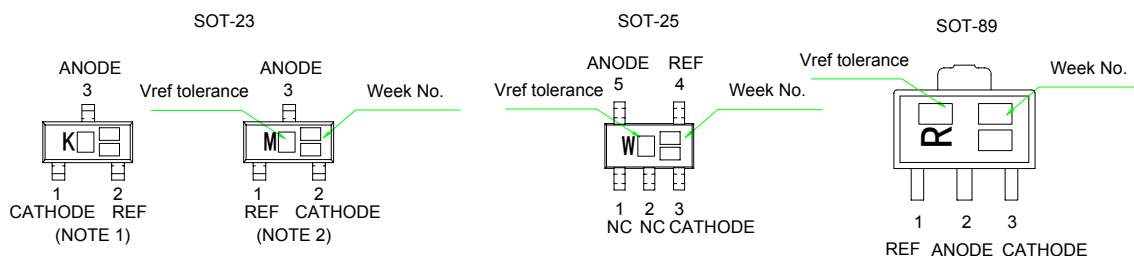


ADJUSTABLE PRECISION SHUNT REGULATORS 精密可調電壓基準源

FH431

DESCRIPTION & FEATURES 概述及特點	
The FH431 series ICs are three-terminal adjustable shunt regulators with guaranteed thermal stability over a full operation range. These ICs feature sharp turn-on characteristics, low temperature coefficient and low output impedance, which make them ideal substitutes for Zener diodes in applications such as switching power supply, charger and other adjustable regulators. The FH431 precision reference is offered in three band gap tolerance: 0.5%, 1.0% and 1.5%.	FH431 系列三端可調精密穩壓電路，具有低溫度係數和低輸出阻抗，這樣精密可調的特性使其可替代許多應用場合下的穩壓二極體。例如：開關電源、充電器及可調穩壓器。FH431 參考電壓有三種精度：0.5%，1.0%和1.5%。
- Adjustable output voltage from V_{REF} to 36V - Low dynamic output resistance: 200mΩ typical - Sink current capacity from 1mA to 100 mA - Low output noise - Typical equivalent full range temperature coefficient of 30ppm/$^{\circ}\text{C}$	- 可調電壓範圍：2.5V~36V - 低動態輸出阻抗：200mΩ（典型值） - 灌電流能力為 1.0~100mA - 低輸出雜訊 - 低溫度係數：30ppm/$^{\circ}\text{C}$（典型值）
Applications 應用	
- PC Motherboard - Voltage monitor - Voltage Reference - PWM down converter with reference - Charger	- 電腦主板 - 電壓監控器 - 電壓基準源 - 開關電源（參考電壓） - 充電器



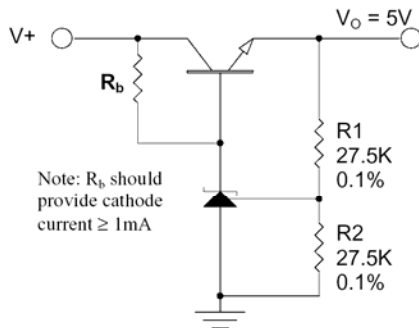
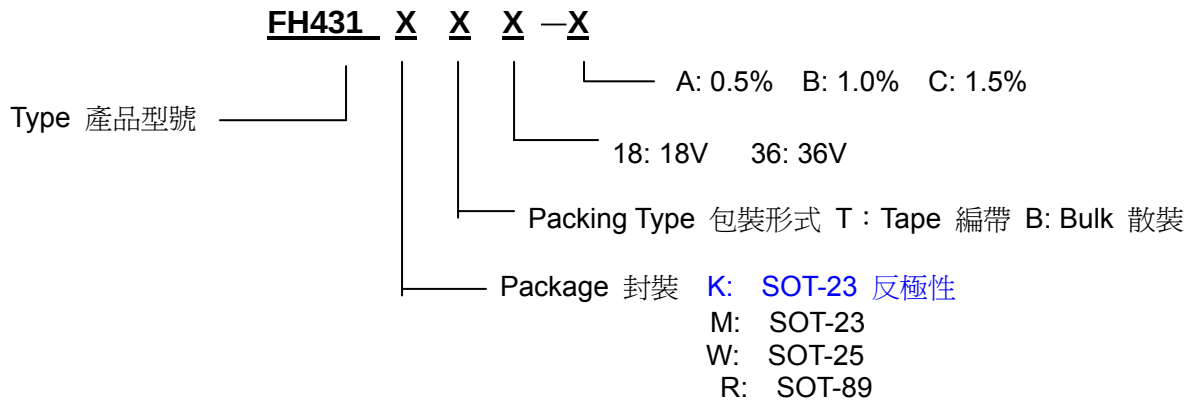
Ordering Information for 40V products 訂購資訊					
Package 封裝類型	Temperature Range 溫度範圍	Voltage Tolerance 精度	Part Number 產品型號	Marking ID 打標	Packing Type 包裝類型
SOT-23	-40°C ~ 85°C	0.5%	FH431KT36-A	K1	Tape
		1.0%	FH431KT36-B	K2	Tape
		1.5%	FH431KT36-C	K3	Tape
SOT-23		0.5%	FH431MT36-A	M1	Tape
		1.0%	FH431MT36-B	M2	Tape
		1.5%	FH431MT36-C	M3	Tape
SOT-25		0.5%	FH431WT36-A	W1	Tape
		1.0%	FH431WT36-B	W2	Tape
		1.5%	FH431WT36-C	W3	Tape
SOT-89		0.5%	FH431RT36-A	R1	Tape
		1.0%	FH431RT36-B	R2	Tape
		1.5%	FH431RT36-C	R3	Tape

