IF DETECTION IC FOR PAGER

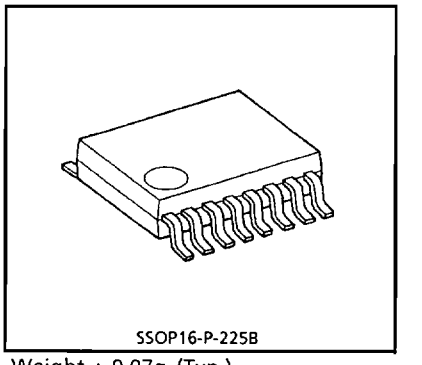
FEATURES

- RSSI function

  To prevent input overload, RSSI output controls RF attenuator
- Built-in low pass filter (LPF) and waveform shaping circuit enable the extraction of FSK signals from voice signal
- High transmit rate : 1200bps (Typ.)
- Built-in battery-saving function
  It is possible to reduce load of the battery which is functioning as power supply
- Alarm function (ALM)

  Alarm sensitivity : $V_{ALM} = 1.1V$ (Typ.)
- Constant voltage power supply can be fabricated through externally adding a transistor

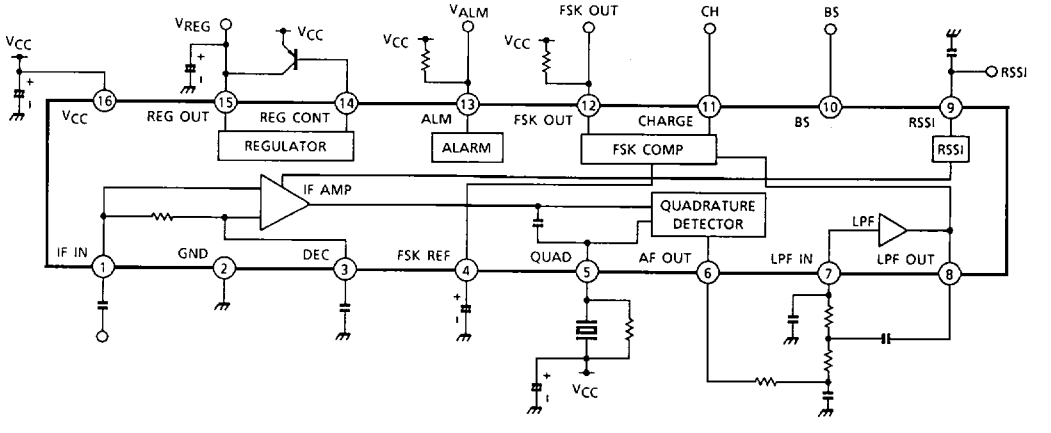
  Output voltage : $V_{REG} = 1.0V$ (Typ.)
- Extremely low current consumption : $I_{CC} = 600\mu A$ (Typ.)
- Power supply voltage : $V_{CC} = 1.1 \sim 3.5V$
- Small package : SSOP16 pin (0.65mm pitch)



SSOP16-P-225B

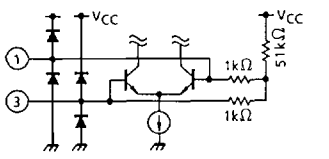
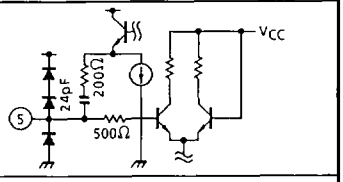
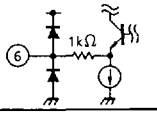
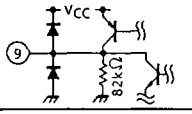
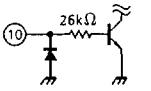
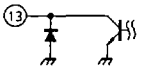
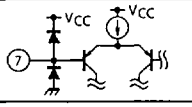
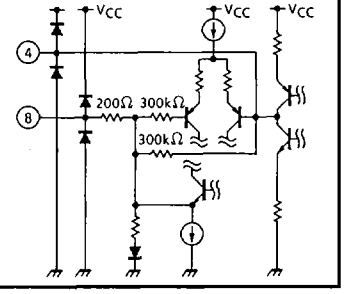
Weight : 0.07g (Typ.)

