



## Voltage Mode PWM Controller with EMI Reduction

### General Description

ASM8P18xx is a high performance, adjustable frequency, PWM controller with an integrated spread spectrum modulator for EMI reduction. It contains all the functions of a standard PWM controller along with a user configurable spread spectrum modulation with adjustable spread. ASM8P18xx allows significant system cost savings by reducing the number of PCB layers and shielding that are traditionally required to pass EMI regulation.

ASM8P18xx is the industry's first general purpose EMI reduction IC, specifically designed for use in SMPS systems. ASM8P18xx is compatible to any other 3842 PWM controllers.

ASM8P18xx is capable of driving 1A maximum current output and it covers a wide supply voltage range from 7V DC to 30V DC. The PWM frequency is selectable from 40 KHz to 400 KHz.

ASM8P18xx provides under voltage lockout, thermal shutdown, overload, and undercurrent protection. It is available in 8-pin MicroSO, P-DIP and SOIC package.

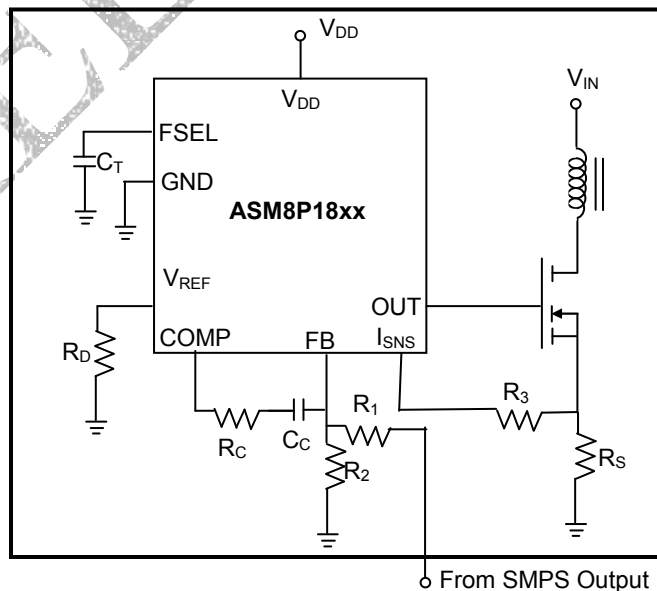
### Features

- 30V maximum operating voltage with CMOS technology
- Adjustable PWM frequencies (40 KHz to 400 KHz)
- Maximum Output drive current of 1A.
- Wide duty cycle range (0% minimum to 95% maximum)
- Spread spectrum modulation with adjustable spread.
- Under voltage lockout with hysteresis.
- Low startup current: 275µA maximum
- Pin compatible with industry standard 3842 PWM controller.
- Temperature range -40°C to +85°C.
- Thermal shutdown, overload and undercurrent protection.
- Frequency skip mode.
- Available in 8-pin plastic MicroSO, P-DIP and SOIC packages.

### Applications

- Off-line converter
- DC-DC converter
- Monitor power supply
- Computer/DVD/STB power supply
- Wireless base station power supply
- Telecom power supply

