Tiny switch
BP pin voltage and current limit

March.2019.Romeo

BP Voltage - detection sequence
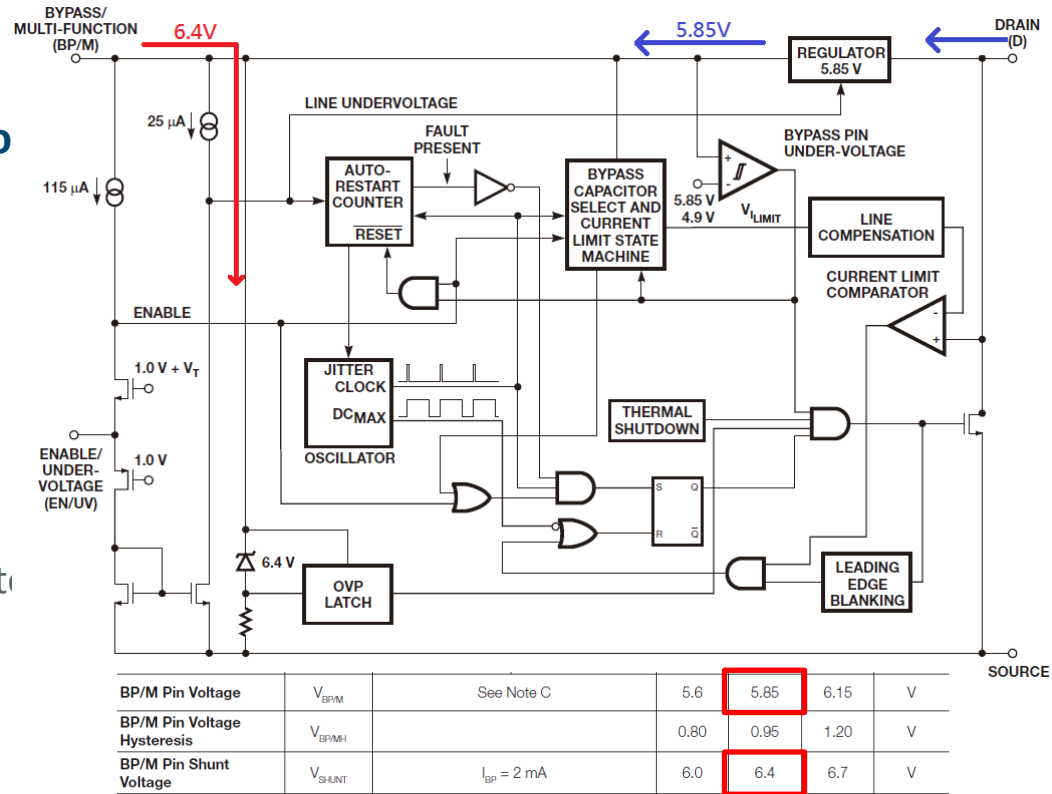
- **On power up BP pin charges to 5.85V**

- **Then BP pin discharges capacitor with 10 mA current sink.**

- **Capacitor discharges to 4.9V.**

- **Time taken to discharge from 5.85V to 4.9V is measured**

BP/M Pin Voltage	$V_{BP/M}$	See Note C	5.6	5.85	6.15	V
BP/M Pin Voltage Hysteresis	$V_{BP/MH}$		0.80	0.95	1.20	V
BP/M Pin Shunt Voltage	V_{SHUNT}	I_{BP} = 2 mA	6.0	6.4	6.7	V

Tiny Switch family

# BP Voltage - Regulator & Shunt Voltage Clamp

- **A current from the voltage on the DRAIN pin to supply 5.85 V regulato**
  - ▷ Energy is from Drain pin

- **There is a 6.4 V shunt regulator clamping the BP pin at 6.4 V when current is provided to the BP pin through an external resistor.**
  - ▷ Energy is from aux winding
  - ▷ Decrease the no-load consumption t well below 50 mW.

