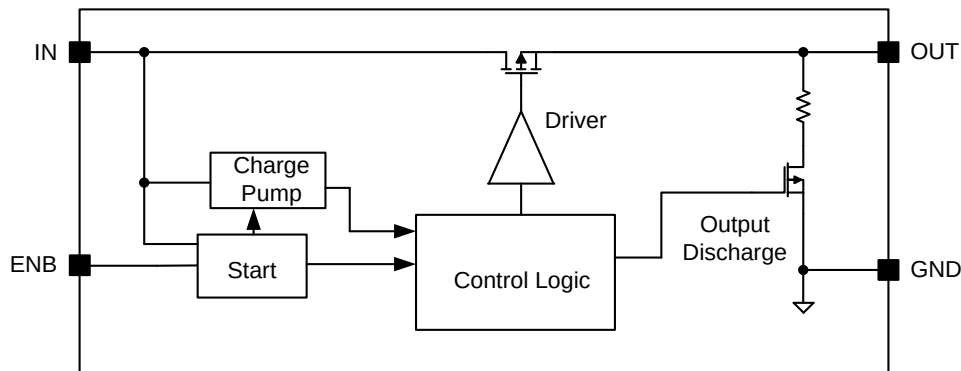


Figure2. Block Diagram

Absolute Maximum Ratings (Note 1)

IN, OUT, ENB to GND	-----	-0.3V to 6V
Power Dissipation, P_D @ $T_A = 25^\circ\text{C}$	-----	0.52W
Package Thermal Resistance (Note 2)		
θ_{JA}	-----	193°C/W
θ_{JC}	-----	2.3°C/W
Junction Temperature	-----	-40°C to 150°C
Lead Temperature (Soldering, 10 sec.)	-----	260°C
Storage Temperature Range	-----	-65°C to 150°C

Recommended Operating Conditions (Note 3)

IN	-----1.05V to 5.5V
OUT	----- 0V to V_{IN}
ENB	----- 0V to 5.5V
Junction Temperature Range	----- -40°C to 125°C
Ambient Temperature Range	----- -40°C to 105°C

Electrical Characteristics

(Unless otherwise noted, the specification in the following table applies over the operating ambient temperature $-40^{\circ}\text{C} \leq T_A \leq +105^{\circ}\text{C}$. **Typical values are for $T_A = 25^{\circ}\text{C}$.**)

Parameter	Symbol	Test Conditions	T_A	Min	Typ	Max	Unit
Quiescent Current	I_Q	$V_{IN}=3.3\text{V}$, $V_{ENB}=0\text{V}$, $I_{OUT}=0\text{A}$	-40°C to +85°C		9.7	15	μA
			-40°C to +105°C			16	μA
Shutdown Current	I_{SHDN}	$V_{IN}=V_{ENB}=3.3\text{V}$, $V_{OUT}=0\text{V}$	-40°C to +85°C		0.5	2	μA
			-40°C to +105°C			3	μA
Switch ON Resistance	R_{ON}	$V_{IN}=5\text{V}$, $I_{OUT}=200\text{mA}$	25°C		37	41	$\text{m}\Omega$
			-40°C to +85°C			51	$\text{m}\Omega$
			-40°C to +105°C			57	$\text{m}\Omega$
		$V_{IN}=3.3\text{V}$, $I_{OUT}=200\text{mA}$	25°C		38	41	$\text{m}\Omega$
			-40°C to +85°C			52	$\text{m}\Omega$
			-40°C to +105°C			58	$\text{m}\Omega$
		$V_{IN}=1.8\text{V}$, $I_{OUT}=200\text{mA}$	25°C		43	48	$\text{m}\Omega$
			-40°C to +85°C			59	$\text{m}\Omega$
			-40°C to +105°C			66	$\text{m}\Omega$
		$V_{IN}=1.2\text{V}$, $I_{OUT}=200\text{mA}$	25°C		52	61	$\text{m}\Omega$
			-40°C to +85°C			73	$\text{m}\Omega$
			-40°C to +105°C			85	$\text{m}\Omega$
		$V_{IN}=1.05\text{V}$, $I_{OUT}=200\text{mA}$	25°C		63	96	$\text{m}\Omega$
			-40°C to +85°C			102	$\text{m}\Omega$
			-40°C to +105°C			107	$\text{m}\Omega$
ENB Input Logic High	V_{IH}	$V_{IN}=1.05\text{V}$ to 5.5V	25°C	1			V
ENB Input Logic Low	V_{IL}	$V_{IN}=1.05\text{V}$ to 5.5V	25°C			0.4	V
ENB Hysteresis	V_{HYS_ENB}	$V_{IN}=5.5\text{V}$	25°C		102		mV
		$V_{IN}=1.05\text{V}$	25°C		92		mV
Discharge Resistance	R_{DSG}	$V_{IN}=V_{OUT}=V_{ENB}=3.3\text{V}$	-40°C to +105°C		143	200	Ω