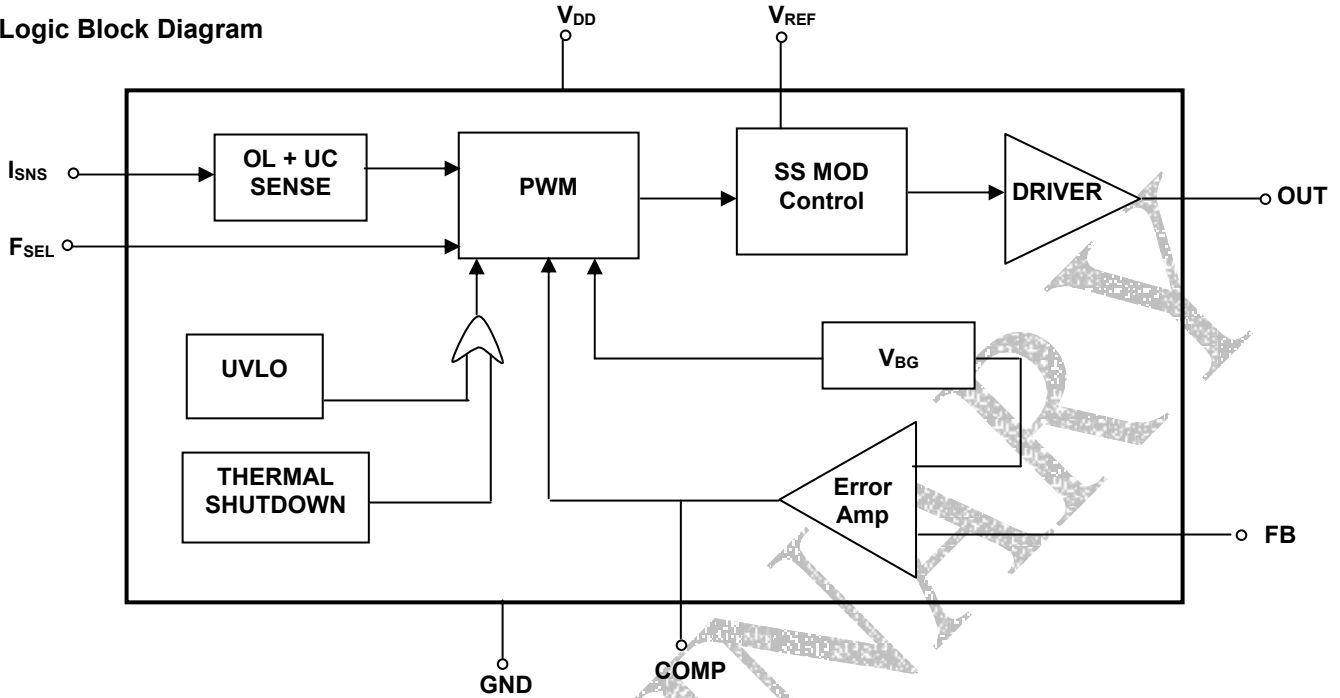
### Typical Operating Circuit





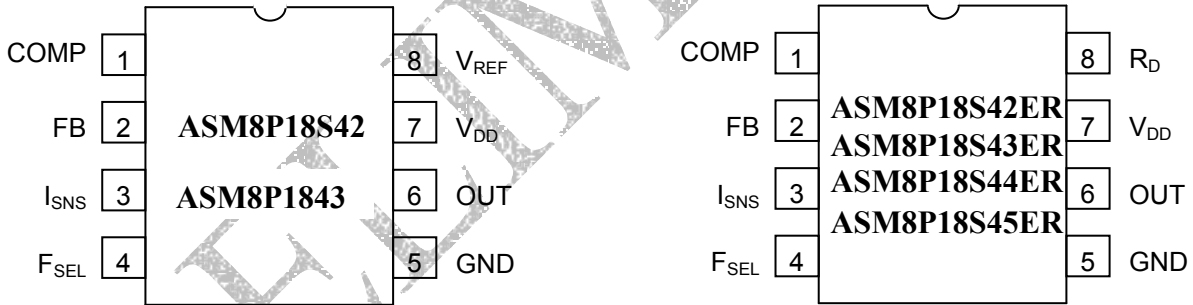
rev 0.6

Logic Block Diagram



Pin Diagram

8-Pin MicroSO, P-DIP and SOIC



Pin Description

Pin #	Pin Name	Function
1	COMP	Input of the PWM Comparator and output of the error amplifier
2	FB	Feedback, inverting input of the error amplifier
3	Isns	Current sense comparator input
4	FSEL	External capacitor selects PWM frequency
5	GND	Ground
6	OUT	SS modulated PWM output
7	VDD	Supply voltage
8	VREF/ RD	5V output for ASM8P18S42 and ASM8P1843 parts. External resistor "RD" to GND sets the modulation spread for the parts with ER suffix.

**rev 0.6****Application Information****Spread Spectrum Deviation**

The deviation can be determined by selecting the proper resistor at  $V_{REF}$  to GND for the parts with 'ER' suffix. (Refer "R<sub>D</sub> Resistor Vs. % Modulation Depth Plot" for resistor selection)

**PWM Frequency**

The PWM frequency can be determined by selecting the proper capacitance ( $C_T$ ) at the FSEL pin.

