

30V 100mA Low DropOut Voltage Regulator

The HT78L05 three terminal positive regulators is available with 5V fixed output voltage, making it useful in a wide range of applications. Used as a Zener-diode and resistor combination replacement, the HT78L05 usually provides an effective output impedance improvement of two orders of magnitude and lower quiescent current.

The HT78L05 is available in the plastic TO-92 package, SOT89-3 package, and SOP8 package. With adequate heat sinking, the regulator can deliver 100-mA output current. Current limiting is included to limit the peak output current to a safe value.

Features

- V_{IN} Range up to 30V
- Output Voltage Tolerances of $\pm 5\%$ Over the Temperature Range
- Output Current of 100 mA
- Output Transistor Safe Area Protection
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limit
- Available in TO-92, SOT-893, XDFN4, SOP8 Low Profile Packages

Applications

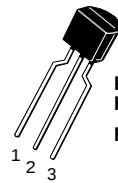
- Battery Chargers
- Portable Instrumentation
- LED Lighting
- Low Wattage Power Supplies

PIN CONNECTIONS



SOP8
R SUFFIX
HT78L05BRZ
HT78L33BRZ

Pin 1. V_{OUT}
 2. GND
 3. GND
 4. NC.
 5. NC.
 6. GND
 7. GND
 8. V_{IN}



TO92
PK SUFFIX
HT78L05BRPKZ
HT78L33BRPKZ

BENT LEAD
TAPE & REEL
AMMO PACK

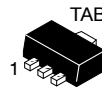
Pin 1. V_{OUT}
 2. GND
 3. V_{IN}



TO92
P SUFFIX
HT78L05BRPZ
HT78L33BRPZ

STRAIGHT LEAD
BULK PACK

Pin 1. V_{OUT}
 2. GND
 3. V_{IN}

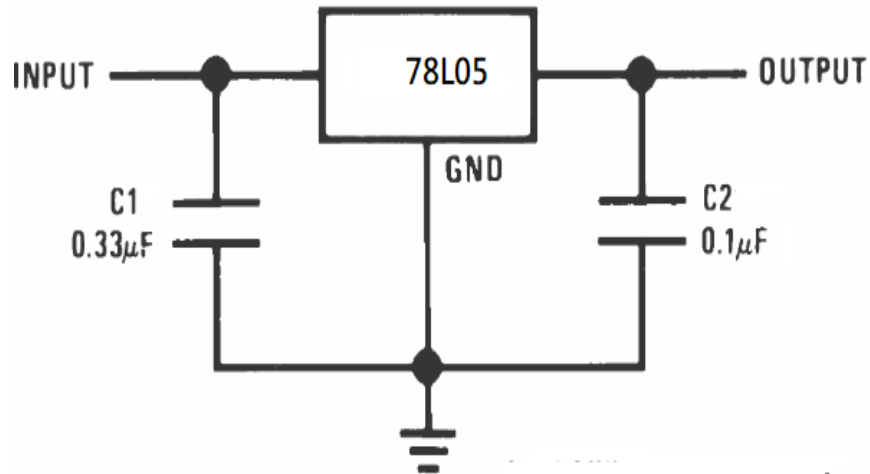


SOT-89 H
SUFFIX
HT78L05BRHZ
HT78L33BRHZ

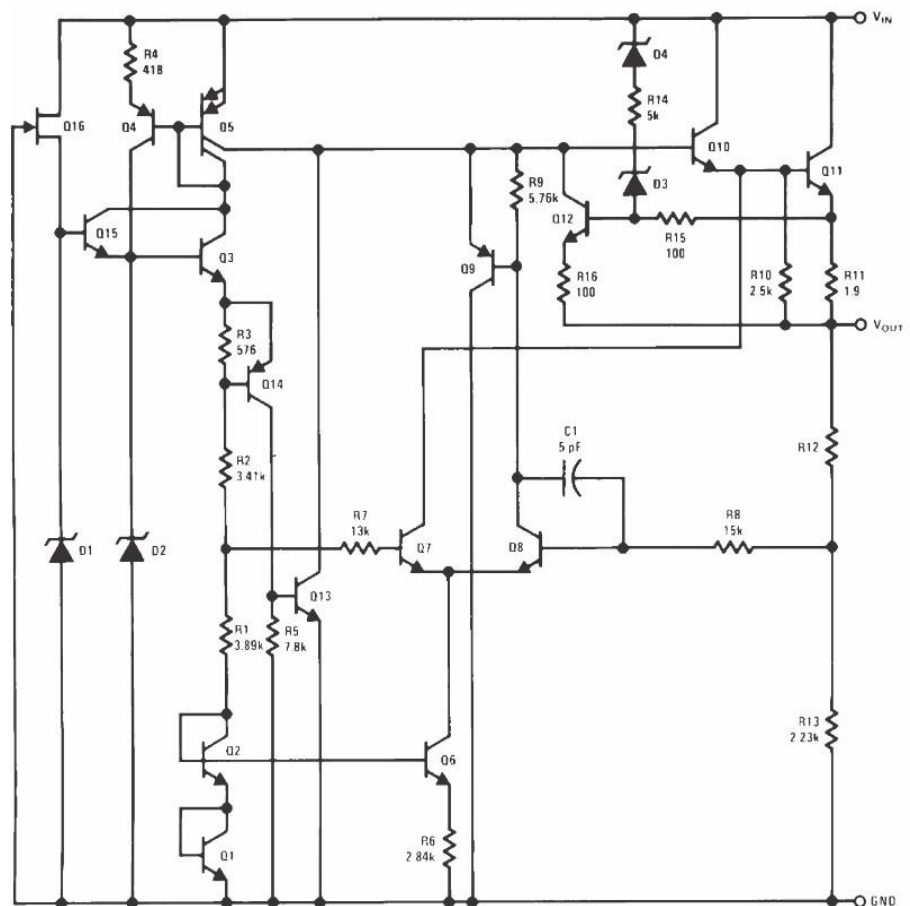
Pin 1. V_{OUT}
 2. GND
 3. V_{IN}

$T_A = -40^\circ$ to 125°C for all packages

Typical Application Circuit



Function Block Diagram



Absolute Maximum Ratings (Note1)

- V_{IN} ----- -0.3V to +35V
- Junction Temperature-----125°C
