Features

- Single-Channel Power Distribution Switch
- Programmable Current Limit in 0.4A~2A Output Current
- Enable polarity: Active High
- 2.4V to 5.5V Supply Range
- Under-Voltage Lockout
- -40°C to +85°C Ambient Temperature Range
- Accurate Current Limit
- 15μA Quiescent Current
- 80mΩ MOSFET
- Thermal-Shutdown Protection
- Built-In Soft Start
- Available in SOT23-5 Package

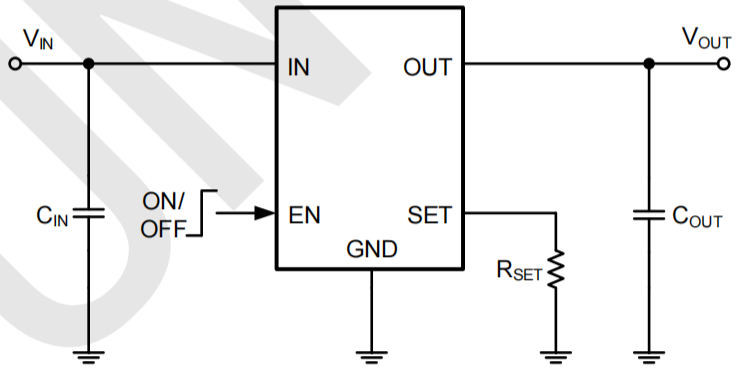
Applications

- Set-Top Boxes
- Wi-Fi Router/AP
- USB 3G Datacard/ USB Dongle
- High-Definition Digital TVs
- ONT Boxes
- USB Ports and Hubs, Laptops, and Desktops
- Smartphone and PDA
- MiniPCI Accessories

General Description

The SY6280 Power Distribution Switch features internal current limiting to prevent damage to host devices due to faulty load conditions. The SY6280 develops ultra-low on-resistance switch with programmable current limiting to protect the power source from over current and short circuit conditions. It integrates the over temperature protection and discharges the output capacitor during the shutdown. The SY6280 is available in SOT23-5 package.

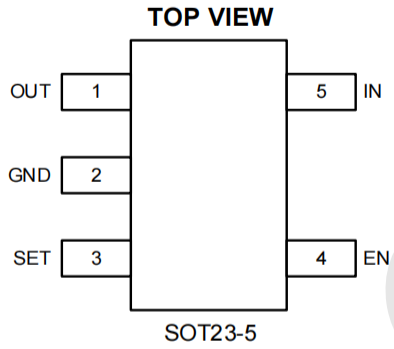
Typical Application Circuit



Basic Application Circuit

Pin Description

Pin Configuration



Top Marking: MEYLL (device code: ME, Y=year code, LL= lot number code)

Pin Description

Pin	Name	Function
1	OUT	Output Pin.
2	GND	Ground Pin.
3	SET	Current limit programming Pin. Connect a resistor R_{SET} from this pin to GND to program the current limit.
4	EN	ON/OFF control. Pull High to enable IC, do not float.
5	IN	Power Supply Pin

Order Information (1)

Marking	Part No.	Model	Description	Package	T/R Qty
MEYLL	00002013	SY6280	SY62801 CH Current Limited IC, V_{IN} 2.4V-5.5V, I_{LIM} ADJ, Active High, SOT23-5	SOT23-5	3000PCS

Note (1): All SUNGOOD parts are Pb-Free and adhere to the RoHS directive.

Specifications

Absolute Maximum Ratings (1) (2)

Item	Min	Max	Unit
All pins voltage	-0.3	6	V
Power dissipation (3)	Internally Limited		
Operating junction temperature, T_J	-40	150	°C
Storage temperature, T_{stg}	-55	150	°C
Lead Temperature (Soldering, 10sec.)		260	°C

Note (1): Exceeding these ratings may damage the device.

Note (2): The device is not guaranteed to function outside of its operating conditions.