**Start-up Current**

ASM8P18xx allows a substantial reduction in the start up current. Low start up current allows high resistance, lower wattage start-up resistor, to supply controller start up power.

**Under Voltage Lockout (UVLO)**

When the power supply voltage is below the start up threshold voltage, internal circuitry puts the output into low impedance state and sets the output to zero.

**Absolute Maximum Ratings**

Symbol	Parameter	Min	Max	Units
$V_{DD}$	Supply Voltage		30	V
$I_{DD}$	Supply Current		TBD*	mA
$I_{OUT}$	Maximum Output Current		1	A
$I_{SNS}$	Current Sense Inputs and feedback $I_{SNS}$ , FB, COMP		5	V
$V_{REF}$	Reference Voltage		6	V
$V_{OSC}$	Oscillator Voltage		4	V
$V_{OUT}$	Output Voltage		30	V
	Operation Junction Temperature	-45	150	°C
	Storage Temperature	-65	150	°C
	Lead Soldering Temperature (10 Seconds)		300	°C
	Static Discharge Voltage MIL-STD-883		2	KV

\*Maximum output voltage = 30V

**Thermal Shutdown**

The output of ASM8P18xx goes down to zero when the junction temperature of the device rises above 155°C. The device automatically resumes operation when temperature drops to 126°C. This protects the device from thermal breakdown.

**Overload and under current protection**

ASM8P18xx provides Cycle by cycle current limit and pulls down PWM output to low as soon as  $I_{SNS}$  pin senses a peak voltage of 1V, with a delay to output of 125 nS maximum.

At no load condition when the device senses the peak voltage level of less than 0.1V at  $I_{SNS}$  pin for a period of 200mS, the oscillator enters in to cycle skip mode. Normal condition is restored once  $I_{SNS}$  increases beyond 0.1V for more than three cycles. Details of cycle skip for different options are provided in the Electrical Characteristics table.



## rev 0.6

**Electrical Characteristics**

Unless otherwise noted,  $V_{DD}=15V$ , Capacitor on  $F_{SEL} = 330pf$ ,  $I_{SENS} = 0.5V$ . Specifications are over the  $-40^{\circ}C$  to  $+85^{\circ}C$  ambient temperature range. Typical values are at  $25^{\circ}C$ .

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>REFERENCE SECTION</b>						
<b>ASM8P18S42 &amp; ASM8P1843</b>						
Output voltage	$V_{REF}$	$T_A = +25^{\circ}C$ , $I_{OUT} = 1mA$	4.90	5.00	5.1	V
Line Regulation	$\Delta V_{REF}$	$12V < V_{DD} < 18V$ , $I_{OUT} = 5\mu A$		25		mV
Total Reference variation		Line, Temperature			0.7	%
Temperature Stability	$TC_{REF}$			0.5		mV/ $^{\circ}C$
Load Regulation (ASM8P1843)		$1mA < I_o < 20mA$		25		mV
<b>ERROR AMPLIFIER SECTION</b>						
Input Bias Current	$I_{BIAS}$			-20		$\mu A$
Input Voltage	$V_I$	$V_{pin1} = 1.25V$	1.2	1.25	1.3	V
Open Loop Voltage Gain	$A_{VOL}$			65		dB
Power Supply Rejection Ratio	PSRR	$V_{START} < V_{CC} < V_{CC} max$		80		dB
Output Sink Current	$I_{OL}$	$V_{FB} = 1.32V$ , $V_{COMP} = 0.15V$		-1.5		mA
Output Source Current	$I_{OH}$	$V_{FB} = 1.18V$ , $V_{COMP} = 4.17V$		0.3		mA
High Output Voltage	$V_{OH}$	$V_{FB} = 1.25V$ , $R_L = 15K\Omega$	4.17			V
Low Output Voltage	$V_{OL}$	$V_{FB} = 1.25V$		0.15		V
<b>CURRENT SENSE SECTION</b>						
Over Current Protection Threshold	$V_{I(MAX)}$	$FB = 0V$ ( $V_{COMP} = 5V$ )	0.90	1.00	1.10	V
Delay to output	$T_{PD}$	$V_{FB} = 0V$ , $I_{SNS} = 0$ to $2V$			125	ns
Under Current Sense Period	$T_{UCS}$			200		ms
Under Current Recovery Period	$T_{UCSD}$			3		Cycles of PWM Frequency
Cycle Skip	Cycle Skip condition: $I_{SENS} \leq 0.1V$	ASM8P18S42, ASM8P18S42ER		1/4		$x f_s$
		ASM8P1843 ASM8P18S43ER ASM8P18S44ER		1/10		
		ASM8P18S45ER		No Skip		
<b>OUTPUT SECTION</b>						
Low Output Voltage	$V_{OL}$	$I_{SINK} = 50mA$ $I_{SINK} = 200mA$	At $V_{DD} = 15V$	0.128	0.470	V
High Output Voltage	$V_{OH}$	$I_{SOURCE} = 50mA$ $I_{SOURCE} = 200mA$		14.71	13.77	V
On Resistance, High	$R_{DS(ON)H}$	$I_{SOURCE} = 0.2A$		6.5		$\Omega$
On Resistance, Low	$R_{DS(ON)L}$	$I_{SINK} = 0.2A$		2.5		$\Omega$