BP/M Pin Voltage	$V_{BP/M}$	See Note C	5.6	5.85	6.15	V
BP/M Pin Voltage Hysteresis	$V_{BP/MH}$		0.80	0.95	1.20	V
BP/M Pin Shunt Voltage	V_{SHUNT}	$I_{BP} = 2$ mA	6.0	6.4	6.7	V

BP Voltage - Regulator & Shunt Voltage Clamp

- **A current from the voltage on the DRAIN pin to supply 5.85 V regulator.**
  - ▷ Energy is from Drain pin
- **There is a 6.4 V shunt regulator clamping the BP pin at 6.4 V when current is provided to the BP pin through an external resistor.**
  - ▷ Energy is from aux winding
  - ▷ Decrease the no-load consumption to well below 50 mW.

啟動後由外部4-5 Winding 透過R4供電

若無4-5 Winding 則持續由高壓取電

由於IC所需之工作電流為固定的 因此高壓取電時 會產生較多功耗 由4-5 Winding取電可降低功耗

External resistor

- **Different device has different supply current request**
  - ▷ Calculate a suitable resistor to provide a suitable current to achieve the best no-load consumption
  - ▷ $R4 = (V_{aux} - V_{BP}) / I_{S2}$
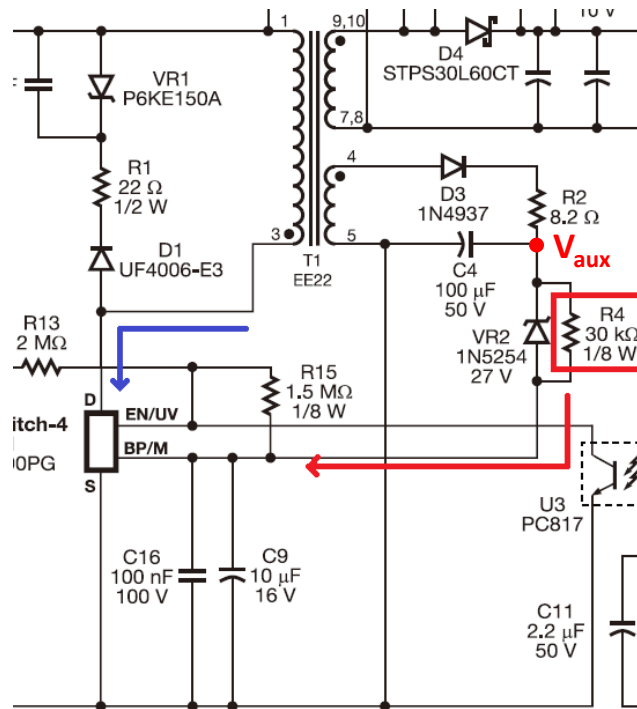
啟動後由外部4-5 Winding 透過R4供電

若無4-5 Winding 則持續由高壓取電

由於IC所需之工作電流為固定的 因此高壓取電時 會產生較多功耗 由4-5 Winding取電可降低功耗

|					
DRAIN Supply Current	I_{S2}	EN/UV Open (MOSFET Switching at f_{OSC}) See Note B	TNY284	360	400	μA
			TNY285	410	440	
			TNY286	430	470	
			TNY287	510	550	
			TNY288	615	650	
			TNY289	715	800	
			TNY290	875	930	

BP Voltage

- **開機的時候BP pin電壓會經由Drain pin到內部穩壓器 將BP pin電壓上升到5.85V(typ.) 然後電壓會drop到(5.85-0.95)=4.9V再爬升到5.85V.**

- **電壓drop的時間是用來設定current limit.**
  - BPP pin電容大小會決定current limit, 0.1uF, 10uF, 1uF三種

- **當輸出電壓上升➜aux winding電壓上升➜V_{BPP} pin會透過aux winding電壓經由電阻供電, 電壓會上升到6.4V.**

BP/M Pin Voltage	$V_{BP/M}$	See Note C	5.6	5.85	6.15	V
BP/M Pin Voltage Hysteresis	$V_{BP/MH}$		0.80	0.95	1.20	V
BP/M Pin Shunt Voltage	V_{SHUNT}	I_{BP} = 2 mA	6.0	6.4	6.7	V

