

THREE-TERMINAL VOLTAGE REGULATOR

FEATURES

- Low Dropout Voltage
- Very Low Standby Current (No Load)
- Good Load Regulation
- Internal Thermal Shutdown
- Short Circuit Protection
- 3% Output Voltage Accuracy
- Available On Paper Tape
- Customized Versions Are Available

APPLICATIONS

- Battery Powered Systems
- Portable Consumer Equipment
- Cordless Telephones
- Personal Communications Equipment
- Portable Instrumentation
- Radio Control Systems
- Toys
- Low Voltage Systems

DESCRIPTION

The TK116xx series devices are low power, linear three-terminal regulators.

An internal PNP pass-transistor is used in order to achieve low dropout voltage (typically 200 mV at 80 mA load current).

The regulated output voltage may be specified in 0.5 V increments between 2.0 to 5.5 V. Separate data sheets are available for the various options. The device has very low (400 μ A) quiescent current with no load and 2 mA with 60 mA load.

An internal thermal shutdown circuit limits the junction temperature to below 150 °C. The load current is internally monitored and the device will shut down in the presence of a short circuit at the output.

The TK116xx series is available in plastic TO-92J and plastic tape and reel TO-92N packages.

ORDERING INFORMATION

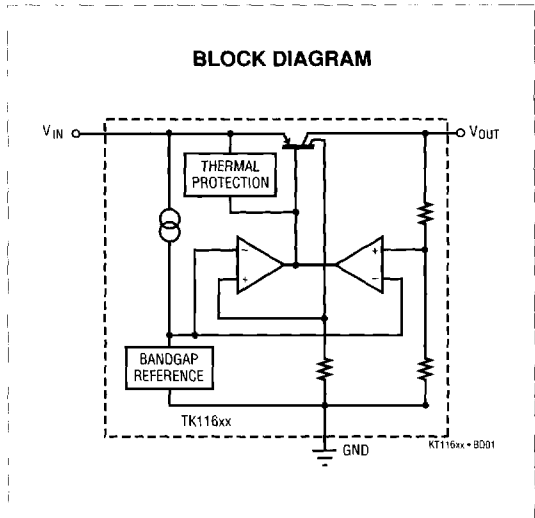
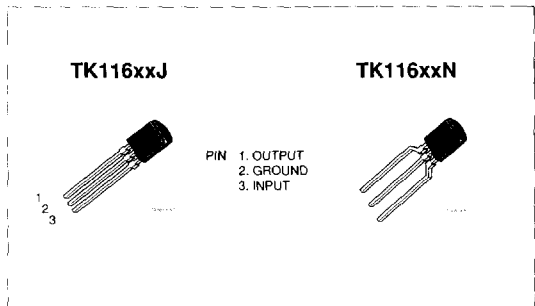
TK116

Tape/Reel Code

Temp. Range

Package Code

<p>VOLTAGE CODE</p> <p>20 = 2.0V 40 = 4.0V</p> <p>25 = 2.5V 45 = 4.5V</p> <p>30 = 3.0V 50 = 5.0V</p> <p>32 = 3.25V 80 = 8.0V</p> <p>35 = 3.5V 90 = 9.0V</p>	<p>PACKAGE CODE</p> <p>J : TO-92 (Straight Lead)</p> <p>N : TO-92 (Bend Lead)</p> <p>TEMP. RANGE</p> <p>C : -20 to +75 °C</p> <p>I : -40 to +85 °C</p>	<p>TAPE/REEL CODE</p> <p>BX : Bulk/Bag</p> <p>TX : Paper Tape</p> <p>TR : Tape Right</p> <p>TL : Tape Left</p>
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TK116xx

ABSOLUTE MAXIMUM RATINGS

Supply Voltage 18 V
 Output Voltage $V_{OUT} \times 1.15$ V
 Load Current 180 mA
 Power Dissipation (Note1) 500 mW

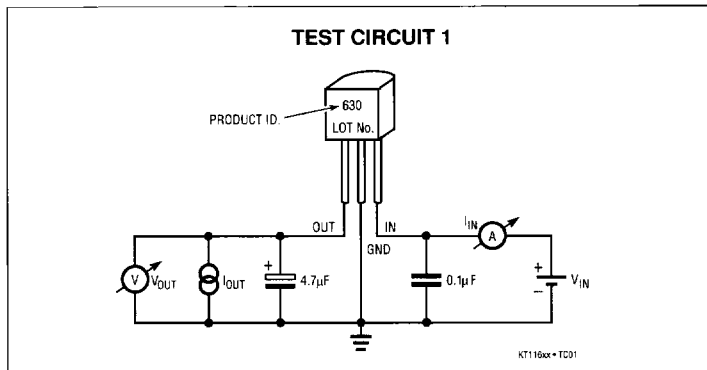
Storage Temperature Range -55 to +150 °C
 Operating Temperature Range (C Version) -20 to +70 °C
 Operating Temperature Range (I Version) -40 to +85 °C
 Lead Soldering Temp. (10 sec.) 240 °C
 Junction Temperature 150 °C

ELECTRICAL CHARACTERISTICS

Due to the common format used here, some specifications may not apply to all versions of output voltage. Detailed specifications are available for each version.

