IRU1246 / IRU1247-18 / IRU1247-25

2A FIXED AND ADJUSTABLE DUAL VOLTAGE REGULATOR

PRELIMINARY DATA SHEET

FEATURES

- Low Dropout Voltage
- Fast Transient Response
- Built-In Thermal Shutdown
- Output Current Limiting
- D-Pak, Ultra Thin-Pak and SOIC
- Fixed 3.3V and Adjustable, or Fixed 3.3V and 1.8V, or Fixed 3.3V and 2.5V

APPLICATIONS

- Motherboard with Multiple Supplies
- Hard Disk Drivers, CD-ROMs, DVDs
- ADSL and Cable Modems
- High Efficiency Linear Regulators

DESCRIPTION

The IRU1246/47 family of voltage regulators contain two integrated, low dropout linear voltage regulators in three different packages, such as new 5-Pin Ultra Thin-Pak surface mount, 5-Pin D-Pak and 8-Pin SOIC. The IRU1246 provides 3.3V fixed and adjustable outputs. The IRU1247-18 provides fixed 3.3V and 1.8V. The IRU1247-25 provides fixed 3.3V and 2.5V output. These products are stable with both Ceramic and Tantalum output capacitors. The adjustable output provides a voltage from 1.25V and up using a simple resistor divider. The input supply for both regulators is supplied from a single 5V supply. Each regulator is capable of 2 amps continuous load current. Both outputs, for each device, are current limit protected as well as having a thermal shutdown that protects the device from excessive temperature.

TYPICAL APPLICATION

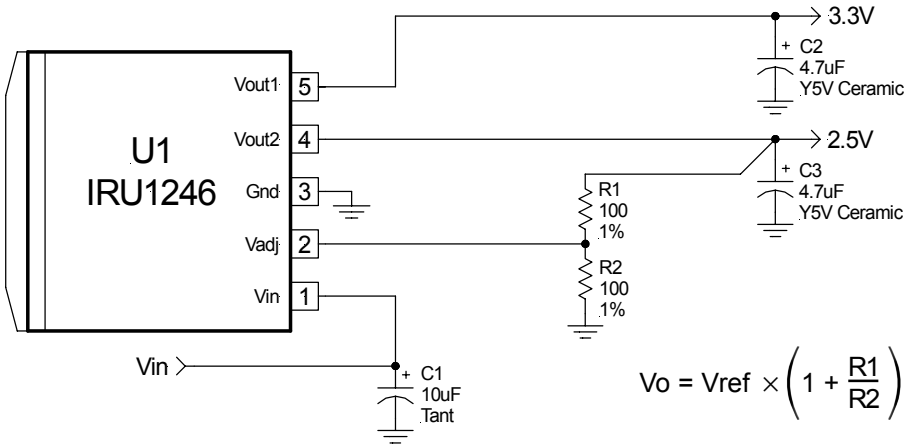


Figure 1 - Typical application of IRU1246 in 5-Pin TO-252 (D-Pak) package.

Note: All caps must be located as close to the pins as physically possible using a plane connection.

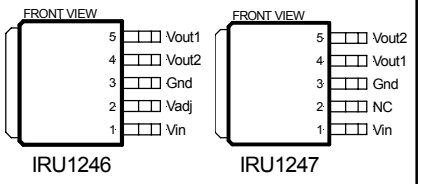
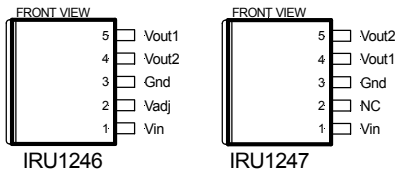
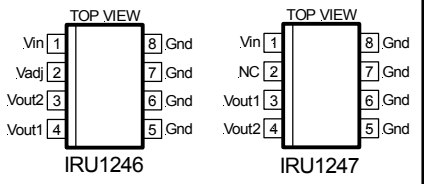
PACKAGE ORDER INFORMATION

T_J (°C)	5-PIN TO-252 (D-Pak)	5-PIN TO-263 Ultra Thin-Pak (P)	8-PIN PLASTIC SOIC POWER (S)	OUTPUT VOLTAGE #1	OUTPUT VOLTAGE #2
0 To 150	IRU1246CD	IRU1246CP	IRU1246CS	3.3V Fixed	Adjustable
0 To 150	IRU1247-18CD	IRU1247-18CP	IRU1247-18CS	3.3V Fixed	1.8V Fixed
0 To 150	IRU1247-25CD	IRU1247-25CP	IRU1247-25CS	3.3V Fixed	2.5V Fixed

