December 16, 1998

TEL:805-498-2111 FAX:805-498-3804 WEB:http://www.semtech.com

DESCRIPTION

The EZ158X family of high performance positive voltage regulators are designed for use in applications requiring very low dropout voltage at 7, 5, 3 and 1.5 amps. When supplying 2.5V on motherboards where both 5V and 3.3V supplies are available, the superior dropout characteristics of the EZ158X result in reduced heat dissipation compared to regular LDOs, thus allowing heat sink size reduction. Additionally, the EZ158X provides excellent regulation over variations in line, load and temperature. Remote sense operation allows compensating for trace, connector and other resistive losses.

Outstanding features include very low dropout performance at rated current, fast transient response, remote sense, internal current limiting, thermal shutdown and safe operating area protection of the output device. The EZ158X is a five terminal adjustable voltage regulator available in the popular 5 pin TO-220 and TO-263 plastic packages.

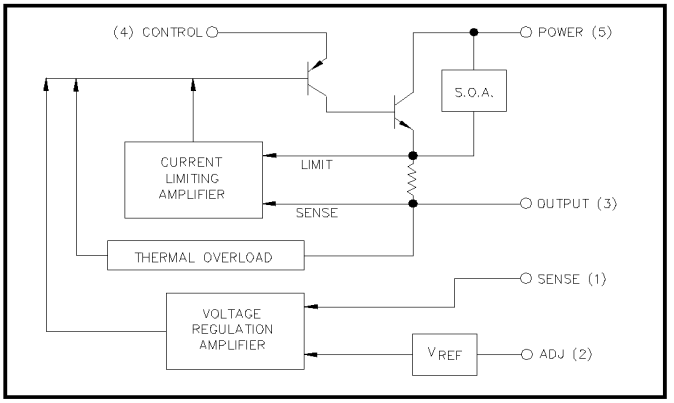
FEATURES

- 540mV dropout @ 7A in dual supply mode (EZ1580)
- Remote sense operation
- Fast transient response
- 0.5% initial accuracy
- 5 Pin TO-220 and TO-263 packages

APPLICATIONS

- Microprocessor supplies
- Split plane microprocessor supplies
- Pentium® Processor P54C and P55C
- PowerPC™ 603/604EV
- AMD5$_K$86™, AMD K6

BLOCK DIAGRAM



ORDERING INFORMATION

DEVICE	PACKAGE	I_{OUT} (A)	V_{OUT} (V)
EZ1580CT-X.X	TO-220, 5-pin	7	See Note (1)
EZ1581CT-X.X		5	
EZ1582CT-X.X		3	
EZ1583CT-X.X		1.5	
EZ1580CM-X.X	TO-263, 5-pin(2)	7	See Note (1)
EZ1581CM-X.X		5	
EZ1582CM-X.X		3	
EZ1583CM-X.X		1.5	

Notes:
(1) Where -X.X denotes voltage options. Available voltages are: 1.5V and 2.5V. Leave blank for adjustable version (1.3 to 5.7V).
(2) Add suffix 'TR' for tape and reel (TO-263).

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Maximum	Units
Input Voltage V_{POWER} $V_{CONTROL}$	 V_P V_C	 7 13.2	 V V
Power Dissipation	P_D	Internally Limited	W
Thermal Resistance Junction to Case EZ1580/1 TO-220 EZ1580/1 TO-263 EZ1582/3 TO-220 EZ1582/3 TO-263	θ_{JC}	 2 2 3 3	°C/W
Thermal Resistance Junction to Ambient EZ158X TO-220 EZ158X TO-263	θ_{JA}	 50 60	°C/W
Operating Junction Temperature Range	T_J	0 to 125	°C
Storage Temperature Range	T_{STG}	-65 to 125	°C
Lead Temperature (Soldering) 10 Sec.	T_{LEAD}	260	°C

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AMD5$_K$86 and K6 are trademarks of Advanced Micro Devices.

