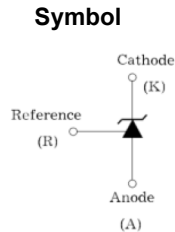
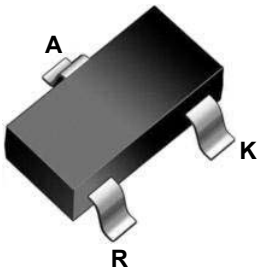
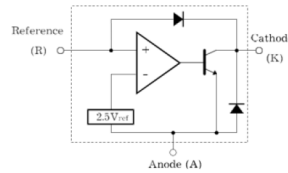


Shunt Regulator Voltage Reference **multicomp**PRO

RoHS
Compliant



Functional block diagram



Features

- Programmable Output Voltage to 40V
- Guaranteed 0.5% Reference Voltage Tolerance
- Low Dynamic Output Impedance 0.2Ω(Typ)
- Cathode Current Range (Continuous) -100 ~ 150mA
- Equivalent Full-Range Temperature Coefficient of 50 ppm/°C
- Temperature Compensated for Operation over Full Rated Operating Temperature Range
- Low Output Noise Voltage
- Fast Turn on Response
- SOT-23 packages
- ESD Tolerance (human body model) 2000V
- Operating Temperature Range -60°C to +125°C

Applications

- Switching Mode Power Supply
- Voltage Monitoring
- Adjustable Voltage and Current Referencing

Absolute Maximum Ratings (T_J=25°C Unless Otherwise Noted)

Symbol	Parameter	Rating	Unit
V _{KA}	Cathode Voltage	42	V
I _K	Cathode Current Range (Continuous)	-100 ~ 150	mA
I _{REF}	Reference Input Current Range	-0.05 ~ +10	
P _D	Power Dissipation at 25°C: SOT-23 Package (θ _{JA} = 625°C/W)	0.2	W
T _J	Junction Temperature Range	0 ~ 150	°C
T _{OPER}	Operating Temperature Range	-60 ~ +125	
T _{STG}	Storage Temperature Range	-65 ~ +150	

Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
V _{KA}	Cathode Voltage	V _{REF}	-	40	V
I _K	Cathode Current	0.5	-	100	mA

Newark.com/multicomp-pro
Farnell.com/multicomp-pro
sg.element14.com/b/multicomp-pro

multicompPRO

Shunt Regulator Voltage Reference **multicomp** PRO

Electrical Characteristics (Ta = 25°C, VKA = VREF, IK = 10mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
VREF	Reference Input Voltage	VKA = VREF, IK = 10mA	2.483	2.495	2.507	V
VREF(dev)	Deviation of Reference Input Voltage Over Full Temperature Range	Tmin ≤ Ta ≤ Tmax		3	17	mA
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta V_{KA} = 10V - V_{REF}$ $\Delta V_{KA} = 40V - 10V$		-1.4 -1.0	-2.7 -2.0	mV/V
IREF	Reference Input Current	R1 = 10KΩ, R2 = ∞		1.8	4	uA
IREF(dev)	Deviation of Reference Input Current Over Full Temperature Range	R1 = 10KΩ, R2 = ∞	--	0.4	1.2	
IK(min)	Minimum Cathode Current for Regulation			--	0.5	mA
IK(off)	Off-State Cathode Current	VKA = 40V, IREF = 0		0.17	0.9	uA
ZKA	Dynamic Impedance	IK = 1mA to 100 mA , f ≤ 1.0KHz		0.27	0.5	Ω

Test Circuits

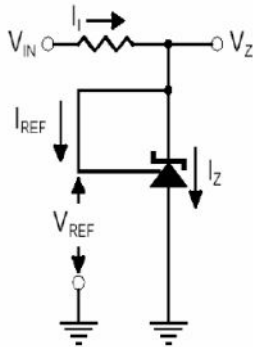


Fig1. Test Circuit for $V_z = V_{REF}$

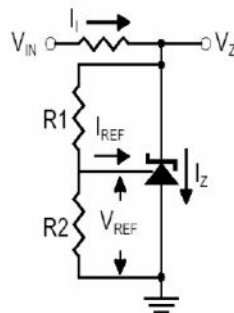


Fig2. Test Circuit for $V_z > V_{REF}$
Note: $V_z = V_{REF}(1 + R1/R2) + I_{REF} \times R1$