BP Voltage Waveform

BP/M Pin Voltage	$V_{BP/M}$	See Note C	5.6	5.85	6.3	V
BP/M Pin Voltage Hysteresis	$V_{BP/MH}$		0.80	0.95	1.20	V
BP/M Pin Shunt Voltage	V_{SHUNT}	I_{BP} = 2 mA	6.0	6.4	6.85	V
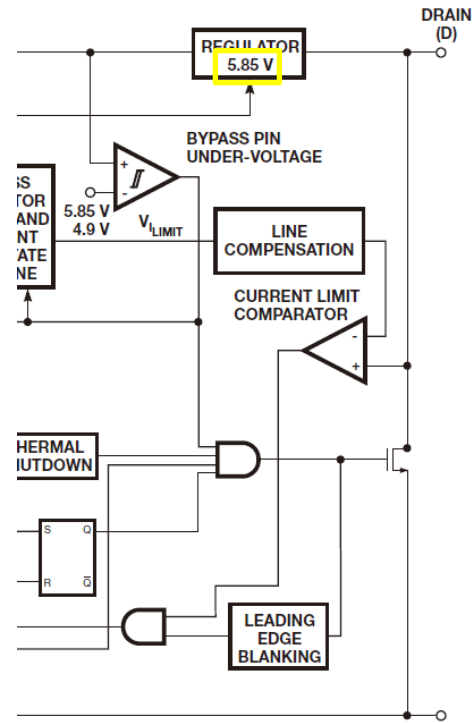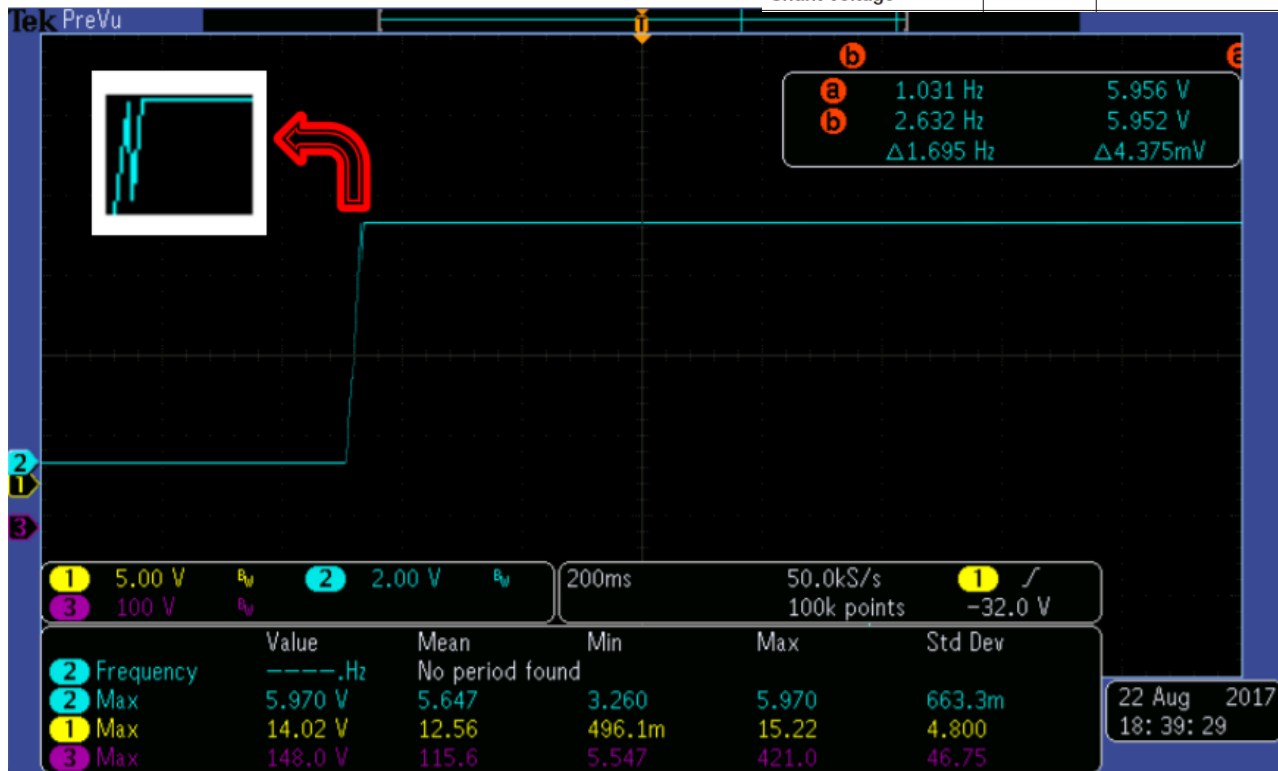
