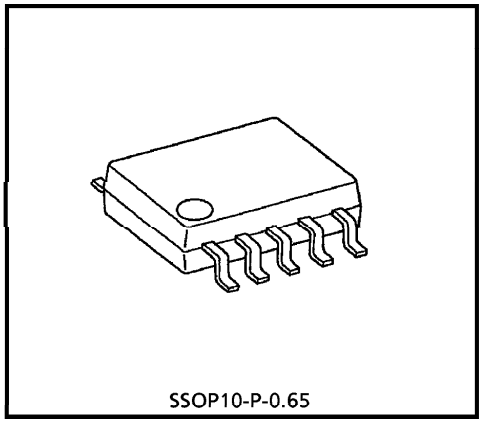
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA2015FN

RIPPLE FILTER (1.5V USE)

The TA2015FN is a ripple filter IC, which is developed for low voltage operation (1.5V).
It is especially suitable for supplying voltage for headphone stereo etc.

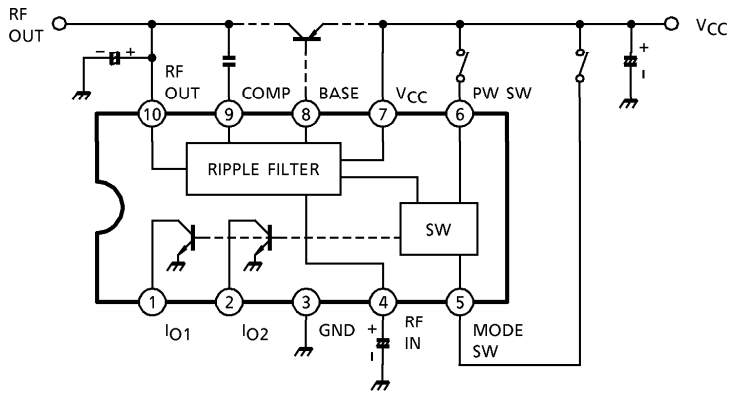


Weight : 0.04g (Typ.)

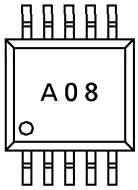
FEATURES

- Built-in a power switch
- Excellent ripple rejection ratio : RR = 43dB (Typ.)
- Ripple filter output voltage can be controlled by external resistor.
- Output voltage is limited to V_{RF} = 1.5V (Typ.)
- Built-in two constant current sources.
- Excellent low voltage operation.
- Low quiescent supply current (V_{CC} = 1.2V, Ta = 25°C)
  I_{CC} = 0.7mA (Typ.)
- Operating supply voltage range. (Ta = 25°C)
  $V_{CC\,(opr)}$ = 0.9~2.2V

BLOCK DIAGRAM



MARKING



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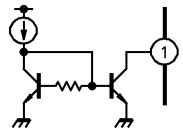
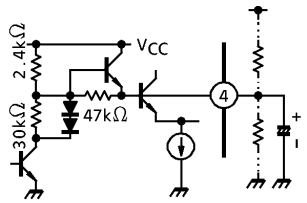
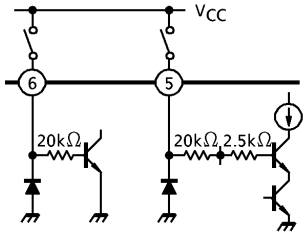
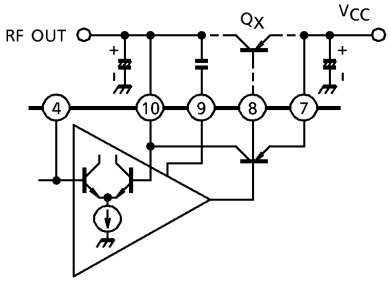
TERMINAL EXPLANATION

Terminal voltage : Typical terminal voltage with test circuit (V_{CC} = 1.2V, Ta = 25°C, non Load)

TERMINAL No.	TERMINAL NAME	FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)
1	I_{O1}	Output of constant current source 1 Operating condition (PW SW : H MODE SW : L		—
2	I_{O2}	Output of constant current source 2 Synchronized to PW SW		—
3	GND	—	—	0
4	RF IN	Ripple filter terminal Ripple filter output voltage can be controlled by external resistor. (See application note)		1.14
5	MODE SW	Mode switch (V_{CC} : I_{O2}, RF OUT on GND / OPEN : I_{O1}, I_{O2} on		—
6	PW SW	Power switch (V_{CC} : Power on GND / OPEN : Power off		—
7	V_{CC}	—	—	1.2
8	BASE	Base biasing terminal for ripple filter transistor. Output current capacity is 1.2mA with only built-in PNP transistor. This capacity can be increased with an external transistor Q_X.		0.5
9	COMP	Phase compensation terminal for a ripple filter circuit		0.5
10	RF OUT	Ripple filter output		1.14

APPLICATION NOTE

1. Operation mode of constant current source

   Operation mode is decided by switch condition shown in table.1. Output of constant current source 1 can be used as a reset circuit by changing start up timing of PW SW, MODE SW.