Switching Characteristics

Refer to the timing test circuit in Figure 3 (unless otherwise noted) for references to external components used for the test condition in the switching characteristics table. Switching characteristics shown below are only valid for the power-up sequence where V_{IN} is already in steady state condition before the ENB pin is asserted low.

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
$V_{IN}=5V, V_{ENB}=0V, T_A=25^{\circ}C$ (Unless otherwise noted)						
Turn ON Time	t_{ON}	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		1300		μs
Turn OFF Time	t_{OFF}	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		2		μs
V_{OUT} Rise Time	t_R	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		1800		μs
V_{OUT} Fall Time	t_F	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		2		μs
Delay Time	t_D	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		663		μs
$V_{IN}=3.3V, V_{ENB}=0V, T_A=25^{\circ}C$ (Unless otherwise noted)						
Turn ON Time	t_{ON}	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		1077		μs
Turn OFF Time	t_{OFF}	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		2		μs
V_{OUT} Rise Time	t_R	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		1200		μs
V_{OUT} Fall Time	t_F	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		2		μs
Delay Time	t_D	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		550		μs
$V_{IN}=1.05V, V_{ENB}=0V, T_A=25^{\circ}C$ (Unless otherwise noted)						
Turn ON Time	t_{ON}	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		650		μs
Turn OFF Time	t_{OFF}	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		23		μs
V_{OUT} Rise Time	t_R	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		350		μs
V_{OUT} Fall Time	t_F	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		2		μs
Delay Time	t_D	$R_L=10\Omega, C_{IN}=1\mu F, C_{OUT}=0.1\mu F$		547		μs

Note 1: Stresses beyond the “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note 2: θ_{JA} is measured in the natural convection at $T_A = 25^{\circ}C$ on a low effective single layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

Note 3: The device is not guaranteed to function outside its operating conditions.

