



## FAST TRANSIENT RESPONSE LINEAR CONTROLLER

### FEATURES

- Low ESR Output Capacitor (MLCC and POSCAP) Applicable
- 0.5V Reference Voltage with 2% Accuracy
- Internal Soft-Start
- Support VID Application Circuit
- Integrated Hard Short-circuit protection
- Fast Transient Response
- Power OK Output with a Delay Time
- Adjustable Output Voltage Down to 0.5V
- Over-Temperature Protection
- RoHS Compliant & Haloge Free

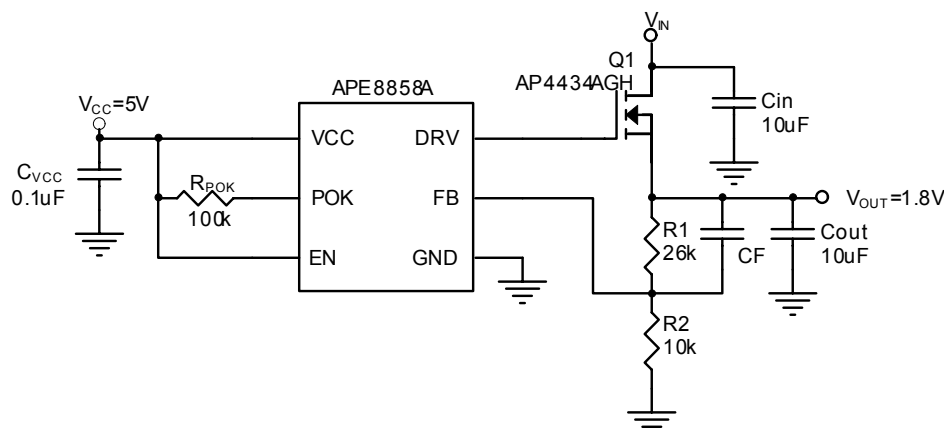
### DESCRIPTION

The APE8858A is an ultra low output voltage linear N-FET controller. This product is specifically designed to provide well supply voltage for front-side-bus termination on motherboards and NB applications. The APE8858A integrates many functions. A Power-On-Reset (POR) circuit monitors supply voltages to prevent wrong operations. A POK indicates the output status with time delay which is set internally. It can control other converter for power sequence. The APE8858A can be enabled by other power system.

A 0.5V reference voltage with 2% accuracy provide tight regulation of the output voltage, enable control, open drain power good signal, under-voltage protection and soft start.

The APE8858A is available in a space saving SOT-26 package.

### TYPICAL APPLICATION



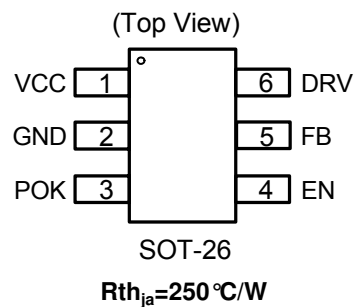
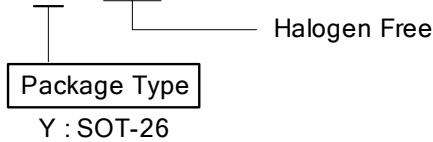


**ABSOLUTE MAXIMUM RATINGS** (at  $T_A=25^{\circ}\text{C}$ )

VCC -----	-0.3V to 7V
DRV to GND -----	-0.3V to VCC+0.3V
Other Pin -----	-0.3V to 6V
Power Dissipation (SOT-26) -----	0.4W
Storage Temperature Range -----	-65 to 150°C
Operating Temperature Range -----	-40 to 85°C
Junction Temperature Range -----	-40 to 125°C

**PACKAGE / ORDERING INFORMATION**

**APE8858A X - HF**



**ELECTRICAL SPECIFICATIONS**

( $V_{IN}=1.5\text{V}$ ,  $V_{SHDN}=V_{IN}$ ,  $T_A=25^{\circ}\text{C}$ ,  $C_{IN}=C_{OUT}=1\mu\text{F}$ , unless otherwise noted.)

