



Shanghai Tide Microelectronic Co.,Ltd.

DF0038B

IR Preamplifier for Remote Control System

No: TDSPEC2006E

Date: 2002.10.

DF0038B IR Preamplifier for Remote Control System

GENERAL DESCRIPTION

The DF0038B is a high performance infrared remote control preamplifier. Especially, it has excellent interference suppression capability. The infrared pulses arriving at the photodiode are treated by the trans-impedance amplifier and amplified by the auto-gain control amplifier, limiter amplifier, and band-pass filter. The following evaluation circuits, including the comparator, integrator, and schmitt-trigger, demodulate the transmitted digital signal. Reduction of sensitivity due to external interference is achieved by the short-time boost and long-time control circuits, which prevent interference voltages from affecting the output.

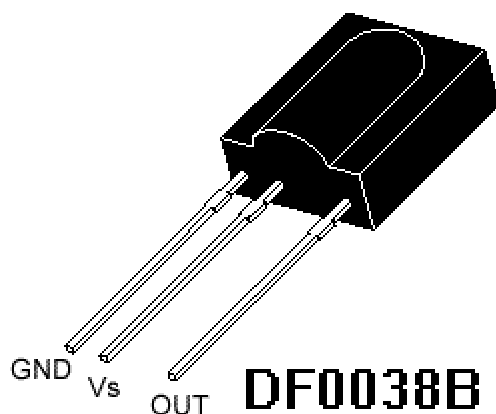
FEATURES

- . Only Two External Components Required Other than the Photodiode.
- . Easy to Integrate into Module due to Small Chip Size.
- . Minimized Chances of Malfunction Due to Ambient Light.
- . Low Power Consumption.
- . Center Frequency of Band Pass Filter Adjustable by an External Resistor.
- . Microcomputer Compatible.

APPLICATIONS

IR Remote Control Receivers for Consumer Electronic Products, such as TVs, VCRs, VCD/DVD Players, Audio Devices, Air Conditioners, Electric Fans...etc.

PIN CONFIGURATIONS

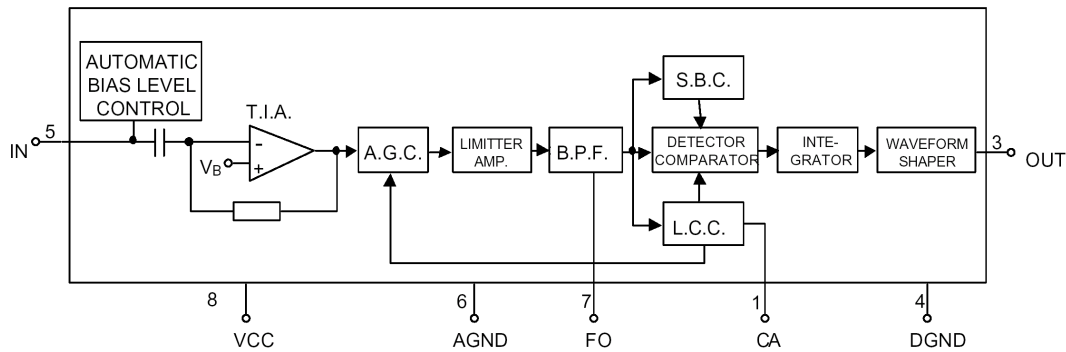


PIN DESCRIPTIONS

PIN 1: GND	Ground.
PIN 2: Vs	Power supply pin.
PIN 3: OUT	Output pin.

DF0038B IR Preamplifier for Remote Control System

BLOCK DIAGRAM



BLOCK DESCRIPTION

AUTOMATIC BIAS LEVEL CONTROL

An ABLC (Automatic Bias Level Control) circuit is built into the input section to prevent the input level from being saturated by the external disturbing lights, such that this circuit is actuated by a strong external disturbing light to fix the bias level of the input terminal.

TRANS-IMPEDANCE AMPLIFIER (T.I.A.)

The Trans-impedance amplifier is an inverted amplifier with a sufficiently low input resistance, which amplifies the input photocurrent pulses. The resistance of the input at the signal frequency should not be too high. Otherwise the wanted signal would be lost to the junction capacitance of photodiode.

AUTO-GAIN CONTROL AMPLIFIER (A.G.C.)

The voltage gain of auto-gain control amplifier is controlled by the voltage at CA pin. In so doing, it supports the long-time interference suppression of the evaluation circuit.

EVALUATION CIRCUIT

The signal delivered from the band-pass filter is compared with a reference by the detector comparator. This reference is determined by the short-time boost circuit and the long-time control circuit. The inherent offset of the detector comparator and the reference determine the sensitivity of the evaluation circuit. The integrator is controlled by the above mentioned comparison. Its output is used to control the output stage after being processed through a schmitt-trigger. Use of the integrator keeps the output free of short-time interference. The ground of the evaluation circuit is routed out separately at pin 4, in order to minimize effect of the output switching edges.

