

April 8, 1998

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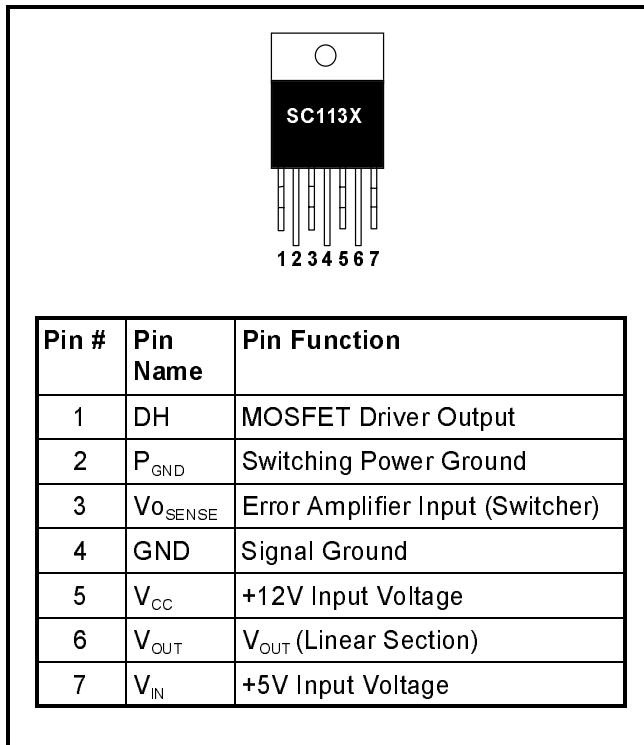
## DESCRIPTION

The SC1131/2/3/4 incorporates a high current low dropout linear regulator section together with a switching buck mode controller. This unique combination is well suited for high current low voltage power supply applications such as the Intel Pentium™ P55, AMD K6 and the Cyrix M2 processors. The SC113X was designed to reduce the number of components required to design a dual power supply for multivoltage processor applications.

**Switching Controller Section:** The switching control section is a voltage mode controller designed for high current, low voltage power supply applications. Key features include a temperature compensated voltage reference, triangular oscillator and an internally compensated transconductance error amplifier. The switching controller operates at a fixed frequency of 200kHz, providing an optimum compromise between size, efficiency and cost in the intended application areas.

**Linear Section:** The linear portion is a high performance positive voltage regulator designed for use in applications requiring "very low dropout performance" at 1.5, 3, 5 and 7.5 amps. Additionally, the linear section provides excellent regulation over variations due to changes in line, load or temperature.

## PIN CONFIGURATION



## FEATURES

- 85% typical efficiency for switching section
- Grounded tab
- 1.5, 2.5 or 3.3V @ 1% for linear
- Thermal shutdown
- Internal short circuit protection
- 7 pin TO-220 package

## APPLICATIONS

- Microprocessor supplies
- Modules supplies
- 1.3V to 3.5V power supplies
- Dual power supplies from 5V source