Note (3): The maximum allowable power dissipation is a function of the maximum junction temperature, $T_{J(MAX)}$, the junction-to-ambient thermal resistance, $R_{\theta JA}$, and the ambient temperature, T_A. The maximum allowable power dissipation at any ambient temperature is calculated using: $P_{D\,(MAX)} = (T_{J(MAX)} - T_A)/R_{\theta JA}$. Exceeding the maximum allowable power dissipation causes excessive die temperature, and the regulator goes into thermal shutdown. Internal thermal shutdown circuitry protects the device from permanent damage. Thermal shutdown engages at T_J=150°C (typical) and disengages at T_J= 130°C (typical).

ESD Ratings

Item	Description	Value	Unit
$V_{(ESD\text{-}HBM)}$	Human Body Model (HBM) ANSI/ESDA/JEDEC JS-001-2014 Classification, Class: 2	±2000	V
$V_{(ESD\text{-}CDM)}$	Charged Device Mode (CDM) ANSI/ESDA/JEDEC JS-002-2014 Classification, Class: C0b	±200	V
$I_{LATCH\text{-}UP}$	JEDEC STANDARD NO.78E APRIL 2016 Temperature Classification, Class: I	±150	mA

Recommended Operating Conditions

Item	Min	Max	Unit
Operating junction temperature (1)	-40	125	°C
Operating temperature range	-40	85	°C
Input voltage V_{IN}	2.4	5.5	V

Note (1): All limits specified at room temperature (T_A = 25°C) unless otherwise specified. All room temperature limits are 100% production tested. All limits at temperature extremes are ensured through correlation using standard Statistical Quality Control (SQC) methods. All limits are used to calculate Average Outgoing Quality Level (AOQL).

Thermal Information

Item	Description	Value	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance (1)(2)	180	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	130	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	45	°C/W
ψ_{JT}	Junction-to-top characterization parameter	35	°C/W
ψ_{JB}	Junction-to-board characterization parameter	45	°C/W

Note (1): The package thermal impedance is calculated in accordance to JESD 51-7.

Note (2): Thermal Resistances were simulated on a 4-layer, JEDEC board.

Electrical Characteristics (1)

(V_{IN} = 5V, C_L=1μF, per channel, T_A = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ.	Max	Unit
Input Voltage Range	V_{IN}		2.4		5.5	V
Shutdown Input Current	I_{SHDN}	Open load, IC Disabled		0.6	1	μA
Quiescent Supply Current	I_Q	Open load, IC Enabled		20		μA
FET RON	$R_{DS(ON)1}$			80		mΩ
ENB Rising Threshold	$V_{ENB(H)}$		1.2			V
ENB Falling Threshold	$V_{ENB(L)}$				0.8	V
ENB Leakage	I_{ENB}	V_{ENB}=5.5V			1	μA
IN UVLO Threshold	$V_{IN,UVLO}$				2.3	V
IN UVLO Hysteresis	$V_{IN,HYS}$			0.1		V
Current Limit	I_{LIM}	RSET=10 kΩ	0.75	1	1.25	A
	$I_{LIM(MIN)}$			0.4		A
	$I_{LIM(MAX)}$			2		A
Trip Current	I_{Trip}			1.25		A
Turn-ON Time (2)	T_{ON}	R_L=10Ω, C_L=1uF		120		μS
Turn-OFF Time (2)	T_{OFF}	R_L=10Ω, C_L=1uF		10		μS
OUT Shutdown Discharge Resistance	R_{DIS}			150		Ω
Thermal Shutdown Temperature	T_{SD}			130		°C
Thermal Shutdown Hysteresis	T_{HYS}			20		°C

Note (1): The device is not guaranteed to function outside its operating conditions.

Note (2): Measured from (50%) EN signal to (90%) output signal.