SHORT-TIME BOOST CIRCUIT (S.B.C.)

The short-time boost circuit reduces the sensitivity of the evaluation circuit after reception of a signal. This prevents short-time interference from affecting the output. The reduction in sensitivity is achieved by boosting the reference input of the detector comparator.

DF0038B IR Preamplifier for Remote Control System

LONG-TIME CONTROL CIRCUIT (L.C.C.)

The long-time control circuit improves the circuit's resistance to long-time interference by adapting the sensitivity of the evaluation circuit and the amplification of the AGC amplifier. Reduction of the evaluation circuit sensitivity is thereby achieved in the same way, as for the SBC, by raising the reference input of the detector comparator. The external capacitor C1 is charged as long as the signal is delivered from band pass filter and the voltage of C1 provides the necessary control voltage for AGC amplifier.

LIMITING VALUES

Supply Voltage 5.5V
 Input Voltage 5 Vp-p
 Operating Temperature Range -20 C~80 C
 Storage Temperature Range - 65 C~ 150 C

ELECTRICAL CHARACTERISTICS (VCC= 5V, Ta=25°C, unless otherwise specified.)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage		Vcc	4.5	5.0	5.5	V
Input Pin Voltage (1)	IIN=0 A	VIN1	3.8	4.2	4.4	V
Input Pin Voltage (2)	IIN=100 A	VIN2	1.5	2.1	2.7	V
Low Level Output Voltage		VOL		0.1	0.3	V
High Level Output Voltage		VOH	4.70	4.94		V
Voltage Gain	100 VP-P, 38KHz	AV	76	81		dB
BPF Characteristics	100 VP-P, 28KHz, 35KHz, 41KHz, 48KHz (note 1)	AQ	4	9		dB
Input Impedance	0.5VP-P, 38KHz (note 2)	RIN	4	11		K
Detecting Ability (1)	100 VP-P, 38KHz 600 S ON Time, 0.2 Duty Cycle	TD1	360	520	680	S
Detecting Ability (2)	50mVP-P, 38KHz 600 S ON Time, 0.2 Duty Cycle	TD2	540	670	800	S

DF0038B IR Preamplifier for Remote Control System

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Switch On Delay Time	100 VP-P, 38KHz 600 S ON Time, 0.2 Duty Cycle	TON	100	250	400	S
Switch Off Delay Time	100 VP-P, 38KHz 600 S ON Time, 0.2 Duty Cycle	TOFF	150	220	400	S
LCC Slew Rate	C1=0.1 F	dv/dt		0.8		V/S
Quiescent Current		ICC	0.4	0.7	1.0	mA

NOTE 1: Ratio of the AC level at 35KHz and the AC level at 28KHz denotes AQ1.

$$AQ1 = 20 \log \text{ measured value (f = 35KHz) / measured value (f = 28KHz)}$$

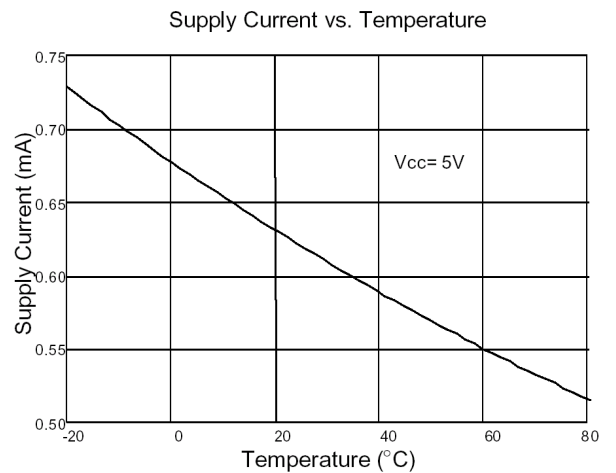
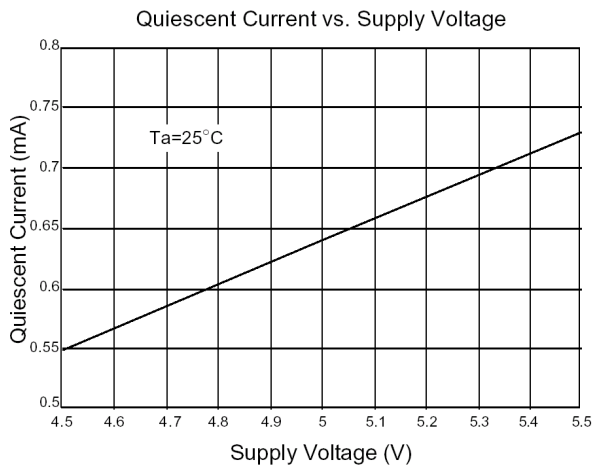
Ratio of the AC level at 41KHz and the AC level at 48KHz denotes AQ2.

