

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA2015FN

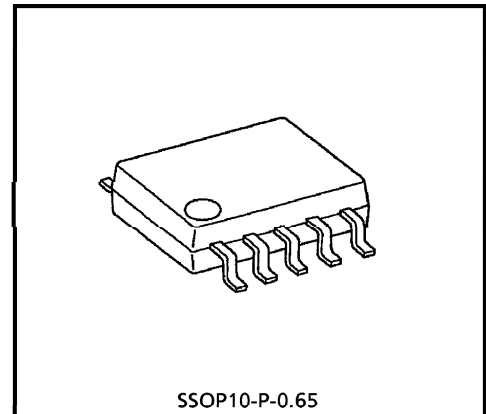
RIPPLE FILTER (1.5V USE)

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.

FEATURES

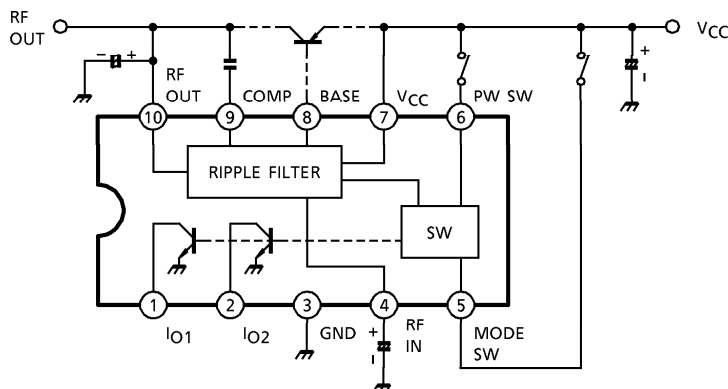
- Built-in a power switch
- Excellent ripple rejection ratio : RR = 43dB (Typ.)
- Ripple filter output voltage can be controlled by external resistor.
- Output voltage is limited to $V_{RF} = 1.5V$ (Typ.)
- Built-in two constant current sources.
- Excellent low voltage operation.
- Low quiescent supply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



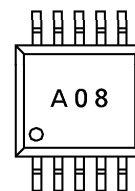
SSOP10-P-0.65

Weight : 0.04g (Typ.)

BLOCK DIAGRAM



MARKING

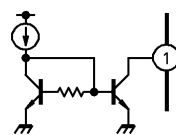
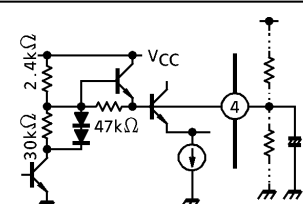
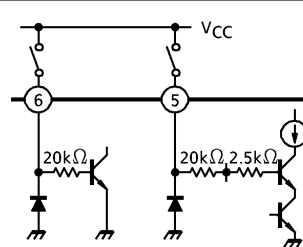
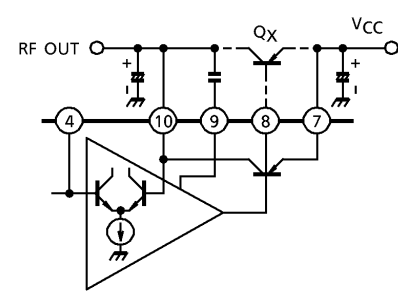


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TERMINAL EXPLANATION

Terminal voltage : Typical terminal voltage with test circuit ($V_{CC} = 1.2V$, $T_a = 25^\circ C$, non Load)

| TERMINAL | | FUNCTION | INTERNAL CIRCUIT | TERMINAL VOLTAGE (V) |
|----------|-----------------|---|--|----------------------|
| No. | NAME | | | |
| 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 |

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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.

| | | | |
|-------|---------|---------------------------|------------------------------------|
| | MODE SW | H | L |
| PW SW | | | |
| 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 R₁, R₂ and Q₃, and limited by D_{1~2} and Q₃ to V_{RF} = 1.5V (Typ.)

Ripple filter output voltage can be controlled by method below.