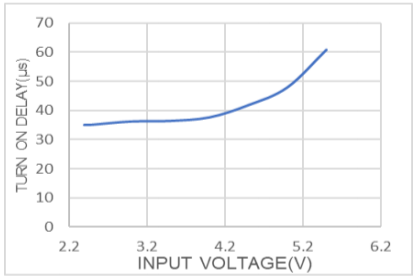
Typical Performance Characteristics (1) (2)

Note (1): Performance waveforms are tested on the evaluation board.

Note (2): V_{IN} =5V, C_{OUT}=1μF, T_A = +25°C, unless otherwise noted.

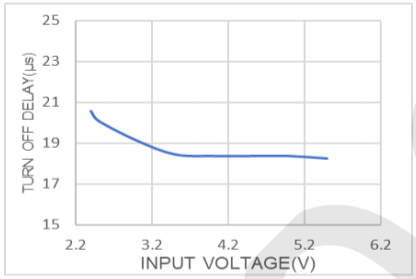
Turn on Delay vs. Input Voltage

V_{EN}=5V，R_{LOAD}=5.5Ω



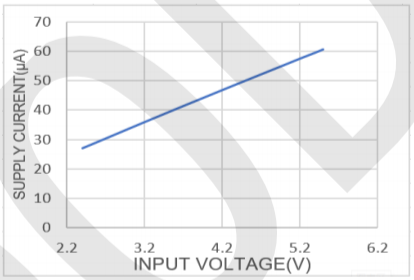
Turn off Delay vs. Input Voltage

V_{EN}=5V，R_{LOAD}=5.5Ω



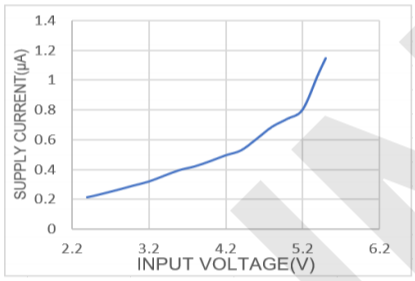
Supply Current, Output Enabled vs. Input Voltage

V_{EN} = 5V



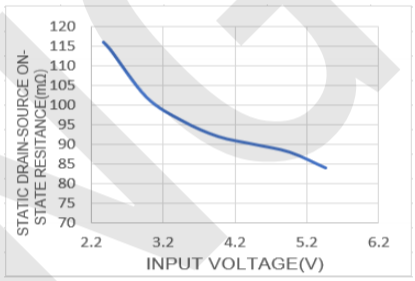
Supply Current, Output Disabled vs. Input Voltage

V_{EN} = 0V



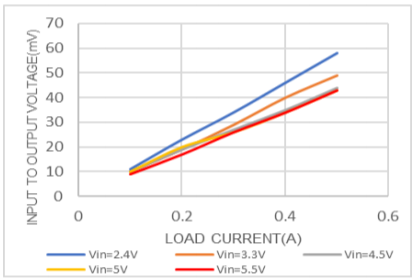
Static Drain-Source On-State Resistance vs. Input Voltage

