

**5A LOW DROPOUT POSITIVE  
 FIXED 3.3V REGULATOR**

**FEATURES**

- Guaranteed < 1.3V Dropout at Full Load Current
- Fast Transient Response
- 1% Voltage Reference Initial Accuracy
- Output Current Limiting
- Built-In Thermal Shutdown

**APPLICATIONS**

- Standard 3.3V Chip Set and Logic Applications

**DESCRIPTION**

The IRU1050-33 is a low dropout three-terminal fixed 3.3V output regulator with minimum of 5A output current capability. This product is specifically designed to provide well regulated supply for low voltage IC applications requiring 3.3V output. The IRU1050-33 is guaranteed to have <1.3V dropout at full load current making it ideal to provide well regulated output with supply voltage as low as 4.6V input.

**TYPICAL APPLICATION**

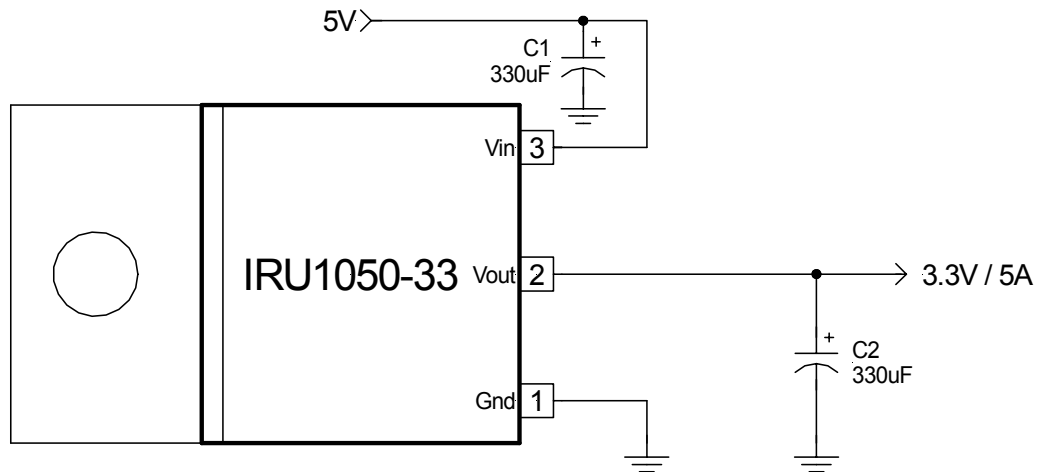


Figure 1 - Typical application of IRU1050-33

**PACKAGE ORDER INFORMATION**

Tj (°C)	3-PIN PLASTIC TO-220 (T)	3-PIN PLASTIC TO-263 (M)	2-PIN PLASTIC Ultra Thin-Pak (P)	2-PIN PLASTIC TO-252 (D-Pak)
0 To 150	IRU1050-33CT	IRU1050-33CM	IRU1050-33CP	IRU1050-33CD

# IRU1050-33

## ABSOLUTE MAXIMUM RATINGS

Input Voltage (Vin) .....	7V
Power Dissipation .....	Internally Limited
Storage Temperature Range .....	-65°C To 150°C
Operating Junction Temperature Range .....	0°C To 150°C

## PACKAGE INFORMATION

3-PIN PLASTIC TO-220 (T)	3-PIN PLASTIC TO-263 (M)	2-PIN PLASTIC ULTRA THIN-PAK (P)	2-PIN PLASTIC TO-252 (D-Pak)
<p><math>\theta_{JT}=2.7^{\circ}\text{C/W}</math> <math>\theta_{JA}=60^{\circ}\text{C/W}</math></p>	<p><math>\theta_{JA}=35^{\circ}\text{C/W}</math> for 1" Square pad</p>	<p><math>\theta_{JA}=70^{\circ}\text{C/W}</math> for 1" Square pad</p>	<p><math>\theta_{JA}=70^{\circ}\text{C/W}</math> for 0.5" Sq pad</p>

## ELECTRICAL SPECIFICATIONS

Unless otherwise specified, these specifications apply over  $C_{in}=1\mu\text{F}$ ,  $C_{out}=10\mu\text{F}$ , and  $T_j=0$  to  $150^{\circ}\text{C}$ . Typical values refer to  $T_j=25^{\circ}\text{C}$ .