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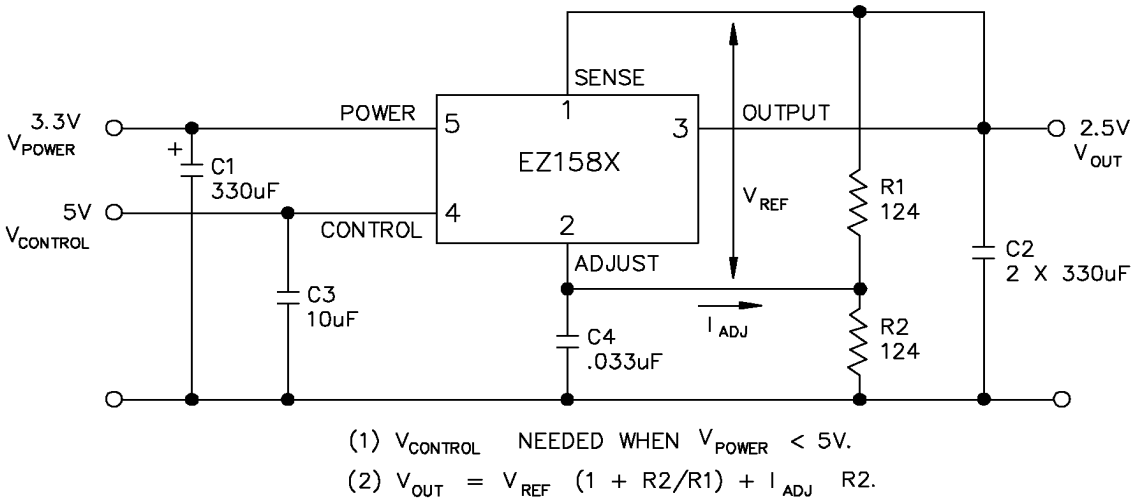
ELECTRICAL CHARACTERISTICS

		Test Conditions (1)				Test Limits			
Parameter	**Symbol**	**V_{CNTL} Volts**	**V_{PWR} Volts**	**Amps**	**T_J (6)**	**Min**	**Typ**	**Max**	**Units**
Reference Voltage	V_{REF}	2.75	2.00	0.01	25°C	1.243	1.250	1.257	
EZ1583 EZ1582 EZ1581 EZ1580		2.7 - 12	2.05 - 5.5	0.01 - 1.5 0.01 - 3.0 0.01 - 5.0 0.01 - 7.0	O.T.	1.237	1.250	1.263	V
Line Regulation	$REG_{(LINE)}$	2.5 - 12	1.75 - 5.5	0.01	O.T.		1.0	3.0	mV
Load Regulation EZ1583 EZ1582 EZ1581 EZ1580	$REG_{(LOAD)}$	2.75	2.1	0.01 - 1.5 0.01 - 3.0 0.01 - 5.0 0.01 - 7.0	O.T.		1.0	5.0	mV
Minimum Load Current (2)	I_O	5	3.3		O.T.		5.0	10	mA
Control Pin Current (3) EZ1583 EZ1582 EZ1581 EZ1580	I_C	2.75	2.05	1.5 3.0 5.0 7.0	O.T.		6.0 30 33 60	120	mA
Adjust Pin Current	I_{ADJ}	2.75	2.05	0.01	O.T.		50	120	µA
Current Limit EZ1583 EZ1582 EZ1581 EZ1580	I_{CL}	2.75	2.05		O.T.	1.6 3.1 5.1 7.1			A
Ripple Rejection (4) EZ1583 EZ1582 EZ1581 EZ1580	R_A	3.75	3.75	0.75 1.5 2.5 3.5	25°C	60	80		dB
Thermal Regulation (5)	$REG_{(THERMAL)}$						0.002	0.02	%/W
Dropout Voltage (7) Minimum V_{CNTL} EZ1583 EZ1582 EZ1581 EZ1580	V_C-V_O		2.05	1.5 3.0 5.0 7.0	O.T.		1.00 1.05 1.10 1.15	1.15 1.18 1.25 1.30	V
Dropout Voltage (7) Minimum V_{POWER}									
EZ1583	V_P-V_O	2.75		1.5	25°C O.T.		0.40 0.50	0.50 0.60	V
EZ1582				3.0	25°C O.T.		0.40 0.50	0.50 0.60	
EZ1581				5.0	25°C O.T.		0.40 0.50	0.50 0.60	
EZ1580				7.0	25°C O.T.		0.54 0.70	0.62 0.80	