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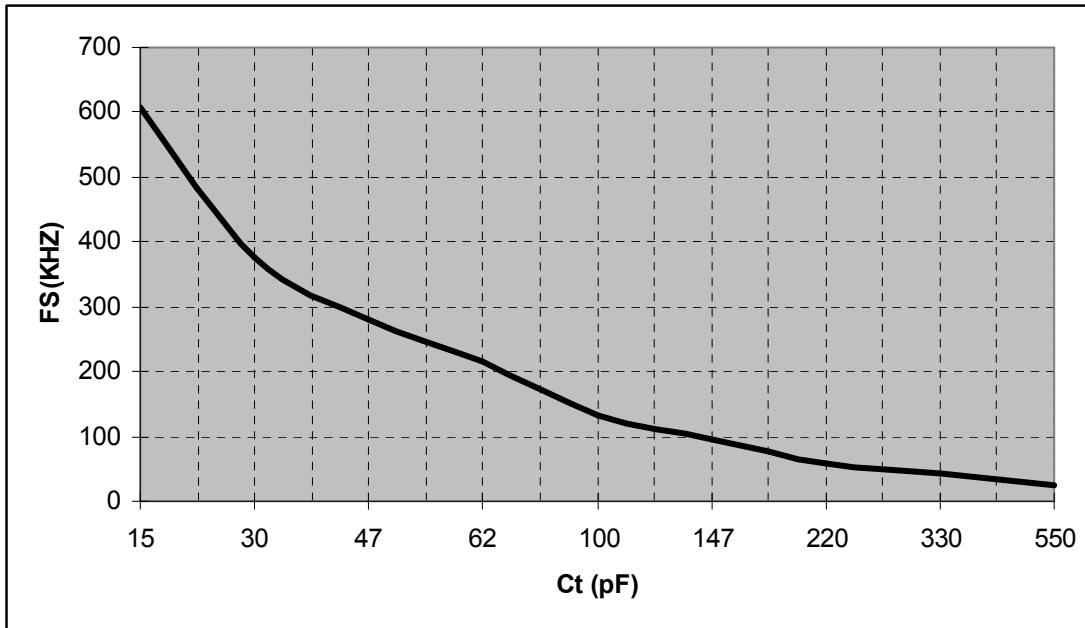
**ASM8P18S42 / ASM8P18S42ER**  
**ASM8P1843 / ASM8P18S43ER**  
**ASM8P18S44ER / ASM8P18S45ER**