- Lead Temperature (Soldering, 10 sec.)-----300°C
- Storage Temperature ----- -65°C to 150°C

Recommended Operating Conditions

- Input Voltage, V_{IN} ----- +7V to +30V
- Junction Temperature ----- -40°C to 125°C

Electrical Characteristics
 $V_{IN}=10V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^\circ C$, unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Output Voltage (HT78L33)	V_{OUT}	$T_J = 25^\circ C$	3.168	3.3	3.432	V
		$V_{IN} = 7 \text{ to } 20V$, $I_{OUT} = 1mA \text{ to } 40mA$ $T_J = 0^\circ C \text{ to } 125^\circ C$	3.135		3.465	
		$I_{OUT} = 1mA \text{ to } 70mA$ $T_J = 0^\circ C \text{ to } 125^\circ C$	3.135		3.465	
Output Voltage (HT78L05)	V_{OUT}	$T_J = 25^\circ C$	4.8	5	5.2	V
		$V_{IN} = 7 \text{ to } 20V$, $I_{OUT} = 1mA \text{ to } 40mA$ $T_J = 0^\circ C \text{ to } 125^\circ C$	4.75		5.25	
		$I_{OUT} = 1mA \text{ to } 70mA$ $T_J = 0^\circ C \text{ to } 125^\circ C$	4.75		5.25	
Line Regulation	ΔV_{LINE}	$V_{IN} = 7 \text{ to } 20V$,		8	30	mV
		$V_{IN} = 8 \text{ to } 20V$,		5	25	
Load Regulation	ΔV_{LOAD}	$I_{OUT} = 1mA \text{ to } 100mA$		20	60	mV
		$I_{OUT} = 1mA \text{ to } 40mA$		10	30	
Quiescent Current	I_Q	$T_J = 25^\circ C$		0.3		mA
		$T_J = 125^\circ C$			1	
Quiescent Current Change	ΔI_Q	$V_{IN} = 8 \text{ to } 20V$, $T_J = 0^\circ C \text{ to } 125^\circ C$			0.2	mA
		$I_{OUT} = 1mA \text{ to } 40mA$ $T_J = 0^\circ C \text{ to } 125^\circ C$			0.1	
Ripple Rejection	$\Delta V_{IN}/\Delta V_{OUT}$	$f = 120Hz$, $V_{IN} = 8V \text{ to } 16V$, $T_J = 25^\circ C$	75	84		dB
Output Noise Voltage	V_N	$f = 10Hz \text{ to } 100KHz$		32		μV
Dropout Voltage	V_{DROP}			0.8		V
V_{OUT} Temp. Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT} = 5mA$		0.2	0.5	$mV/^\circ C$
Peak Output Current	I_{PK}			170		mA

