

# STA6940M

## ■ Features

- Output current: 4A (peak: 8A)
- Power supply voltage:  $V_{BB} = 10$  to 40V
- Logic supply voltage:  $V_{DD} = 3.0$  to 5.5V
- Built-in UVLO, OCP, and TSD protection
- Built-in diag output function
- STA 18-pin package

## ■ Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Conditions
Driver Supply Voltage	$V_{BB}$	44	V	
Logic Supply Voltage	$V_{DD}$	6	V	
Output Current	$I_o$	8	A	100 $\mu$ s or less
Logic Input Voltage	$V_{IN}$	-0.3 to $V_{DD}+0.3$	V	
PWM REF Input Voltage	$V_{PREF}$	-0.3 to $V_{DD}+0.3$	V	
OCP REF Input Voltage	$V_{OREF}$	-0.3 to $V_{DD}+0.3$	V	
Sense Voltage	$V_{RS}$	-1 to 2	V	
Power Dissipation	$P_D$	2.7	W	DC control ( $T_a = 25^\circ\text{C}$ )
		3.0	W	PWM control ( $T_a = 25^\circ\text{C}$ ) at Slow Decay
		3.2	W	PWM control ( $T_a = 25^\circ\text{C}$ ) at Fast Decay
Junction Temperature	$T_j$	150	$^\circ\text{C}$	
Operating Ambient Temperature	$T_a$	-20 to 85	$^\circ\text{C}$	
Storage Temperature	$T_{stg}$	-30 to 150	$^\circ\text{C}$	

\*: Output current value may be limited, depending on the duty ratio, ambient temperature, and heating conditions. Do not exceed junction temperature of  $T_j$  under any circumstances.

## ■ Recommended Operating Conditions

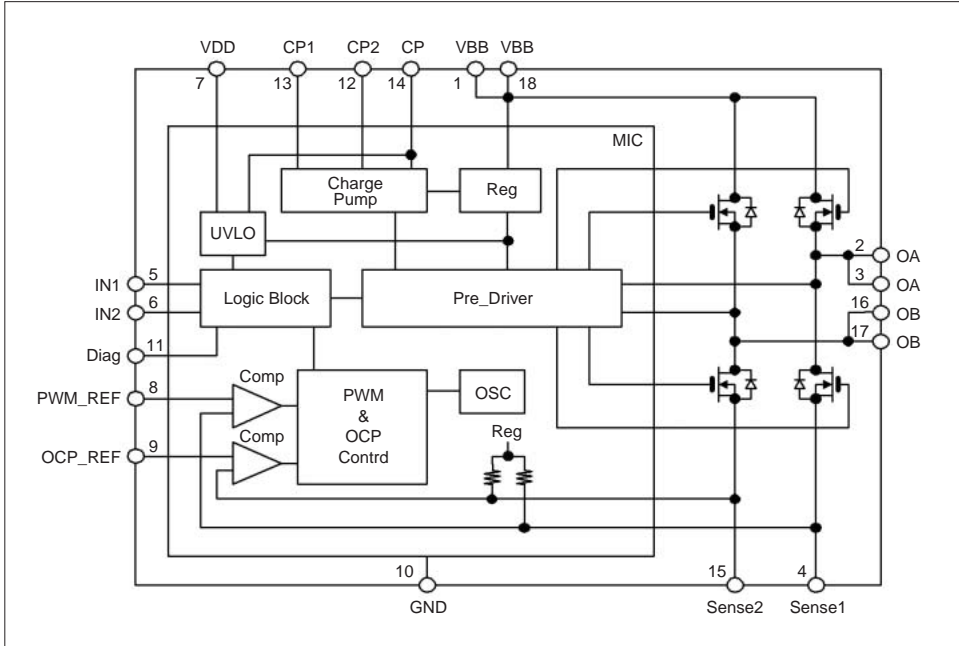
Parameter	Symbol	Ratings		Unit	Conditions
		min.	max.		
Main Supply Voltage	$V_{BB}$	10	40	V	
Output Current	$I_o$		4.0	A	
Logic Supply Voltage	$V_{DD}$	3.0	5.5	V	
PWM REF Input Voltage	$V_{PREF}$		1	V	When operating current control
OCP REF Input Voltage	$V_{OREF}$		2	V	When operating overcurrent control
Case Temperature	$T_c$		85	$^\circ\text{C}$	Rear center (without Fin)