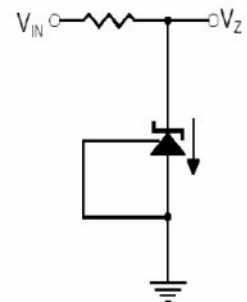
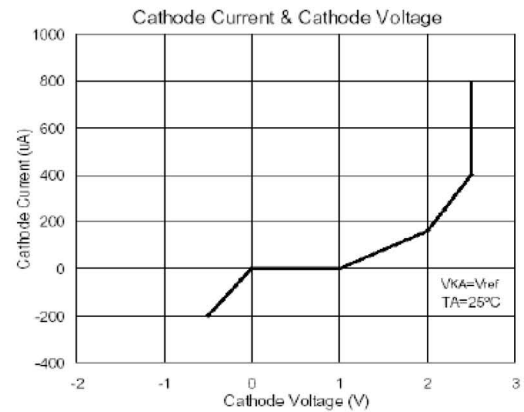
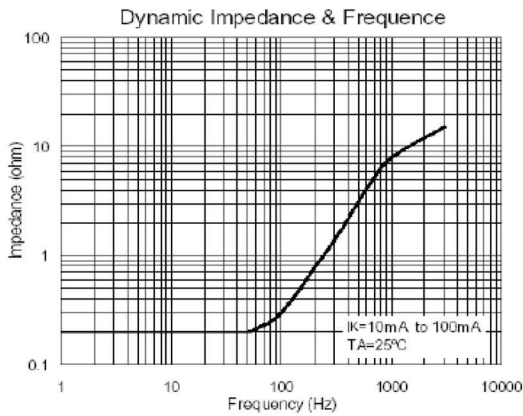
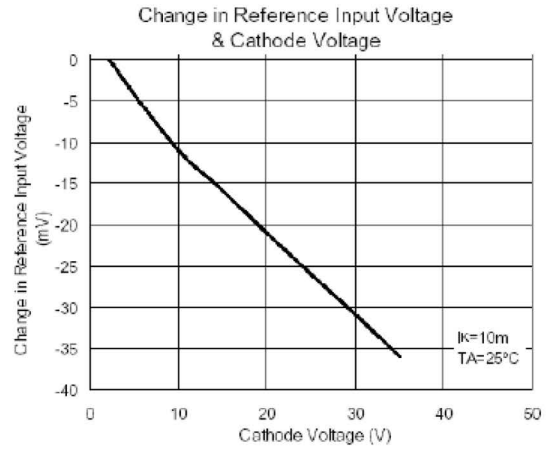
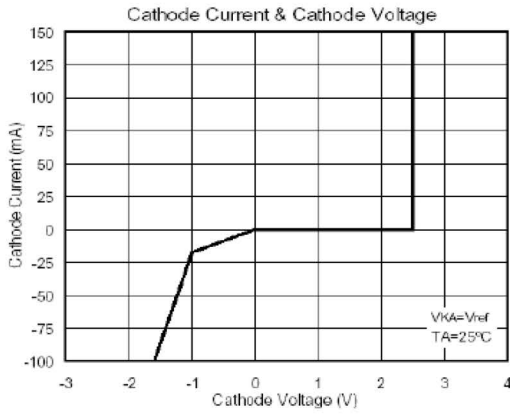


Fig3. Test Circuit for Off-State Current

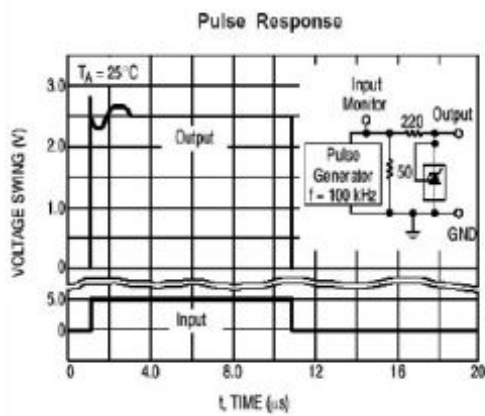
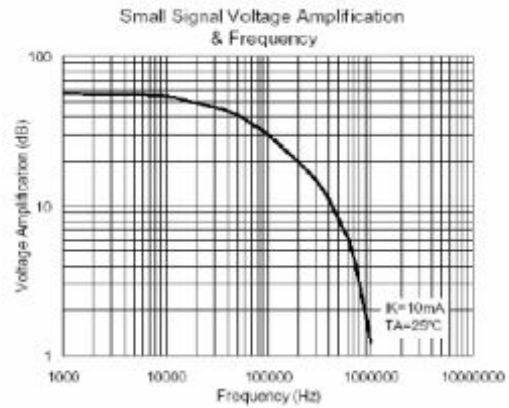
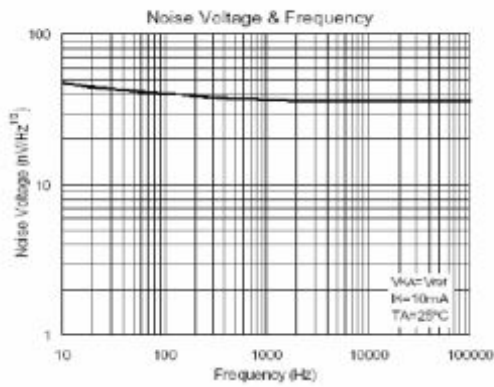
Shunt Regulator Voltage Reference **multicomp**PRO

