MITSUBISHI STANDARD LINEAR IC

New Product

M62238FP

CONSTANT VOLTAGE CONSTANT CURRENT CONTROL+2 SYSTEM LED CONTROL IC

DESCRIPTION

M62238FP is a constant voltage/current control IC with high accuracy ref. voltage(1.265V ±1.0%) most suitable for charger control. Built-in OP Amps for voltage/current control and 2 system LED drivers allow for compact design with a small number of external components. LED indications automatically change from"RED" meaning "during charging" to "GREEN"meaning "charge completion"

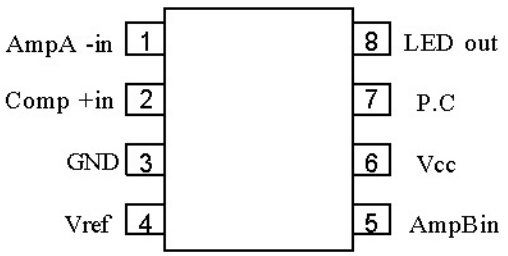
FEATURES

*Operating power supply voltage range-----2.5-15V
*High accuracy ref. voltage----------1.265V ±1.0%
*PC terminal output current----------20mA
*LED terminal output current----------10mA

APPLICATION

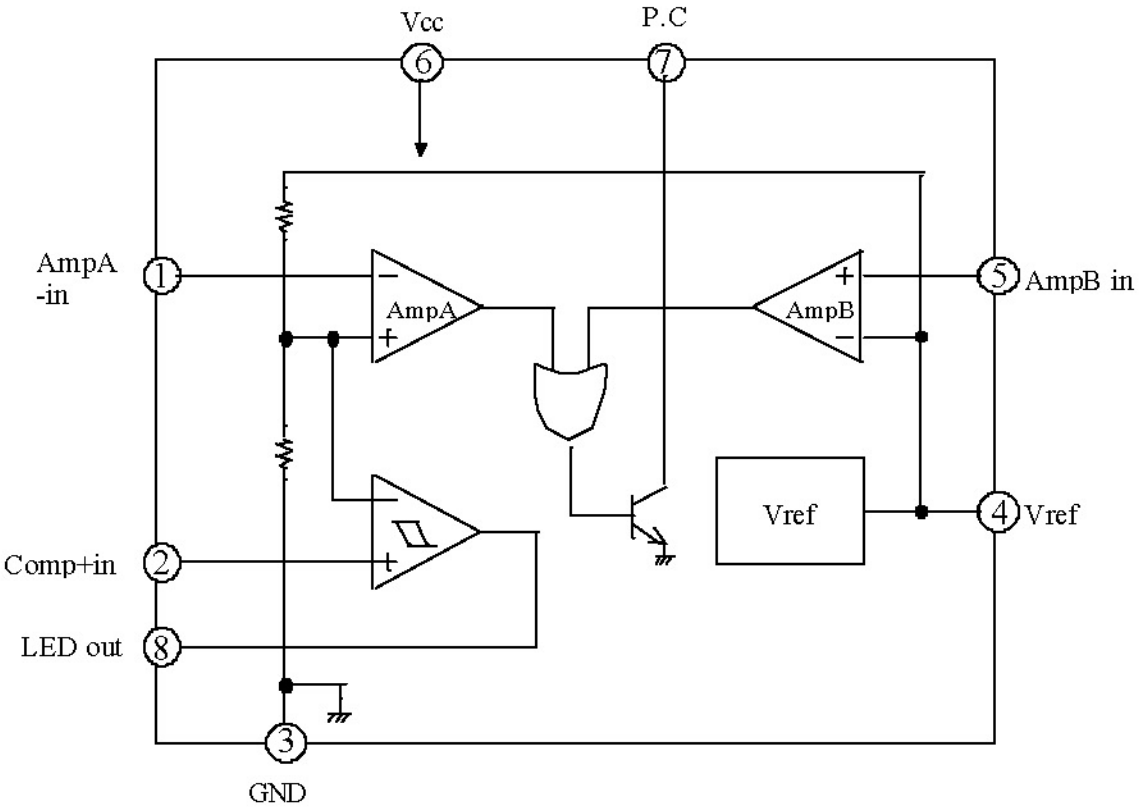
Charger for MP3 player, PDA, and so forth

PIN CONFIGURATION(TOP VIEW)



OUTLINE 8P2S-A

BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS(Ta=25deg.,unless otherwise specified.)