SYMBOL	PARAMETER	TEST CONDITION	-20 to +70 °C			-40 to +85 °C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{IN}	Supply Voltage Range		2.5		16	2.5		16	V
I_{IN1}	Supply Current 1	$V_{IN} = V_O + 1$ V, $I_O = 0$ mA		400	800		400	800	μ A
I_{IN2}	Supply Current 2	$V_{IN} = V_O + 1$ V, $I_O = 0$ mA		0.8	2.0		0.8	2.0	mA
V_O	Regulated Output Voltage	$V_{IN} = V_O + 1$ V, $I_O = 10$ mA, $T_A = 25$	$\pm 3\%$ or ± 100						mV
V_O	Regulated Output Voltage	$V_{IN} = V_O + 1$ V, $I_O = 10$ mA	$\pm 4\%$ or 130			$\pm 5\%$ or 150			mV
V_{DROP1}	Dropout Voltage 1	$I_O = 0$ mA		25	80		25	80	mV
V_{DROP2}	Dropout Voltage 2	$I_O = 60$ mA		150	300		150	300	mV
I_O	Output Current	$V_{IN} = V_{OUT} + 1$ V		130			130		mA
I_{OR}	Recommended Output Current	$V_{IN} = V_{OUT} + 1$ V			100			100	mA
Lin Reg	Line Regulation	$V_{IN} = V_O + 1$ V ~ $V_O + 6$ V		2	30		2	30	mV
Loa Reg1	Load Regulation 1	$I_O = 1$ to 30 mA		15	70		15	70	mV
Loa Reg2	Load Regulation 2	$I_O = 1$ to 60 mA		30	120		30	120	mV
RR	Ripple Rejection	$V_{IN} = V_O + 1.5$ V		55			55		dB
$\Delta V/\Delta T$	Temperature Coefficient	$V_{IN} = V_{OUT} + 1.5$ V, $I_{OUT} = 10$ mA		± 0.3			± 0.3		mV/°C
V_O	Output Noise Voltage	$V_{IN} = V_O + 1.5$ V, $I_O = 10$ mA			150			150	μ V(rms)

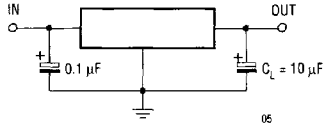
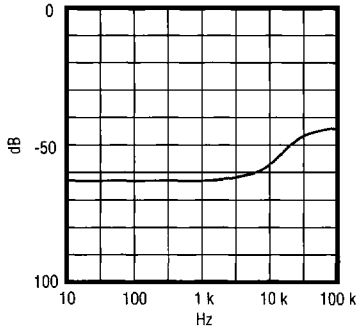
Note 1: Power dissipation must be derated at the rate of 1.6 mW/°C for operation at $T_A = 25$ °C and above.



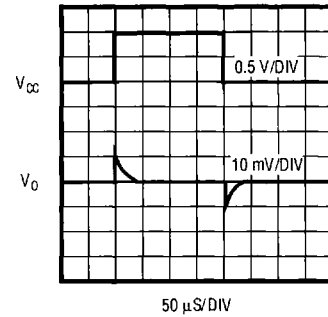
TYPICAL PERFORMANCE CHARACTERISTICS

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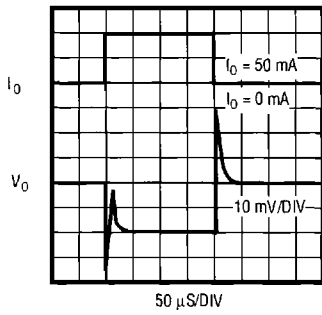
RIPPLE REJECTION