Typical Characteristics

$V_{IN}=10V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^{\circ}C$, unless otherwise specified

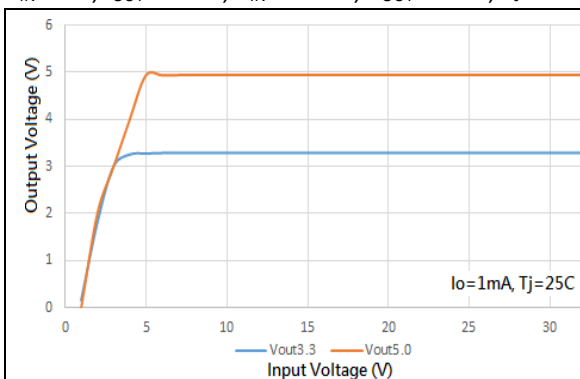


Fig 1. Output Voltage vs Input Voltage

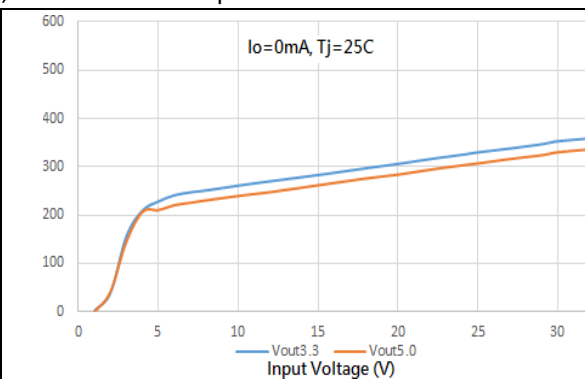


Fig 2. Quiescent Current vs Input Voltage

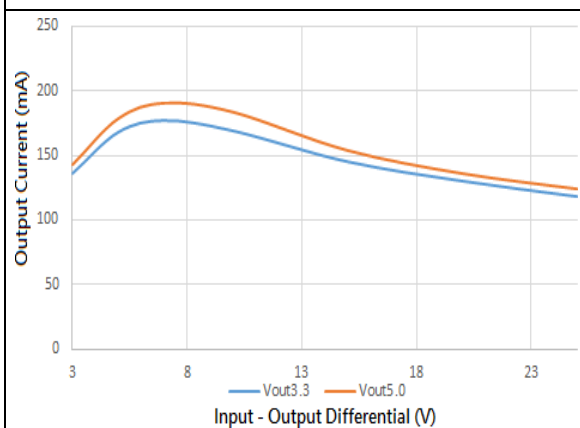


Fig 3. Peak Output Current vs Input-Output Differential

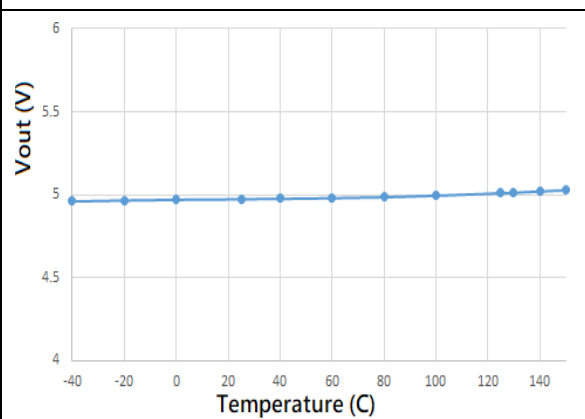