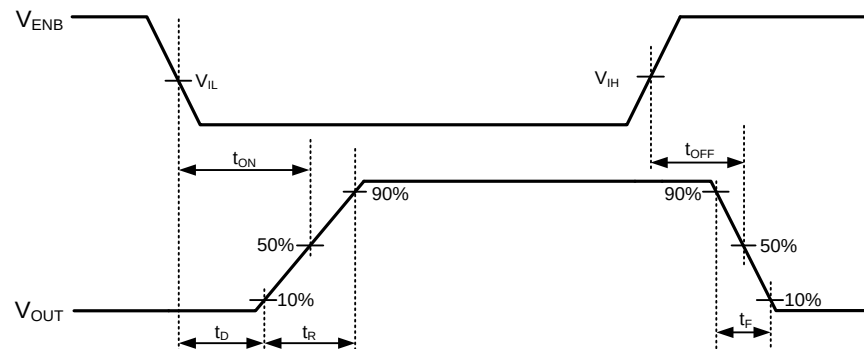
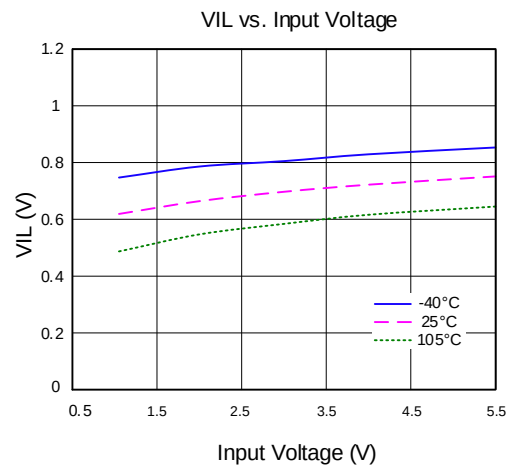
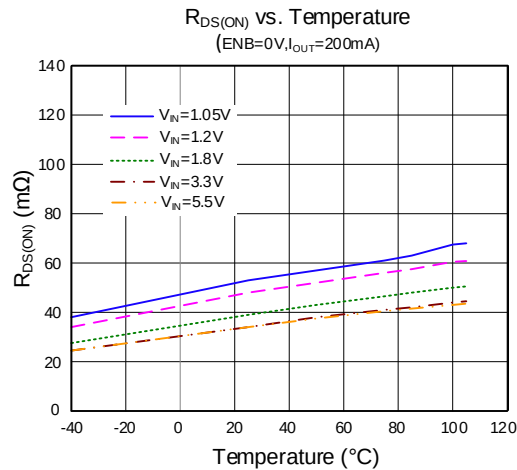
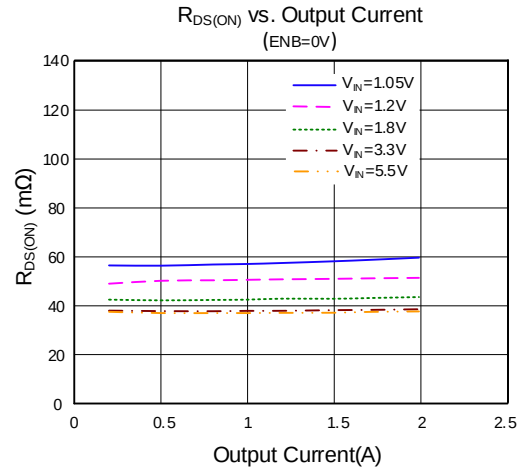
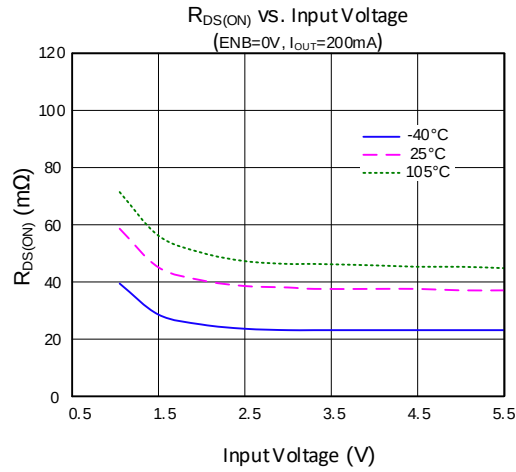
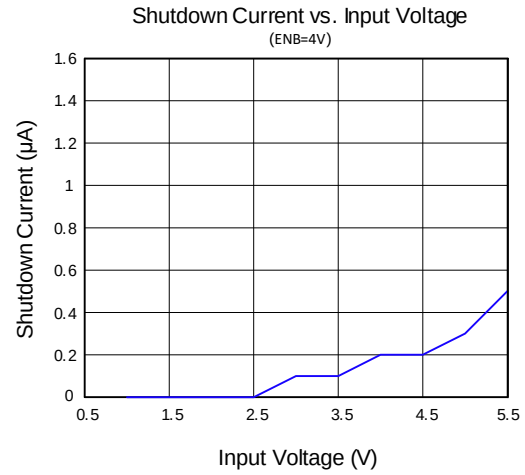