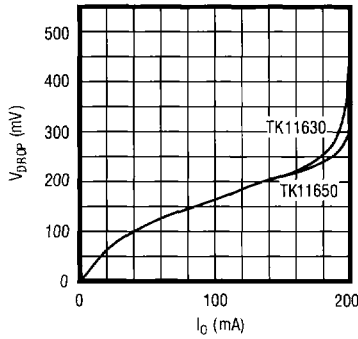
LINE TRANSIENT RESPONSE



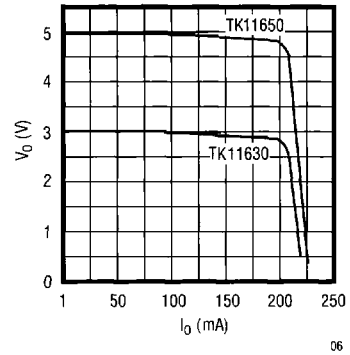
LOAD TRANSIENT RESPONSE



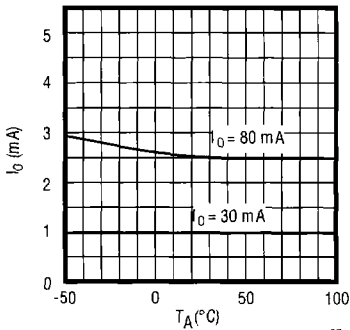
DROPOUT VOLTAGE vs LOAD CURRENT



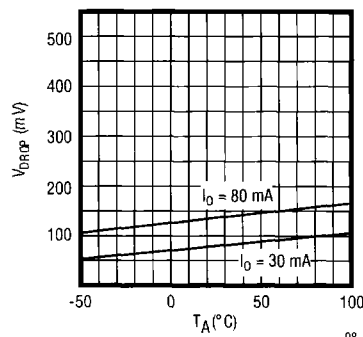
SHORT CIRCUIT PROTECTION



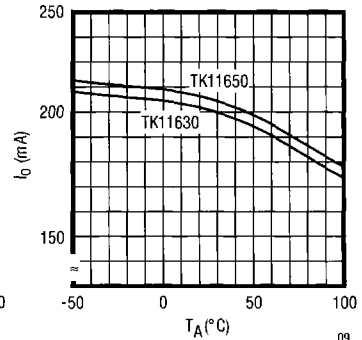
QUIESCENT CURRENT vs TEMPERATURE



DROPOUT VOLTAGE vs TEMPERATURE



OUTPUT CURRENT I_OUT MAX vs TEMPERATURE

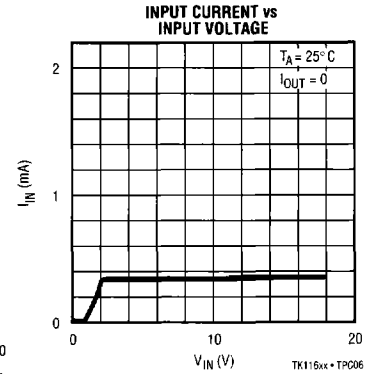
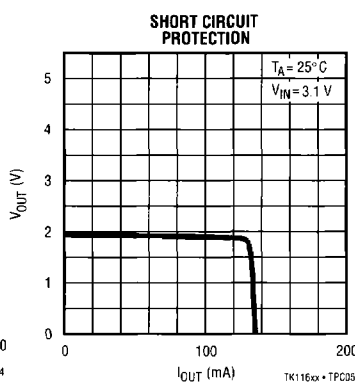
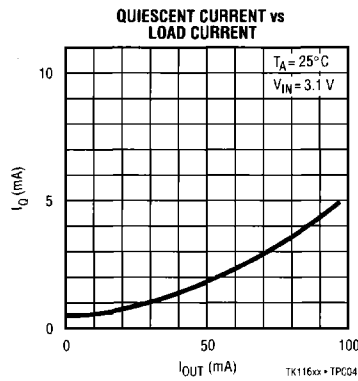
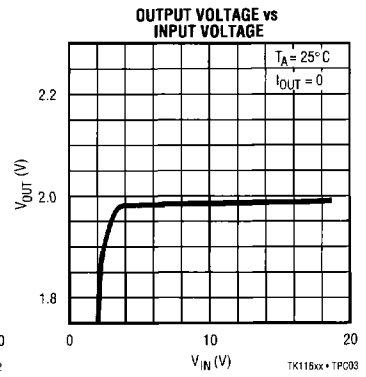
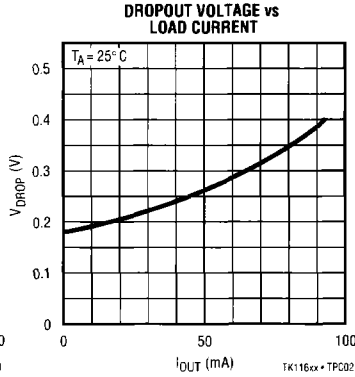
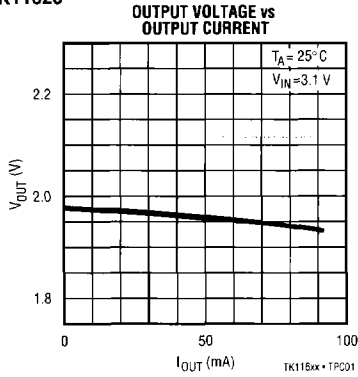


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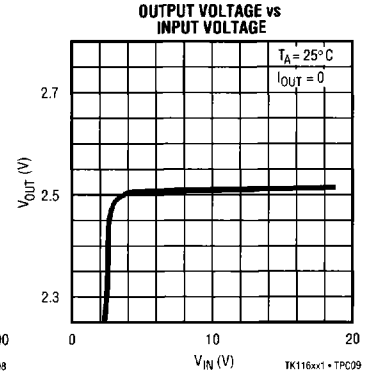
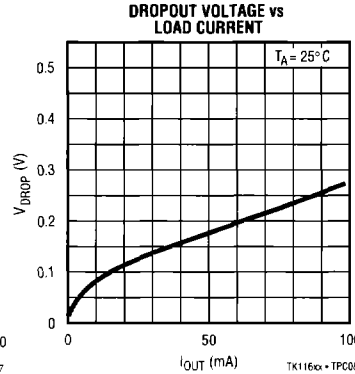
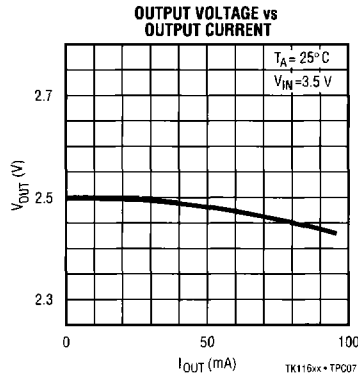
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TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

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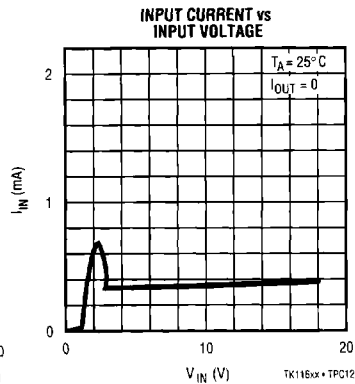
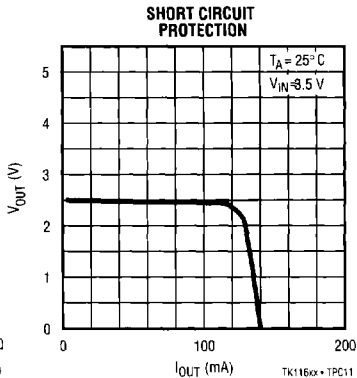
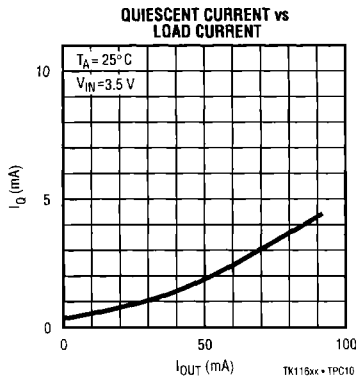