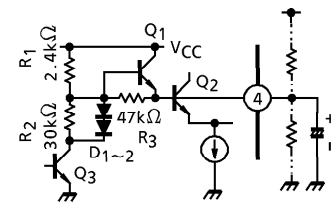


Fig.1 Internal circuit of pin④

(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 R₁, R₃ (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)

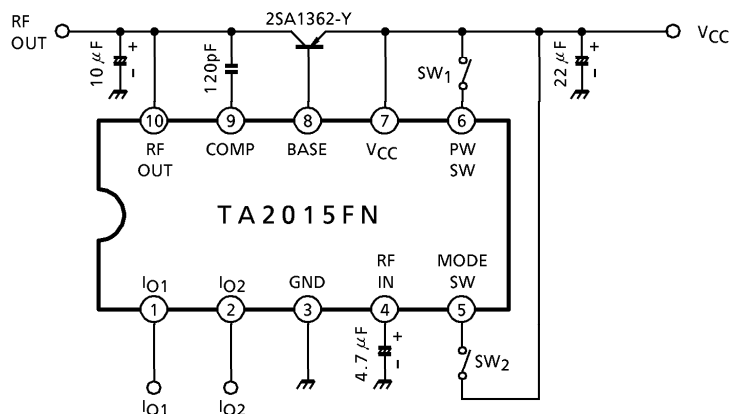
| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|---|-----------------------|---------|------|
| Supply Voltage | V _{CC} | 4.5 | V |
| Constant Current Source Output Voltage | V _S | 4.5 | |
| Constant Current Source Output Current | I _S | 10 | mA |
| Ripple Filter Output Current (Built-in transistor) | 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.

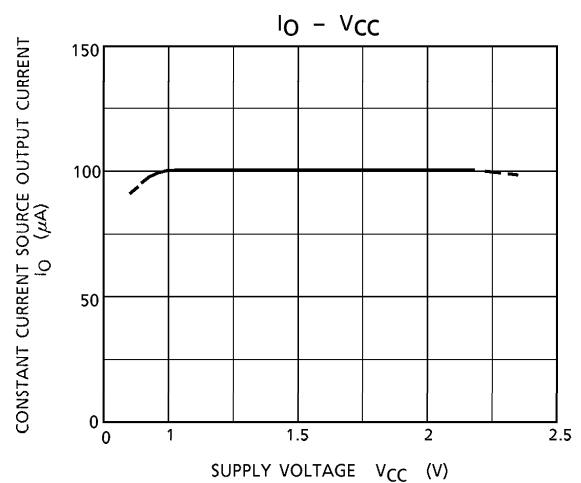
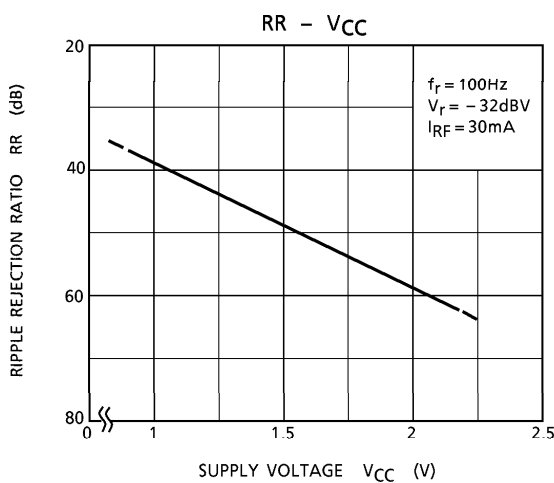
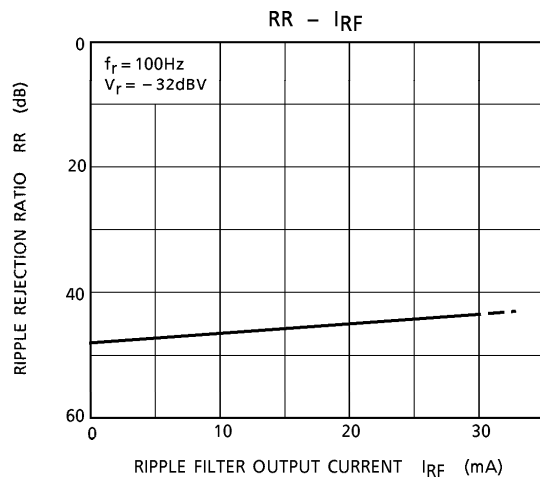
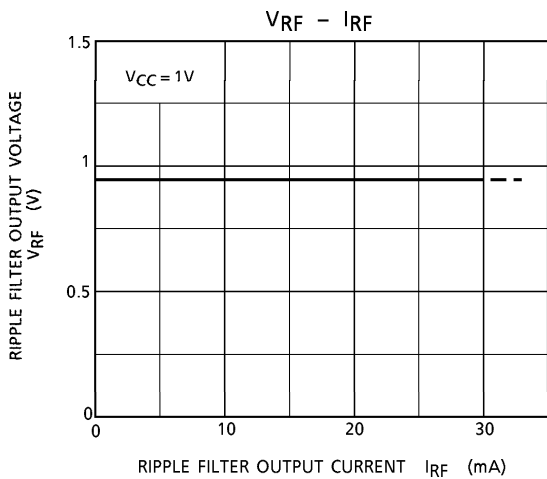
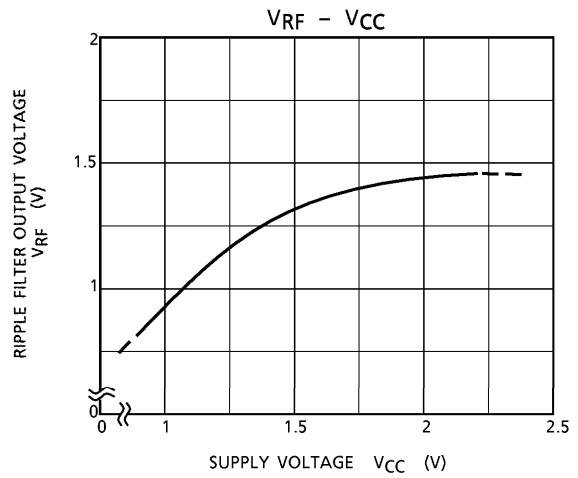
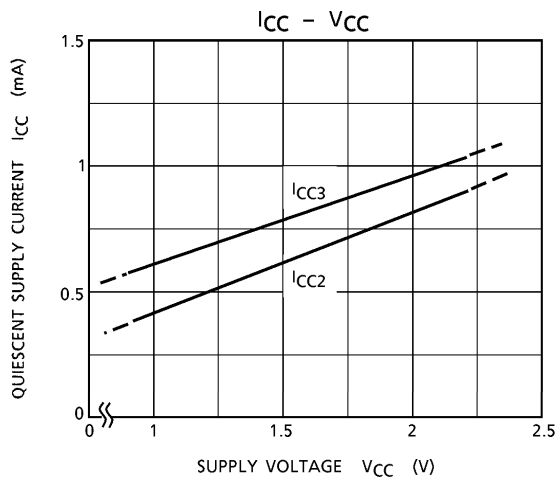
ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{CC} = 1.2V, Ta = 25°C, SW₁ : ON, SW₂ : ON)