Electrical characteristic curves



Shunt Regulator Voltage Reference **multicomp**PRO

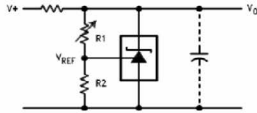
Electrical characteristic curves



Shunt Regulator Voltage Reference **multicomp**PRO

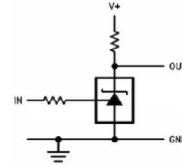
Typical Application

Shunt Regulator



$$V_o \approx \left(1 + \frac{R_1}{R_2}\right) V_{REF}$$

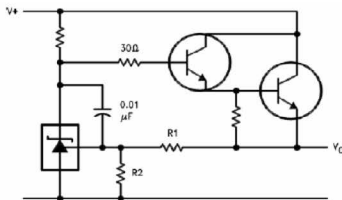
Single Supply Comparator with Temperature Compensated Threshold



$$V_{TH} \approx 2.5V$$

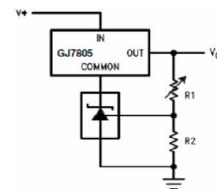
$$V_{ON} \approx 2V, V_{OFF} = V^+$$

Series Regulator



$$V_o \approx \left(1 + \frac{R_1}{R_2}\right) V_{REF}$$

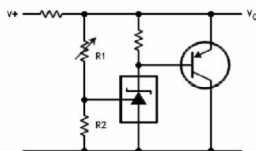
Output Control of a Three Terminal Fixed Regulator



$$V_o \approx \left(1 + \frac{R_1}{R_2}\right) V_{REF}$$

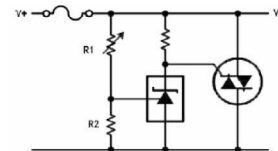
$$V_o \text{ MIN} \approx V_{REF} + 5V$$

Higher Current Shunt Regulator



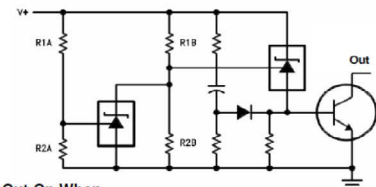
$$V_o \approx \left(1 + \frac{R_1}{R_2}\right) V_{REF}$$

Crow Bar



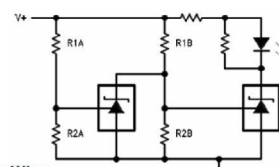
$$V_{Limit} \approx \left(1 + \frac{R_1}{R_2}\right) V_{REF}$$

Over Voltage/under Voltage Protection Circuit



Out On When
 Low Limit < V* < High Limit
 Low Limit $\approx V_{REF} \left(1 + \frac{R_{1B}}{R_{2B}}\right) + V_{BE}$
 High Limit $\approx V_{REF} \left(1 + \frac{R_{1A}}{R_{2A}}\right)$

Voltage Monitor

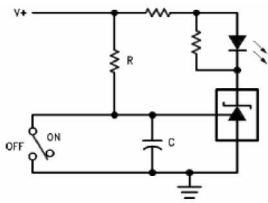


LED On When
 Low Limit < V* < High Limit
 Low Limit $\approx V_{REF} \left(1 + \frac{R_{1B}}{R_{2B}}\right)$
 High Limit $\approx V_{REF} \left(1 + \frac{R_{1A}}{R_{2A}}\right)$

Shunt Regulator Voltage Reference **multicomp** PRO

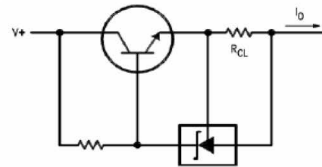
Typical Application

Delay Timer



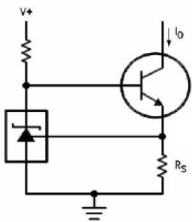
$$\text{Delay} = R \cdot C \cdot \ln \frac{V^+}{(V^+) - V_{REF}}$$

Current Limiter or Current Source



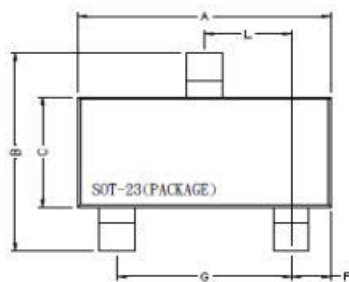
$$I_o = \frac{V_{REF}}{R_{CL}}$$

Constant Current Sink

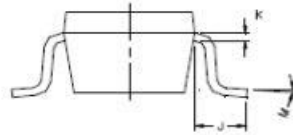
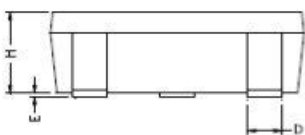


$$I_o = \frac{V_{REF}}{R_s}$$

Packaging Dimensions



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.7	3.1	G	1.9 REF.	
B	2.4	2.8	H	1	1.3
C	1.4	1.6	K	0.1	0.2
D	0.35	0.5	J	0.4	-
E	0	0.1	L	0.85	1.15
F	0.45	0.55	M	0	10



Dimensions : Millimetres

Part Number Table

Description	Part Number
Voltage Reference, Adjustable, 2.495V, 40V, $\pm 0.5\%$, 150mA, SOT-23	H431LK

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