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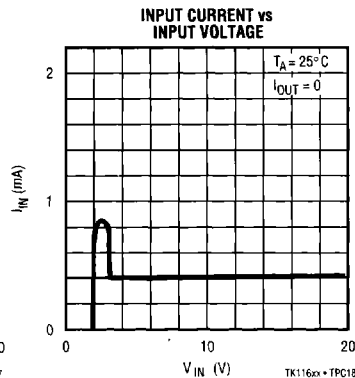
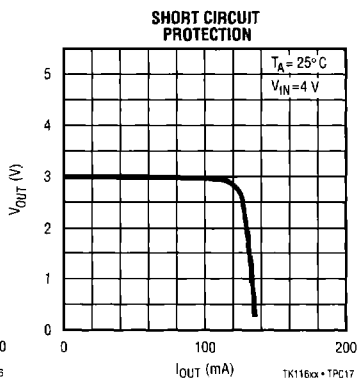
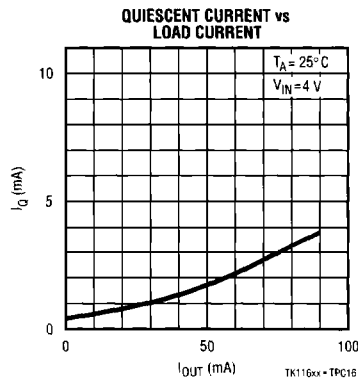
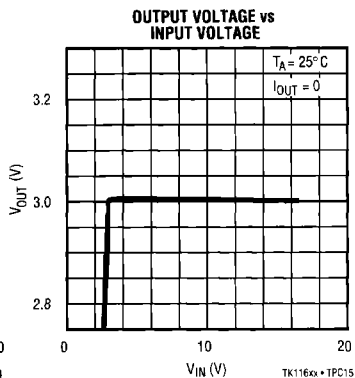
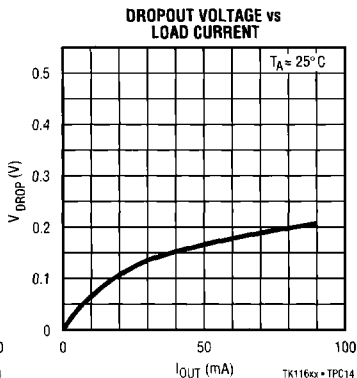
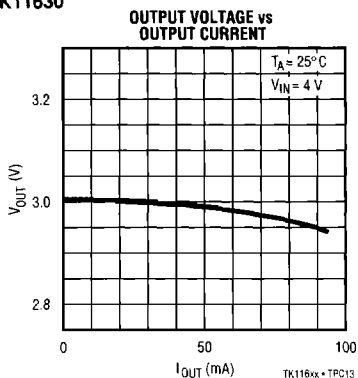


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TK11625 (CONT.)