PW SW \ MODE SW	H	L
H	I_{O2} RF OUT	I_{O1} I_{O2}
L	—	—

Table.1 Operation mode

2. Ripple filter output

   It is necessary to connect an external pull-down resistor with PW SW (pin⑥) and MODE SW (pin⑤) in case that ripple filter circuit doesn't operate normally due to external noise etc.

3. Adjustment of ripple filter output voltage

   Internal circuit of pin④ is shown in Fig.1. Ripple filter output voltage is decided by internal resistor R_1, R_2 and Q_3, and limited by $D_{1\sim2}$ and Q_3 to $V_{RF} = 1.5V$ (Typ.)
   Ripple filter output voltage can be controlled by method below.

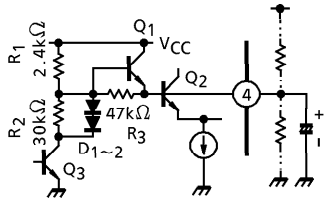


Fig.1 Internal circuit of pin④

   (1) Method to rise the ripple filter output voltage

   External resistor should be connected between V_{CC} and RF IN terminal (pin④). In this case, output current capacity of ripple filter circuit is down. Because at ripple filter output stage, collector-emitter voltage of PNP transistor will small, and drive capacity of transistor is down.

   (2) Method to drop the ripple filter output voltage

   External resistor should be connected between GND and RF IN terminal (pin④).
   Current flows through external resistor and internal resistor R_1, R_3 (2.4kΩ, 47kΩ).
   In case that output voltage dropped too much, ripple rejection ratio and other characteristics will be worse, because constant current source of differential amplifier is saturated especially at low voltage.

MAXIMUM RATINGS (Ta = 25°C)

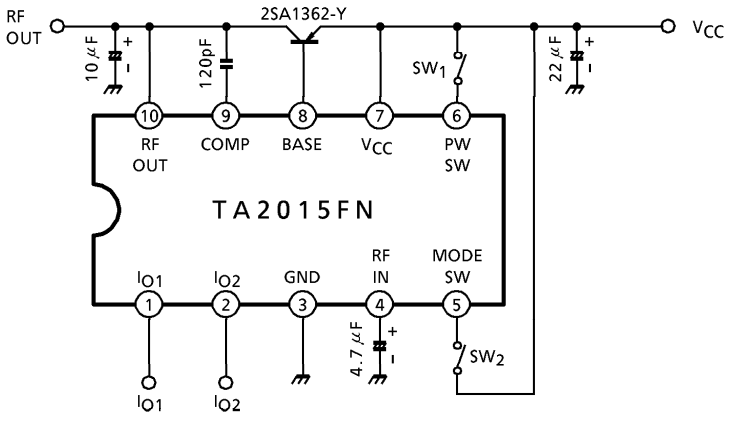
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	4.5	V
Constant Current Source Output Voltage	V_S	4.5	
Constant Current Source Output Current	I_S	10	mA
Ripple Filter Output Current (Built-in transistor)	I_{RF}	20	
Power Dissipation	P_D (Note)	300	mW
Operating Temperature	T_{opr}	−25~75	°C
Storage Temperature	T_{stg}	−55~150	

(Note) Derated above Ta = 25°C in the proportion of 2.4mW / °C.