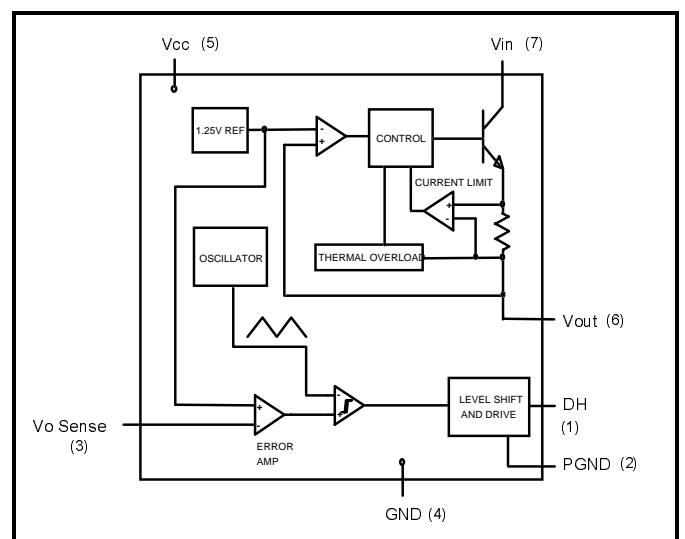
## ORDERING INFORMATION

PART NUMBER <sup>(1)</sup>	PACKAGE	OUTPUT CURRENT
SC1131CT-XY	TO-220	1.5A
SC1132CT-XY	TO-220	3.0A
SC1133CT-XY	TO-220	5.0A
SC1134CT-XY	TO-220	7.5A

Note:

(1) Where XY denotes voltage options and lead configurations. Available voltages (X) are: 1.5V, 2.5V and 3.3V. Available lead configurations (Y) are dual bend (DB), single bend (SB) and straight leads (leave blank). Sample part number: SC1133CT-2.5DB.

## BLOCK DIAGRAM



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**ABSOLUTE MAXIMUM RATINGS**

$V_{IN}$ to GND		-0.3V, 7V
$V_{CC}$ to GND		-0.3V, 15V
$T_J$	Junction Operating Temperature	0°C to +125°C
$T_S$	Storage Temperature	-65°C to +125°C
$T_L$	Lead Soldering Temperature	260°C, 10 sec.
$\theta_{JC}$	Thermal Resistance, Junction to Case	2°C/W
$\theta_{JA}$	Thermal Resistance, Junction to Ambient	50°C/W

**ELECTRICAL CHARACTERISTICS**
**SWITCHING CONTROL SECTION**
 $V_{CC} = 12V$ ;  $V_{IN} = 5.0V$ ;  $GND = P_{GND} = 0V$ ;  $V_{OUT} = 2.8V$ . Per application circuit unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
$I_{CC}$	Total Quiescent Current	Linear out = No Load	25° C		15	25	mA
$V_{REF}$	Reference Voltage		25° C	1.238	1.250	1.263	V
			0-125° C	1.225	1.250	1.275	
$Reg_{LOAD}$	Load Regulation		25° C			1	%
$Reg_{LINE}$	Line Regulation		25° C		0.5		%
$DH_{HI}$	MOSFET Driver Source Voltage	$V_{CC} - DH$ ; $I_{DH} = 0.5A$	25° C		1.6		V
$DH_{LOW}$	MOSFET Driver Sink Voltage	$DH - P_{GND}$ ; $I_{DH} = 0.5A$	25° C		1.1		V
$f_{OSC}$	Oscillator Frequency		25° C	180	200	220	kHz
dc	Duty Cycle (maximum)		25° C	90	95		%