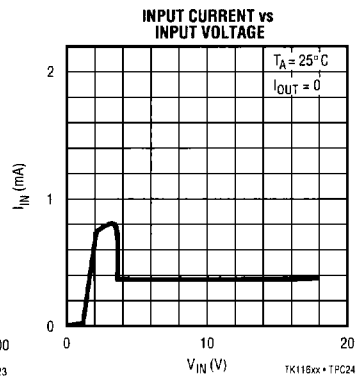
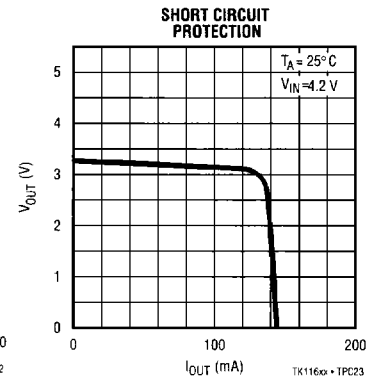
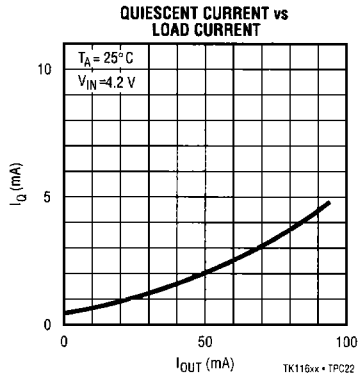
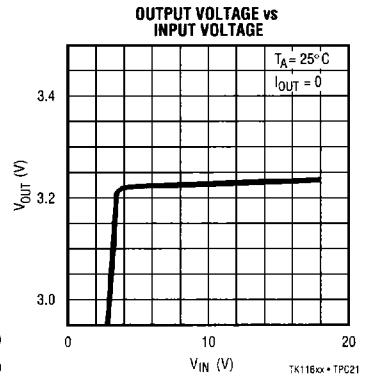
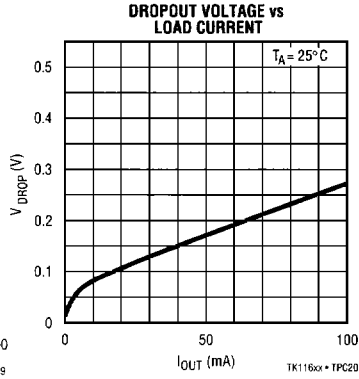
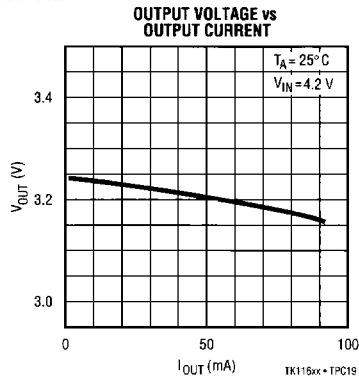
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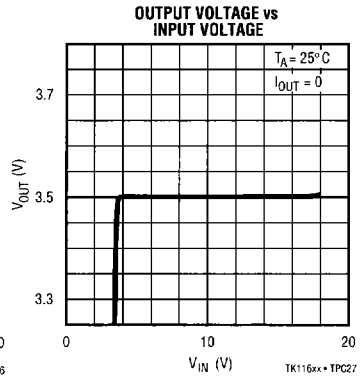
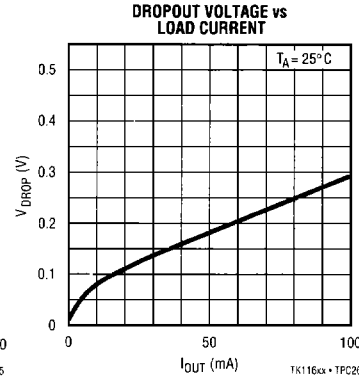
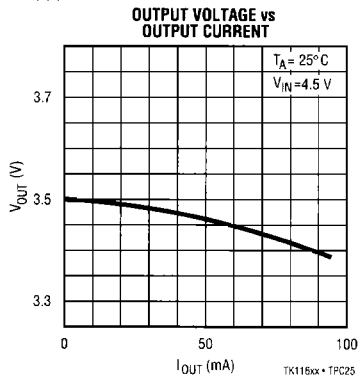
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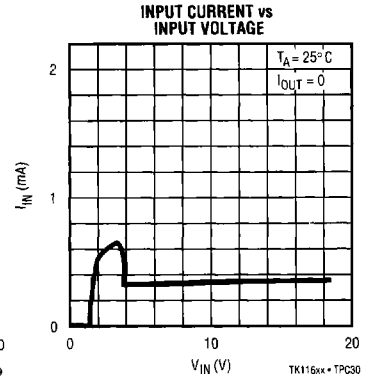
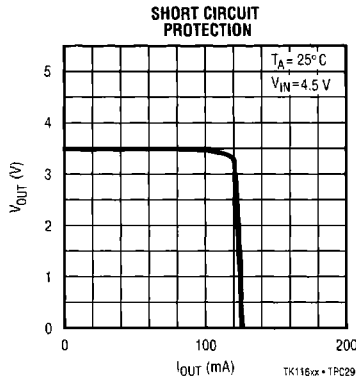
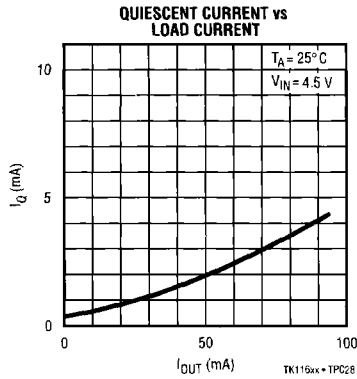


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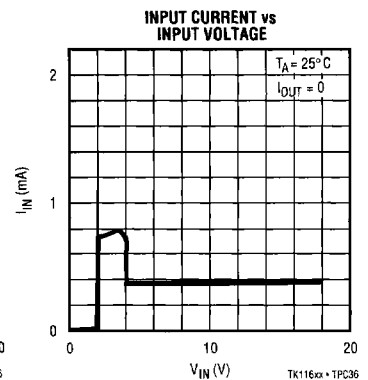
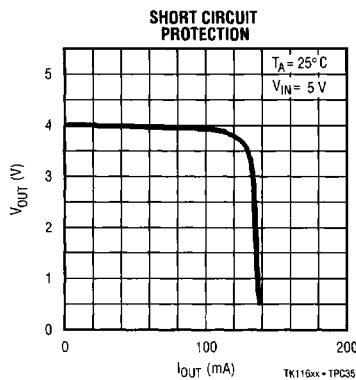
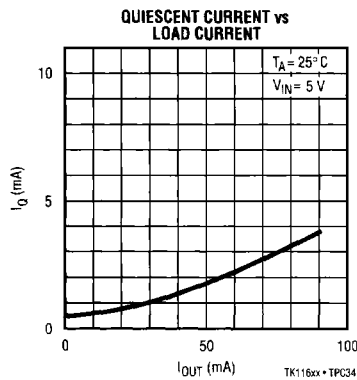
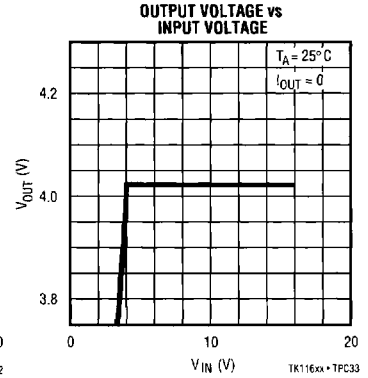
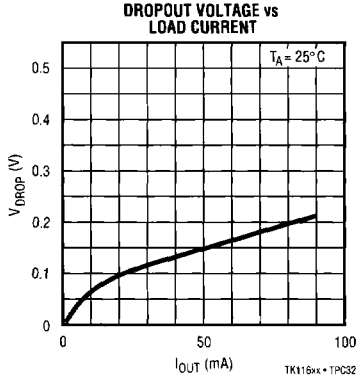
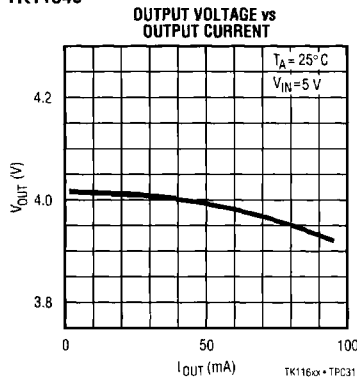


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TK11635 (CONT.)