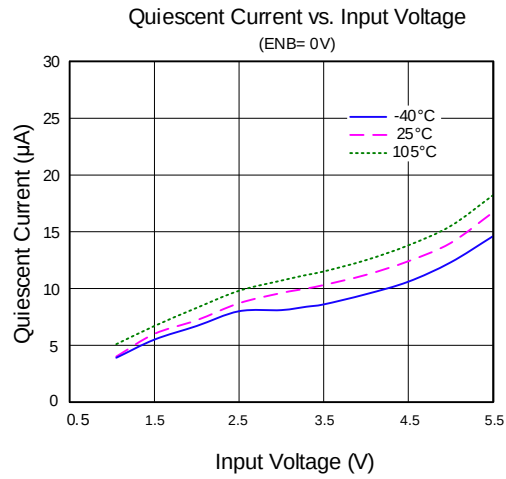
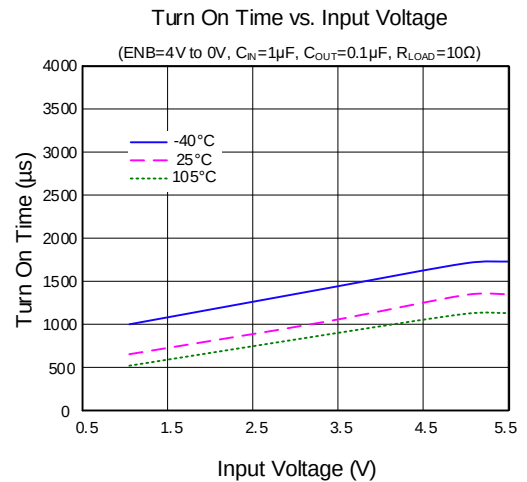
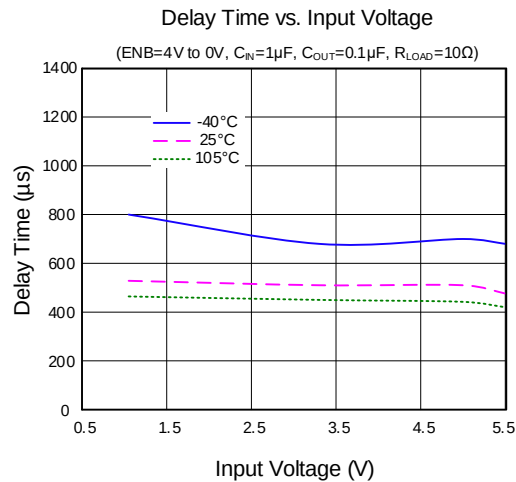
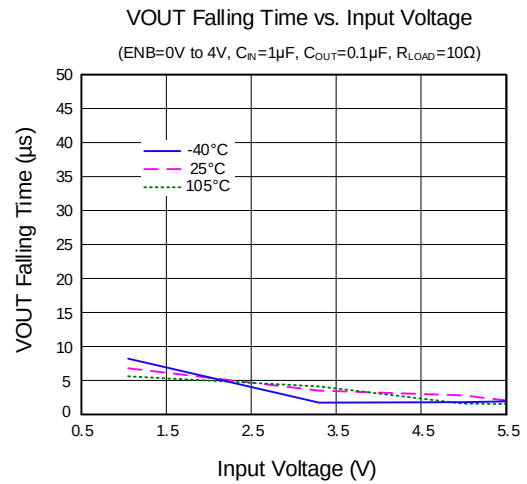
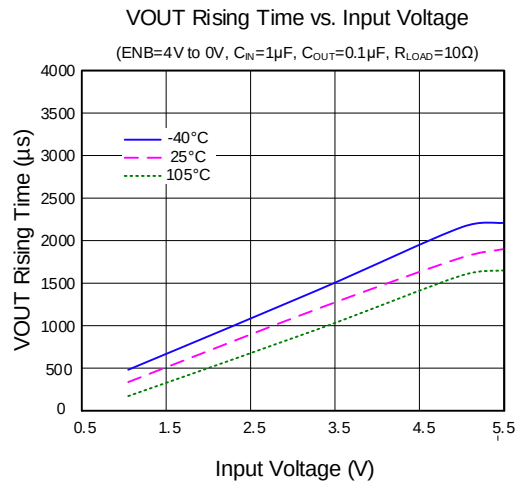
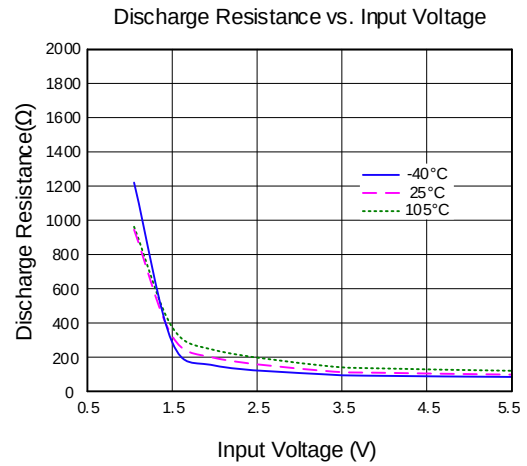