V_{EN} = 5V，I_{LOAD}=0.5A

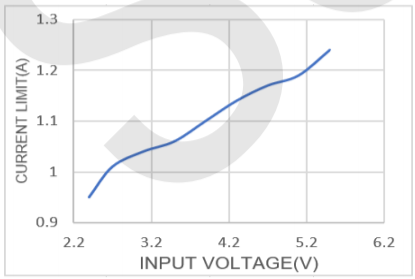


Input to Output Voltage vs. Load Current

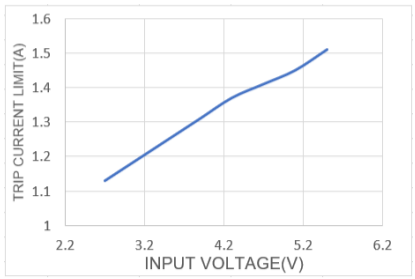
V_{EN} = 5V



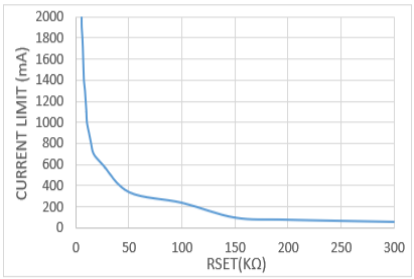
Current Limit vs. Input Voltage



Threshold Trip Current vs. Input Voltage

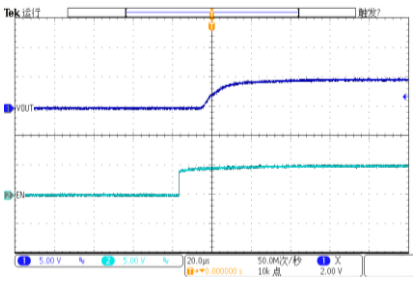


Current Limit vs. R_{SET}

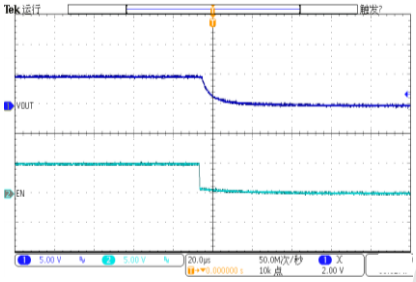


Turn on Delay Rise Time

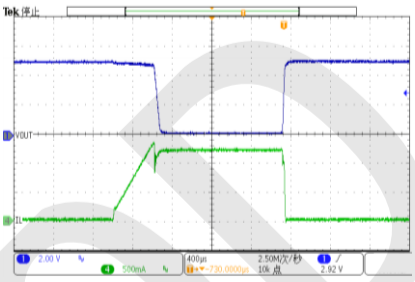
V_{EN} = 5V，R_{LOAD}=5 Ω



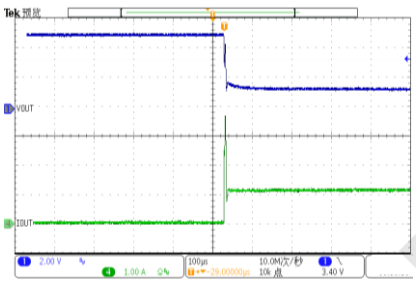
Turn off Delay Fall Time



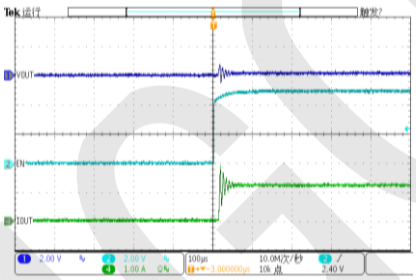
Threshold Trip Current with Ramped Load Enabled Device