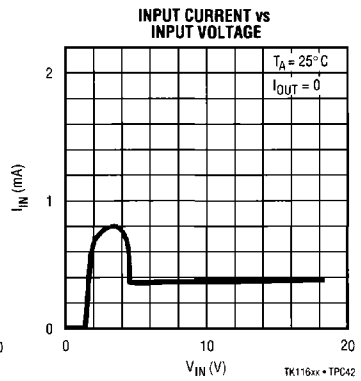
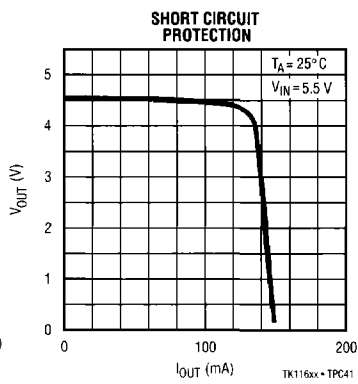
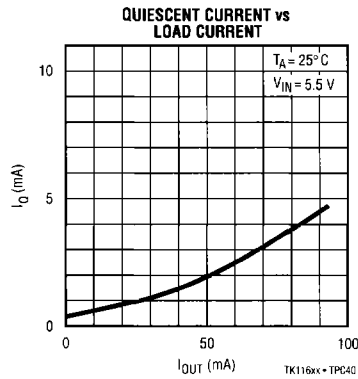
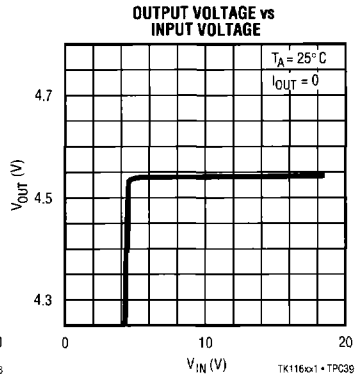
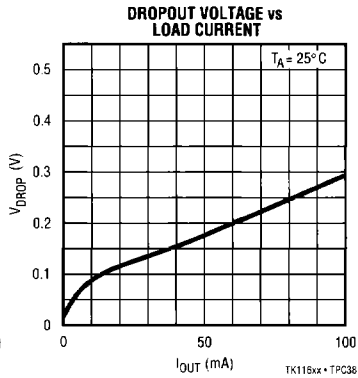
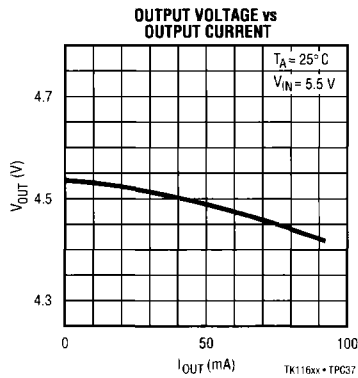
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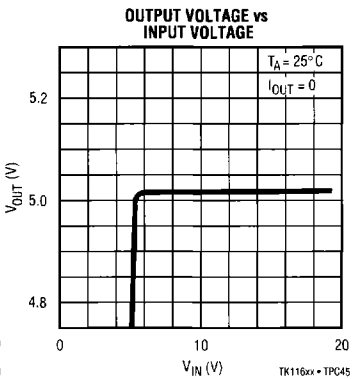
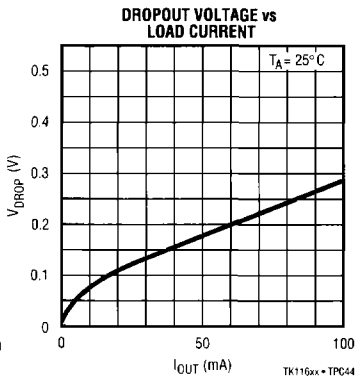
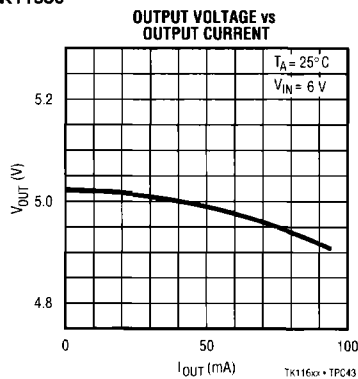
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TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

TK11645

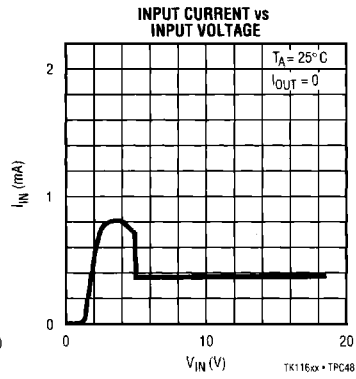
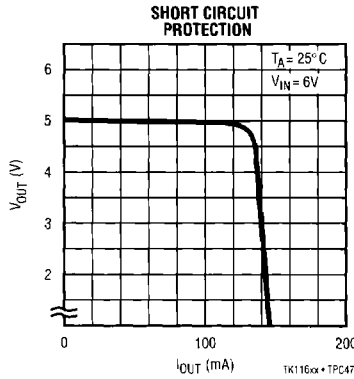
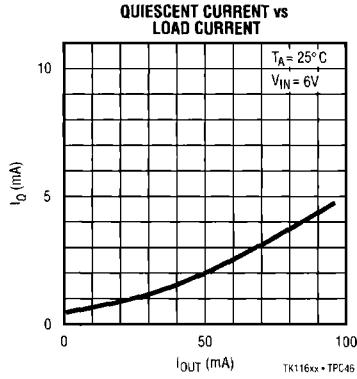