Note: 1. For FH431KTXX, 2. For FH431MTXX.

Ordering Information for 20V products 訂購資訊

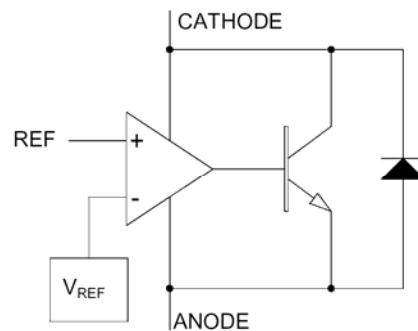
Package 封裝類型	Temperature Range 溫度範圍	Voltage Tolerance 精度	Part Number 產品型號	Marking ID 打標	Packing Type 包裝類型
SOT-23	-40°C ~ 85°C	0.5%	FH431KT18-A	K4	Tape
		1.0%	FH431KT18-B	K5	Tape
		1.5%	FH431KT18-C	K6	Tape
SOT-23		0.5%	FH431MT18-A	M4	Tape
		1.0%	FH431MT18-B	M5	Tape
		1.5%	FH431MT18-C	M6	Tape
SOT-25		0.5%	FH431WT18-A	W4	Tape
		1.0%	FH431WT18-B	W5	Tape
		1.5%	FH431WT18-C	W6	Tape
SOT-89		0.5%	FH431RT18-A	R4	Tape
		1.0%	FH431RT18-B	R5	Tape
		1.5%	FH431RT18-C	R6	Tape

Note: 1. For FH431KTXX, 2. For FH431MTXX.



5V Precision Regulator

TYPICAL APPLICATION (典型應用)



BLOCK DIAGRAM (功能框圖)

MAXIMUM RATINGS (T_a=25°C) 最大額定值 (Note 1)

Characteristic 特性參數	Symbol 符號	Rating 額定值		Unit 單位
		Min 最小	Max 最大	
Cathode Voltage (Note 2) 陰極電壓	V _{KA}	-0.3	FH431 (40V) 40 FH431 (20V) 20	V
Continuous Cathode Current 陰極連續電流	I _K	-100	150	mA
Reference Input Current Range 參考端輸入電流	I _{REF}	-0.05	10	mA
Power Dissipation 耗散功率	P _D	SOT-23-3/5L	370	mW
		SOT-89-3	770	
Junction Temperature 工作結溫	T _J	0	150	°C
Thermal Impedance (Note 3) 熱阻	θ_{JA}	SOT-23-3	330	°C / W
		SOT-23-5	250	
		SOT-89-3	100	
Storage Temperature Range 儲存溫度	T _{STG}	-65	150	°C

Note 1: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground.

Currents are positive into, negative out of the specified terminal.

Note 2: Voltage values are with respect to the anode terminal unless otherwise noted.

Note 3: θ_{JA} : Thermal Resistance-Junction to Ambient, $D_F = 1/\theta_{JA}$

Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.