$$AQ2 = 20 \log \text{ measured value (f = 41KHz) / measured value (f = 48KHz)}$$

NOTE 2: Input level denotes VI and measured level denotes VX, then

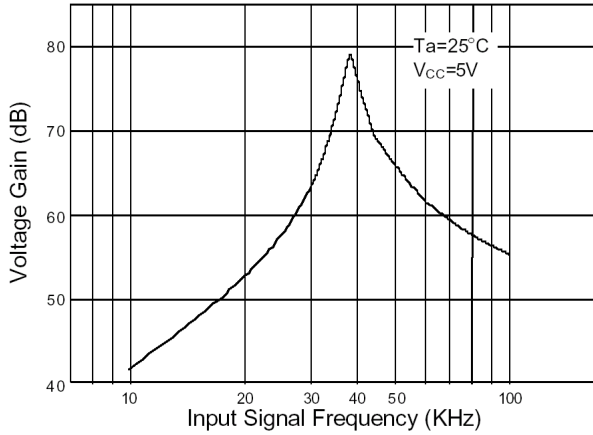
$$RIN = 47K \Omega / (Vi / Vx - 1)$$

TYPICAL CHARACTERISTICS

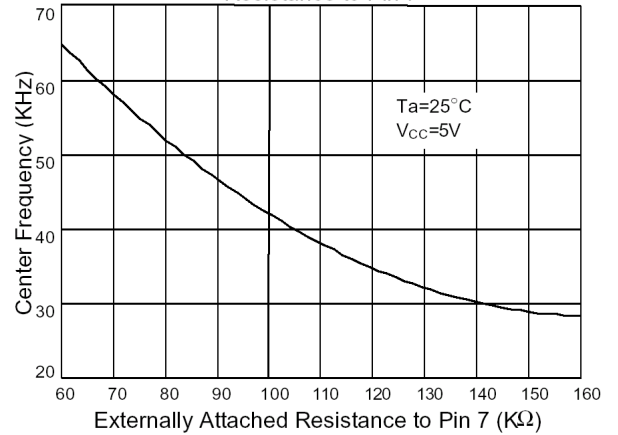


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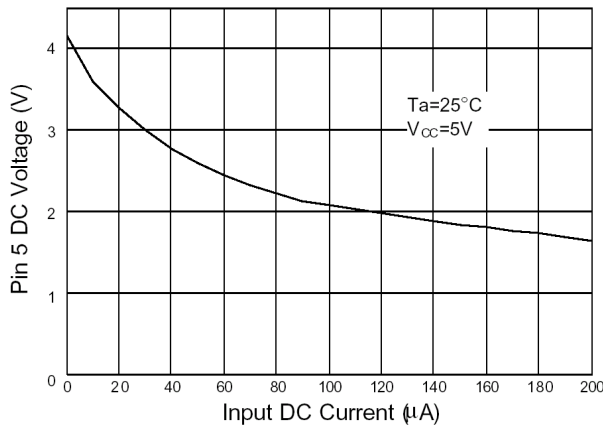
Voltage Gain vs. Input Signal Frequency



Center Frequency vs. Externally Attached Resistance to Pin 7



Pin 5 DC Voltage vs. Input DC Current



DESIGN GUIDE

SETTING THE CENTER FREQUENCY OF BAND PASS FILTER

Connect a resistor from pin 7 to VCC to set the center frequency of band pass filter. The center frequency will be lower if the resistor value is higher. The relationships between center frequency of band pass filter and the resistance of external resistor are tabulated as below:

f0(KHz)	33	36	37	38	40	56.8
R1(KΩ)	130	118	114	110	104	72

DF0038B IR Preamplifier for Remote Control System

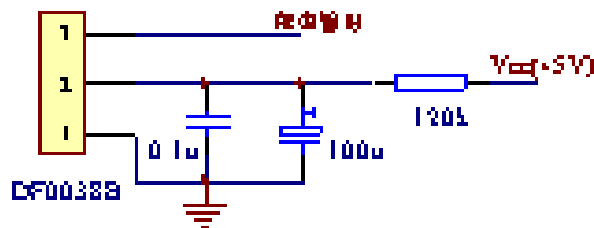
SETTING LCC CAPACITOR C1

With the transmitted data signal with duty cycle lower than 0.4 (average, during the whole transmission), the detection sensitivity is unchanged all the time. Otherwise, with the transmitted data signal with duty cycle higher than 0.4, the detection sensitivity will maintain unchanged for a proportional time period and gradually be reduced due to increasing control voltage at CA pin. Higher duty cycle enables more reduction of detection sensitivity in specific transmission time. Increasing the capacitance of C1 causes longer transmission time as duty cycle higher than the maximum allowable duty cycle.