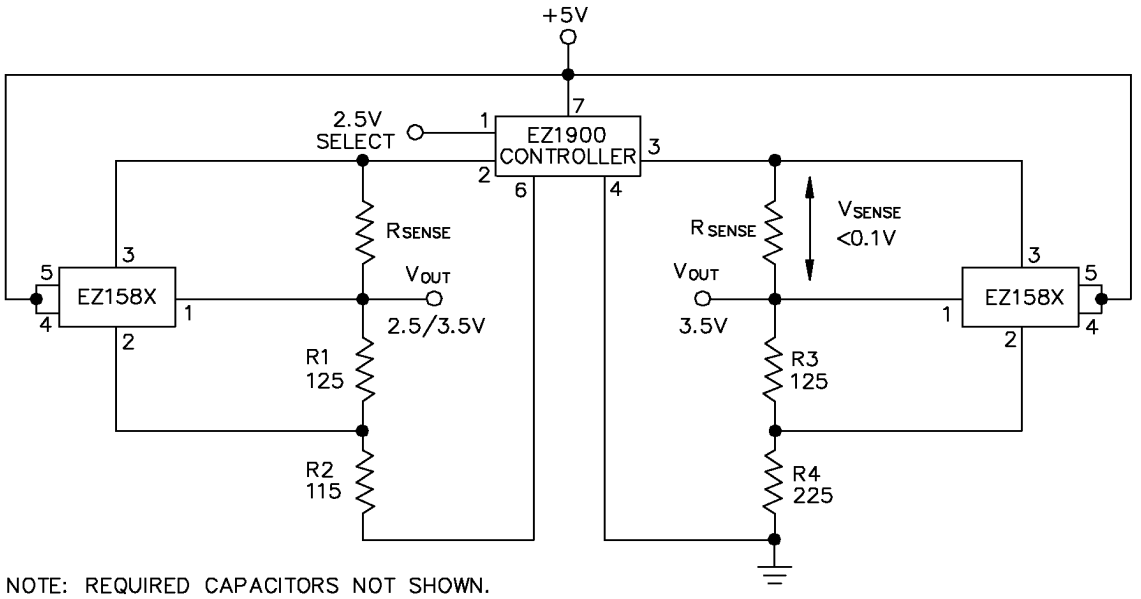
NOTES:
(1) Unless otherwise specified, $V_{OUT} = V_{SENSE}$, $V_{ADJ} = 0V$.
(2) Required to maintain regulation. Voltage set resistors R1, R2 are usually utilized for minimum load current.
(3) Current used to drive the output section; minimum value equals the standby current of the device.
(4) $V_C = V_P = 3.75V$ Avg; $V_{RIPPLE} = 1V_{PK-PK}$.
(5) 30ms.
(6) Over Temp (O.T.) = over specified operating junction temperature range.
(7) Minimum input/output voltage required to maintain 1% regulation.

December 16, 1998

TYPICAL APPLICATION



Flexible Motherboard Design, using the EZ158X and EZ1900 Regulator Balance Controller
The EZ158X can be used in conjunction with Semtech's EZ1900 Regulator Balance Controller to make a power supply flexible enough to take single voltage plane or split plane microprocessors. The EZ1900 uses the processor's upgrade pin level to determine whether the outputs of the two EZ1580s are to be tied together at 3.3V (for single voltage plane processors) or are set to supply separate 2.5V (processor core) and 3.3V (processor I/O).



652 MITCHELL ROAD NEWBURY PARK CA 91320

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APPLICATION INFORMATION

The EZ158X is a low dropout regulator designed to power the next generation of low voltage, split voltage plane processors, such as the Pentium® Processor P55C, the IBM PowerPC™ 603EV and 604EV and the AMD5$_K$86™ and K6 Processors.