Symbol	Parameter	Conditions		Ratings	Unit
Vcc	Supply voltage			16	V
VP.C	P.C terminal voltage			16	V
IP.C	P.C terminal input current			20	mA
ILED+	LED terminal input current			10	mA
ILED-	LED terminal output current			-10	mA
Iref.	Vref terminal output current			-5	mA
VID	Input differential voltage	Amp.A		16	V
		Amp.B		9	V
		LED Comp.	Vcc≧5V	5	V
			Vcc<5V	Vcc	V
Pd	Power dissipation			440	mW
Kθ	Thermal derating	Ta≧25deg.		4.4	mW/deg.
Topr.	Operating temperature			-20~75	deg.
Tstg.	Storage temperature			-40~125	deg.

ELECTRICAL CHARACTERISTICS (Vcc=6V, Ta=25deg. unless otherwise specified.)

	Symbol	Parameter	Conditions	Ratings			Unit
				MIN.	TYP.	MAX	
ALL	Vcc	Supply voltage		2.5	—	15.0	V
	Icc	Supply current	IP.C=0,Iref=0, ILED=open		2.0		mA
	Vref	Ref.voltage	Iref=0,IP.C=5mA, ILED=open	1.252	1.265	1.278	V
	deltaVref	Ref.voltage regulation	Iref=0~2mA	—	10	30	mV
P.C	Vsat	P.C terminal sat. volt.	IP.C=10mA	—	0.2	0.4	V
	IP.CLEAK	P.C terminal leak current	VP.C=6V	—	—	2	μA
AMP.A(Note1)	VIO	Input offset voltage		—	0.5	2.5	mV
	IB-	Input bias current		—	-100	—	nA
	GVO	Open voltage gain		—	80	—	dB
	SVRR	Supply voltage rejection ratio		—	70	—	dB
	SR	Slew rate		—	0.5	—	V/μsec
AMP.A(Note2)	VIO	Input offset voltage		—	0.5	3.5	mV
	IB-	Input bias current		—	-100	—	nA
	GVO	Open voltage gain		—	80	—	dB
	SVRR	Supply voltage rejection ratio		—	70	—	dB
	SR	Slew rate		—	0.5	—	V/μsec
LED comp.	VLEDH	LED output 'H' voltage	ILED= -10mA	Vcc-12	—	—	V
	VLEDL	LED output 'L' voltage	ILED= +10mA	—	0.2	0.4	V
	VTH	Threshold voltage		—	0.633	—	V
	SVRR	Hysterisis voltage		—	18	—	mV
	SR	Slew rate		—	0.5	—	V/μsec

Note1. Amp A+in,-in terminal for input, PC terminal for output Note2. Amp B+in,-in terminal for input, PC terminal for output