The θ_{JA} numbers are guidelines for the thermal performance of the device/PC-board system.

All of the above assume no ambient airflow.

RECOMMENDED OPERATING CONDITIONS 推薦使用條件	Symbol 符號	Min 最小	Max 最大	Unit 單位
Operating free air temperature range 使用溫度範圍	T _A	0	70	°C
Cathode current 陰極電流	I _K	1	100	mA
Cathode voltage 陰極電壓	V _{KA}	0	FH431 (40V) 36	V
			FH431 (20V) 18	

ADJUSTABLE PRECISION SHUNT REGULATORS 精密可調電壓基準源

FH431

ELECTRICAL CHARACTERISTICS 電特性

 $T_A = 25^\circ\text{C}$ unless otherwise noted 如無特殊說明，溫度為 25°C

Parameter 參數	Symbol 符號	Test Conditions 測試條件	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 單位
Reference Input Voltage 輸入基準電壓	V_{REF}	$I_K = 10\text{mA}$, $V_{KA} = V_{\text{REF}}$, note 1	2.487	2.500	2.513	V
		$I_K = 10\text{mA}$, $V_{KA} = V_{\text{REF}}$, note 2	2.475	2.500	2.525	
		$I_K = 10\text{mA}$, $V_{KA} = V_{\text{REF}}$, note 3	2.462	2.500	2.538	
Reference Drift 參考電壓變化率	ΔV_{REF}	$I_K = 10\text{mA}$, $V_{KA} = V_{\text{REF}}$, $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$	—	4	17	mV
Voltage Ratio, Ref to Cathode 陰極電壓對參考電壓變化率	$\frac{\Delta V_{\text{REF}}}{\Delta V_{KA}}$	$I_K = 10\text{mA}$, $V_{KA} = 2.5\text{V to } 10\text{V}$	—	-1.4	-2.7	mV/V
		$I_K = 10\text{mA}$, $V_{KA} = 10\text{V to } 36\text{V}$	—	-1.0	-2.0	
Reference Input Current 參考端出入電流	I_{REF}	$I_K = 10\text{mA}$, $V_{KA} = V_{\text{REF}}$	—	—	2.3	μA
		$I_K = 10\text{mA}$, $V_{KA} = V_{\text{REF}}$, $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$	—	2	4	
Minimum Operating Current 最小工作電流	I_{min}	$V_{KA} = V_{\text{REF}}$	—	0.4	1	mA
Off-State Cathode Current 關斷陰極電流	I_{off}	$V_{KA} = 36\text{V}$, $V_{\text{REF}} = 0\text{V}$	—	0.1	1	μA
Dynamic Impedance 動態阻抗	$ Z_{KA} $	$V_{KA} = V_{\text{REF}}$, $I_K = 1\text{mA to } 100\text{mA}$, $f \leq 1\text{kHz}$	—	0.2	0.5	Ω

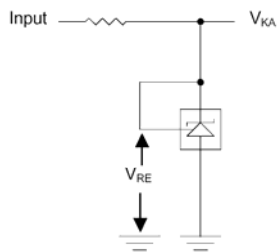
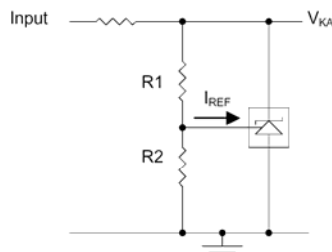
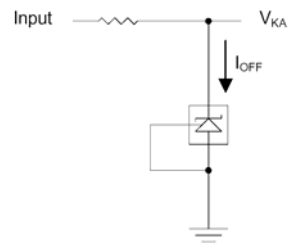
Note 1: For FH431A only. The output accuracy is 0.5%.

Note 2: For FH431B only. The output accuracy is 1.0%.

Note 3: For FH431C only. The output accuracy is 1.5%.

Note 4: $\Delta V_{\text{REF}} / \Delta V_{KA}$ Ratio of change in reference input voltage to the change in cathode voltage.

PARAMETER MEASUREMENT INFORMATION 參數測試圖

Figure 1. Test Circuit for $V_{KA} = V_{\text{REF}}$ Figure 2. Test Circuit for $V_{KA} > V_{\text{REF}}$ Figure 3. Test Circuit for I_{OFF}