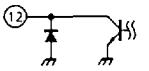
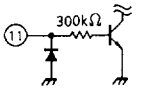
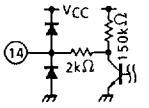
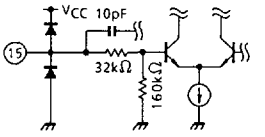
BLOCK DIAGRAM



TA31143FN-1

PIN FUNCTION (The values of resistor and capacitor are typical.)

PIN No.	PIN NAME	FUNCTION	INTERNAL EQUIVALENT CIRCUIT
1	IF IN	Input terminal for IF AMP (pin 1). Terminal for decoupling of bias (pin 3). Input impedance is about 2kΩ.	
3	DEC		
5	QUAD	Phase-shift input terminal of FM demodulator. Connect the discriminator.	
6	AF OUT	Output terminal for FM demodulator.	
9	RSSI	Output terminal for RSSI. DC electric potential which correspond to input signal level of IF AMP output to RSSI terminal.	
10	BS	Control terminal for battery-saving. "H" Battery-saving OFF state "L" Battery-saving state	
13	ALM	Output terminal for ALARM. At $V_{CC} \simeq 1.1V$, this terminal output becomes "H" ($\simeq V_{CC}$) and can indicate deterioration of battery.	
7	LPF IN	Input terminal for LPF. Bias is supplied from pin 6 through external resistor.	
8	LPF OUT	Output terminal for LPF. This output is composed by operation amplifier.	
4	FSK REF	Reference input terminal of differential amplifier which is waveform shaping section. Connect the capacitor externally. By the quick charge-discharge circuit of pushpull output, potentials of pin 4 and pin 8 can be made equal.	

PIN No.	PIN NAME	FUNCTION	INTERNAL EQUIVALENT CIRCUIT
12	FSK OUT	Output terminal for waveform shaping. FSK signal, which is input from LPF OUT (pin 8) and of which waveform is shaped, is output as inverted signal.	
11	CHARGE	Control terminal for quick charge-discharge circuit. "H" Quick charge-discharge ON "L" Quick charge-discharge OFF	
14	REG CONT	Control terminal of external transistor for regulator for external power supply. Connect the PNP transistor externally.	
15	REG OUT	Output voltage monitoring terminal of regulator for external power supply.	
2	GND	Terminal for GND.	—
16	V_{CC}	Terminal for power supply.	—

DESCRIPTION

1. Battery-saving function

Since the battery-saving function is built-in, this IC can minimize the consumption of battery by means of reducing the current consumption by the battery-saving function when the battery is used as the power supply of the set.

Since BS terminal (pin 10) functions as the base input of the NPN transistor, this IC can be driven by the CMOS output of the microcomputer because of its high input impedance and the drivability with low power.

STATE OF BS TERMINAL (PIN 10)	BATTERY-SAVING FUNCTION	EACH CIRCUIT OPERATION STATE IN IC	QUIESCENT CURRENT CONSUMPTION OF IC
L	Battery-saving state	Operation-stop state	0μA (Typ.)
H	Battery-saving OFF state	Normal-operation state	600μA (Typ.)

2. FSK waveform shaping function

For extracting the FSK signal from the FSK demodulation signal, the waveform is shaped by the waveform shaping circuit (comparator) in IC and turned into a more correct logic output resulting in reducing the read error of the microcomputer when the FSK signal level is low or the noise is superimposed upon the FSK signal in the weak electric field.

3. Quick charge-discharge circuit

When operation state turn to the battery-saving OFF state (Normal operation state) from the battery-saving state, if the FSK signal is input, the time that the FSK REF terminal (pin 4) arrives at the reference voltage is delayed by the time constant determined by the capacitor connected to the FSK REF terminal (pin 4) and the internal resistor.
In this case, sometimes the erroneous waveform shaping signal is output because of the error of the input voltage of the waveform shaping circuit (comparator).
In such a case, by means of charging or discharging quickly the capacitor connected to the FSK REF terminal (pin 4) by the quickly charging-discharging circuit, it is quick that voltage of FSK REF terminal becomes the same potential as that of LPF OUT (pin 8), and FSK output of the erroneous waveform shaping signal is prevented.

