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KA2803B

Earth Leakage Detector

Features

- Low power consumption P_D =5mW, 100V/200V
- Built-in voltage regulator
- High gain differential amplifier
- 0.4mA output current pulse to trigger SCR' S
- Low external part count
- DIP package (8 Dip), high packing density
- High noise immunity, large surge margin
- Super temperature characteristic of input sensitivity
- Wide operating temperature range (T_A = - 25°C ~ +80°C)

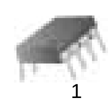
Functions

- Differential amplifier
- Level comparator
- Latch circuit

Description

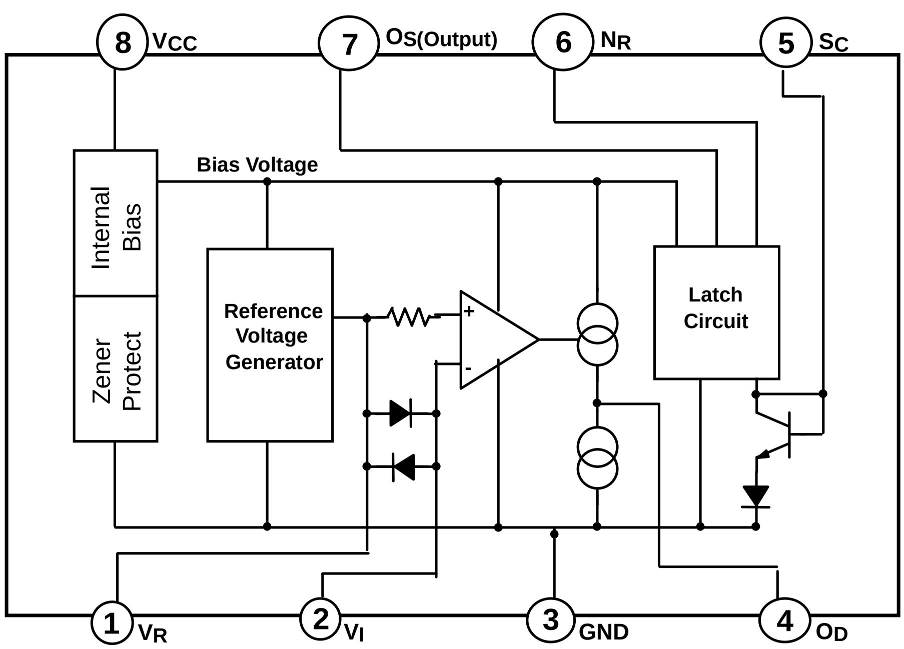
The KA2803B is designed for use in earth leakage circuit interrupters, for stable operation of the AC line in breakers. The input of the differential amplifier is connected to the secondary coil of ZCT (Zero Current Transformer). The amplified output of differential amplifier is integrated at external capacitor to gain adequate time delay that is specified in KSC4613. The level comparator generates high level when earth leakage current is greater than the fixed level.

8-DIP



8-SOP

Block Diagram



Rev. 1.0.2

Absolute Maximum Ratings (T_A = 25°C)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	20	V
Supply Current	I_{CC}	8	mA
Power Dissipation	P_D	300	mW
Lead Temperature (soldering 10 sec)	T_{LEAD}	260	°C
Operating Temperature	T_{OPR}	- 25 ~ + 80	°C
Storage Temperature	T_{STG}	- 65 ~ + 150	°C