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{CC} = 1.2V, Ta = 25°C, SW_1 : ON, SW_2 : ON)

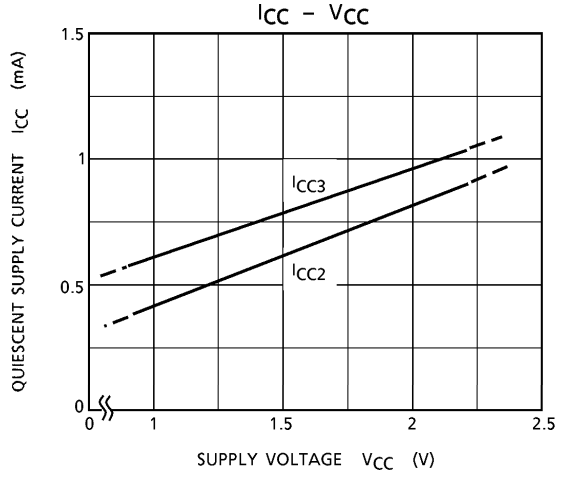
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Quiescent Supply Current	I_{CC1}	—	PW OFF, SW_1 : OPEN SW_2 : OPEN		—	0.1	5	μA
	I_{CC2}	—	SW_2 : OPEN, $I_{O1} = I_{O2} = 0$		—	0.5	0.8	mA
	I_{CC3}	—	$I_{RF} = I_{O2} = 0$		—	0.7	1.0	
Ripple Filter Output Voltage	V_{RF}	—	V_{CC} = 1V, $I_{RF} = 0$		0.91	0.94	—	V
Ripple Rejection Ratio	RR	—	V_r = −32dBV f_r = 100Hz, I_{RF} = 30mA		36	43	—	dB
Constant Current Source Output Current	I_{O1}	—	SW_2 : OPEN		50	—	—	μA
	I_{O2}	—	—		50	—	—	
Power Switch On Current	I_6	—	V_{CC} = 0.9V	$V_{10} \geqq 0.6V$	5	—	—	μA
Power Switch Off Voltage	V_6	—		$V_{10} \leqq 0.3V$	0	—	0.3	V
Mode Switch On Current	I_5	—		$V_{10} \geqq 0.6V$	5	—	—	μA
Mode Switch Off Voltage	V_5	—		$V_{10} \leqq 0.3V$	0	—	0.3	V

TEST CIRCUIT

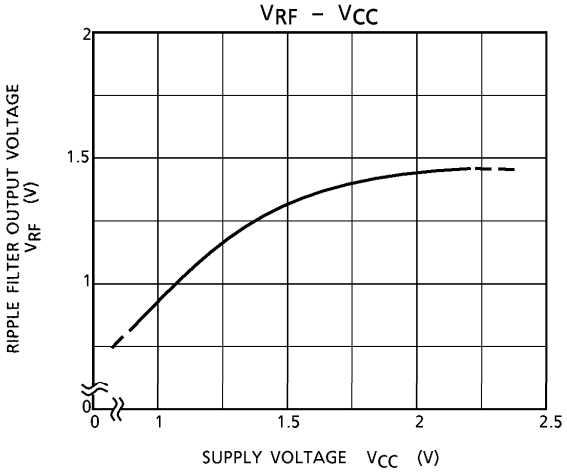


CHARACTERISTIC CURVES (Unless otherwise specified, V_{CC} = 1.2V, I_{RF} = 0, I_{O1} = I_{O2} = 0, Ta = 25°C)