ABSOLUTE MAXIMUM RATINGS

Input Voltage (V_{IN}) 7V
Storage Temperature Range ..... -65°C To 150°C
Operating Junction Temperature Range ..... 0°C To 150°C

PACKAGE INFORMATION

5-PIN PLASTIC TO-252 (D-Pak)	5-PIN ULTRA THIN-PAK (P)	8-PIN PLASTIC POWER SOIC (S)
		
θ_{JA}=358C/W with 1" Copper area	θ_{JA}=25°C/W with 1" Copper area	θ_{JA}=55°C/W for 1" Sq pad

ELECTRICAL SPECIFICATIONS

Unless otherwise specified, these specifications apply over Vin=5.0V, Cin=Cout=4.7μF. Typical values refer to T_J=25°C. I_{FL1}=2A, I_{FL2}=2A

PARAMETER	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
Output Voltage #1	V_{O1}	I_{O2}=10mA, T_J=25°C	3.230	3.300	3.370	V
Output Voltage #1	V_{O1}	I_{O1}=10mA, T_J=0 to 125°C	3.200	3.300	3.400	V
Output Voltage #2(IRU1246)	V_{O2}	I_{O1}=10mA, T_J=25°C, Vo=Vadj	1.238	1.250	1.262	V
Output Voltage #2(IRU1246)	V_{O2}	I_{O1}=10mA, T_J=0 to 125°C, Vo=Vadj	1.225	1.250	1.275	V
Output Voltage #2(IRU1247-18)	V_{O2}	I_{O1}=10mA, T_J=25°C	1.782	1.800	1.818	V
Output Voltage #2(IRU1247-18)	V_{O2}	I_{O1}=10mA, T_J=0 to 125°C	1.764	1.800	1.836	V
Output Voltage #2(IRU1247-25)	V_{O2}	I_{O1}=10mA, T_J=25°C	2.475	2.500	2.525	V
Output Voltage #2(IRU1247-25)	V_{O2}	I_{O1}=10mA, T_J=0 to 125°C	2.450	2.500	2.550	V
Line Regulation	Reg_{LINE}	Io=10mA, Vcc ±5%		0.2		%Vo
Load Regulation	Reg_{LOAD}	Note 1, 10mA<Io<I_{FL}		0.4		%Vo
Dropout Voltage (Output #1)	V_{DO1}	Note 2, I_{O1} = I_{FL1}		1.1	1.3	V
Dropout Voltage (Output #2)	V_{DO2}	Note 2, I_{O2} = I_{FL2}		1.1	1.3	V
Current Limit (Output #1)	I_{OL1}	ΔV_{O1}=10% below regulation	2.1			A
Current Limit (Output #2)	I_{OL2}	ΔV_{O2}=10% below regulation	2.1			A
Minimum Load Current (Output #1)	$I_{O1(MIN)}$	Note 3, 5			5	mA
Minimum Load Current (Output #2)	$I_{O2(MIN)}$	Note 3, 5			5	mA
Thermal Regulation	Reg_{therm}	Note 5, 30ms pulse, Io=I_{FL}		0.1		%/Watt
Ripple Rejection (Vcc to Output #1)	$PSRR_1$	Note 5,100Hz<f<100KHz,Io=I_{FL1}/10		40		dB
Ripple Rejection (Vcc to Output #2)	$PSRR_2$	Note 5,100Hz<f<100KHz, Io=I_{FL2}/10		40		dB
Temperature Stability	$Stab_{TEMP}$	Note 4, 5, Io =10mA		0.5		%Vo
Long Term Stability	$Stab_{LONG}$	Note 5, T_J=125°C, 1000Hrs		0.3		%Vo
RMS Output Noise	Vn	Note 5, 10Hz<f<10KHz		0.003		%Vo
Vin Quiescent current	I_{Q1}	I_{O1}=I_{O2}=0		10		mA

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 Vin and Vout required to maintain regulation at Vout. 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.

Note 4: Temperature stability is the change in output from nominal over the operating temperature range.

Note 5: Guaranteed by design, but not tested in production.