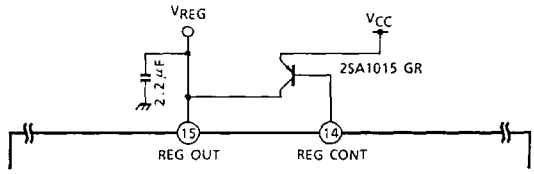
* When CHARGE terminal (pin 11) is at "H", the quick charge-discharge circuit becomes active state.

4. Alarm function

In case the battery is used as the power supply of the set, when the power supply voltage is reduced and the voltage of the V_{CC} terminal (pin 16) becomes approx. 1.1V, the output of the ALM terminal (pin 13) rises up to approx. 1.1V ($\simeq V_{CC}$) and the consumption of the battery power can be detected.

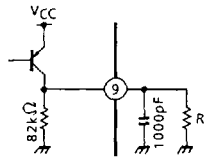
5. Constant voltage regulator for power supply of external part

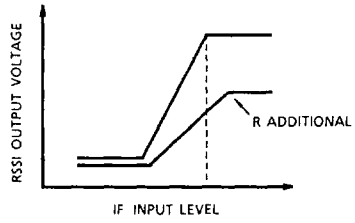
Connecting the transistor to the REG CONT terminal (pin 14) externally as shown in the figure below, the REG OUT terminal (pin 15) can be used for the constant voltage regulator (V_{REG} = 1.0V (Typ.)) of high-output type.
At the battery-saving state, the constant voltage regulator also becomes OFF.



6. RSSI function

DC electric potential which correspond to input level of IF IN terminal (pin 1) output to RSSI terminal (pin 9).
Because RSSI output is changing voltage by internal resistance (82kΩ), it is able to change slope (Refer to figure).
In this case, because of skew temperature coefficient of external resistance and IC internal resistance, it must be careful there is the possibility temperature characteristics for RSSI output changes.
The RSSI terminal (pin 9) doesn't directly short GND (The circumstances for internal circuit of IC).





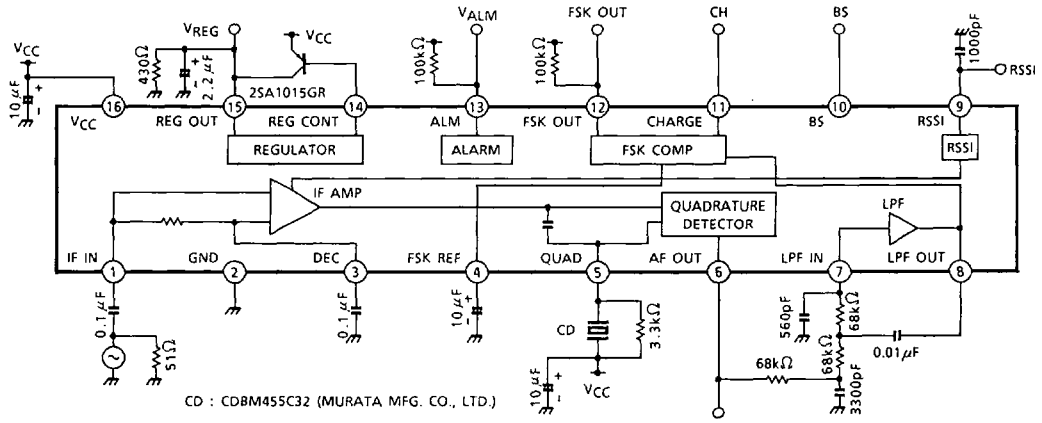
MAXIMUM RATING (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V_{CC}	4	V
Power Dissipation	P_D	560	mW
Operating Temperature	T_{opr}	−30~85	°C
Storage Temperature	T_{stg}	−55~150	°C