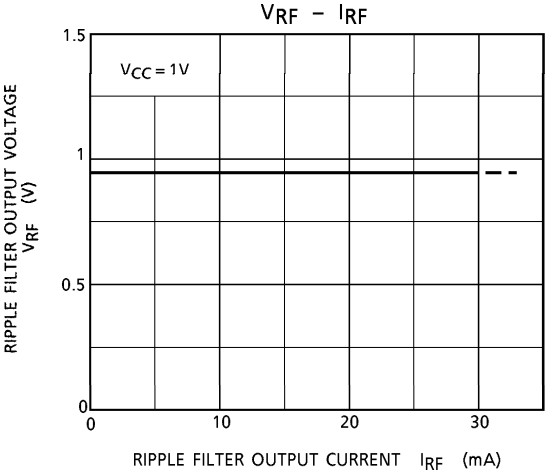
I_{CC} – V_{CC}



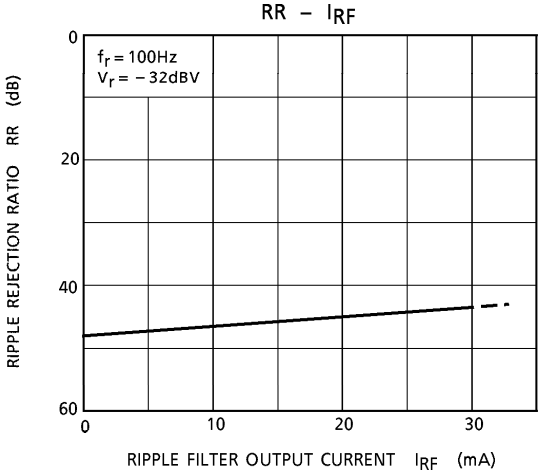
V_{RF} – V_{CC}



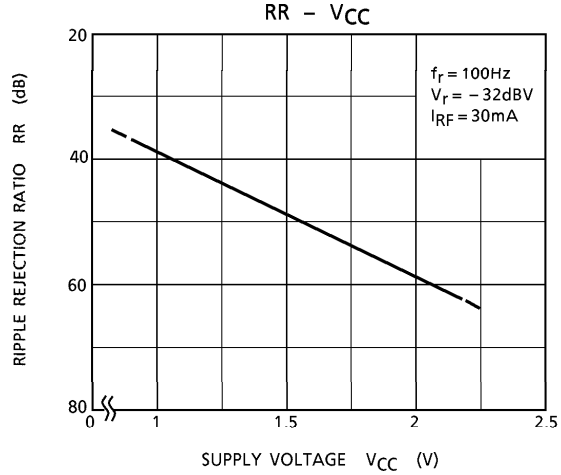
V_{RF} – I_{RF}



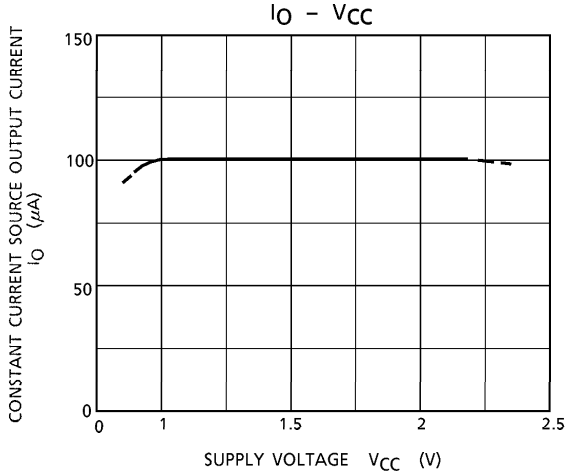
RR – I_{RF}



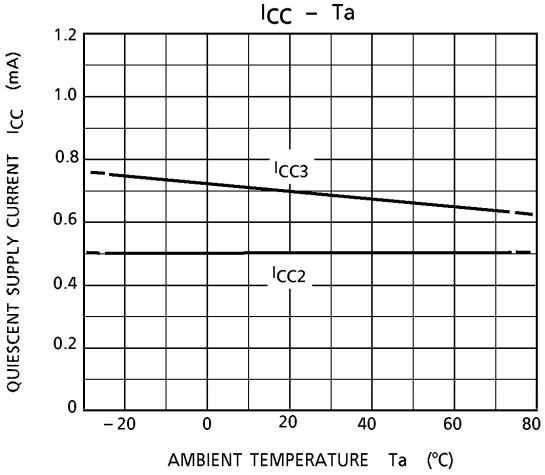
RR – V_{CC}