1Ω Load Connected to Enabled Device

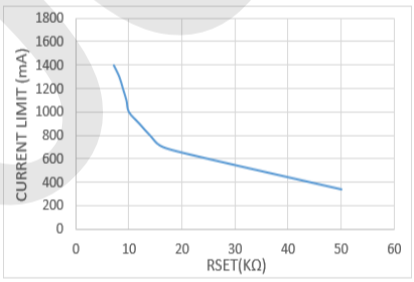


Short Circuit Current，Device Enabled into Short

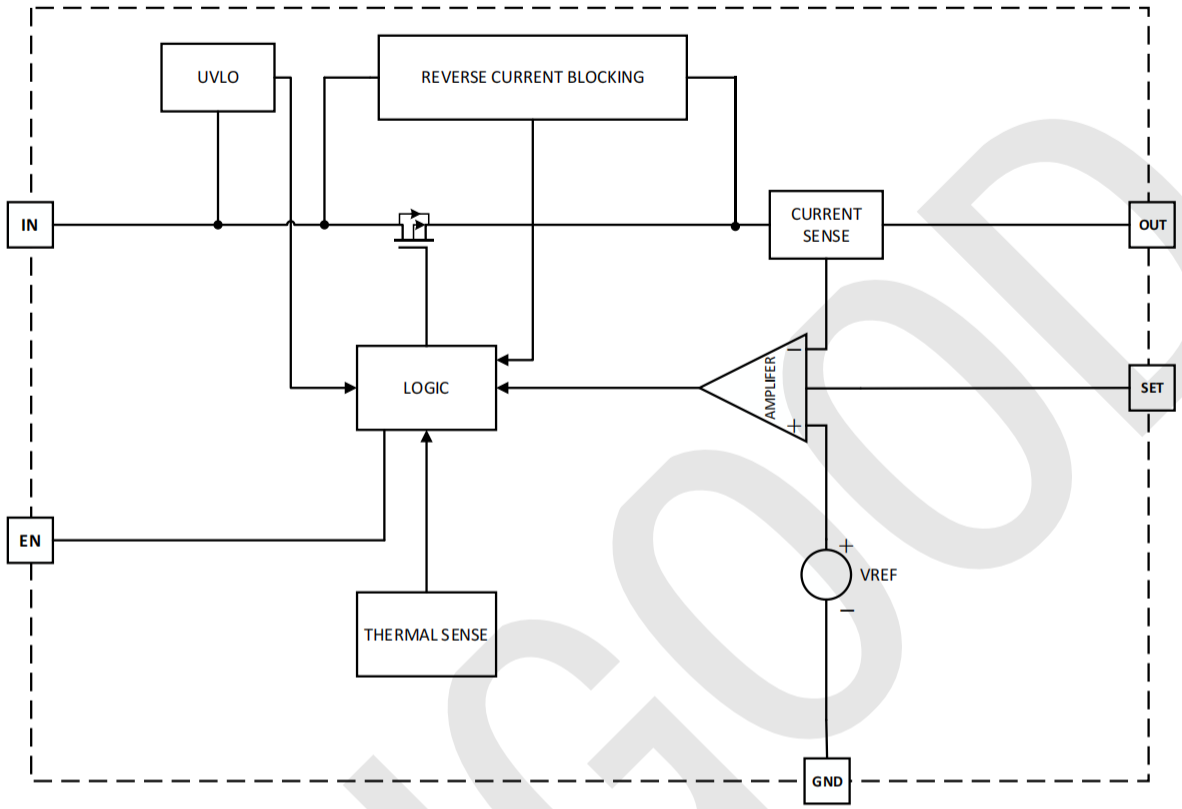


Current Limit vs. R_{SET}

I_{LIM}=0.4~1.5A



Functional Block Diagram



Block Diagram

Functions Description

Current Limit

The SY6280 provides a constant current limit that can be programmed by an external resistor. Once the device reaches its current limit threshold, the internal circuit regulates the gate voltage to hold the current in the power MOSFET constant. Below table can be taken as a reference to choose R_{SET} to set the current limit threshold. Following table are all tested with 5V input as the test condition

R_{SET} (kΩ)	Typical Current Limit (mA)
4.99	2000
5.1	1900
5.76	1800
6.49	1600
8.87	1200
9.53	1100
10	1000
12	900
30	600
50	350
100	250

Over Current

When the load exceeds trip current (minimum threshold current triggering constant-current mode) or short circuited, SY6280 switches into to constant-current mode (current limit value). SY6280 will be shut down only if the overcurrent condition stays long enough to trigger thermal protection.

Trigger overcurrent protection for different overload conditions occurring in applications:

1) The output has been shorted or overloaded before the device is enabled or input applied. SY6280 detects the short or overload and immediately switches into a constant-current mode.

2) A short or an overload occurs after the device is enabled. The device switches into constant current mode after the current-limit circuit has been tripped (reached the trip current threshold). However, high current may flow for a short period of time before the current-limit circuit can react.