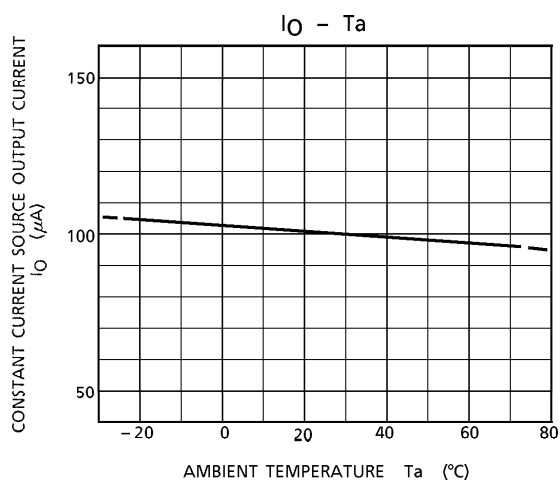
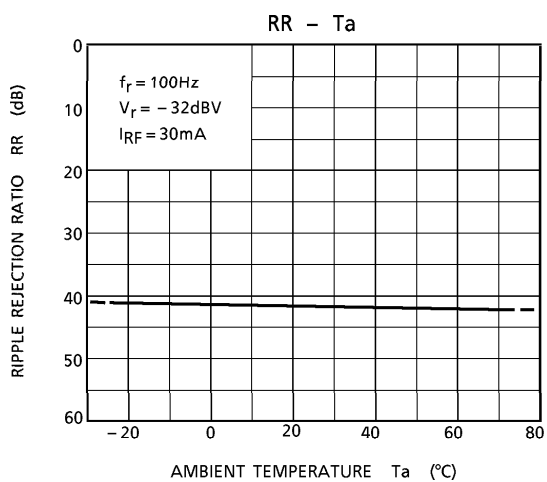
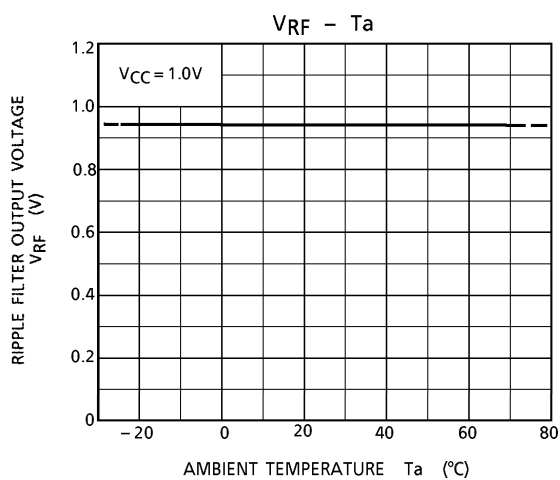
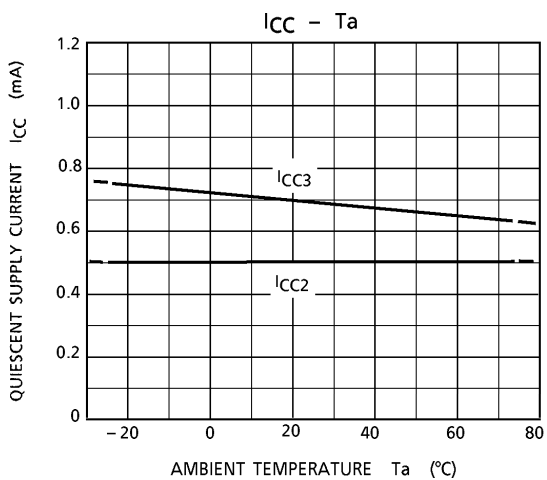
| CHARACTERISTIC | SYMBOL | TEST CIRCUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|--|------------------|--------------|---|------------------------|------|------|------|----|
| Quiescent Supply Current | I _{CC1} | — | PW OFF, SW ₁ : OPEN SW ₂ : OPEN | — | 0.1 | 5 | μA | |
| | I _{CC2} | — | 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 ≧ 0.6V | 5 | — | μA | |
| Power Switch Off Voltage | V ₆ | — | | V ₁₀ ≧ 0.3V | 0 | — | 0.3 | V |
| Mode Switch On Current | I ₅ | — | | V ₁₀ ≧ 0.6V | 5 | — | — | μA |
| Mode Switch Off Voltage | V ₅ | — | | V ₁₀ ≧ 0.3V | 0 | — | 0.3 | V |

