# <u>TOSHIBA</u>

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

# TA76433FC

High-Precision Shunt Regulators with Adjustable Output Voltage

Due to the increasing requirement for low power dissipation levels, 3-V power supply systems in electronic equipment are now in greater demand than conventional 5-V power supply systems. Toshiba has developed the TA76433FC, a high-precision shunt regulator with adjustable output voltage is aimed for use in even lower voltage applications.

It differs from the conventional shunt regulator (TA76431/432 series) of our company, the power supply input terminal which became separate of the cathode terminal is set up.

Since the cathode terminal of the detection side and the input terminal of the power supply side is separate, a cathode terminal can operate from 0.2 V.

It is suitable for the secondary side difference amplifier of the switching regulator of 1.8 V to 2 V class.

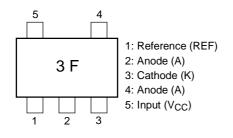
#### Features

- Separate power supply input pin ( $V_{CC}$ ) and cathode pin (K)
- Precision reference voltage:  $V_{REF} = 1.26 \text{ V} \pm 1.4\%$  (Ta = 25°C)
- Maximum cathode voltage: 15 V
- Maximum cathode current: 20 mA
- Cathode voltage: 0.2 to 14 V
- Cathode current: 0.4 to 20 mA
- Operating temperature: Ta = -40 to 85°C
- Packages: SMV can be mounted on a  $3.1 \times 3.0$  mm space.

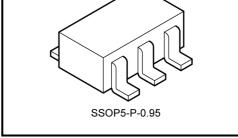
#### How to Order

Product No.	Package Type	Package Type and Capacity		
TA76433FC	SMV	On cut tape (TE85L): 100/tape section		
TA76433FC (TE85L)	(surface-mount type)	Embossed tape (TE85L): 3000/tape section		

#### Pin Assignment/Marking

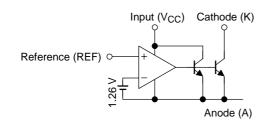


Pin No.	Symbol	Description	
1	REF	Reference voltage terminal of 1.26 V	
2	А	Ground terminal	
3	К	Constant output voltage terminal	
4	А	Ground terminal	
5	V <sub>CC</sub>	Power supply input terminal	

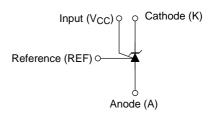


Weight: 0.014 g (typ.)

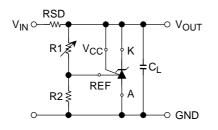
# **Functional Block Diagram**

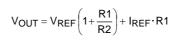


## Circuit Symbol



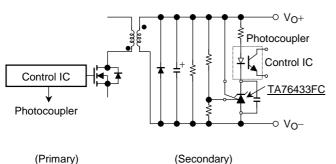
# **Typical Application Circuits**





#### **Application Circuit Example**

#### Error amplification circuit for switching power supply



The circuit amplifies the difference (a changed value) of the reference voltage of a shunt regulator and the output voltage of a switching regulator, and is fed back to a primary side through a photocoupler.

(Fiinary)

## **Precautions during Use**

(1) TA76433FC

These products contain MOS elements. Please take care to avoid generating static electricity when handling these devices.

(2) TA76433FC

The oscillation frequency of these devices is determined by the value of the capacitor connected between the anode and the cathode.

When establishing maximum operating condition parameters, please derate the maximum rating values specified in these datasheets so as to allow an operational safety margin.

(3) Precautions when handling anode pin of TA76433FCPin 2 and pin 4 should normally be shorted together. Do not leave pin 4 open and use pin 2 only.

## Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit	
Power supply voltage	V <sub>CC</sub>	15	V	
Cathode voltage	V <sub>KA</sub>	V <sub>CC</sub>	V	
Reference voltage	V <sub>REF</sub>	7	V	
Cathode current	١ <sub>K</sub>	20		
Cathode-anode reverse current	-I <sub>K</sub>	10	mA	
Reference current	I <sub>REF</sub>	50	μA	
Reference-anode reverse current	-I <sub>REF</sub>	10	mA	
Power supply current	ICC	3	mA	
Power dissipation	Pa	0.2	W	
	PD	0.38 (Note)	vv	
Thermal resistance	P.	625	⁰C/W	
memariesistance	R <sub>th</sub>	328 (Note)	-0/00	
Operating temperature	T <sub>opr</sub>	-40~85	٥C	
Junction temperature	Тj	150	٥C	
Storage temperature	T <sub>stg</sub>	-55~150	°C	

Note: Mounted on a glass-epoxy substrate: 30 mm  $\times$  30 mm  $\times$  0.8 mmt (Cu pad area 50 mm²)

## **Recommended Operating Conditions**

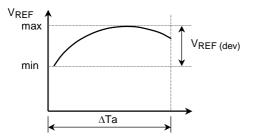
Characteristics	Symbol	Min	Тур.	Max	Unit
Power supply voltage	V <sub>CC</sub>	$V_{REF}$	_	14	V
Cathode voltage	V <sub>KA</sub>	0.2	_	V <sub>CC</sub>	V
Cathode current	١ <sub>K</sub>	0.4	_	15	mA
Operating temperature	T <sub>opr</sub>	-40		85	°C

## Electrical Characteristics (Unless otherwise specified, $V_{CC} = 2 V$ , $I_K = 5 mA$ , Ta = 25°C)

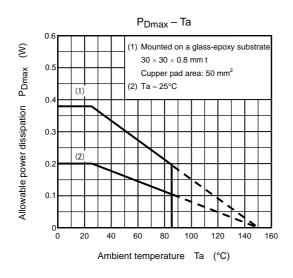
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Reference voltage	V <sub>REF</sub>	$V_{KA} = V_{REF}$	1.242	1.26	1.278	V
Deviation of reference input voltage overtemperature	V <sub>REF (dev)</sub>	$0^{\circ}C \leq Ta \leq 85^{\circ}C, V_{KA} = V_{REF}$	_	5	15	mV
Ratio of change in reference input voltage to the change in power supply voltage	$\Delta V_{REF} / \Delta V_{CC}$	$1.8 \text{ V} \leq \text{V}_{CC} \leq 15 \text{ V}$	_	-0.3	-1.5	mV/V
Reference Input current	I <sub>REF</sub>	$V_{KA} = V_{REF}, R_1 = 10 \text{ k}\Omega, R_2 = \infty$	_	2	4	μA
Deviation of reference input current over temperature	IREF (dev)	$ \begin{array}{l} 0^{\circ}C \leq \text{Ta} \leq 85^{\circ}\text{C}, \ \text{V}_{KA} = \text{V}_{REF}, \\ \text{R}_{1} = 10 \ \text{k}\Omega, \ \text{R}_{2} = \infty \end{array} $	_	0.3	1.2	μA
Minimum cathode current for regulation	I <sub>Kmin</sub>	V <sub>KA</sub> = V <sub>REF</sub>	_	200	400	μA
Cathode saturation voltage	V <sub>Ksat</sub>	$V_{REF} = 1.3 \text{ V}, I_{K} = 5 \text{ mA}$	_	0.05	0.2	V
Off-State cathode current	I <sub>Koff</sub>	$V_{KA} = V_{CC} = 15 \text{ V},  V_{REF} = 0 \text{ V}$	_	_	1.0	μA
Dynamic impedance	Z <sub>KA</sub>	0.4 mA $\leq I_K \leq$ 15 mA, f $\leq$ 1 kHz	_	0.2	0.5	Ω

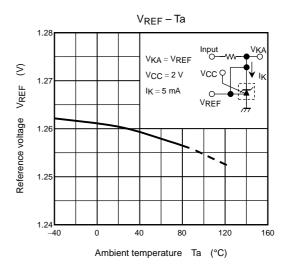
The deviation parameters  $V_{REF}$  (dev) and  $I_{REF}$  (dev) are defined as the maximum variation of the  $V_{REF}$  and  $I_{REF}$  over the rated temperature range.