3) Output current has been gradually increased beyond the recommended operating current. The load current rises until the trip current threshold is reached or until the thermal limit of the device is exceeded. Once the trip threshold has been reached, the device switches into its constant-current mode.

Thermal Protection

If the current limit block starts to regulate the output current, the power loss on power MOSFET will cause the IC temperature rise. The die temperature is internally monitored until the thermal limit is reached. Once this temperature is reached, the switch will turn off to allow the chip to cool until the over temperature fault remove. The over temperature threshold is 130℃ and hysteresis is 20℃.

Under-voltage Lockout (UVLO)

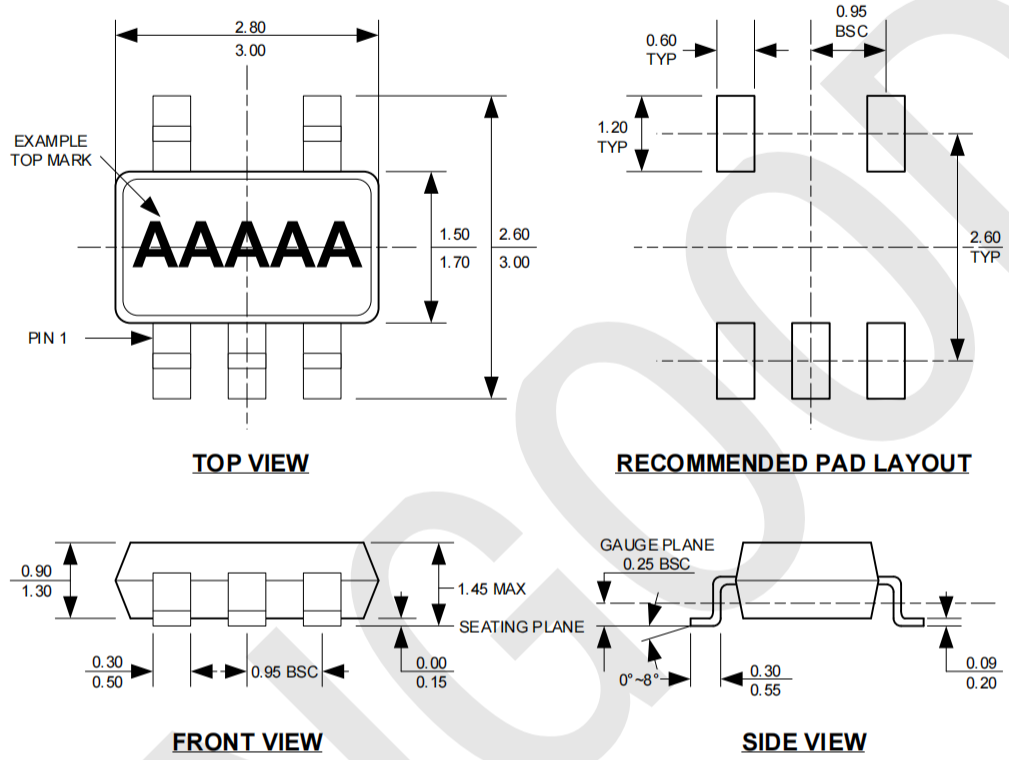
This circuit is used to monitor the input voltage to ensure that the SY6280 is operating correctly. This UVLO circuit also ensures that there is no operation until the input voltage reaches the minimum spec.

Output Discharge

SY6280 has output discharge function. It can discharge the output capacitor by internal pulldown resistance during shutdown.

Package Description

SOT23-5



NOTE:
1. CONTROL DIMENSION IS IN INCHES. DIMENSION IN BRACKET IS IN MILLIMETERS.
2. PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
3. PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
4. LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.004" INCHES MAX.
5. DRAWING CONFORMS TO JEDEC MS-012, VARIATION BA.
6. DRAWING IS NOT TO SCALE.