## ■ Electrical Characteristics

( $V_{DD}=5V$ ,  $V_{BB}=24V$ ,  $T_a=25^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions
		min.	typ.	max.		
Main Supply Current	$I_{BB}$			20	mA	In operation
Logic Supply Current	$I_{DD}$			5	mA	
Charge Pump Voltage	$V_{CP}$		$V_{BB}+5$		V	$V_{BB}=10V$ to 40V
Charge Pump Oscillation Frequency	$f_{CP}$		360		kHz	
Low Driver Supply Voltage Protection Voltage	$V_{UVBL}$		7		V	
	$V_{UVBH}$		7.8		V	
Low Logic Supply Voltage Protection Voltage	$V_{UVDL}$		2.3		V	
	$V_{UVDH}$		2.5		V	
Low Charge Pump Voltage Protection Voltage	$V_{UVC L}$		3.8		V	against $V_{BB}$
	$V_{UVC H}$		4		V	
Output MOSFET Breakdown Voltage	$V_{(BR)DS}$	53			V	$I_D=250\mu\text{A}$
Output MOSFET ON Resistance	$R_{DS(ON)}$		0.1	0.13	$\Omega$	$I_D=4.0A$
Output MOSFET Diode Forward Voltage	$V_F$		0.95	2.1	V	$I_F=4.0A$
Logic Input Voltage	$V_{LIL}$			0.25 $V_{DD}$	V	
	$V_{LIH}$	0.75 $V_{DD}$			V	
Logic Input Current	$I_{LIL}$		$\pm 1$		$\mu\text{A}$	
	$I_{LIH}$		$\pm 1$		$\mu\text{A}$	
Maximum Logic Input Clock Frequency	$f_{CLK}$	100			kHz	duty=50%
PWM REF Input Voltage	$V_{PREF}$	0.1		1	V	When controlling the current
PWM REF Input Current	$I_{PREF}$		$\pm 10$		$\mu\text{A}$	$V_{REF}=0$ to $V_{DD}$
OCP REF Input Voltage	$V_{OREF}$	0.1		2	V	When controlling the current
OCP REF Input Current	$I_{OREF}$		$\pm 10$		$\mu\text{A}$	$V_{REF}=0$ to $V_{DD}$
PWM Sense Voltage	$V_{PSEN}$	$V_{PREF}$	$V_{PREF}$	$V_{PREF}$	V	
		-0.045	-0.015	+0.015		
Overcurrent Sense Voltage	$V_{OSEN}$	$V_{OREF}$	$V_{OREF}$	$V_{OREF}$	V	
		-0.045	-0.015	+0.015		
Sense Input Current	$I_{SENSE}$		$\pm 20$		$\mu\text{A}$	
Diag Output Voltage	$V_{LLOL}$			1.25	V	$I_{LOL}=1.25\text{mA}$
	$V_{LLOH}$	$V_{DD}-1.25$			V	$I_{LOL}=-1.25\text{mA}$
Diag Output Current	$I_{LLOL}$			1.25	mA	$V_{LOL}=1.25V$
	$I_{LLOH}$	-1.25			mA	$V_{LOH}=V_{DD}-1.25$
Diag Output Frequency	$f_{DIAG}$		90		kHz	
PWM Minimum ON Time	$t_{pon}(\text{min})$		5		$\mu\text{s}$	During PWM operation
PWM OFF Time	$t_{poff}$		35		$\mu\text{s}$	
OCP Minimum ON Time	$t_{oon}(\text{min})$		5		$\mu\text{s}$	During OCP operation
OCP OFF Time	$t_{ooff}$		142		$\mu\text{s}$	
Crossover Current Delay Time	$t_{COCD}$	150		750	ns	
Switching Time	$t_{con}$		3		$\mu\text{s}$	IN $\rightarrow$ Out ON
	$t_{coff}$		2.7		$\mu\text{s}$	IN $\rightarrow$ Out OFF
Thermal Protection Activation Temperature	$T_{tsdon}$		140		$^\circ\text{C}$	Temperature of rear of package (at saturation)
Thermal Protection Deactivation Temperature	$T_{tsdoff}$		115		$^\circ\text{C}$	