TEST CIRCUIT



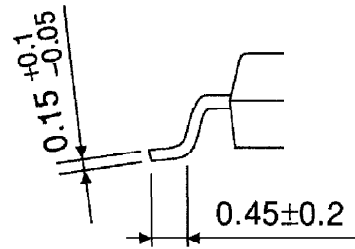
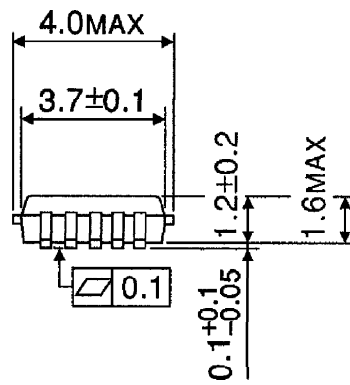
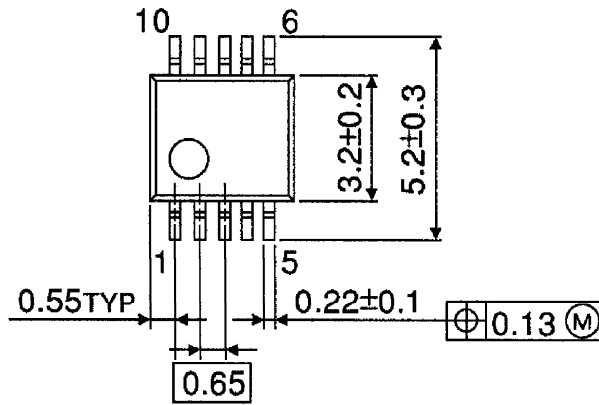
CHARACTERISTIC CURVES (Unless otherwise specified, $V_{CC} = 1.2V$, $I_{RF} = 0$, $I_{O1} = I_{O2} = 0$, $T_a = 25^\circ C$)





OUTLINE DRAWING
SSOP10-P-0.65

Unit : mm



Weight : 0.04g (Typ.)