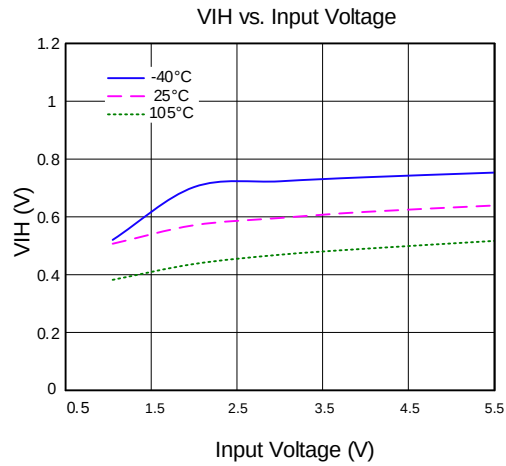
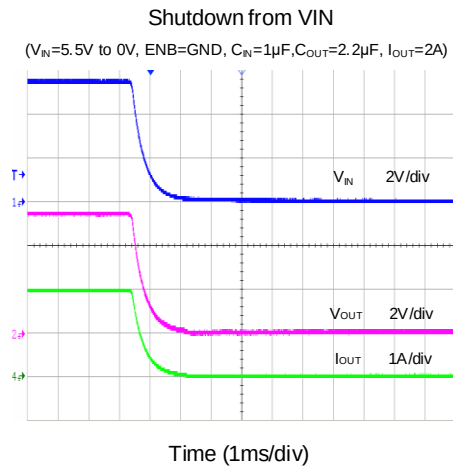
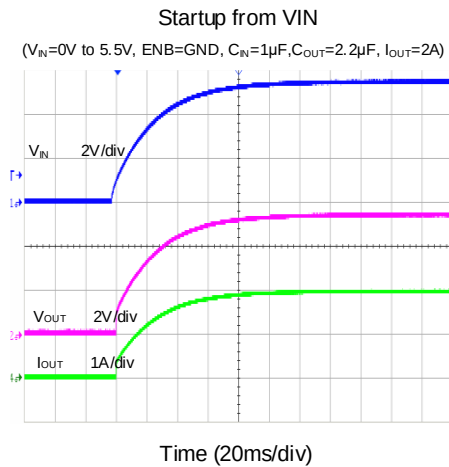
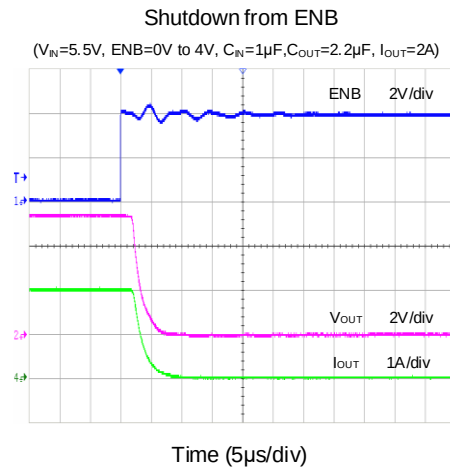
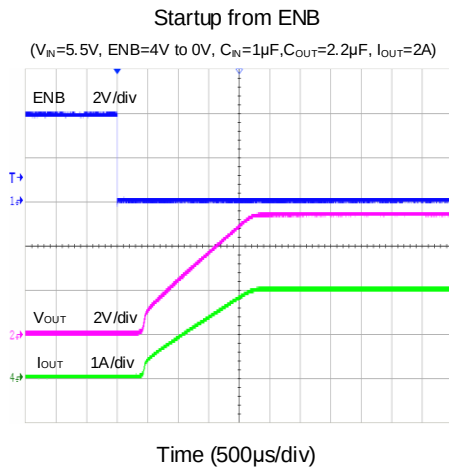
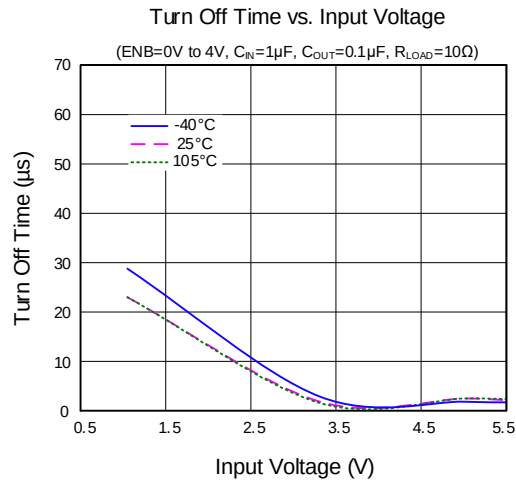