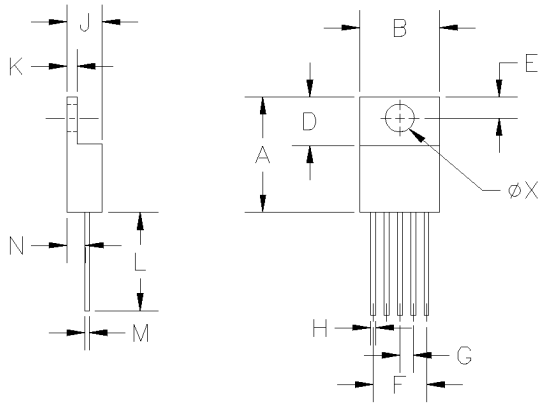
The dropout voltage is minimized by utilizing a separate input voltage, $V_{CONTROL}$, which should exceed V_{OUT} by at least 1.3V. The 2.5V power for the load (microprocessor core) can be derived from a 3.3V system supply. Since the efficiency of a linear regulator is the ratio of the output to the input voltage, heat dissipation is reduced by using a 3.3 input, thereby lowering heatsink and cooling fan costs. For a load of 7A at 2.5V, the regulator would dissipate 17.5W when converting from 5V, but only 5.6W from a 3.3V input.

Remote Kelvin sensing of the output voltage can be achieved by connecting the sense pin to the output at the load. Remote sensing will reduce errors associated with resistive trace losses between regulator and processor.

PIN DESCRIPTIONS

PIN 1: SENSE	This pin is the positive side of the reference voltage for this device. With this pin it is possible to Kelvin sense the output voltage at the load.
PIN 2: ADJUST	This pin is the negative side of the reference voltage for the device. Transient response can be improved by adding a small bypass capacitor from the adjust pin to ground.
PIN 3: OUTPUT	This is the power output of the device, and is electrically connected to the tab.
PIN 4: $V_{CONTROL}$	This pin is the supply pin for the control circuitry for the device. The current flow into this pin will be approximately 1% of the output current. For the device to regulate, the voltage at this pin must be between 1.0V and 1.3V greater than the output voltage (see dropout specifications).
PIN 5: V_{POWER}	This is the collector input to the power device of the EZ158X. The output load current is supplied through this pin. For the device to regulate, the voltage on this pin must be between 0.1V and 0.7V greater than the output voltage (see dropout specifications).

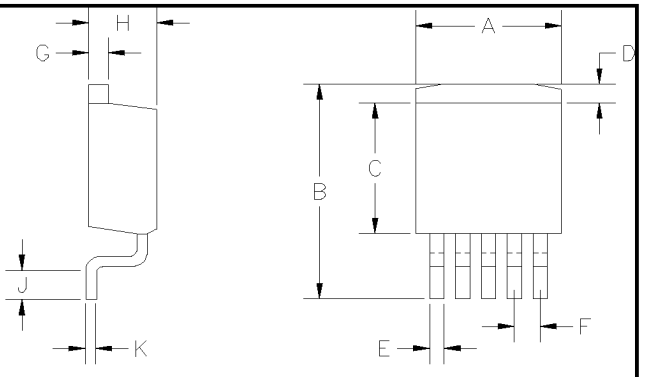
DEVICE OUTLINE - TO-220, 5 PIN



DIMN	INCHES MIN	INCHES MAX	MM MIN	MM MAX	NOTE
A	.560	.650	14.22	16.51	—
B	.380	.420	9.65	10.67	—
D	.230	.260	5.84	6.60	—
E	.100	.135	2.54	3.43	—
F	.263	.273	6.68	6.94	—
G	.062	.072	1.57	1.83	—
H	.025	.040	.63	1.02	—
J	.140	.190	3.55	4.83	—
K	.045	.055	1.14	1.40	—
L	.540	.560	13.72	14.22	—
M	.014	.022	.35	.56	—
N	.080	.120	2.03	3.05	—
ØX	.139	.161	3.53	4.09	—

JEDEC TO-220

DEVICE OUTLINE - TO-263, 5 PIN



DIMN	INCHES MIN	INCHES MAX	MM MIN	MM MAX	NOTE
A	.380	.405	9.65	10.29	—
B	.575	.625	14.60	15.88	—
C	.325	.380	8.25	9.66	—
D	—	.055	—	1.40	—
E	.020	.039	.50	.99	—
F	.060	.072	1.52	1.83	—
G	.045	.055	1.14	1.40	—
H	.160	.190	4.06	4.83	—
J	.090	.110	2.28	2.80	—
K	.018	.029	.457	.736	—

JEDEC TO-263