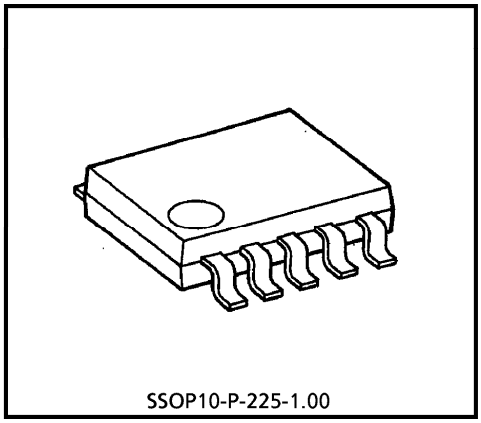
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8198F

DC / DC CONVERTER FOR ELECTRIC TUNING (3V USE)

The TA8198F is a DC / DC converter IC which is developed for biasing varactor diodes of tuner system.
It is especially suitable for supplying high voltage (about 15.5V) for digital tuning (FM / TV / AM) system of headphone stereos, radio cassette recorders, or other equipments.



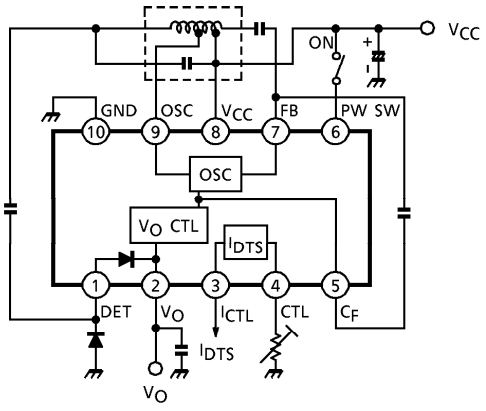
SSOP10-P-225-1.00

Weight : 0.09g (Typ.)

FEATURES

- Few external parts.
- Excellent spurious radiation by oscillation of sine wave.
- Built-in constant current source, it is suitable for digital tuning system. (I_{CTL} can be controlled by R_{CTL})
- Output voltage V_O = 15.5V (Typ.)
- Excellent regulatory capability of output voltage against fluctuation of supply voltage, and of ambient temperature.
- Built-in power switch
- Low supply current (at non-load, V_{CC} = 3V, Ta = 25°C) I_{CCQ} = 2.4mA (Typ.)
- Operating supply voltage range (Ta = 25°C) $V_{CC\ (opr)}$ = 1.8~10V

BLOCK DIAGRAM

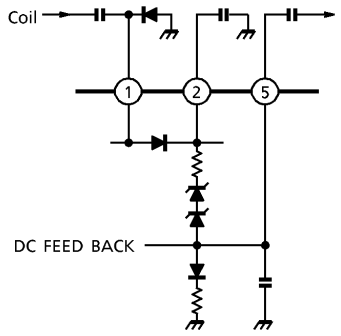
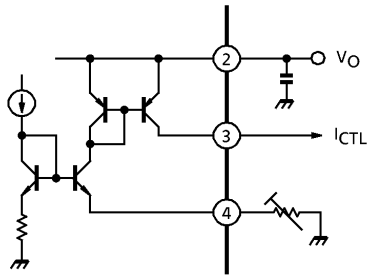
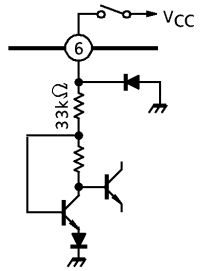
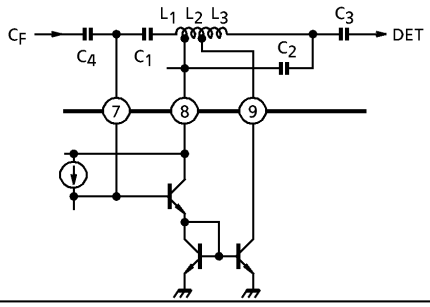


※ Handle with care to prevent devices from deterioration by static electricity.