rev 0.6

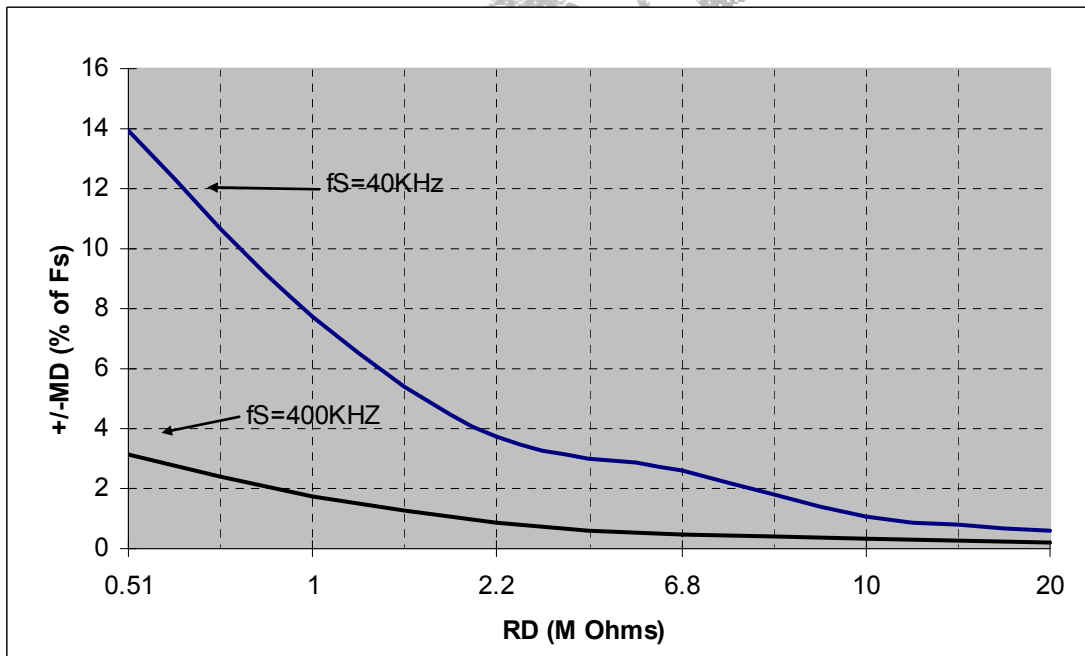
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Rise Time	$t_R$	$T_A = 25^\circ\text{C}$ , $C_L = 1\text{nF}$	30			nS
Fall Time	$t_F$	$T_A = 25^\circ\text{C}$ , $C_L = 1\text{nF}$	30			nS
Shoot Through Current				0		
<b>UVLO SECTION</b>						
Start threshold	$V_{th(START)}$	ASM8P1843, ASM8P18S43ER, ASM8P18S45ER,		7.8		V
		ASM8P18S42, ASM8P18S42ER ASM8P18S44ER		15.4		
Stop Threshold	$V_{th(STOP)}$	ASM8P1843, ASM8P18S43ER, ASM8P18S45ER		6.7		V
		ASM8P18S42, ASM8P18S42ER, ASM8P18S44ER		10.2		
<b>PWM SECTION</b>						
PWM frequency	$f_s$		40		400	kHz
Duty Cycle Range		ASM8P18S44ER, ASM8P18S45ER	0		50	%
		ASM8P18S42, ASM8P18S42ER, ASM8P1843, ASM8P18S43ER	0		95	
<b>TOTAL DEVICE</b>						
Start up Current	$I_{ST}$				275	$\mu\text{A}$
Peak Output Current	$I_{OUT(PK)}$			1000		mA
Operating Current	$I_{CC(OPR)}$	$V_{FB} = 0$ ; $I_{SNS} = 0.5$ ; $V_{DD} = 15\text{V}$		5	6	mA
Thermal Shutdown	$V_Z$	Junction Temp		155		$^\circ\text{C}$
Thermal Recovery				126		$^\circ\text{C}$
<b>SPREAD SPECTRUM SECTION</b>						
Modulation Rate		ASM8P18S43ER, ASM8P18S45ER		1/20		of Switching Frequency (KHz)
		ASM8P18S42, ASM8P18S42ER, ASM8P18S44ER		1/10		
Modulation Depth		Refer $R_D$ Resistor Vs. % Modulation Depth Plot				
<b>OSCILLATOR SECTION</b>						
Frequency change with Voltage	$Df/d V_{CC}$			0.04	0.05	%
Oscillator Amplitude					1.66	V (Pk-Pk)
Temperature Stability	$T_{OSC}$			0.1		$\% / ^\circ\text{C}$



