

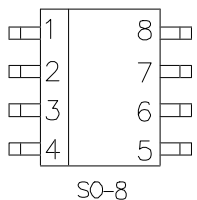
May 27, 1999

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## DESCRIPTION

The EZ1900 is a high performance positive load current balancer designed for use in applications utilizing 2 regulators in parallel to achieve equal current sharing or identical current for each load. The regulator balance controller allows a flexible motherboard design to be made to cope with different processor configurations. The controller reads a logic level upgrade signal (denoted  $V_{CC2DET}$  on the Intel P55C; similar on AMD, Cyrix and PowerPC microprocessors) to control the output voltage of two linear low dropout voltage regulators to the CPU core and I/O planes. In single-voltage plane configurations ( $V_{CC2DET}$  floating), both regulators are set to the same output voltage (usually 3.3 - 3.5V) and are configured in master-slave mode. For split plane processors ( $V_{CC2DET}$  low), the outputs of the two regulators are switched - the core voltage will be set to a nominal 2.5V while the I/O voltage will remain at 3.3V. The actual output voltages can be adjusted by means of resistors. The EZ1900 programmable current balancer is available in the popular SO-8 surface mount package.

## PIN CONFIGURATION



Pin #	Legend	Description
1	Sel	Non-slave mode, voltage select
2	-IN	Negative error amplifier input
3	+IN	Positive error amplifier input
4	-V	Power input, common
5	nc	No Connection
6	S <sub>OUT</sub>	Sets V <sub>OUT</sub> of slave device
7	+V	Power input, positive
8	nc	No connection

**Slave Mode Pin:** For non "Computer Select Operation", the Select Mode, pin #1, can be left open circuited for continuous slave mode operation or balance current control. Ground the Select Mode, pin #1, for non-slave mode operation.

## FEATURES

- Current balance controller for regulators in parallel
- Slave and non-slave voltage modes
- Slave or non-slave mode computer selected
- Compatible with 3 or 5 pin low drop regulators
- Remote sense operation
- SO-8 package

## APPLICATIONS

- Flexible upgrade from single voltage plane to split-plane processors
- Intel Pentium® Processor P54CS & P55C upgrades
- PowerPC™ 603 & 604 upgrades
- AMD5<sub>x</sub>86™ upgrades

## ORDERING INFORMATION

DEVICE <sup>(1)</sup>	PACKAGE
EZ1900CS	SO-8

Note:

(1) Add suffix 'TR' for tape and reel.

## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Maximum	Units
Input Voltage Supply	V <sub>IN</sub>	7	V
Differential Amplifier	-IN, +IN S <sub>OUT</sub>	7 0 to +V	V
Slave Output Current (sink only)	I <sub>SLAVE</sub>	50	mA
Thermal Resistance Junction to Ambient	θ <sub>JA</sub>	160	°C/W
Operating Junction Temperature Range	T <sub>J</sub>	0 to 70	°C
Storage Temperature Range	T <sub>STG</sub>	-65 to 125	°C
Lead Temperature (Soldering) 5 Sec	T <sub>LEAD</sub>	260	°C

May 27, 1999

**ELECTRICAL CHARACTERISTICS**

 Unless otherwise specified:  $V_{IN} = 5V$ ;  $I_{SLAVE} = 10mA$ ;  $T_J = 25^{\circ}C$ .

Parameter	Symbol	Test Conditions			Test Limits			Units
		+V	S <sub>OUT</sub>	T <sub>J</sub>	Min	Typ	Max	
<b>Input</b>								
Input Error Voltage	$V_{IO}$						5	mV
Common Mode Input Range	$V_{CM}$	7V			1		7	V
Average Temperature Coefficient, Input DIFF Voltage	$\frac{\Delta V_{IE}}{\Delta T}$					0.01		mV/°C
Input Current	$I_{IC}$					50	200	nA
Common Mode Rejection Ratio	CMRR	7V			70	80		dB
Power Supply Rejection Ration	PSRR				60	70		dB
Sensitivity	$\Delta I_{OUT} / \Delta V_{DIFF}$				10	50		ϕ
Select Threshold Low High	$V_{TH}$				2.4		0.8	V
Select Input Current Low SEL = 0V	$I_{SEL}$					-150	-200	μA
High SEL = 7V							1	
<b>Output</b>								
Slave Output Leakage	S <sub>OL</sub>		7V				1	μA
Slave Output Resistance	R <sub>O</sub>				2	3	4	Ω
Power Supply Current Slave Mode	$I_{CC}$					500	700	μA
Non-Slave Mode						3	5	mA
Off Mode								700

May 27, 1999

## V<sub>OUT</sub>/RESISTOR SELECTION REFERENCE

(Resistor selection in Ω. See Typical Applications on following pages.)