961001EBA2

TERMINAL EXPLANATION

Terminal voltage : Typical terminal voltage with test circuit (V_{CC} = 3V, Ta = 25°C)

TERMINAL No.	TERMINAL NAME	FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)
1	DET	Boosted output (Voltage double rectifier)		—
2	V_O			15.5
5	C_F			1.4
3	I_{CTL}	Constant current source output (for digital tuning) V_O supplies this circuit with power source. In case that this circuit isn't used, the I_{CTL} terminal is connected with GND line.		—
4	CTL			—
6	PW SW	Power on / off switch (V_{CC} : Power on GND / OPEN : Power off		—
7	FB	Hartley type oscillator $f_{OSC} \fallingdotseq \frac{1}{2\pi\sqrt{L_3 \cdot C_2}}$ Controlling oscillation current at the terminal of FB.		1.4
8	V_{CC}			3.0
9	OSC			—
10	GND	—	—	0

APPLICATION NOTE

1. PW SW

   It is necessary to connect an external pull-down resistor with the terminal PW SW (pin 6), in case that this IC is turned on due to external noise etc.

2. Designing of coil

   This IC has the output voltage by means of boosting the oscillation voltage, derived from Hartley type oscillator circuit and of voltage-double rectifier with C_3, D_1 and D_2.

   (1) Designing of oscillation frequency

   $$f_{OSC} \fallingdotseq \frac{1}{2\pi\sqrt{L_3 \cdot C_2}}$$

   (2) Coil turns can be designed as following

   $$V_{OSC\,(p\text{-}p)} = 2\,(V_{CC\,(min)} - V_{CE1\,(sat)})$$

   $$n = \frac{n3}{n2} \fallingdotseq \frac{V_O}{V_{OSC\,(p\text{-}p)}}$$

   Note : $V_{CC\,(min)}$: Minimum of supply voltage designed by a equipment
   $V_{CE1\,(sat)}$: Saturation voltage of Q_1
   n : Coil turns ratio (L_2, L_3)
   V_O : Output voltage V_O = 15.5V (Typ.)

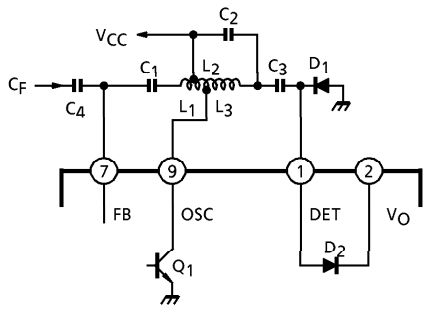
   

   Fig.1 Oscillator and Voltage-Double

   The turn of L_1 is designed, so as to make the terminal of FB be about 200~300m$V_{p\text{-}p}$ through C_1. The turn of L_1 should be small, and the capacitance of C_1 and Q_0 of coil should be large, for the oscillation start at turning power on.

   (3) Allowance is advisable for coil design of n, Q_0. However, spurious radiation can be reduced, in case that the output current and n of coil don't make large.

3. Pattern Diagram

   The Fig.2 shows the oscillation loop. This pattern diagram should be small, because spurious radiation due to the oscillation is reduced.
   The Fig.3 shows the rectifier loop. This pattern diagram should be of the small, because spurious radiation due to the switching rectifier is reduced. The two loops should be isolated from other DC lines.

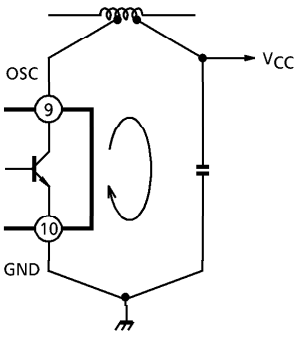
   

   Fig.2 Oscillation Loop

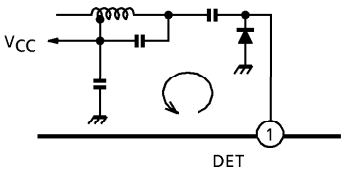
   

   Fig.3 Rectifier Loop

4. I_{CTL}

I_{CTL} can be controlled by R_{CTL} resistor between pin 4 and GND (see Fig.4).