RENESAS

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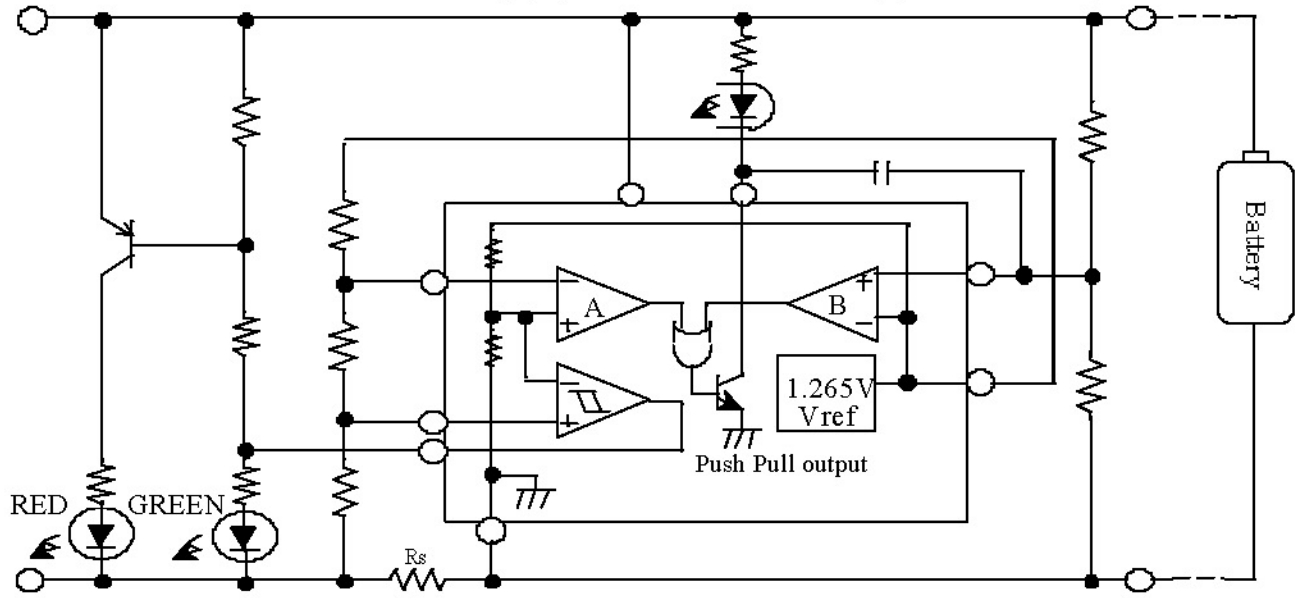
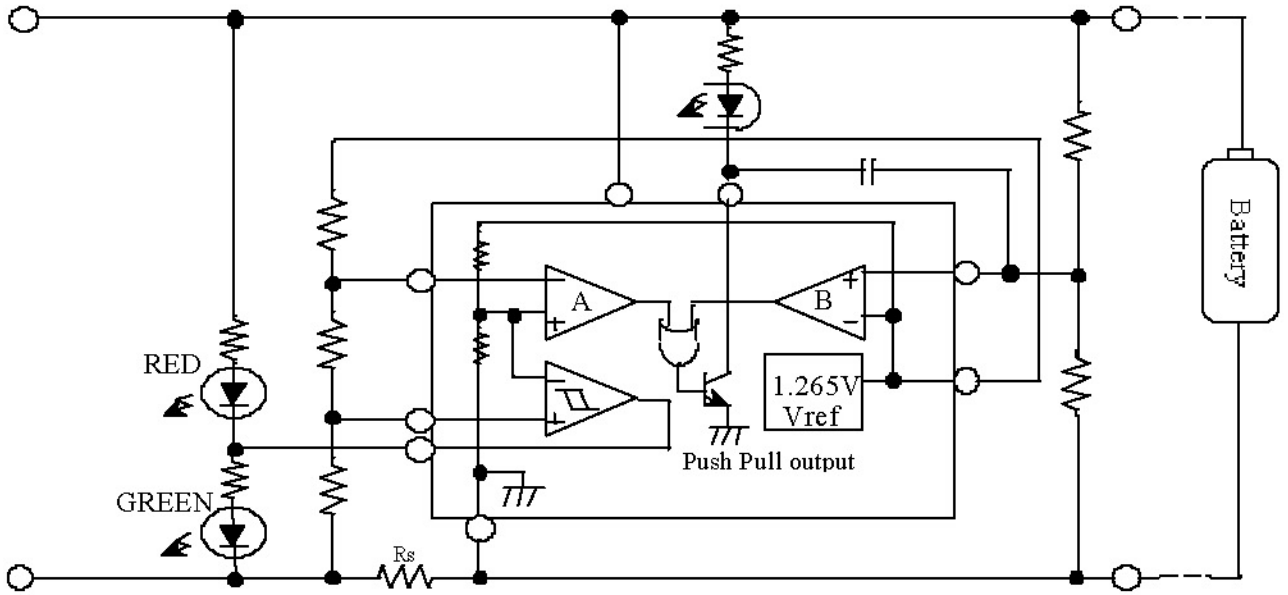
APPLICATION CIRCUIT EXAMPLE [1] (when cathode common type LED is used)



APPLICATION CIRCUIT EXAMPLE [2] (when separate LED's are used)



Constant current control(Quick charge)

Inverting input and non-inverting input voltage of Amp A is controlled to be equal. By this, charge current is controlled by the voltage between current detection resistor Rs.(Non-inverting input voltage of Amp.A is the divided voltage by resistors inside of this device.) In this case, non-inverting input voltage of comparator is lower than that of inverting one. So the output of comparator is 'L' to make 'RED' LED turn on.

Constant voltage control

When the charge voltage reaches the full charge voltage by constant current charge, control is switched from Amp.A to Amp.B. Then charge current starts to decrease gradually. Comparator output switches to 'H' to make 'GREEN' LED turn on when charge current set by the resistors of comparator non-inverting input bcomes the inverting input voltage.
(Comparator inverting input voltage is the divided voltage by resistors insice of the chip equal to non-inverting voltage of Amp.A.)

3. How to set the constants for constant current constant voltage control

1) When constant current control is operative as explained in 1, inverting input terminal of Amp A and non-inverting input terminal are under imaginary shortcircuited condition. Therefore, these two terminals are controlled to be equal in potential.(Vref/2) Therefore, equations below represent the constant current control operation. (I1: each current for R1, R2, and R3 when constant current control is operative.)