Parameter	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
Supply Voltage Range	$V_{CC}$		4.5	-	5.5	V
Input Voltage UVLO Threshold	$V_{UVLO}$	$V_{CC}$ rising	-	3.75	-	V
Input Voltage UVLO Hysteresis	$V_{HYST}$	$V_{CC}$ falling	-	0.25	-	V
Supply Current	$I_{CC}$	EN= $V_{CC}$	-	0.4	0.8	mA
Shutdown Current	$I_{SD}$	EN= 0V	-1	-	1	uA
Feedback Voltage	$V_{FB}$		0.49	0.5	0.51	V
Feedback Pin Input Current	$I_{FB}$	$V_{FB} = 0.5\text{V}$	-100	-	100	nA
Soft Start Time	TSS		-	1	-	ms
EN Pin Logic High Threshold Voltage	$V_{ENH}$	Enable	1.3	-	-	V
	$V_{ENL}$	Disable	-	-	0.5	
EN Pin Input Current	$I_{EN}$	$I_{OUT}=0\text{mA}$ , $V_{IN}=5\text{V}$	-1	-	+1	uA
Output Voltage UVLO Threshold	$V_{TH(UV)}$	$V_{FB}$ Falling	0.2	0.25	0.3	V
Ton Duty	$T_{ON}$	$V_{FB} < 0.25\text{V}$	-	30	-	%
DRV Output Current	$I_{DRV(SRC)}$	Sourcing, $V_{FB}=0.48\text{V}$	-	20	-	mA
	$I_{DRV(SINK)}$	Sinking, $V_{FB}=0.52\text{V}$	-	20	-	
DRV Pin Output Voltage	$V_{DRV}$	$V_{FB}=0.48\text{V}$ , $V_{CC}=5\text{V}$ , no load	4.8	-	5.0	V
POK Threshold Voltage for Power OK	$V_{POK}$	$V_{FB}$ Rising	93%	95%	97%	VFB



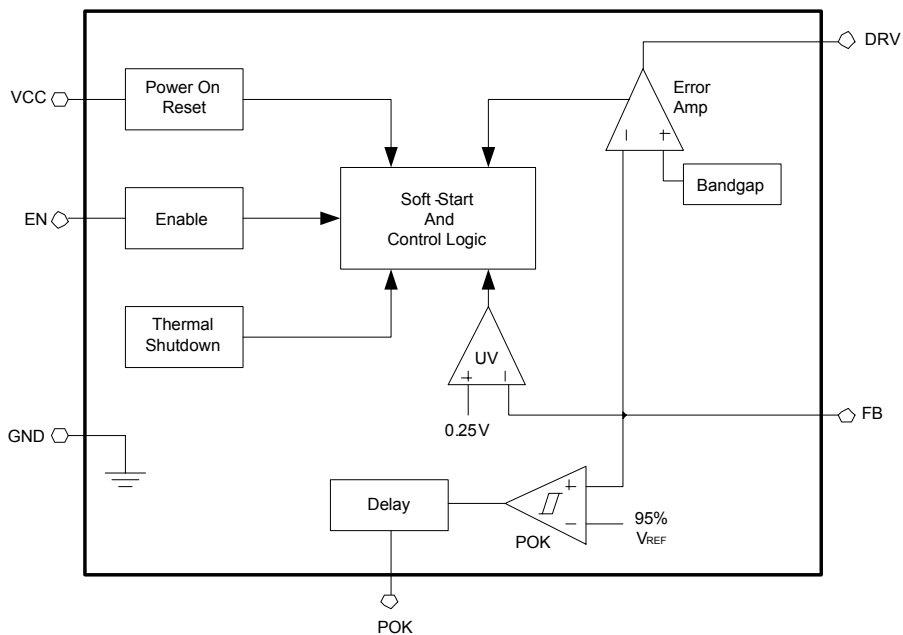
**ELECTRICAL SPECIFICATIONS(Cont.)**

Parameter	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
POK Threshold Voltage for Power Not OK	$V_{PNOK}$	$V_{FB}$ Falling	86%	89%	93%	VFB
POK Low Voltage		POK sinks 1mA	-	50	100	mV
POK Delay Time	$T_{DELAY}$		0.8	2	10	ms
Thermal Shutdown Temperature	TSD		-	150	-	°C
Thermal Shutdown Hysteresis			-	50	-	°C

**PIN DESCRIPTIONS**

PIN SYMBOL	PIN DESCRIPTION
<b>FB</b>	Feedback Pin
<b>GND</b>	Common Ground Pin
<b>DRV</b>	Gate Drive to N-FET
<b>POK</b>	Power ok Output Pin
<b>EN</b>	H : Normal Operation L : Shutdown
<b>VCC</b>	Input Voltage

**BLOCK DIAGRAM**





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## **FUNCTION DESCRIPTIONS**

### **Power-On-Reset**

A Power-On-Reset (POR) circuit monitors input voltages at VCC pins to prevent wrong logic controls. The POR function initiates a soft-start process after the supply voltages exceed the rising POR threshold voltages during powering on. The POR function also pulls low the POK pin regardless the output voltage when the VCC voltage falls below its falling POR threshold.

### **Internal Soft-Start**

An internal soft-start function controls rise rate of the output voltage to limit the current surge at start-up. The typical soft-start interval is about 1ms.