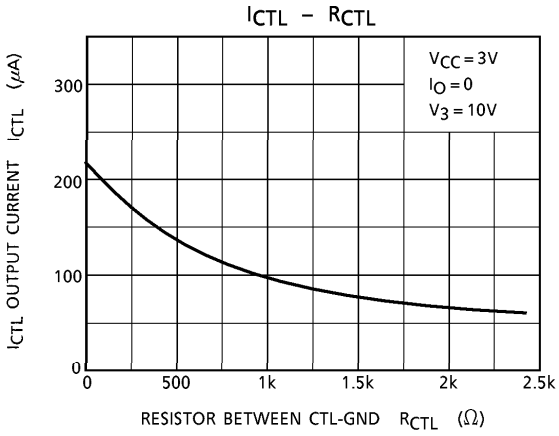


Fig.4 I_{CTL}-R_{CTL}

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	12	V
Output Voltage	V_O	18	
Constant Current Source Circuit Output Current	I_{CTL}	2	mA
Power Dissipation	P_D (Note)	400	mW
Operating Temperature	T_{opr}	−25~75	°C
Storage Temperature	T_{stg}	−55~150	

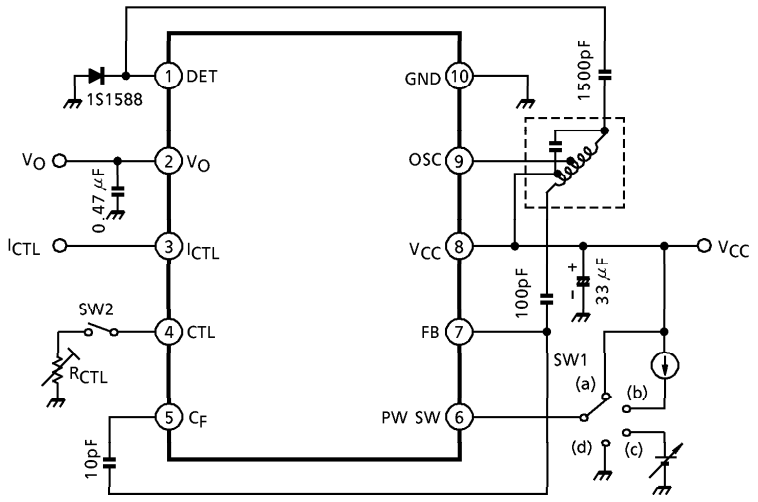
(Note) Derated above Ta = 25°C in the proportion of 3.2mW.

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified : V_{CC} = 3V, f_{OSC} = 3MHz, I_O = 100μA, Ta = 25°C, SW1 : a, SW2 : OPEN)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Quiescent Supply Current	I_{CCQ1}	—	I_O = 0	PW OFF, SW1 : d	—	—	5	μA
	I_{CCQ2}	—			—	2.4	4.0	mA
Boosted Output Voltage	V_O	—			14.5	15.5	16.5	V
V_O Supply Voltage Fluctuation	ΔV_O	—	V_{CC} = 1.8~10V		− 20	0	+ 20	mV
V_O Maximum Output Current	I_O (MAX)	—	ΔV_O = 30mV (With respect to standard I_O = 100μA)		300	—	—	μA
V_O Ambient Temperature Coefficient	V_O / T	—			—	± 0.3	—	mV / °C
Constant Current Source Output Current	I_{CTL}	—	I_O = 0, V_3 = 10V SW2 : ON (R_{CTL} = 820Ω)		85	110	140	μA
I_{CTL} Maximum Current	I_{CTL} (MAX)	—	I_O = 0, V_3 = 10V SW2 : ON (R_{CTL} = 0) ΔV_O = 30mV (With respect to standard I_{CTL} = 100μA)		—	200	—	
Power Switch On Current	I_{ON}	—	V_{CC} = 1.8V	SW1 : b $V_O \geqq$ 13V	5	—	—	μA
Power Switch Off Voltage	V_{OFF}	—		SW1 : c $V_O \leqq$ 3.5V	0	—	0.7	V

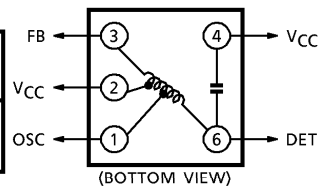
TEST CIRCUIT



COIL DATA (TEST CIRCUIT)

TEST FREQUENCY	L (μH)	Q_0	C_0 (pF)	TURN			WIRE (mmϕ)	REFERENCE
	2-6		4-6	1-2	2-3	1-6		
3MHz	103	40	22	7	2	$57\frac{1}{2}$	0.1UEW	Ⓢ4143-3099-356