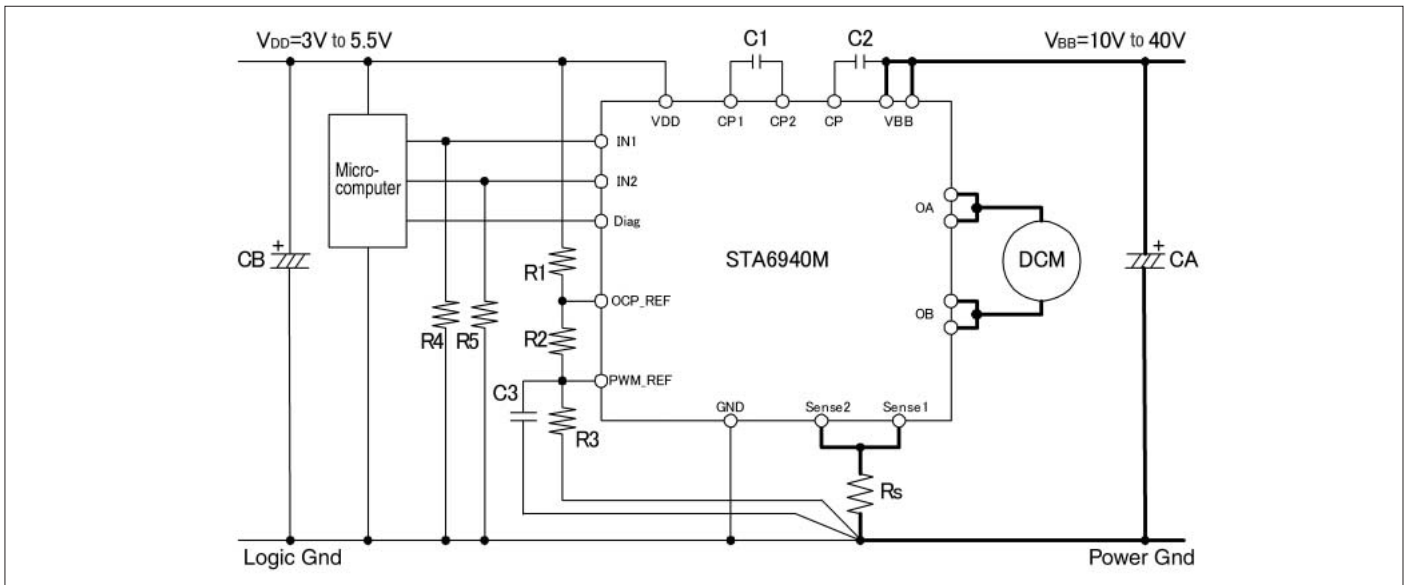
Internal Block Diagram



Pin Assignment

Pin No.	Symbol	Function
1	VBB	Main supply
2,3	OA	Output terminal A
4	Sense 1	Constant current sense terminal
5	IN1	Output setting terminal
6	IN2	
7	VDD	Logic supply
8	PWM_REF	Constant current setting input terminal
9	OCP_REF	Overcurrent setting input terminal
10	Gnd	Device Gnd
11	Diag	Monitor terminal
12	CP2	Capacitor connection terminal for charge pump
13	CP1	
14	CP	
15	Sense 2	Overcurrent sense terminal
16,17	OB	Output terminal B
18	VBB	Driver supply

Typical Connection Diagram



External Dimensions (ZIP18 [STA18Pin])