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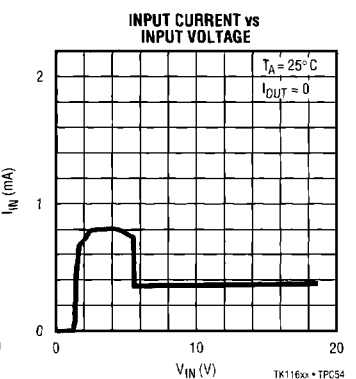
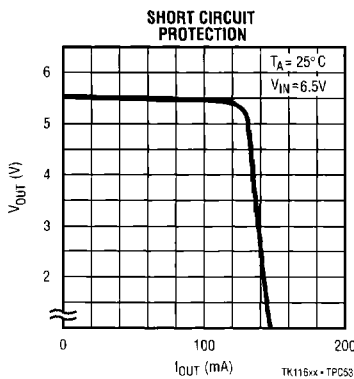
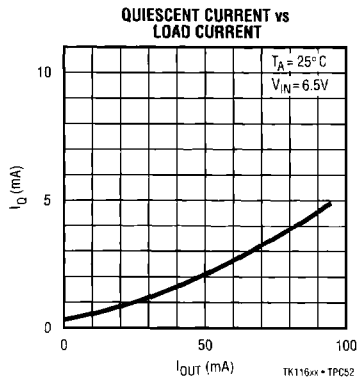
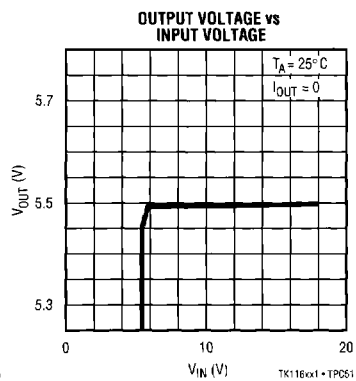
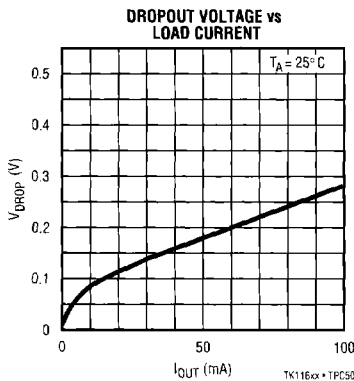
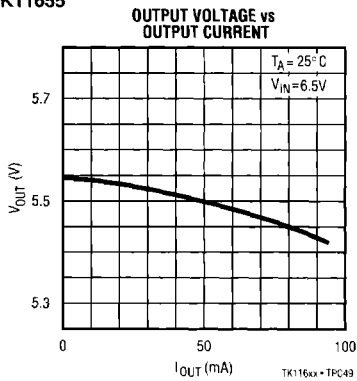


TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

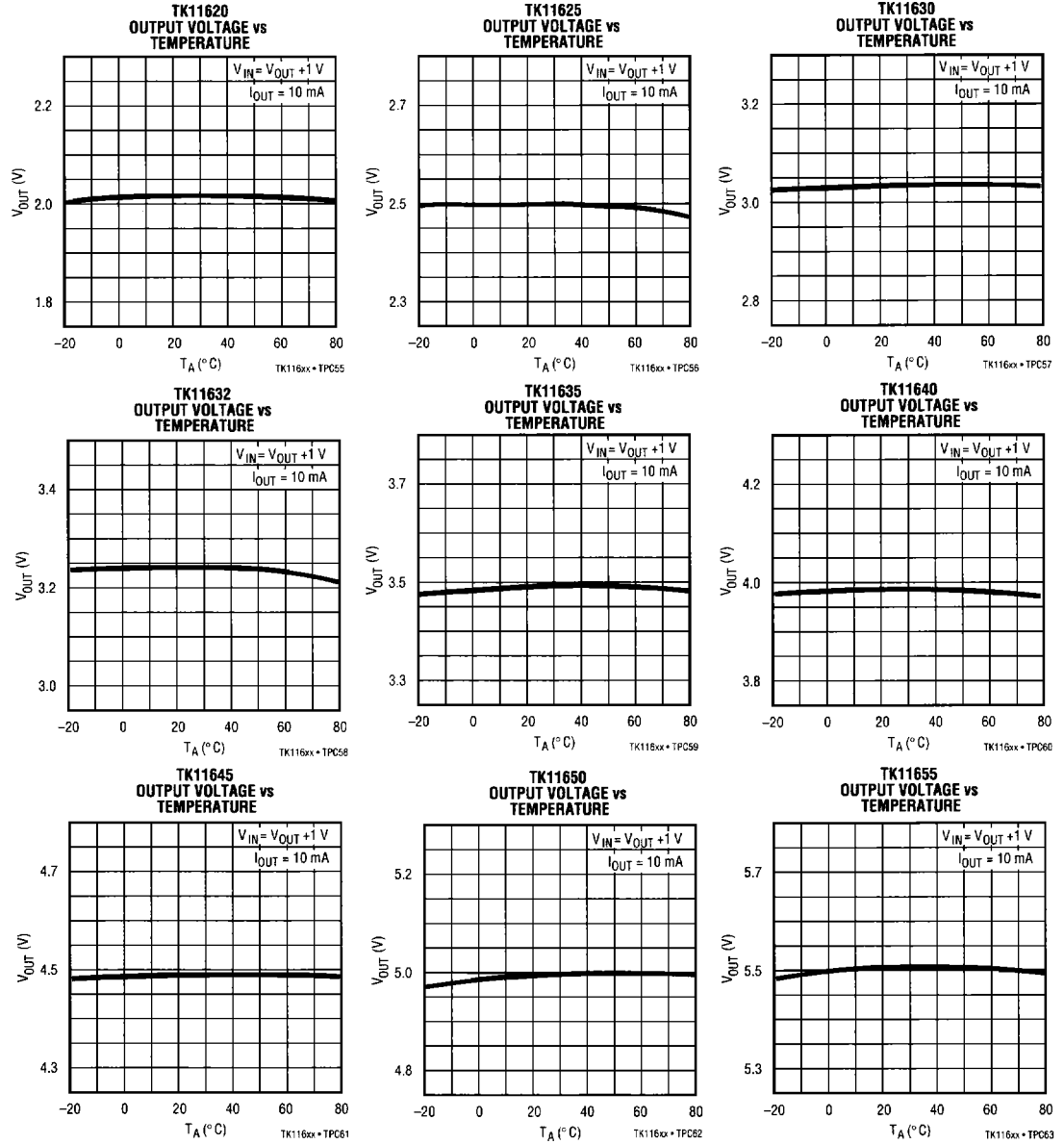
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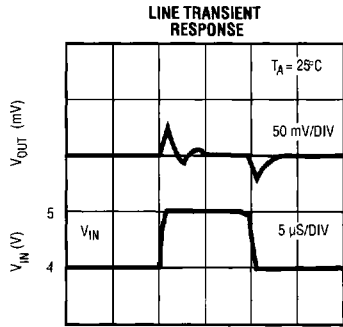