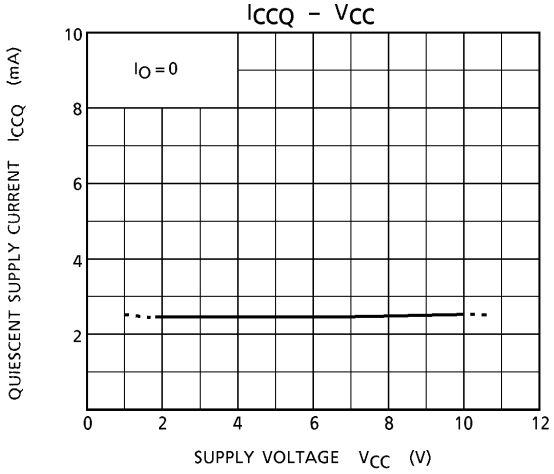
Ⓢ : SUMIDA ELECTRIC & Co.,Ltd.



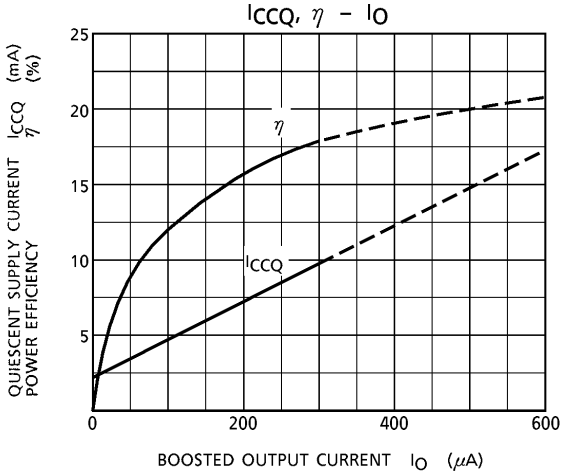
CHARACTERISTIC CURVES

(Unles otherwise specified : V_{CC} = 3V, f_{OSC} = 3MHz, I_O = 100μA, I_{CTL} = 0, Ta = 25°C)