### Slave Mode (Master Regulator) V<sub>M</sub>

V <sub>OUT</sub>	R3	R4	Calc V <sub>OUT</sub>
3.500	130	232	3.494
3.300	115	187	3.293
2.900	133	174	2.895
2.800	137	169	2.801
2.700	137	158	2.700
2.600	121	130	2.600
2.500	115	115	2.506

### Non-Slave Mode (Slave Regulator) V<sub>S</sub>

V <sub>OUT</sub>	R1	R2	*Calc V <sub>OUT</sub>
3.500	137	243	3.508
3.300	137	221	3.306
2.900	137	178	2.911
2.800	124	150	2.801
2.700	130	147	2.701
2.600	121	127	2.600
2.500	133	137	2.498

**Notes:**

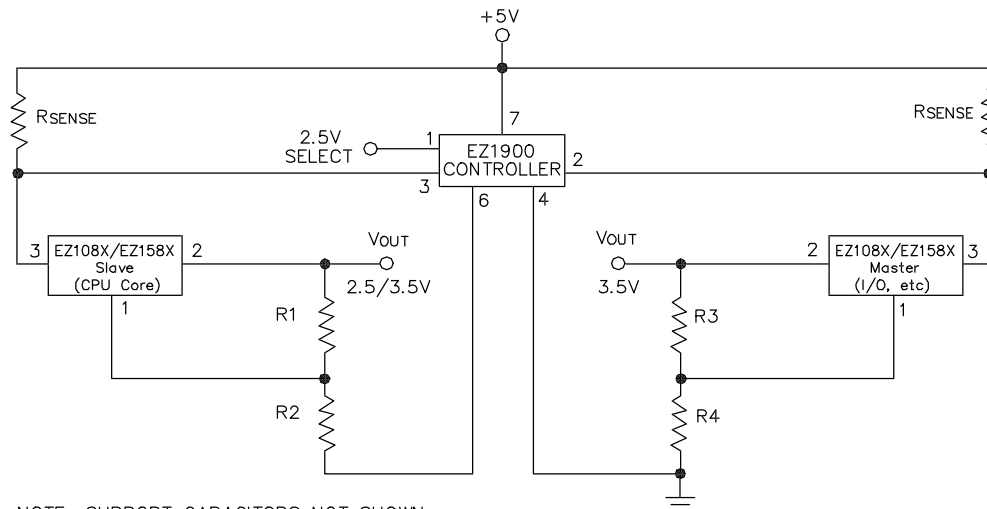
$$V_M = V_{REF} (1 + R4 / R3) + I_{ADJ} R4$$
 Resistor selection is based upon standard table for 1% resistors.

**Notes:**

$$V_S = V_{REF} (1 + (R2 + 3\Omega) / R1) + I_{ADJ} (R2 + 3\Omega)$$
 \*The EZ1900 operating in the non-slave mode operation will introduce approximately 3 ohms of resistance in the voltage set path when selected. The calculated values are based upon this addition.

## TYPICAL APPLICATIONS

### Balanced Current Controller Utilizing EZ108X/EZ158X Series



NOTE: SUPPORT CAPACITORS NOT SHOWN.