BP Voltage Waveform - BP$_{CAP}$ = 10μF
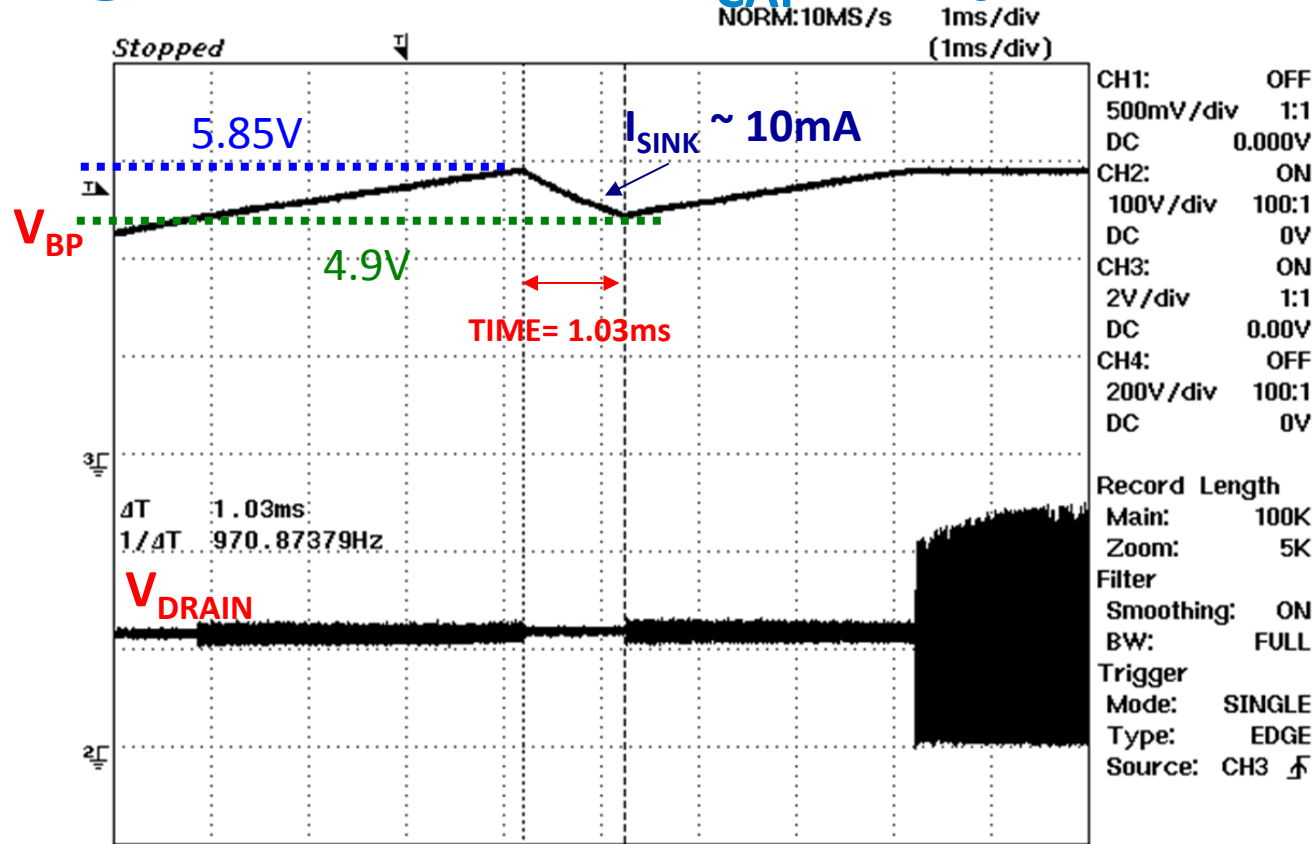
BP internal timer

BP Capacitor	I_{sink} Time (I_{sink} ~ 10 mA)	Internal Timer Cap Detection (±10%)
0.1 µF (Standard I_{Lim})	10 µs	< 30 µs
1 µF (Low I_{Lim})	100 µs	30 µs< t < 300 µs
10 µF (Hi I_{Lim})	1 ms	>300 µs