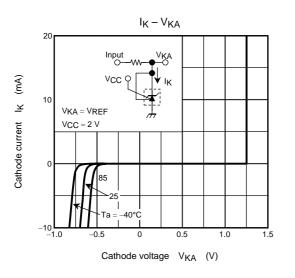
The average temperature coefficient of the  $\ensuremath{V\!\mathrm{REF}}$  is defined as:

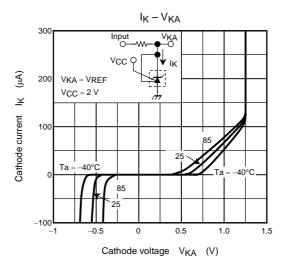


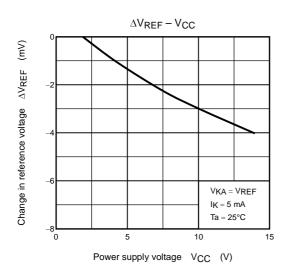
$$\left| \alpha V_{\mathsf{REF}} \right| = \frac{\left( \frac{V_{\mathsf{REF}} (\mathsf{dev}) \times 10^{6}}{V_{\mathsf{REF}} @ 25^{\circ} \mathsf{C}} \right)}{\Delta \mathsf{Ta}} (\mathsf{ppm}/^{\circ} \mathsf{C})$$

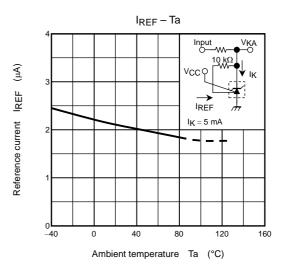


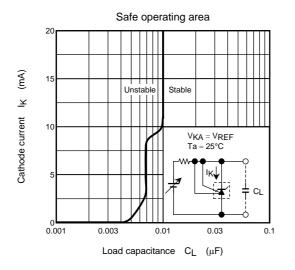


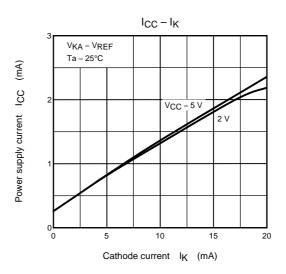


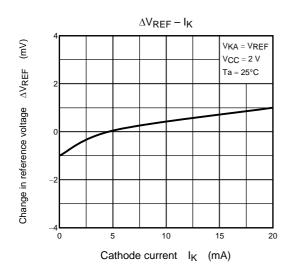


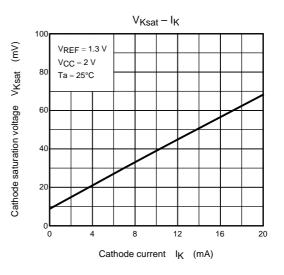








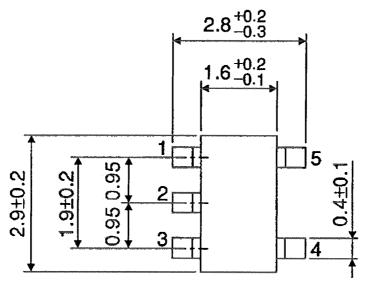


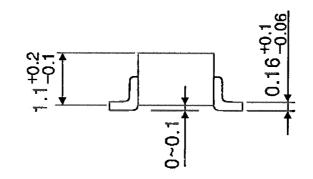


# Package Dimensions

SSOP5-P-0.95

Unit : mm





Weight: 0.014 g (typ.)

#### **RESTRICTIONS ON PRODUCT USE**

Handbook" etc..

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