### **Output Voltage Regulation**

An error amplifier working with a temperature compensated 0.5V reference and an output NMOS regulates output to the preset voltage. The error amplifier designed with high bandwidth and DC gain provides very fast transient response and less load regulation.

### **Under-Voltage Protection (UVP)**

APE8858A monitors the voltage on FB pin after soft-start process is finished. Therefore the UVP is disabling during soft-start. When the voltage on FB pin falls below the under-voltage threshold, the UVP circuit shuts off the output immediately. After a while ( ~ 70% Duty ) , APE8858A starts a new soft-start to regulate output.

### **Thermal Shutdown**

A thermal shutdown circuit limits the junction temperature of APE8858A. When the junction temperature exceeds +150 °C, a thermal sensor turns off the output NMOS, allowing the device to cool down. The regulator regulates the output again through initiation of a new soft-start cycle after the junction temperature cools by 50°C, resulting in a pulsed output during continuous thermal overload conditions.



TYPICAL PERFORMANCE CHARACTERISTICS

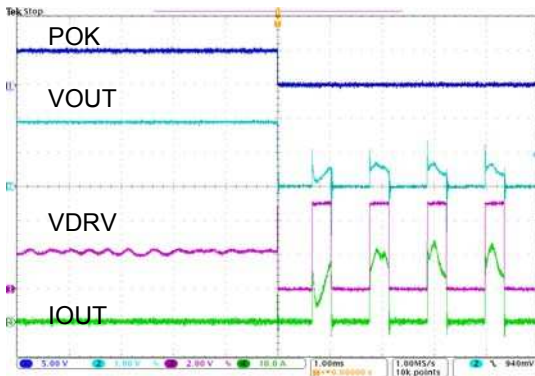


Fig.1 Hard Short Circuit Protection

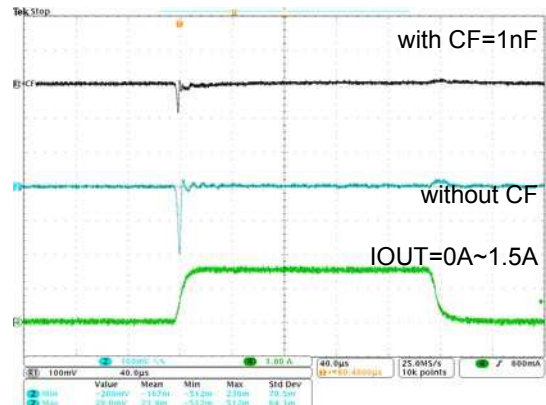


Fig.2 Load Transient, 3Vi to 1.8Vo

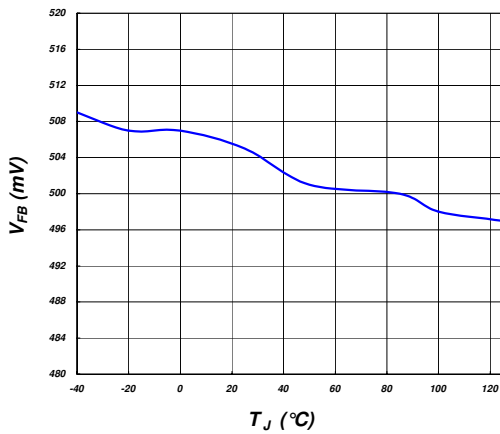


Fig.3 Feedback Voltage vs. Temperature

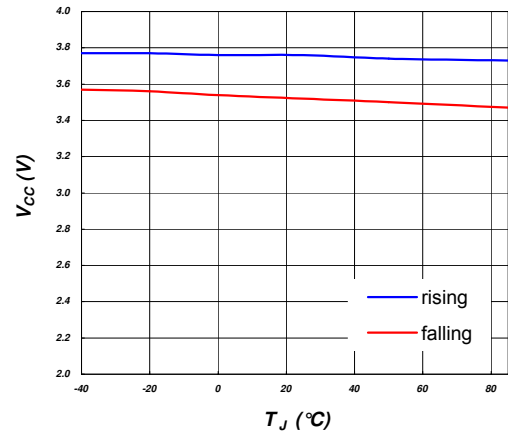


Fig.4 UVLO vs. Temperature

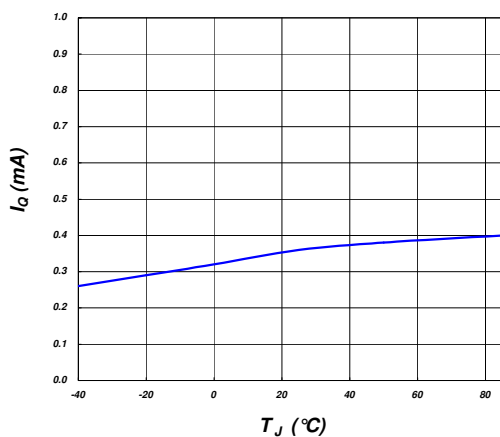


Fig.5 Supply Current vs. Temperature

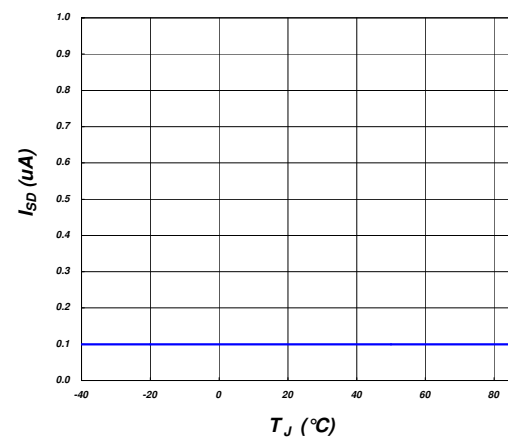
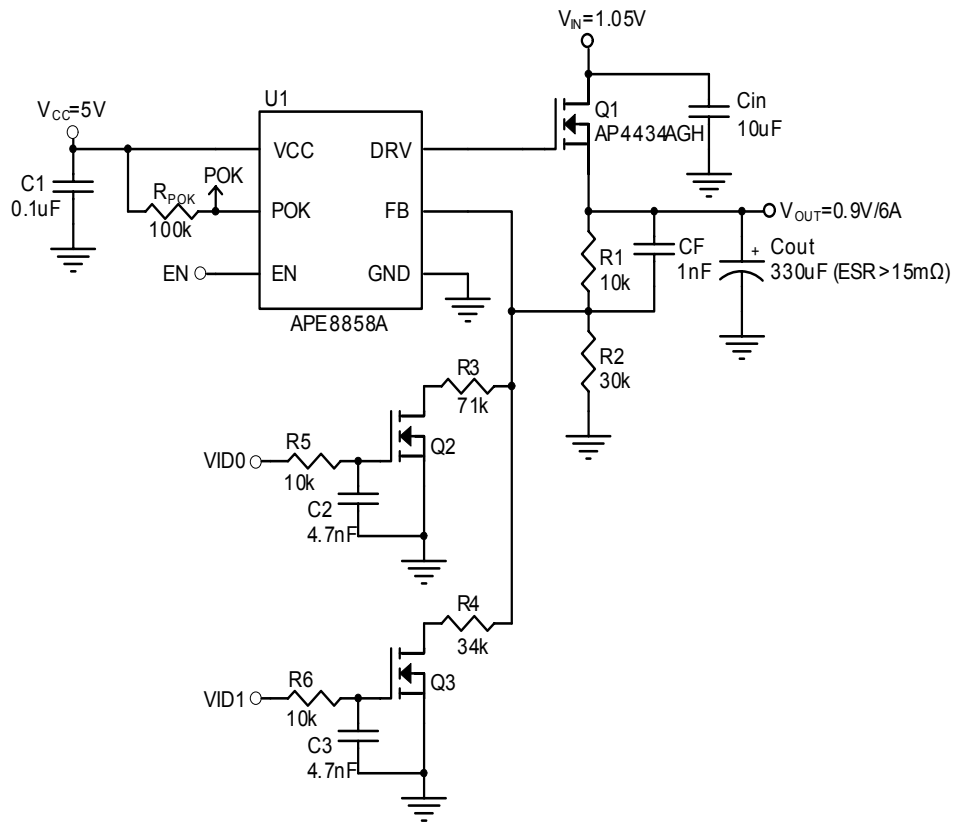


Fig.6 Shutdown Current vs. Temperature



APPLICATION CIRCUIT



VID1	VID0	Vo (V)
0	0	0.675
0	1	0.725
1	0	0.8
1	1	0.9

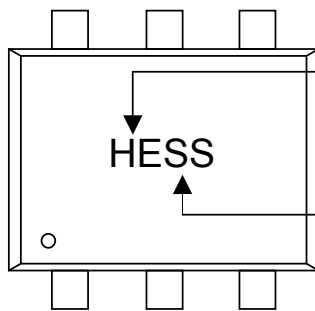
APE8858A with output voltage step function from 0.9V to 0.675V



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**MARKING INFORMATION**

SOT-26



Part Number : HE

Date Code

SS:2004,2008,2012...

SS:2003,2007,2011...

SS:2002,2006,2010...

SS:2001,2005,2009...