PIN DESCRIPTIONS

IRU1246

PIN #	PIN SYMBOL	PIN DESCRIPTION
1	Vin	The power 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 higher than both Vout pins by the amount of the dropout voltage in order for the device regulate properly.
2	Vadj	A resistor divider from this pin to Vout2 (pin4) and ground sets the output voltage.
3	Gnd	This pin is connected to ground. It is also the TAB of the Ultra Thin-Pak package.
4	Vout2	The output #2 (adjustable) of the regulator. A minimum of 4.7μF capacitor must be connected from this pin to ground to insure stability.
5	Vout1	The output #1 (3.3V) of the regulator. A minimum of 4.7μF capacitor must be connected from this pin to ground to insure stability.

IRU1247-18, IRU1247-25

PIN #	PIN SYMBOL	PIN DESCRIPTION
1	Vin	The power 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 higher than both Vout pins by the amount of the dropout voltage in order for the device to regulate properly.
2	NC	No connection.
3	Gnd	This pin is connected to ground. It is also the TAB of the Ultra Thin-Pak package.
4	Vout1	The output #1 (1.8V for 1247-18 and 2.5V for 1247-25) of the regulator. A minimum of 4.7μF capacitor must be connected from this pin to ground to insure stability.
5	Vout2	The output #2 (3.3V) of the regulator. A minimum of 4.7μF capacitor must be connected from this pin to ground to insure stability.

APPLICATION INFORMATION

Thermal
The following thermal design check illustrates the method used to calculate the maximum junction temperature of the regulator.

Power Flex Package (Ultra Thin-Pak)

R_{THJA} = 25°C/W (Note 1)
T_A = 45°C
V_5 = 5V
$I_{2.5}$ = 0.30A
$I_{3.3}$ = 0.80A
$V_{2.5}$ = 2.5V
$V_{3.3}$ = 3.3V

$P_D = (V_5 - V_{3.3}) \times I_{3.3} + (V_5 - V_{2.5}) \times I_{2.5}$

$P_D = (5 - 3.3) \times 0.8 + (5 - 2.5) \times 0.3 = 2.11W$

$\Delta T = P_D \times R_{THJA} = 2.11 \times 25 = 53°C$

$T_J = T_A + \Delta T = 45 + 53 = 98°C$

$T_J = 98°C$

Note 1: This thermal impedance is for a four-layer board mounted on a minimum of one inch square area. It is possible to further reduce this by mounting the device close to other thermally conductive elements such as mounting screws.

Layout Consideration
The IRU1246/1247-xx like many other high speed regulators requires that the output capacitors to be close to the device for stability reasons. For power consideration, a ground plane pad of approximately one inch square pad on the component side must be dedicated to the device where all ground pins are connected to dissipate the power. If multilayer board is used, it is recommended that the inner layers of the board are also dedicated to the size of the pad for better thermal characteristics.

TYPICAL APPLICATION

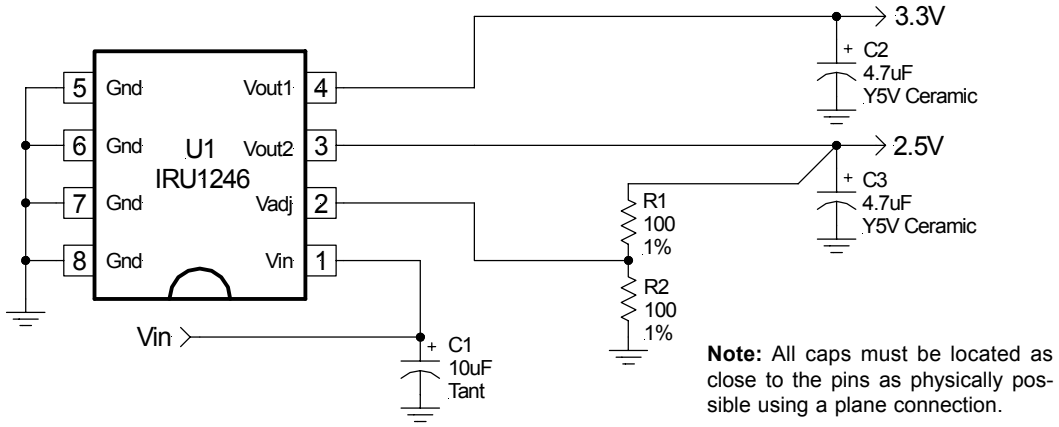


Figure 2 - Typical application of IRU1246 in power 8-Pin SOIC package.