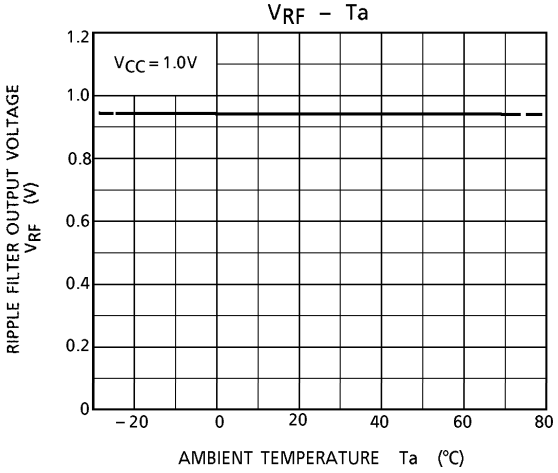
I_O – V_{CC}



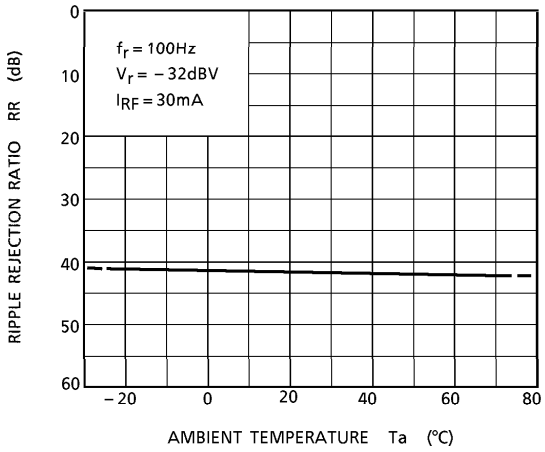
I_{CC} – Ta



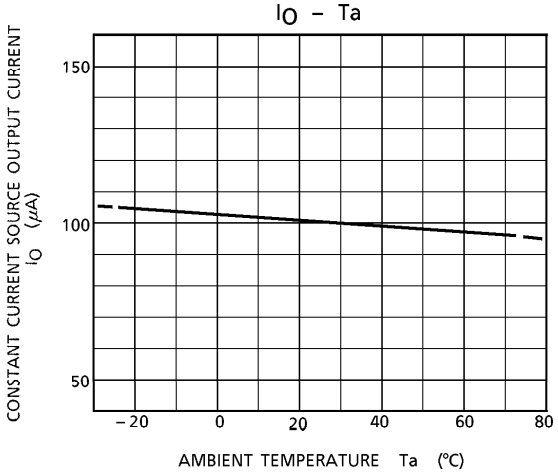
V_{RF} – Ta



RR – Ta



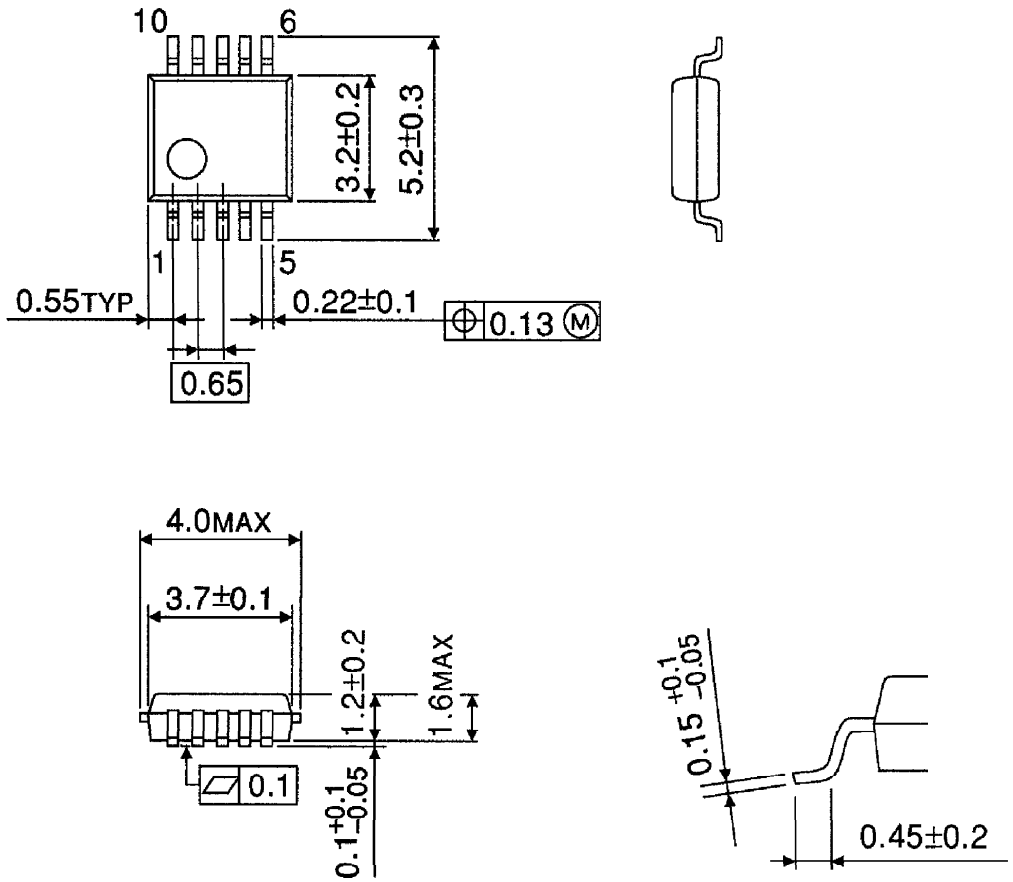
I_O – Ta



OUTLINE DRAWING

SSOP10-P-0.65

Unit : mm



Weight : 0.04g (Typ.)