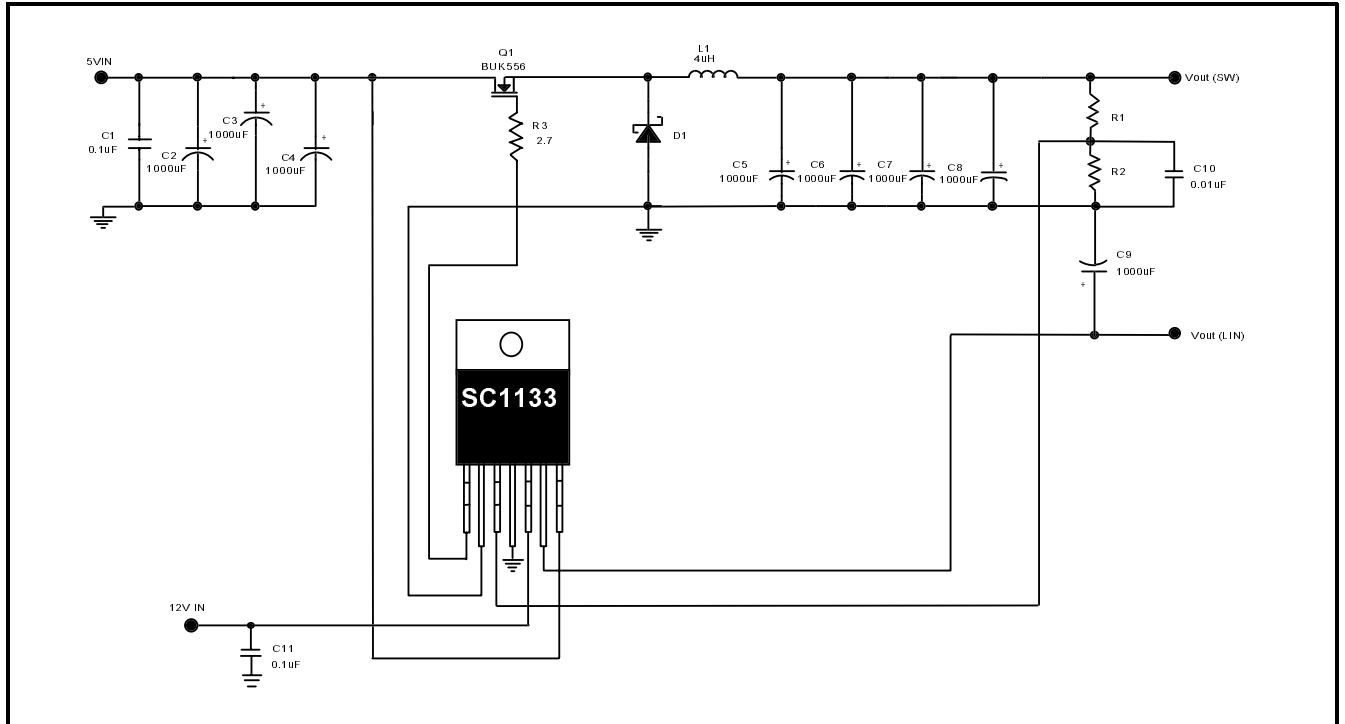
**LINEAR SECTION**
 $V_{CC} = 12V$ ;  $V_{IN} = 5.0V$ ;  $GND = P_{GND} = 0V$ ;  $V_{OUT} = 3.3V$ . Per application circuit unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
$V_{OUT}$	Output Voltage	$V_{IN} = 5.0V$ , $I_{OUT} = I_R$	25° C	3.267	3.300	3.333	V
		$V_{IN} = 4.75-5.55V$ , $I_{OUT} = 10mA$ to $I_R$	0-125° C	3.234	3.300	3.366	
$Reg_{LOAD}$	Load Regulation	$V_{IN} = 5.0V$ , $I_{OUT} = 10mA$ to $I_R$	25° C			1	%
			0-125 C			1.5	
$Reg_{LINE}$	Line Regulation	$V_{IN} = 4.75-5.55V$ , $I_{OUT} = I_R$	25° C		0.5		%
			0-125 C		1		
$I_{LIMIT}$	Current Limit		25° C	$I_R + 0.1$			A
$R_A$	Ripple Rejection <sup>(1)</sup>	$V_{IN} = 5.0V$ , $I_{OUT} = I_R/2$	25° C	60	80		dB
$T_{REG}$	Thermal Regulation <sup>(2)</sup>		25° C		0.002	0.02	%/°C
$V_{DO}$	Dropout Voltage <sup>(3)</sup>	$I_{OUT} = I_R$	SC1131, 2, 3	25° C	0.8	0.9	V
			SC1134	25° C	1.3	1.4	
$V_{IN}$	Minimum $V_{IN}$	$I_{OUT} = I_R$	SC1131, 2, 3	25° C	0.8	0.9	V
			SC1134	25° C	1.3	1.4	