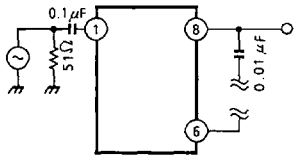
ELECTRICAL CHARACTERISTICS
(Unless otherwise specified, V_{CC} = 1.4V, f_{IN} = 455kHz, Δf = ±4kHz, f_{MOD} = 600Hz, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current Consumption	I_{CCQ}	2	—	—	600	900	μA
Current Consumption	I_{CCO}	3	At battery-saving	—	0	5	μA
IF AMP Input Resistance	$R_{IN\ (IF)}$	—	—	—	2	—	kΩ
SN Ratio 1	SN1	1	$V_{IN\ (IF)}$ = 60dBμV EMF	—	62	—	dB
SN Ratio 2	SN2	1	$V_{IN\ (IF)}$ = 25dBμV EMF	—	35	—	dB
−3dB Limitting Sensitivity	$V_{I\ (LIM)}$	1	—	—	22	27	dBμV EMF
Demodulation Output Level	V_{OD}	1	$V_{IN\ (IF)}$ = 60dBμV EMF	30	46	65	mV_{rms}
AM Rejection Ratio	AMR	1	$V_{IN\ (IF)}$ = 60dBμV EMF, AM = 30%	—	50	—	dB
FSK Output Duty Ratio	DR	1	$V_{IN\ (IF)}$ = 60dBμV EMF	40	50	60	%
Alarm Detected Voltage	V_{ALM}	1	—	1.05	1.1	1.15	V
Constant Voltage Output	V_{REG}	1	R_L = 430Ω	0.95	1	1.05	V
"L" Level Output Voltage (ALM)	$V_{ALM\ L}$	1	I_L = 100μA	—	0	0.4	V
"H" Level Leak Current (ALM)	$I_{ALM\ H}$	1	—	—	0	2	μA
"L" Level Output Voltage (FSK)	$V_{FSK\ L}$	1	I_L = 100μA	—	0	0.4	V
"H" Level Leak Current (FSK)	$I_{FSK\ H}$	1	—	—	0	2	μA
"L" Level Output Voltage (REG CONT)	REG L	1	I_L = 100μA	—	—	0.6	V
RSSI Output Voltage	V_{RSSI}	1	$V_{IN\ (IF)}$ = 80dBμV EMF	0.48	0.62	0.76	V
RSSI Output Resistance	R_{RSSI}	—	—	—	82	—	kΩ
Quick Charging And Discharging Current	I_{CH}	4	V_4 = GND, V_8 = 0.18V	35	65	110	μA

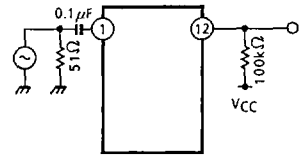
TEST CIRCUIT 1



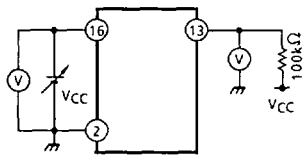
(1) SN1 and 2, $V_{I\,(LIM)}$, V_{OD}, AMR