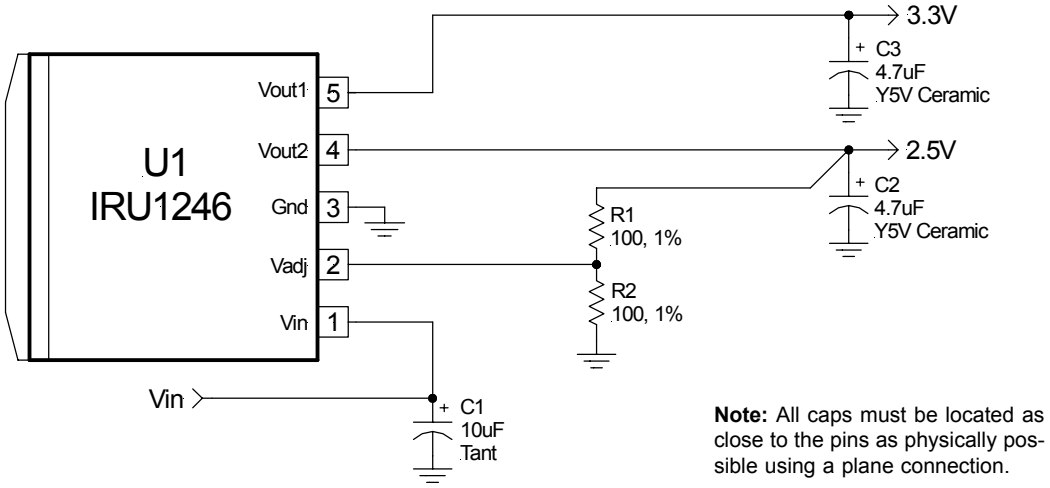


Figure 3 - Typical application of IRU1246 in 5-Pin Ultra Thin-Pak package.

TYPICAL APPLICATION

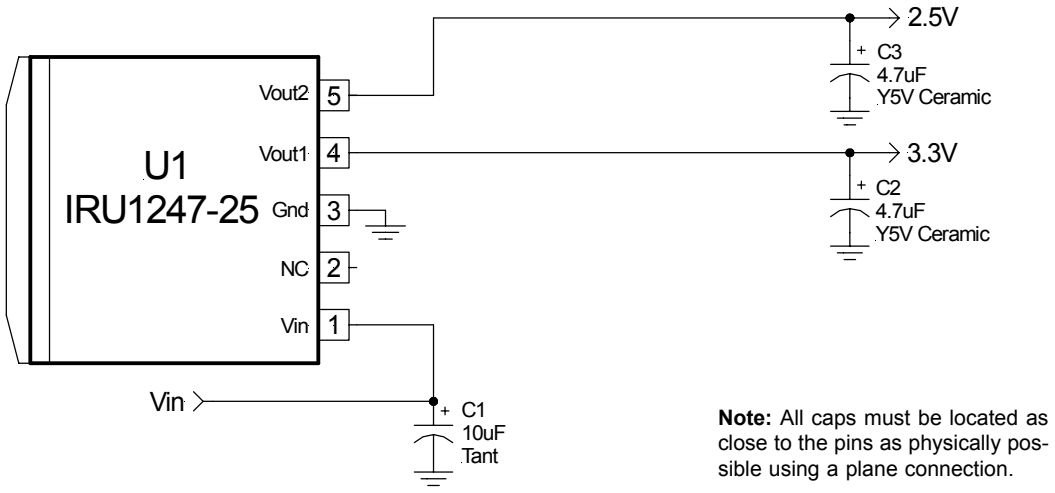


Figure 4 - Typical application of IRU1247-25 in 5-Pin Ultra Thin-Pak and TO-252 (D-Pak) packages.