Figure 3 SY20806G Timing Waveform

Typical Operating Characteristics







Operation

The SY20806G is a small, low R_{ON} , single channel load switch with controlled slew rate. The device contains an N-channel MOSFET that can operate over an input voltage range of 1.05 V to 5.5V and can support a maximum continuous current of 2A.

The switch is controlled by an on and off input (Active Low), which is capable of interfacing directly with low voltage control signals.

Applications Information

Input Capacitor

To reduce device inrush current, a $1\mu\text{F}$ ceramic capacitor, C_{IN} , is recommended. A higher value of C_{IN} can be used to reduce the voltage drop experienced as the switch is turned on into large capacitive load. To minimize the potential noise problem, C_{IN} should be placed really close to the IN and GND pins.

Output Capacitor

A $2.2\mu\text{F}$ ceramic output cap is recommended to prevent parasitic board inductance from forcing V_{OUT} below GND when switching off

Output Discharge

SY20806G integrate a 143Ω pull down resistor for quick output discharge. The resistor is activated when the switch is turned off.

PCB Layout Guide

For best performance of the SY20806GPAC, the following guidelines must be strictly followed:

- ✧ Keep all power traces as short and wide as possible and use at least 1-ounce copper for all power traces.
- ✧ Place a ground plane under all circuitry to lower both resistance and inductance and improve DC and transient performance.
- ✧ Locate the output capacitors as close to the connectors as possible to lower the impedance (mainly inductance) between the port and the capacitor and improve transient performance.
- ✧ Input and output capacitors should be placed closed to the IC and connected to ground plane to reduce noise coupling.