### Frequency Selection Curve



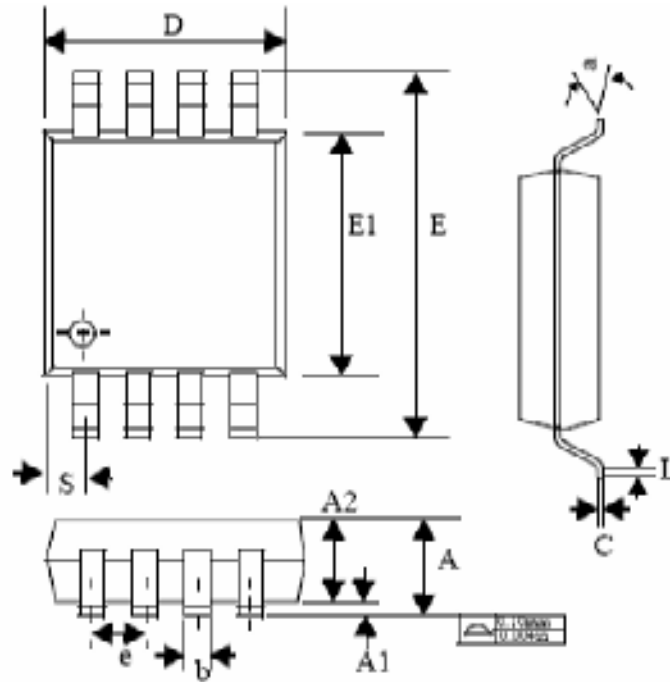
### R<sub>D</sub> Resistor vs % Modulation Depth Plot





Package Information

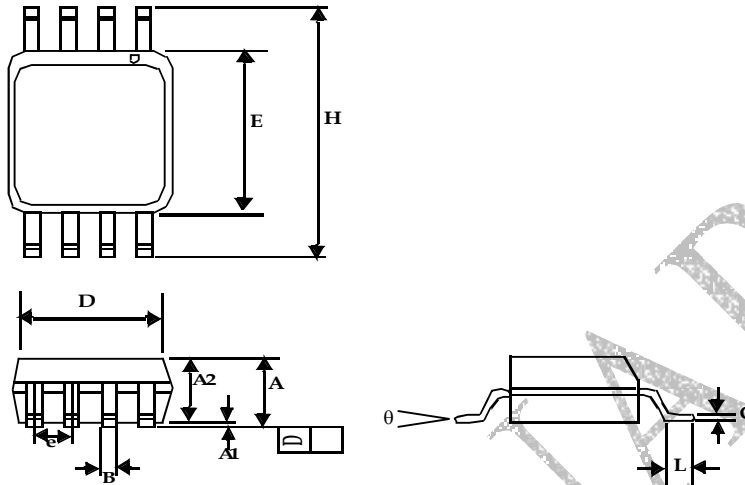
8-lead MSOP Package



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	0.032	0.044	0.81	1.10
A1	0.002	0.006	0.05	0.15
A2	0.030	0.038	0.76	0.97
b	0.012 BSC		0.30 BSC	
C	0.004	0.008	0.10	0.20
D	0.114	0.122	2.90	3.10
e	0.0256 BSC		0.65 BSC	
E1	0.114	0.122	2.90	3.10
E	0.184	0.200	4.67	5.08
L	0.016	0.026	0.41	0.66
θ	0°	6°	0°	6°
S	0.0206 BSC		0.52 BSC	