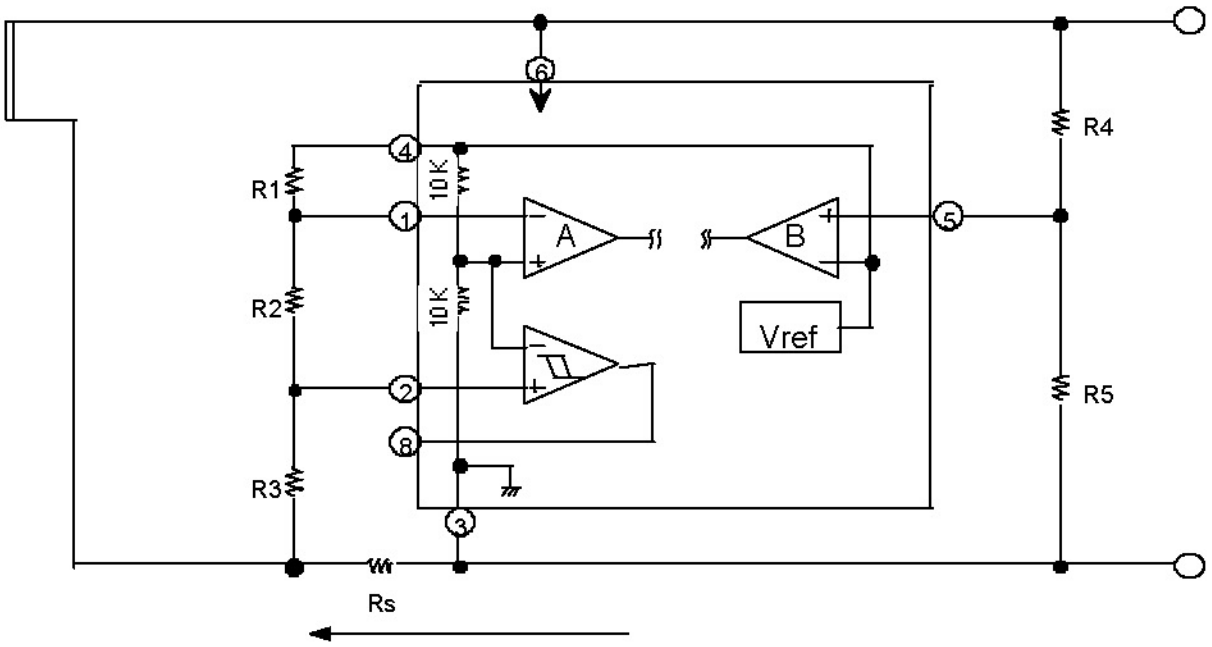
$$V_{ref}+I_{s1}\times R_s=I_1\times(R_1+R_2+R_3) \quad \text{----------(1)}$$
$$V_{ref}/2=I_1\times R_1 \quad \text{----------(2)}$$
$$(V_{ref}/2)+I_{s1}\times R_s=I_1\times(R_2+R_3) \quad \text{----------(3)}$$

2) When constant voltage control is operative as explained in 2, Is1 current gradually decreases to make LED comparator output invert when the current becomes that of Is2. Below equations represent the status above. (I2: each current for R1, R2, and R3 when constant voltage control is operative and the current is Is2.)

$$V_{ref}+I_{s2}\times R_s=I_2\times(R_1+R_2+R_3) \quad \text{----------(4)}$$
$$V_{ref}/2=I_2\times(R_1+R_2) \quad \text{----------(5)}$$
$$(V_{ref}/2)+I_{s2}\times R_s=I_2\times R_3 \quad \text{----------(6)}$$

3) How to set constant voltage control voltage Vbatt

$$V_{batt}=V_{refx}[(R_4+R_5)/R_5] \quad \text{----------(7)}$$



Is1: set current when constant current control is operative

Is2: set current when constant voltage control is operative

4. Examples for setting the constants for constant current constant voltage control(R1-R5)
Constant voltage control voltage=4.2V, constant current control current Is1=600mA, switch current for LED comparator at constant voltage control=100mA, Detection resisitor Rs=1ohm
(Set the suitable current for I1 with ref. voltage load capability taken into account)

Given I1 for R1, R2, and R3 is 100uA,

From (1), R1+R2+R3=18650(ohm) (Vref=1.265V)

From (2), R1=6325(ohm)

From (3), R2+R3=12325(ohm)

From (4), I2=(Vref+IsxRs)/(R1+R2+R3)=73.19(uA)

From (5), R2=(Vref/(2xI2))-R1=2317(ohm)

From (6), R3=10008(ohm)

How to set R4, R5 for constant voltage control

Given R5=2.2kohm,

From (7), Vbatt=1.265x[(R4+2.2k]

9420=1.265x(R4+2.2k)

R4=5.1k(ohm)