Fig 4. V_{OUT} vs Temp

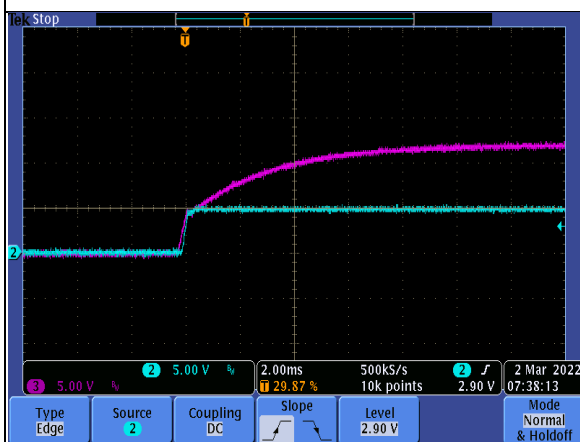


Fig 5. V_{IN} Start up

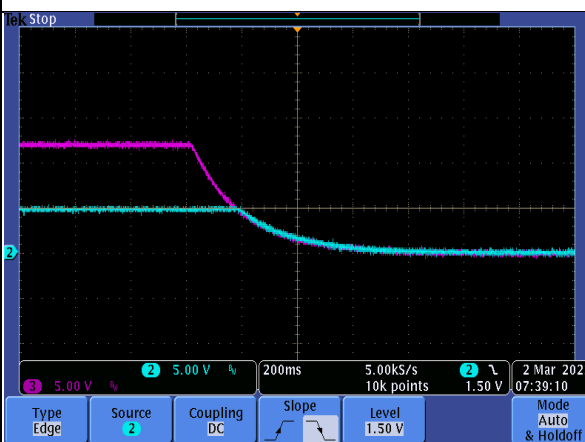


Fig 6. V_{IN} Power off

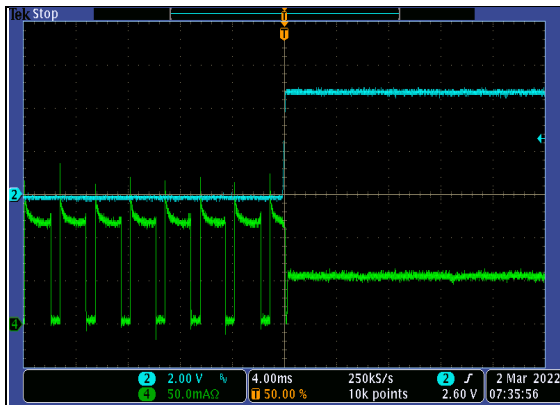


Fig 7. V_{OUT} Short to GND and Release

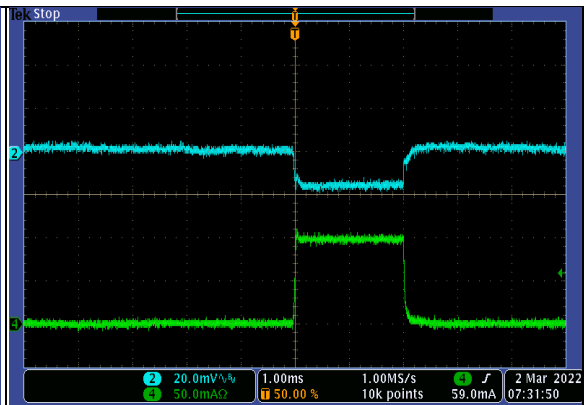
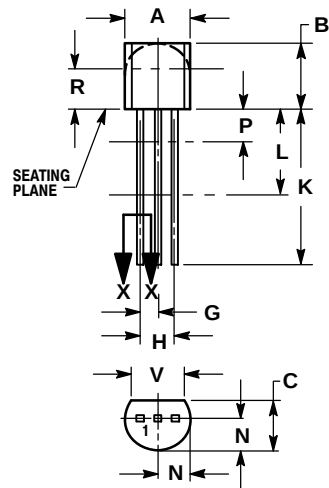
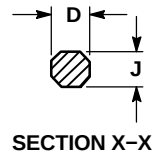
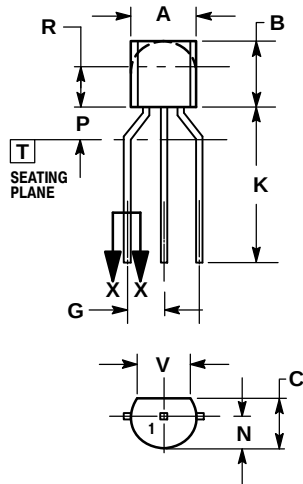
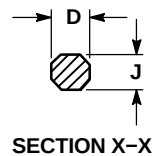