**NOTES:**

- (1)  $V_{CC} = V_{IN} = 5.0V$  Avg;  $V_{RIPPLE} = 1V_{PK-PK}$ , 120 Hz.
- (2) 30ms pulse
- (3) Minimum input/output voltage required to maintain 1% regulation
- (4)  $I_R$  = Rated load current per ordering information

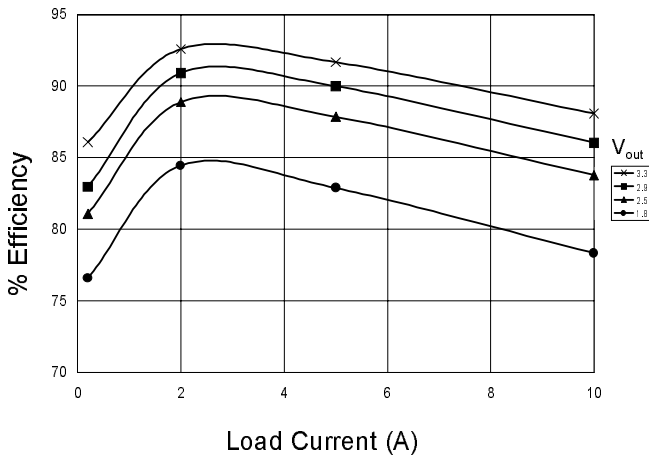
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**APPLICATION CIRCUIT**

**MATERIALS LIST**

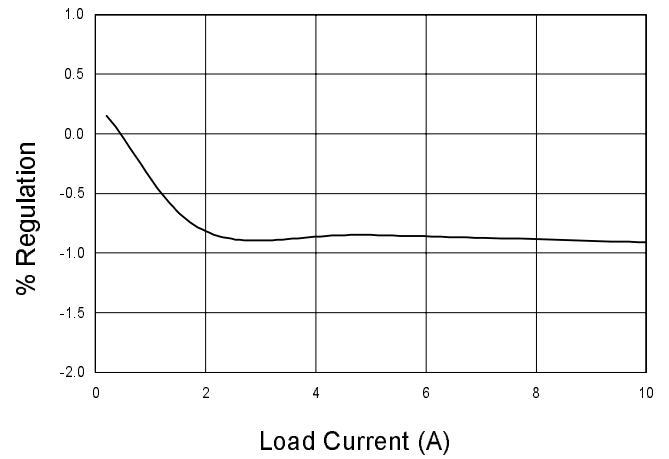
Quantity	Reference	Part/Description	Vendor	Notes
1	C1,C11	0.1µF Ceramic	Various	
1	C10	0.01µF Ceramic	Various	
8	C2-C9	1000µF/6.3V	SANYO	MV-GX or equiv. Low ESR
1	D1	32CTQ030	Various	16A, 30V Schottky, TO-220
1	L1	4µH		8 Turns 16AWG on MICROMETALS T50-52D core
1	Q1	BUK556	PHILIPS	Logic level FET, ≤ 22mΩ, 30V
1	U1	SC1133T-XY	SEMTECH	5A Linear Regulator with Switching Controller
1	R1	SMT 1%	Various	Value depends on $V_{OUT}$
1	R2	SMT 1%	Various	Value depends on $V_{OUT}$
1	R3	2.7Ω 1/8W	Various	

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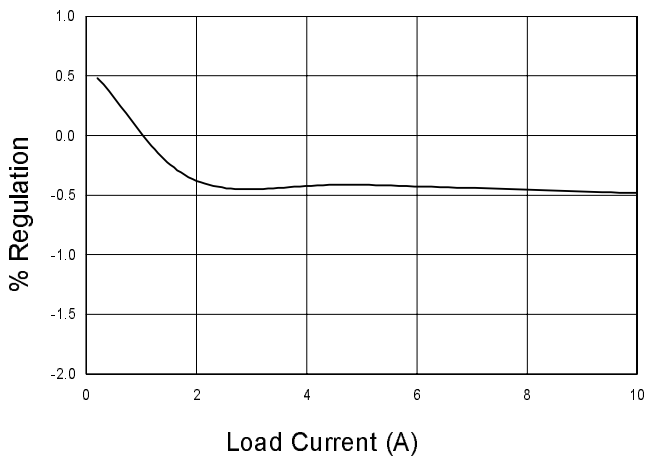
**SC113x Efficiency**