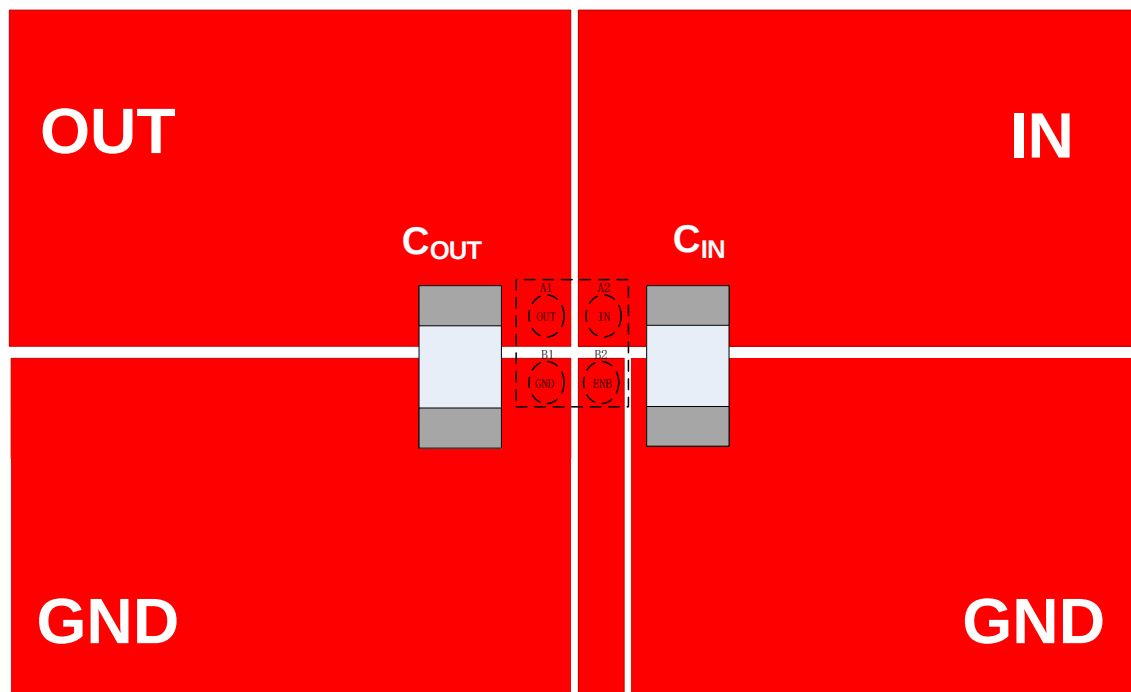
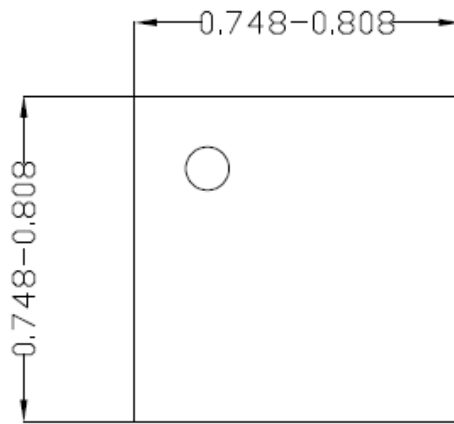
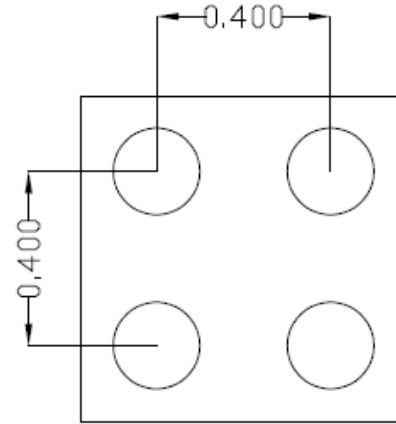


Figure4. PCB Layout Suggestion

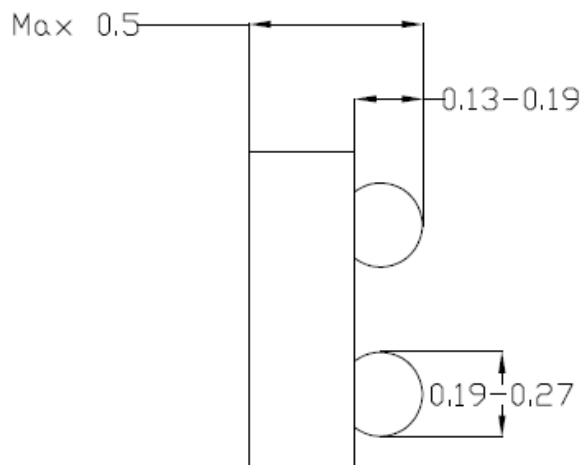
CSP0.78×0.78-4 Package Outline



Top View

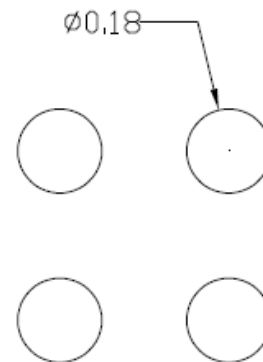


Bottom View



Side View

(Recommended)