GROUNDING

The AGND pin, DGND pin and all the external parts are recommended to be connected as much as possible to “one ground point” for good noise performance.

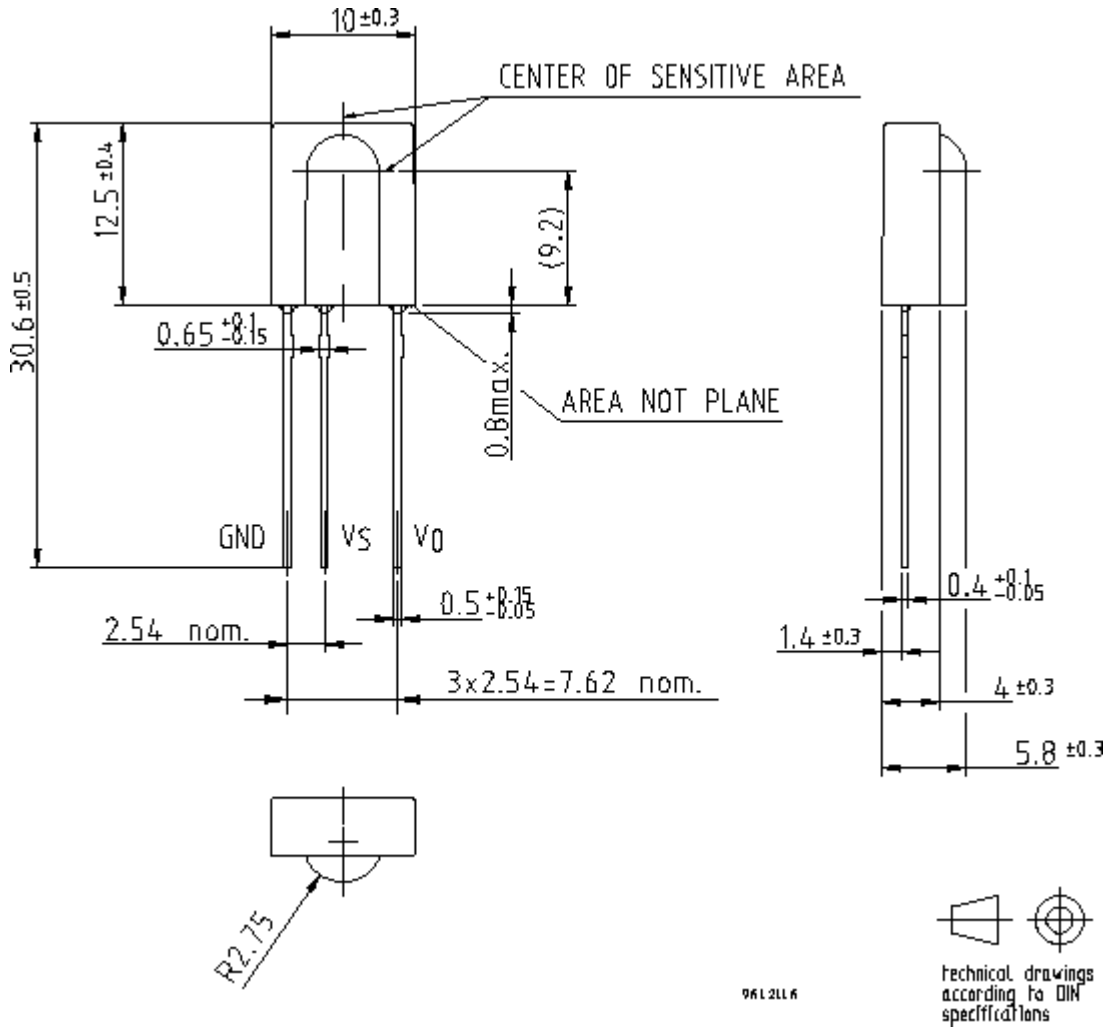
TYPICAL APPLICATION CIRCUIT



PACKAGE DIMENSIONS

3 LEAD PLASTIC (UNIT : mm)

DF0038B IR Preampifier for Remote Control System



Note: TIDE corporation assumes no responsibility for any errors which may appear in this document. reserves the right to change devices or specifications detailed herein at any time without notice.

Attach:

Revision History:

Date	REV	Description	Page
2002-10	1.0		
2003-01	2.0	Add typical application circuit	7