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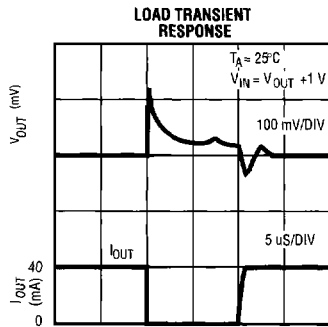


TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

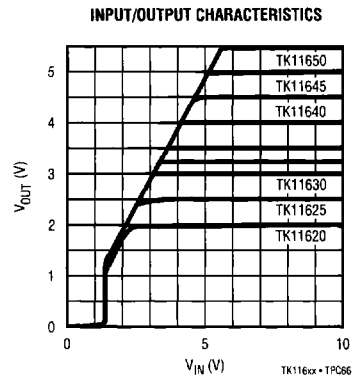
COMMON CHARACTERISTICS



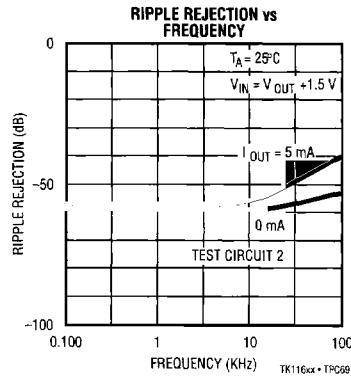
TK116xx • TPC64



TK116xx • TPC65

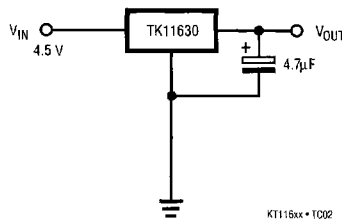


TK116xx • TPC66



TK116xx • TPC69

TEST CIRCUIT 2



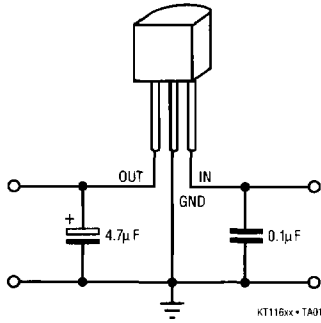
TK116xx • TC02

RIPPLE REJECTION TEST CIRCUIT

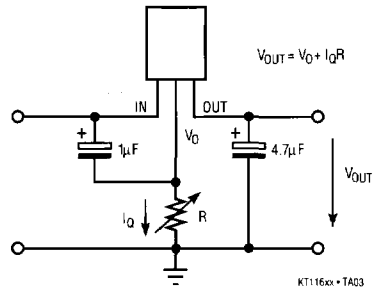
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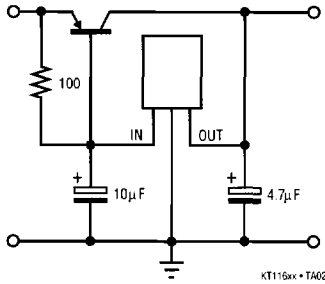
TYPICAL APPLICATIONS



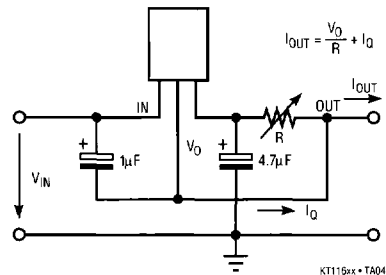
VOLTAGE REGULATOR CIRCUIT



VOLTAGE BOOST CIRCUIT



CURRENT BOOST CIRCUIT



CURRENT REGULATOR CIRCUIT

APPLICATION HINTS

Maximize copper foil area connecting to all IC pins for optimum heat conduction. Place input and output bypass capacitors close to the GND pin. For best transient behavior and lowest output impedance, use as large a capacitor value as possible. The temperature coefficient of the capacitance and Equivalent Series Resistance (ESR) should be taken into account, as these parameters can influence power supply noise and ripple rejection. In extreme cases, oscillation may occur. In order to maintain stability, the output bypass capacitor value should be minimum 1 μF for Tantalum electrolytic or 4.7 μF for Aluminum electrolytic at T_A=25 °C.