**Voltage Select**

 Slave Mode Operation  $V_M = V_{OUT}$  of Master  

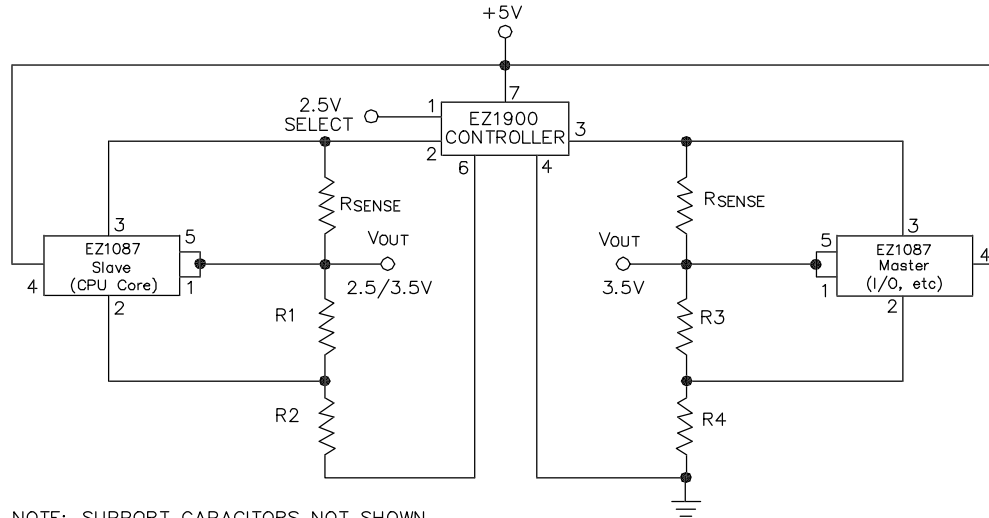
$$V_M = V_{REF} (1 + R4/R3) + I_{ADJ} R4$$
 Non-Slave Mode,  $V_S = V_{OUT}$  of Slave  

$$V_S = V_{REF} (1 + (R2 + 3\Omega) / R1) + I_{ADJ} (R2 + 3\Omega)$$
**R<sub>SENSE</sub> Select**

 R<sub>SENSE</sub> Select; Typical selection can be  

$$(50mV \text{ to } 100mV) / (\text{Total } I_{OUT} / 2)$$
 Trace resistance of 10mΩ and above can easily accommodate value required.

May 27, 1999

**TYPICAL APPLICATIONS (cont.)**
**Balanced Current Controller Utilizing EZ1087 Series**


NOTE: SUPPORT CAPACITORS NOT SHOWN.

**Voltage Select**

 Slave Mode Operation  $V_M = V_{OUT}$  of Master

$$V_M = V_{REF} (1 + R4/R3) + I_{ADJ} R4$$

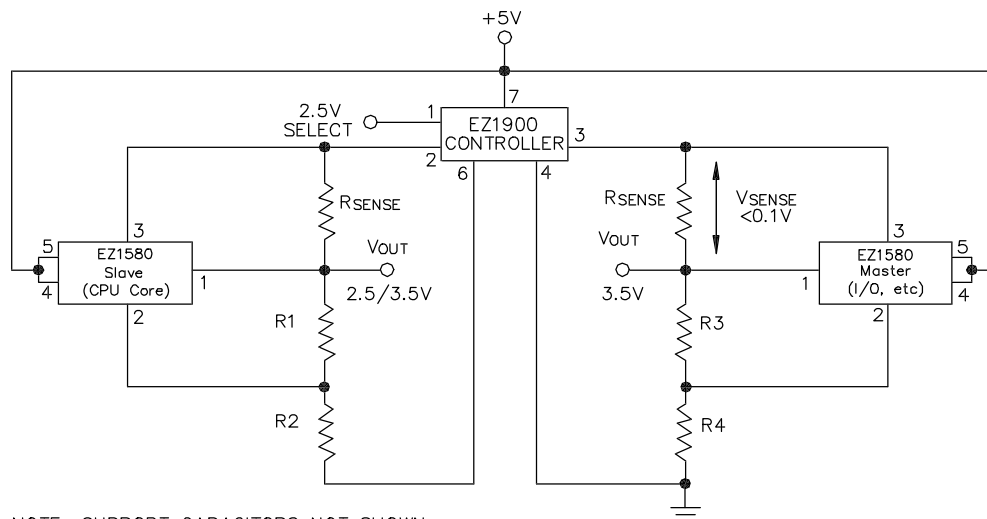
 Non-Slave Mode,  $V_S = V_{OUT}$  of Slave

$$V_S = V_{REF} (1 + (R2 + 3\Omega) / R1) + I_{ADJ} (R2 + 3\Omega)$$

 **$R_{SENSE}$  Select**
 $R_{SENSE}$  Select; Typical selection can be

$$(50\text{mV to } 100\text{mV}) / (\text{Total } I_{OUT} / 2).$$

 Trace resistance of  $10\text{m}\Omega$  and above can easily accommodate value required.