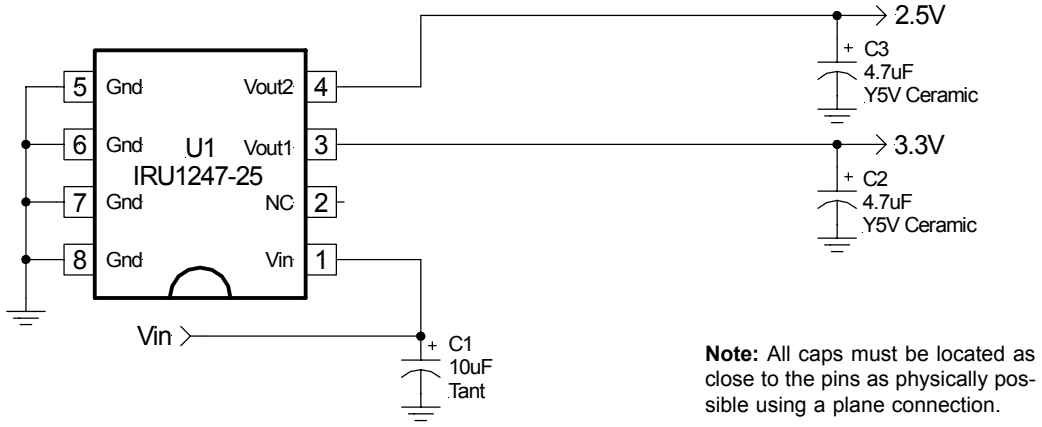


Figure 5 - Typical application of IRU1247-25 in power 8-Pin SOIC package.

TYPICAL APPLICATION

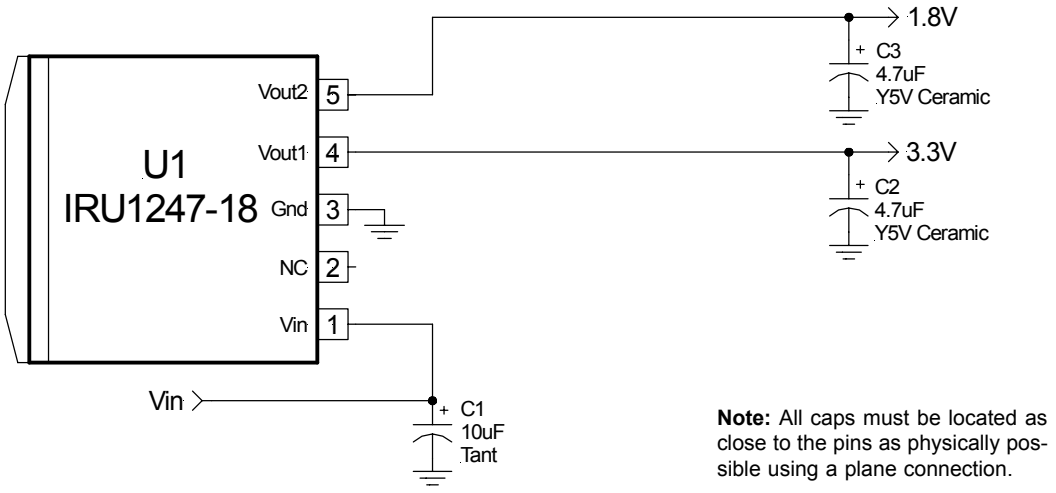


Figure 6 - Typical application of IRU1247-18 in 5-Pin Ultra Thin-Pak and TO-252 (D-Pak) packages.

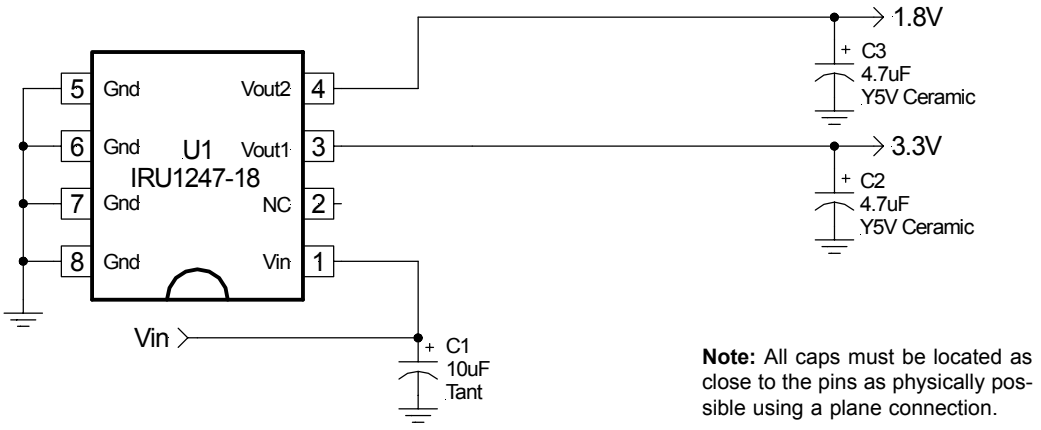


Figure 7 - Typical application of IRU1247-18 in power SOIC 8-Pin package.

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