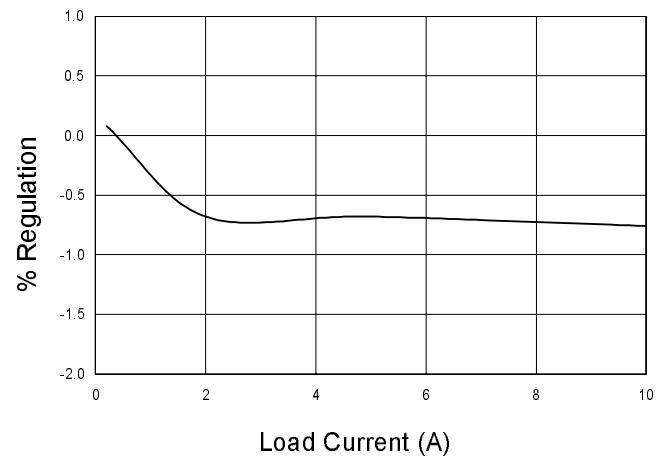
**% Load Regulation 3.3V, 0.3 to 10 Amps**



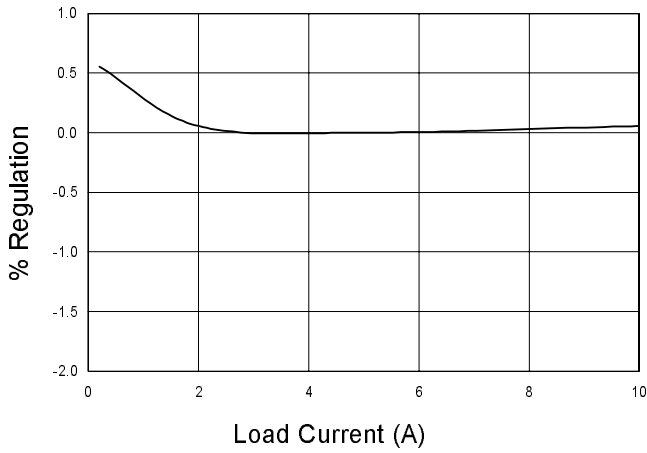
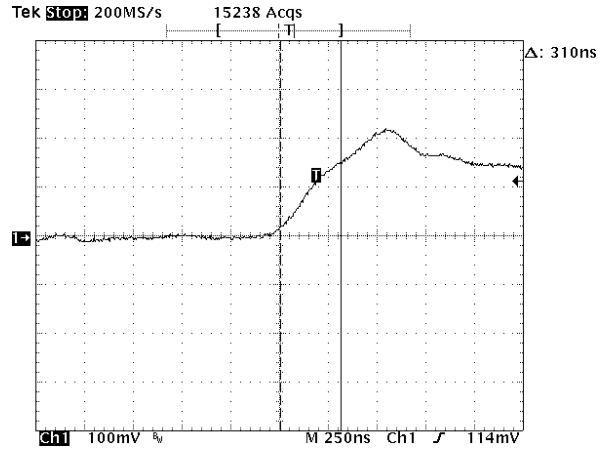
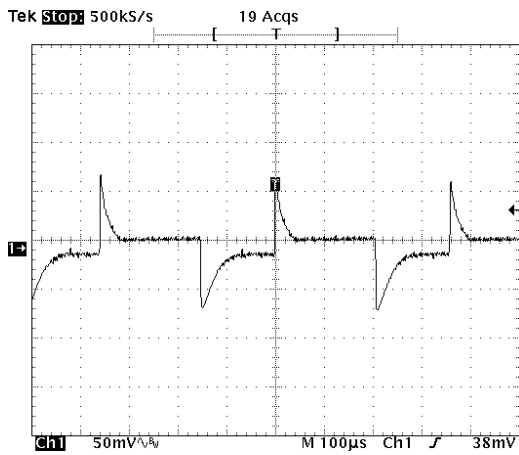
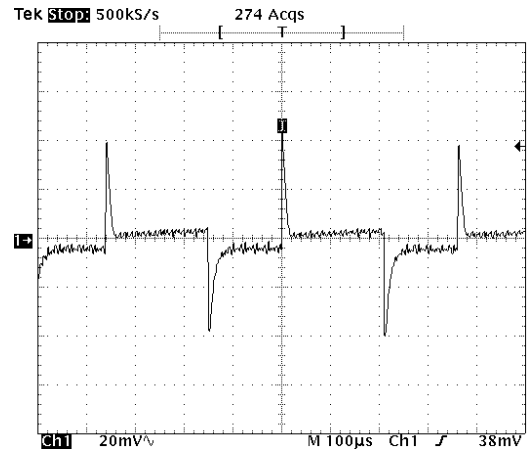
**% Load Regulation 2.9V, 0.3 to 10 Amps**