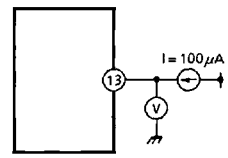
(2) DR



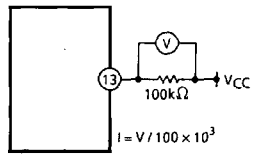
(3) V_{ALM}



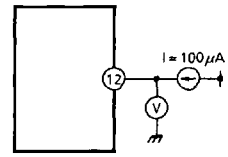
(4) $V_{ALM\ L}$



(5) I_{ALM}



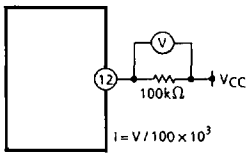
(6) $V_{FSK\ L}$



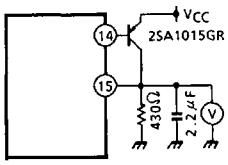
TEST CONDITION···TEST CIRCUIT 1

6

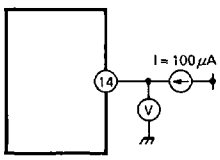
(7) I_{FSK}



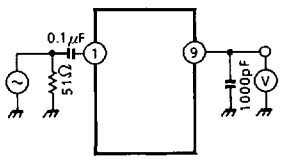
(8) V_{REG}



(9) REG L



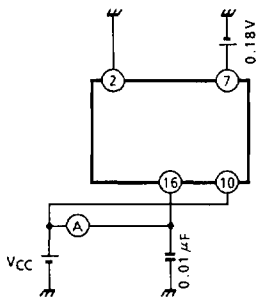
(10) V_{RSSI}



TEST CONDITION···TEST CIRCUIT 1

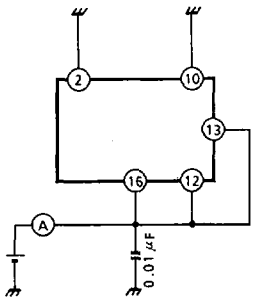
TEST CIRCUIT 2

I_{CCQ}



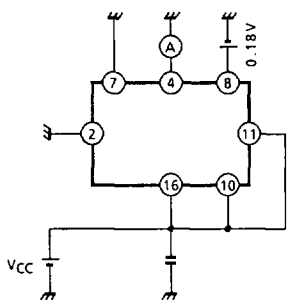
TEST CIRCUIT 3

I_{CCO}

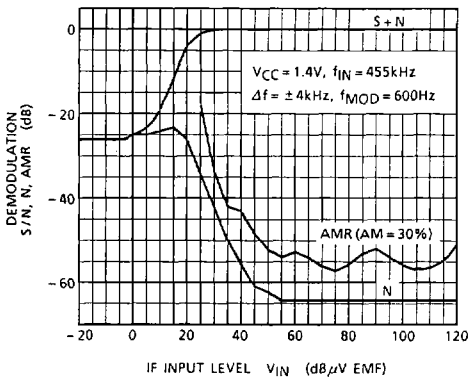


TEST CIRCUIT 4

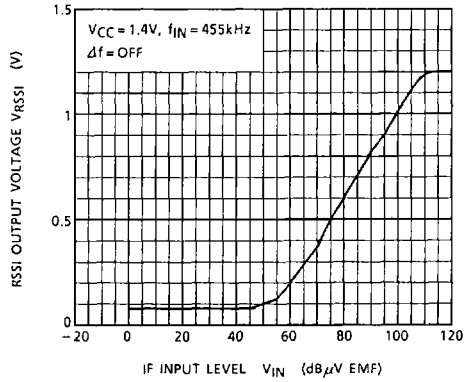
I_{CH}



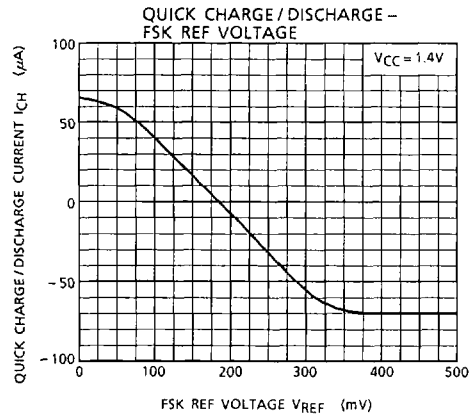
DEMODULATION CHARACTERISTICS



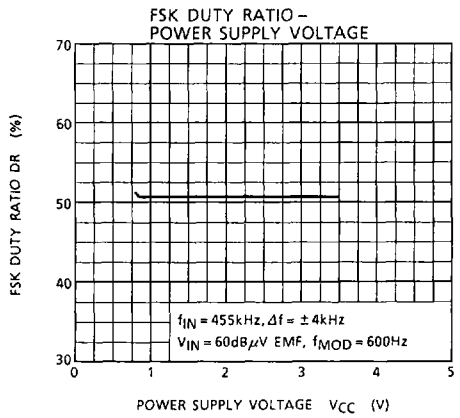
RSSI CHARACTERISTICS



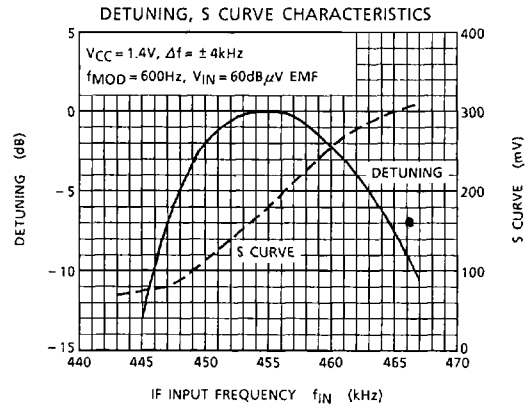
QUICK CHARGE / DISCHARGE – FSK REF VOLTAGE



FSK DUTY RATIO – POWER SUPPLY VOLTAGE



DETUNING, S CURVE CHARACTERISTICS



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