PARAMETER	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
Output Voltage	$V_o$	$I_o=10\text{mA}$ , $T_j=25^{\circ}\text{C}$ , $V_{in}=5\text{V}$ $I_o=10\text{mA}$ , $V_{in}=5\text{V}$	3.267 3.234	3.300 3.300	3.333 3.366	V
Line Regulation		$I_o=10\text{mA}$ , $4.7\text{V}<V_{in}<7\text{V}$			0.2	%
Load Regulation (Note 1)		$V_{in}=5\text{V}$ , $V_{adj}=0$ , $10\text{mA}<I_o<5\text{A}$			0.4	%
Dropout Voltage (Note 2)	$\Delta V_o$	Note 2, $I_o=5\text{A}$		1.1	1.3	V
Current Limit		$V_{in}=5\text{V}$ , $dV_o=100\text{mV}$	5.1			A
Minimum Load Current (Note 3)		$V_{in}=5\text{V}$		5	10	mA
Thermal Regulation		30ms Pulse, $V_{in}-V_o=3\text{V}$ , $I_o=5\text{A}$		0.01	0.02	%/W
Ripple Rejection		$f=120\text{Hz}$ , $C_o=25\mu\text{F}$ Tantalum, $I_o=2.5\text{A}$ , $V_{in}-V_o=3\text{V}$	60	70		dB
Adjust Pin Current Change		$I_o=10\text{mA}$ , $V_{in}-V_o=1.5\text{V}$ , $T_j=25^{\circ}\text{C}$		0.2	5	$\mu\text{A}$
Temperature Stability		$V_{in}=5\text{V}$ , $V_{adj}=0\text{V}$ , $I_o=10\text{mA}$		0.5		%
Long Term Stability		$T_j=125^{\circ}\text{C}$ , 1000Hrs		0.3	1	%
RMS Output Noise		$T_j=25^{\circ}\text{C}$ , $10\text{Hz}<f<10\text{KHz}$		0.003		% $V_o$

**Note 1:** Low duty cycle pulse testing with Kelvin connections is required in order to maintain accurate data.

**Note 2:** Dropout voltage is defined as the minimum differential voltage between  $V_{in}$  and  $V_{out}$  required to maintain regulation at  $V_{out}$ . It is measured when the output voltage drops 1% below its nominal value.

**Note 3:** Minimum load current is defined as the minimum current required at the output in order for the output voltage to maintain regulation. Typically the resistor dividers are selected such that it automatically maintains this current.

**PIN DESCRIPTIONS**

PIN #	PIN SYMBOL	PIN DESCRIPTION
1	Gnd	This pin must be connected to ground plane using a low inductance short connection.
2	Vout	The output of the regulator. A minimum of 10 $\mu$ F capacitor must be connected from this pin to ground to insure stability.
3	Vin	The input pin of the regulator. Typically a large storage capacitor is connected from this pin to ground to insure that the input voltage does not sag below the minimum dropout voltage during the load transient response. This pin must always be 1.3V higher than Vout in order for the device to regulate properly.

**BLOCK DIAGRAM**

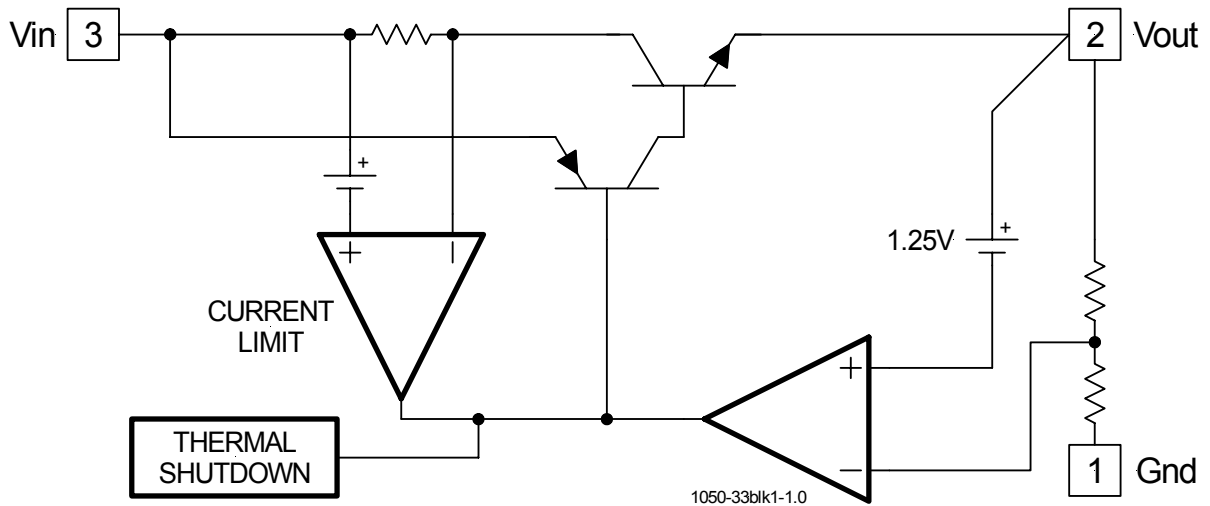


Figure 1 - Simplified block diagram of the IRU1050-33

**APPLICATION INFORMATION**

**Stability**

The IRU1050-33 requires the use of an output capacitor as part of the frequency compensation in order to make the regulator stable. Typical designs for microprocessor applications use standard electrolytic capacitors with a typical ESR in the range of 50 to 100m $\Omega$  and an output capacitance of 500 to 1000 $\mu$ F. Fortunately as the capacitance increases, the ESR decreases resulting in a fixed RC time constant. The IRU1050-33 takes advantage of this phenomena in making the overall regulator loop stable. For most applications a minimum of 100 $\mu$ F aluminum electrolytic capacitor such as Sanyo MVGX series, Panasonic FA series as well as the Nichicon PL series insures both stability and good transient response.

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