**Balanced Current Controller Utilizing EZ1580 Series**


NOTE: SUPPORT CAPACITORS NOT SHOWN.

**Voltage Select**

 Slave Mode Operation  $V_M = V_{OUT}$  of Master

$$V_M = V_{REF} (1 + R4/R3) + I_{ADJ} R4$$

 Non-Slave Mode,  $V_S = V_{OUT}$  of Slave

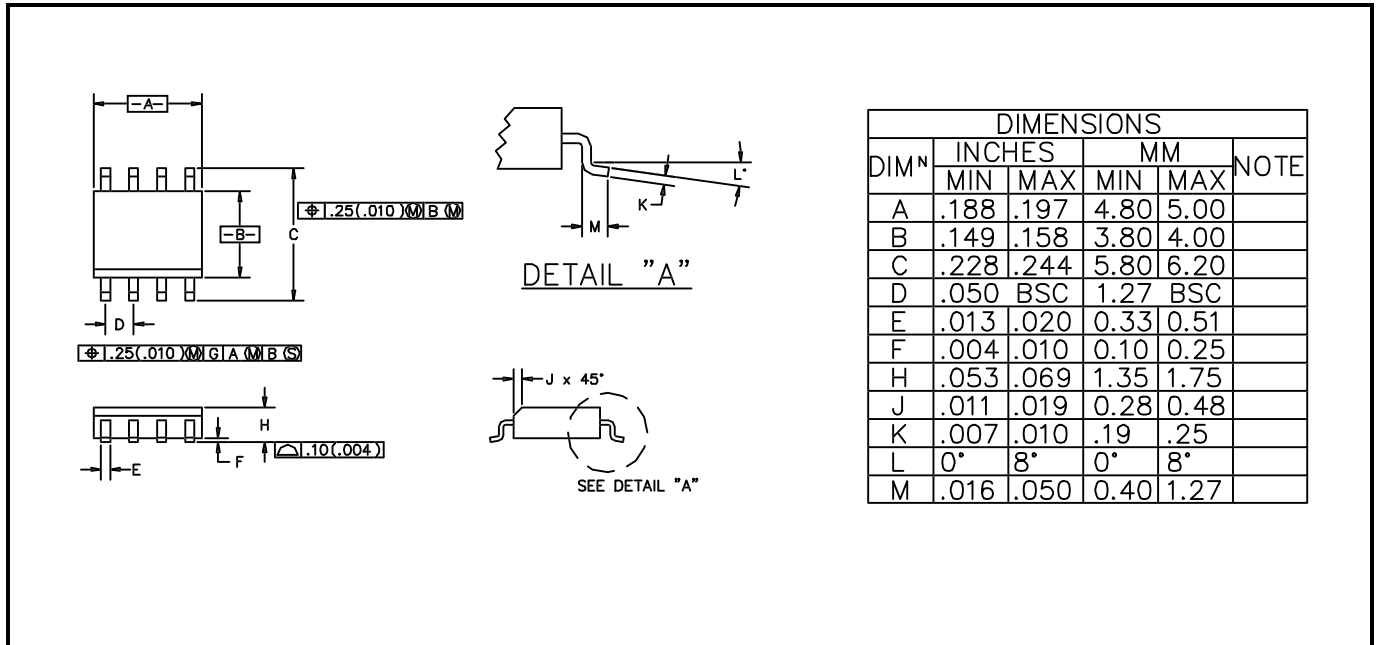
$$V_S = V_{REF} (1 + (R2 + 3\Omega) / R1) + I_{ADJ} (R2 + 3\Omega)$$

 **$R_{SENSE}$  Select**
 $R_{SENSE}$  Select (100mV Min) / (Total  $I_{OUT}$  / 2)

 The EZ1580 series requires  $R_{SENSE}$  voltage to be less than 100mV.

Trace resistance can easily accommodate value required.

May 27, 1999

**OUTLINE DRAWING SO-8**

**LAND PATTERN SO-8**