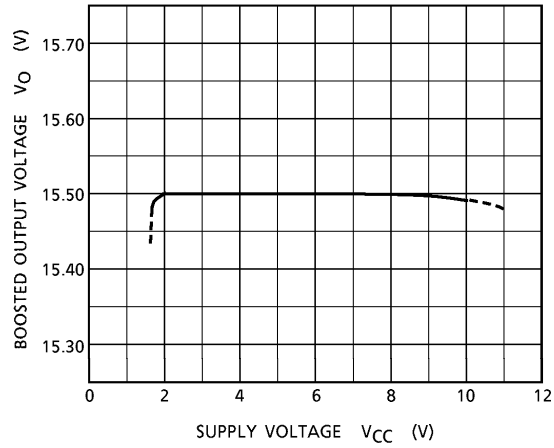
I_{CCQ} – V_{CC}



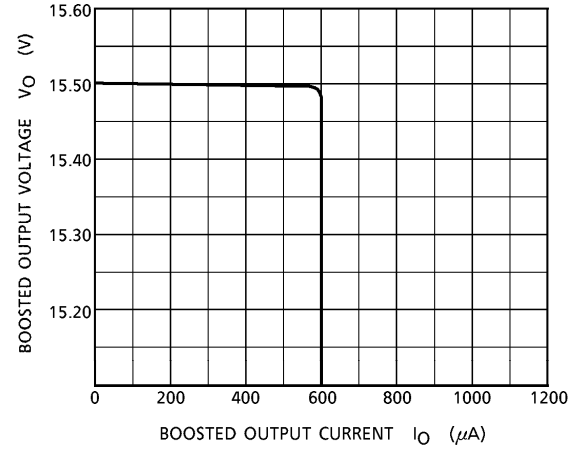
I_{CCQ}, η – I_O



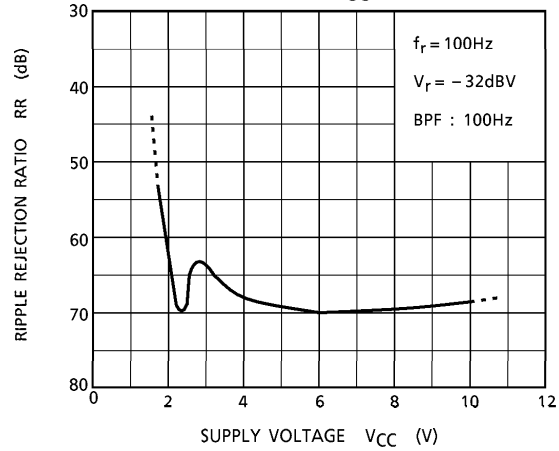
V_O – V_{CC}



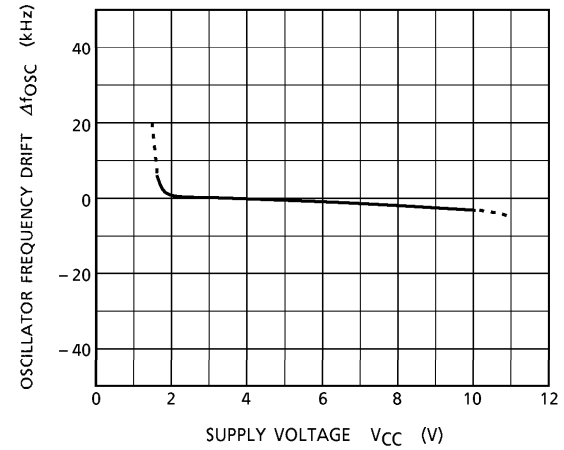
V_O – I_O



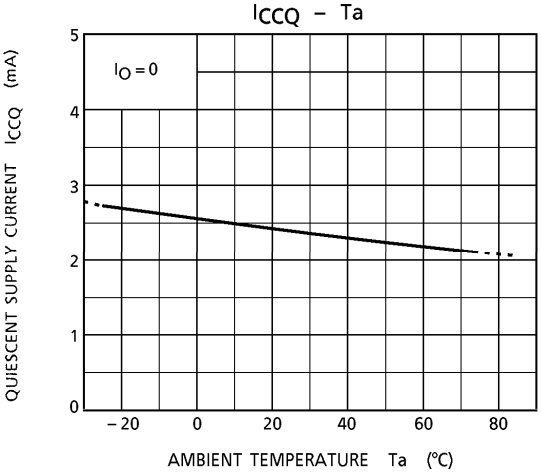
RR – V_{CC}



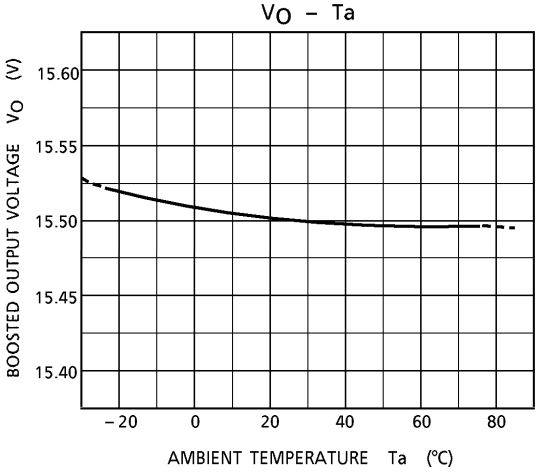