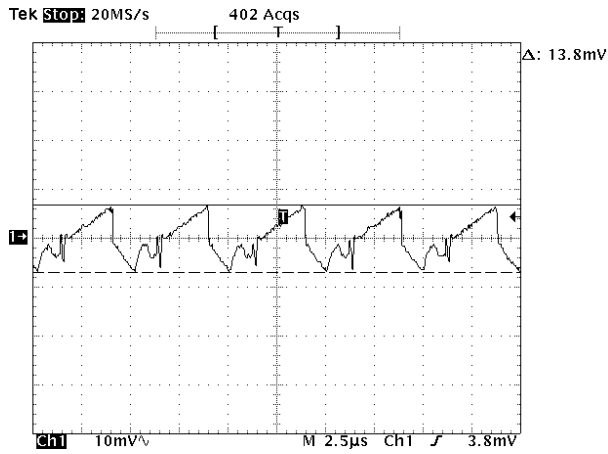
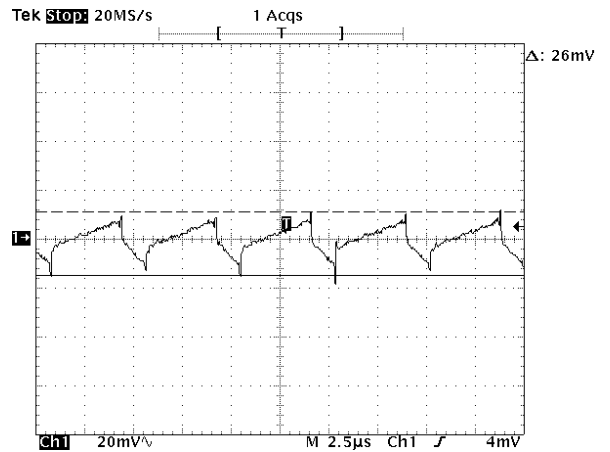
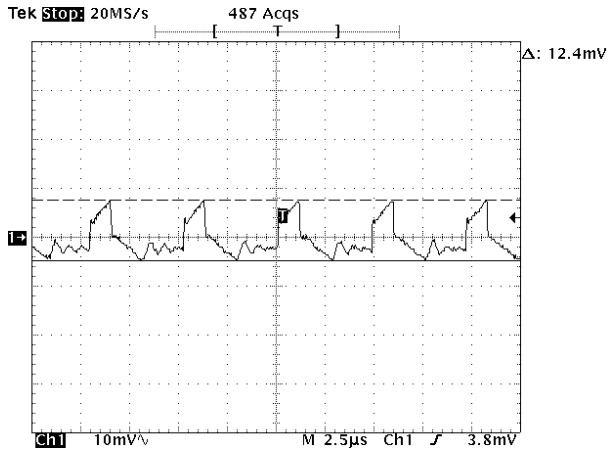
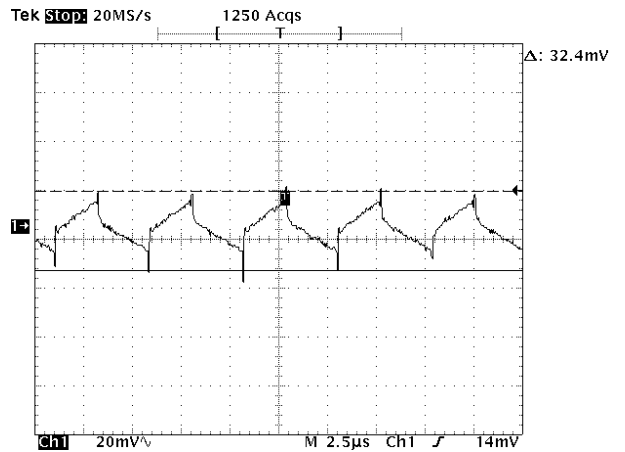
**% Load Regulation 2.3V, 0.2 to 10 Amps**