8-lead (150-mil) SOIC Package

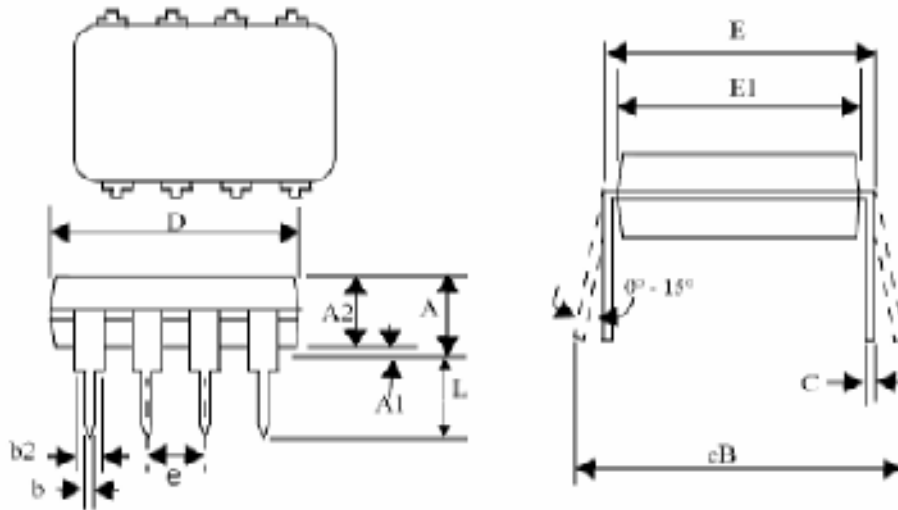


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A1	0.004	0.010	0.10	0.25
A	0.053	0.069	1.35	1.75
A2	0.049	0.059	1.25	1.50
B	0.012	0.020	0.31	0.51
C	0.007	0.010	0.18	0.25
D	0.193 BSC		4.90 BSC	
E	0.154 BSC		3.91 BSC	
e	0.050 BSC		1.27 BSC	
H	0.236 BSC		6.00 BSC	
L	0.016	0.050	0.41	1.27
$\theta$	0°	8°	0°	8°





8-lead PDIP Package



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A		0.210		5.33
A1	0.015		0.38	
A2	0.115	0.195	2.92	4.95
b	0.014	0.022	0.36	0.56
b2	0.045	0.070	1.14	1.78
C	0.008	0.014	0.20	0.36
D	0.355	0.400	9.02	10.16
E	0.300	0.325	7.62	8.26
E1	0.240	0.280	6.10	7.11
e	0.10 BSC		2.54 BSC	
eB		0.430		10.92
L	0.115	0.150	2.92	3.81