Δf_{OSC} – V_{CC}



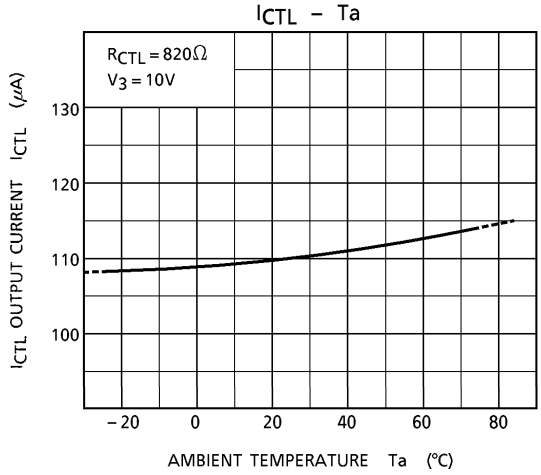
I_{CCQ} – Ta



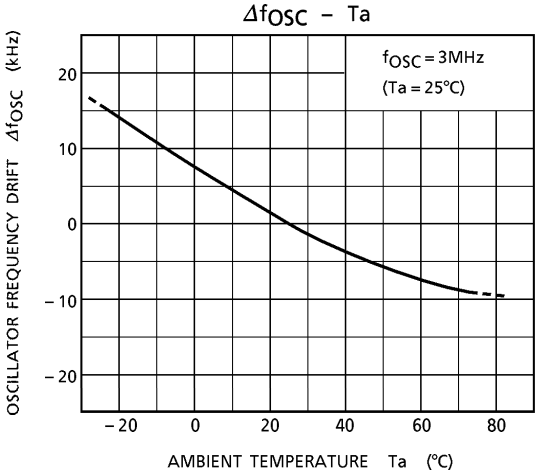
V_O – Ta



I_{CTL} – Ta

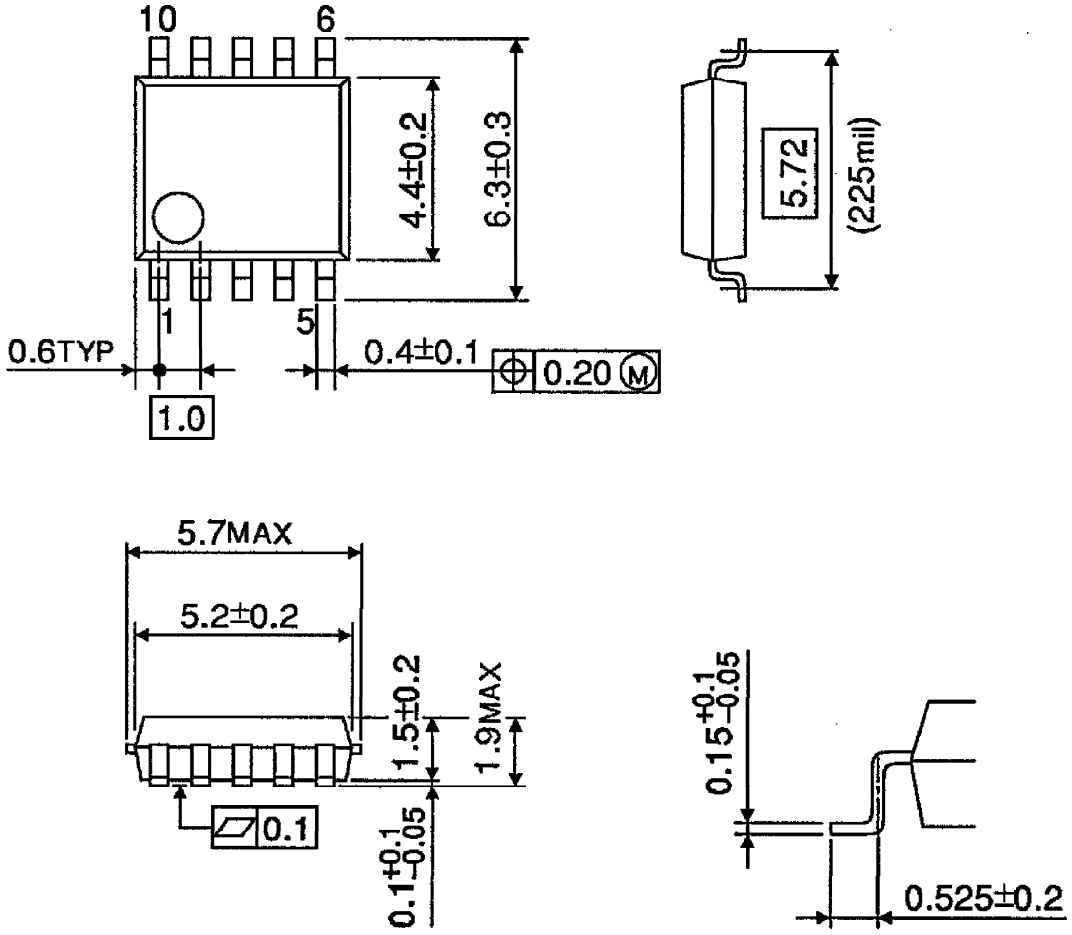


Δf_{OSC} – Ta



OUTLINE DRAWING

SSOP10-P-225-1.00 Unit : mm



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