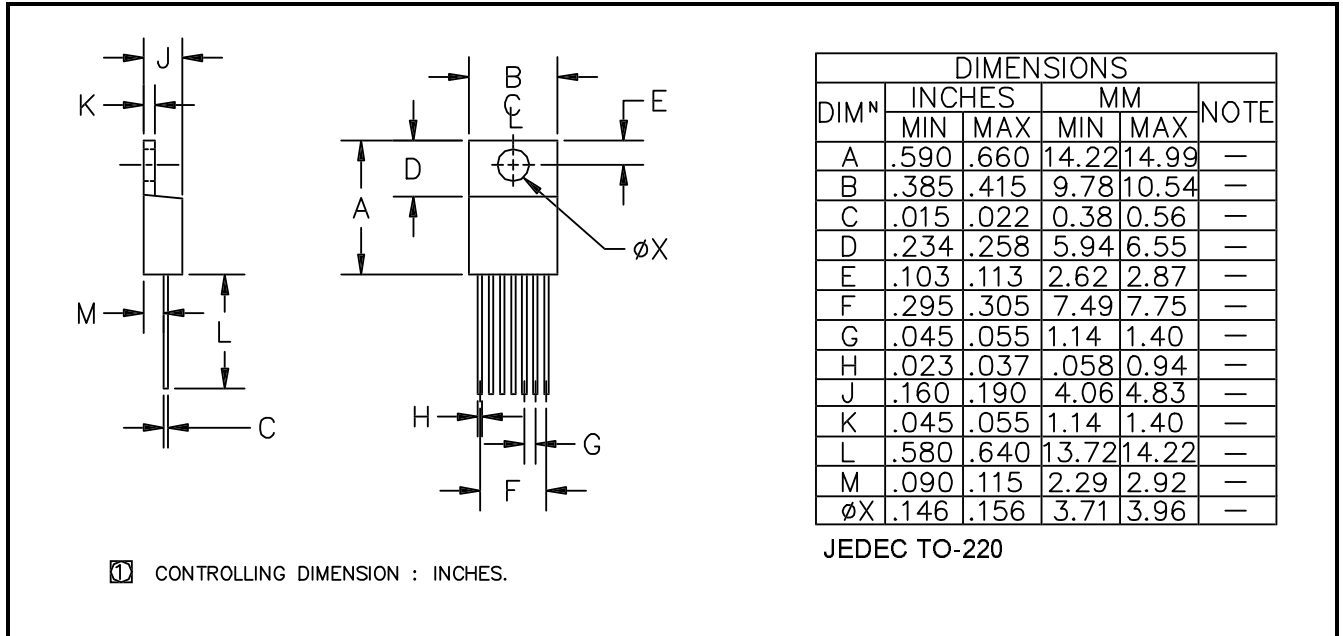
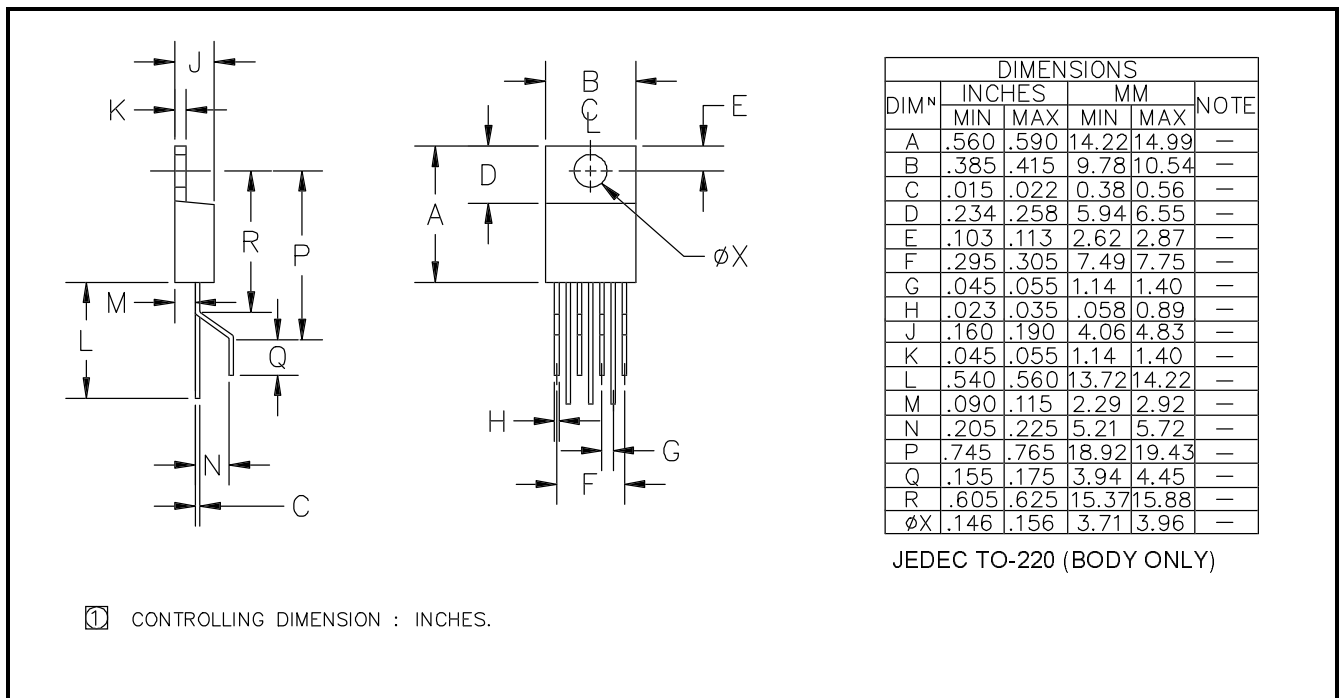
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**% Load Regulation 1.8V, 0.2 to 10 Amps**

**Transient Load Current Rise 3.3V @ 10A**

**Transient Voltage Response 3.3V From 0.3 to 10A**

**Transient Voltage Response 1.8V From 0.2 to 10A**


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**Output Ripple 3.3V @ 0.3A**

**Output Ripple 1.8V @ 0.2A**

**Output Ripple 3.3V @ 10A**

**Output Ripple 1.8V @ 10A**


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**OUTLINE TO-220 (STRAIGHT LEAD)**

**OUTLINE: TO-220-SB (SINGLE BEND LEAD)**


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**OUTLINE: TO-220-DB (DUAL BEND LEAD)**