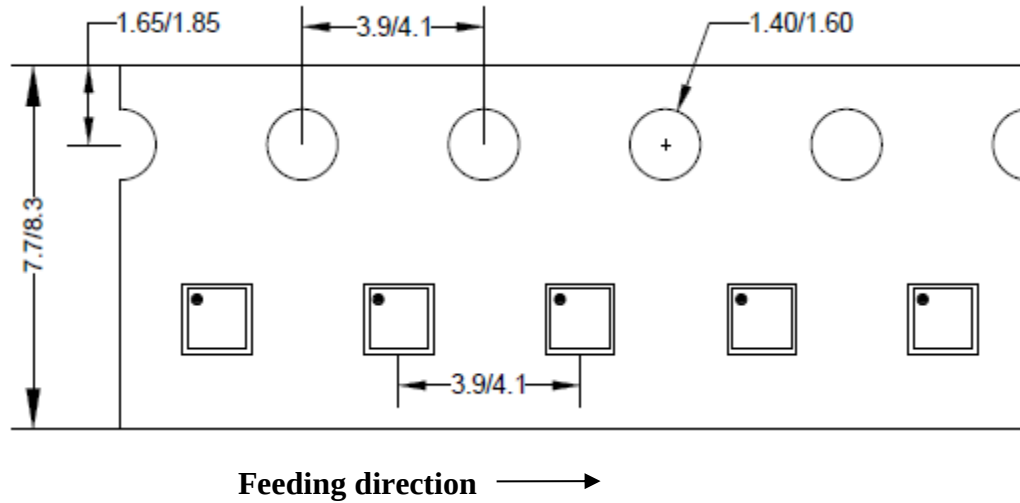
PCB layout

Notes: All dimension in millimeter and exclude mold flash & metal burr.

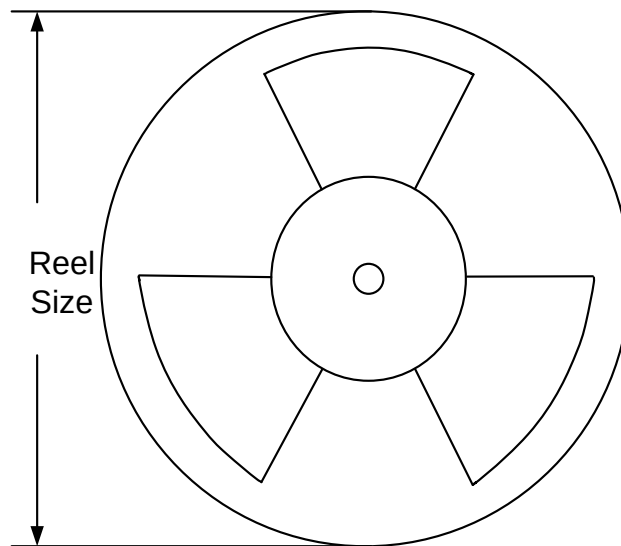
Taping & Reel Specification

1. Taping orientation

CSP0.78×0.78



2. Carrier Tape & Reel specification for packages



Package type	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer length(mm)	Leader length (mm)	Qty per reel
CSP0.78×0.78	8	4	7"	400	160	5000

3. Others: NA

Revision History

The revision history provided is for informational purpose only and is believed to be accurate, however, not warranted. Please make sure that you have the latest revision.

Date	Revision	Change
Oct.13, 2022	Revision 0.9	Initial Release

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