Fig 8. Load Transient

TO-92

**STRAIGHT LEAD
BULK PACK**

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---


**BENT LEAD
TAPE & REEL
AMMO PACK**

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	MILLIMETERS	
	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---

Technical drawings of the 1000 Series Single-Phase Transformer, showing top, side, and detail views.

Top View: Shows the transformer core with dimensions W (width) and H (height). It includes mounting feet and a central terminal block with two circular terminals.

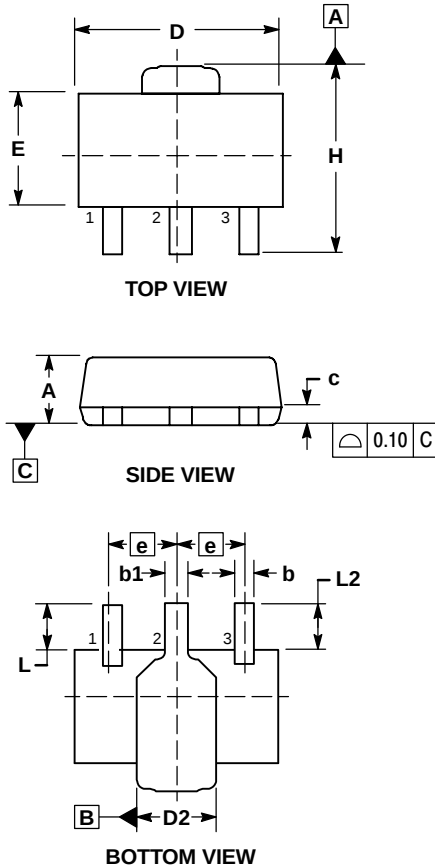
Side View: Shows the transformer core with dimensions L (length) and H (height). It includes mounting feet and a central terminal block with two circular terminals.

Detail View: Shows a close-up of the terminal block with dimensions $N \times 45^\circ$ (angle), M (width), and J (height). It also shows the mounting feet with dimension K (height).

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1987.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

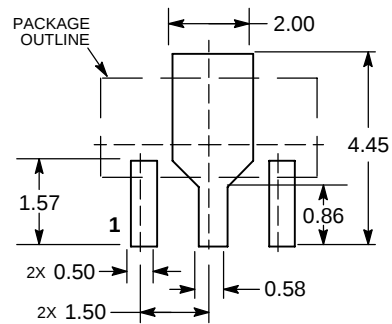
Figure 10: Detail of a column section. The diagram shows a cross-section of a column with a central vertical axis. Dimensions are given in feet and inches. The total height is 7.0 feet (210 inches). The top section has a height of 1.52 feet (46 inches) and a width of 0.060 feet (7.2 inches). The bottom section has a height of 4.0 feet (120 inches) and a width of 0.155 feet (18.6 inches). The total width is 0.275 feet (33 inches). The bottom section is divided into three parts: a central part of 0.024 feet (2.9 inches) and two side parts of 0.06 feet (7.2 inches) each. The scale is 6:1.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

SOT-89

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. LEAD THICKNESS INCLUDES LEAD FINISH.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. DIMENSIONS L, L2, D2, AND H ARE MEASURED AT DATUM PLANE C.
6. CENTER LEAD CONTOUR MAY VARY WITHIN THE REGION DEFINED BY DIMENSION E.
7. DIMENSION D2 IS DEFINED AT ITS WIDEST POINT.

DIM	MILLIMETERS	
	MIN	MAX
A	1.40	1.60
b	0.38	0.47
b1	0.46	0.55
c	0.40	0.44
D	4.40	4.60
D2	1.60	1.90
E	2.40	2.60
e	1.50 BSC	
H	4.05	4.25
L	0.89	1.20

RECOMMENDED MOUNTING FOOTPRINT*


DIMENSIONS: MILLIMETERS

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