## Ordering Information

ASM Ordering Part Number	Package	Operating Temp Range	Start-up Voltage	Minimum Operating Voltage	Maximum Duty Cycle	Modulation Depth Control	Peak Output Current	Package Top Mark
ASM8118S42ERF-08-Px	8-PDIP	-45 to 85°C	15.4V	10.2V	95	External R	1A	8118S42ERF
ASM8118S42ERF-08-Mx	8-MSOP	-45 to 85°C	15.4V	10.2V	95	External R	1A	8118S42ERF
ASM8118S42ERF-08-Sx	8-SOIC	-45 to 85°C	15.4V	10.2V	95	External R	1A	8118S42ERF
ASM8P18S42ERF-08-Px	8-PDIP	0 to 70°C	15.4V	10.2V	95	External R	1A	8P18S42ERF
ASM8P18S42ERF-08-Mx	8-MSOP	0 to 70°C	15.4V	10.2V	95	External R	1A	8P18S42ERF
ASM8P18S42ERF-08-Sx	8-SOIC	0 to 70°C	15.4V	10.2V	95	External R	1A	8P18S42ERF
ASM8118S43ERF-08-Px	8-PDIP	-45 to 85°C	7.8V	6.7V	95	External R	1A	8118S43ERF
ASM8118S43ERF-08-Mx	8-MSOP	-45 to 85°C	7.8V	6.7V	95	External R	1A	8118S43ERF
ASM8118S43ERF-08-Sx	8-SOIC	-45 to 85°C	7.8V	6.7V	95	External R	1A	8118S43ERF
ASM8P18S43ERF-08-Px	8-PDIP	0 to 70°C	7.8V	6.7V	95	External R	1A	8P18S43ERF
ASM8P18S43ERF-08-Mx	8-MSOP	0 to 70°C	7.8V	6.7V	95	External R	1A	8P18S43ERF
ASM8P18S43ERF-08-Sx	8-SOIC	0 to 70°C	7.8V	6.7V	95	External R	1A	8P18S43ERF
ASM8118S44ERF-08-Px	8-PDIP	-45 to 85°C	15.4V	10.2V	50	External R	1A	8118S44ERF
ASM8118S44ERF-08-Mx	8-MSOP	-45 to 85°C	15.4V	10.2V	50	External R	1A	8118S44ERF
ASM8118S44ERF-08-Sx	8-SOIC	-45 to 85°C	15.4V	10.2V	50	External R	1A	8118S44ERF
ASM8P18S44ERF-08-Px	8-PDIP	0 to 70°C	15.4V	10.2V	50	External R	1A	8P18S44ERF
ASM8P18S44ERF-08-Mx	8-MSOP	0 to 70°C	15.4V	10.2V	50	External R	1A	8P18S44ERF
ASM8P18S44ERF-08-Sx	8-SOIC	0 to 70°C	15.4V	10.2V	50	External R	1A	8P18S44ERF
ASM8118S45ERF-08-Px	8-PDIP	-45 to 85°C	7.8V	6.7V	50	External R	1A	8118S45ERF
ASM8118S45ERF-08-Mx	8-MSOP	-45 to 85°C	7.8V	6.7V	50	External R	1A	8118S45ERF
ASM8118S45ERF-08-Sx	8-SOIC	-45 to 85°C	7.8V	6.7V	50	External R	1A	8118S45ERF
ASM8P18S45ERF-08-Px	8-PDIP	0 to 70°C	7.8V	6.7V	50	External R	1A	8P18S45ERF
ASM8P18S45ERF-08-Mx	8-MSOP	0 to 70°C	7.8V	6.7V	50	External R	1A	8P18S45ERF
ASM8P18S45ERF-08-Sx	8-SOIC	0 to 70°C	7.8V	6.7V	50	External R	1A	8P18S45ERF
ASM8118S42F-08-Px	8-PDIP	-45 to 85°C	15.4V	10.2V	95	NA	1A	8118S42F
ASM8118S42F-08-Mx	8-MSOP	-45 to 85°C	15.4V	10.2V	95	NA	1A	8118S42F
ASM8118S42F-08-Sx	8-SOIC	-45 to 85°C	15.4V	10.2V	95	NA	1A	8118S42F
ASM8P18S42F-08-Px	8-PDIP	0 to 70°C	15.4V	10.2V	95	NA	1A	8P18S42F
ASM8P18S42F-08-Mx	8-MSOP	0 to 70°C	15.4V	10.2V	95	NA	1A	8P18S42F
ASM8P18S42F-08-Sx	8-SOIC	0 to 70°C	15.4V	10.2V	95	NA	1A	8P18S42F
ASM811843F-08-Px	8-PDIP	-45 to 85°C	7.8V	6.7V	95	NA	1A	811843F
ASM811843F-08-Mx	8-MSOP	-45 to 85°C	7.8V	6.7V	95	NA	1A	811843F
ASM811843F-08-Sx	8-SOIC	-45 to 85°C	7.8V	6.7V	95	NA	1A	811843F
ASM8P1843F-08-Px	8-PDIP	0 to 70°C	7.8V	6.7V	95	NA	1A	8P1843F
ASM8P1843F-08-Mx	8-MSOP	0 to 70°C	7.8V	6.7V	95	NA	1A	8P1843F
ASM8P1843F-08-Sx	8-SOIC	0 to 70°C	7.8V	6.7V	95	NA	1A	8P1843F

Note: All Alliance Semiconductor Lead Free Parts are RoHS Compliant. All parts are Lead Free by default. Contact factory for Non Lead Free Parts.

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**ASM8P18S42 / ASM8P18S42ER**  
**ASM8P1843 / ASM8P18S43ER**  
**ASM8P18S44ER / ASM8P18S45ER**

rev 0.6



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ASM8P18S42 / ASM8P18S43ER  
ASM8P18S44ER / ASM8P18S45ER  
Document Version: v0.6

Note: This product utilizes US Patent # 6,646,463 Impedance Emulator Patent issued to Alliance Semiconductor, dated 11-11-2003

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