Electrical Characteristics

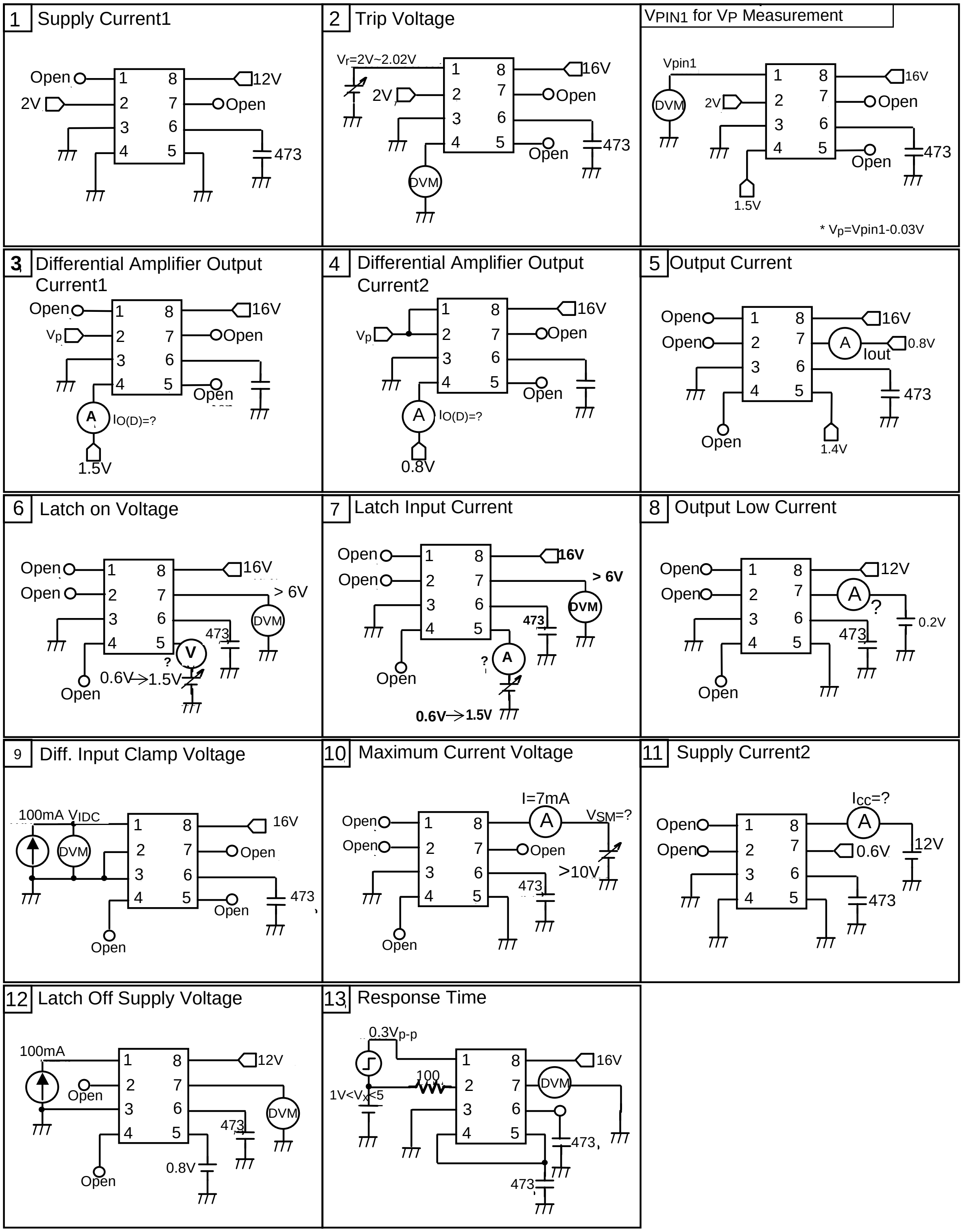
(T_A = -25°C to 80°C)

Parameter	Symbol	Conditions	Circuit	Min.	Typ.	Max.	Unit
Supply Current 1	I_{CC}	V_{CC}=2V (-25°C)	1	-	-	580	µA
		V_R=OPEN (25°C)		300	400	530	
		V_I=2V (80°C)		-	-	480	
Trip Voltage	V_T	V_{CC} =16V V_R=2V~2.02V V_I=2V	2	14	16	18	mV
		(Note1)		12.5	14.2	17	
Differential Amplifier Output Current 1	$I_{O(D)}$	V_{CC} =16V (V_R-V_I =30mV , V_{OD} =1.2V)	3	-12	20	-30	(rms) µA
Differential Amplifier Output Current 2	$I_{O(D)}$	V_{CC} =16V V_{OD} =0.8V V_R, V_I =V_P (Note2)	4	17	27	37	µA
Output Current	I_O	V_{SC} =1.4V (-25°C)	5	200	400	800	µA
		V_{OS} =0.8V (25°C)		200	400	800	
		V_{CC} =16V (25°C)		100	300	600	
Latch on Voltage	V_{SCON}	V_{CC} =16V	6	0.7	1.0	1.4	V
Latch Input Current	I_{SCON}	V_{CC} =16V	7	-13	-7	-1	µA
Output Low Current	I_{OSL}	V_{CC} =12V V_{OSL} =0.2V	8	200	800	1400	µA
Diff. Input Clamp Voltage	V_{IDC}	V_{CC}=16V I_{IDC} =100mA	9	0.4	1.2	2	V
Maximum Current Voltage	V_{SM}	I_{SM}=7mA	10	20	24	28	V
Supply Current 2	I_{S2}	V_{CC} =12V V_{OSL} =0.6V	11	200	400	900	µA
Latch Off Supply Voltage	V_{SOFF}	V_{OS} =12V	12	7.0	8.0	9.0	V
		V_{SC} =1.8V					
		I_{IDC} =100mA					
Response Time(Note1)	T_{ON}	V_{CC} =16V V_R-V_I =0.3V , 1V<V_X<5V	13	2	3	4	mS

Note:

1. This Parameter, although guaranteed, is not tested in Production.
2. V_P=V_{pin1} -0.03V at V_{pin2}=2.0V , V_{pin4}=1.5V

Test Circuit



Typical Characteristics

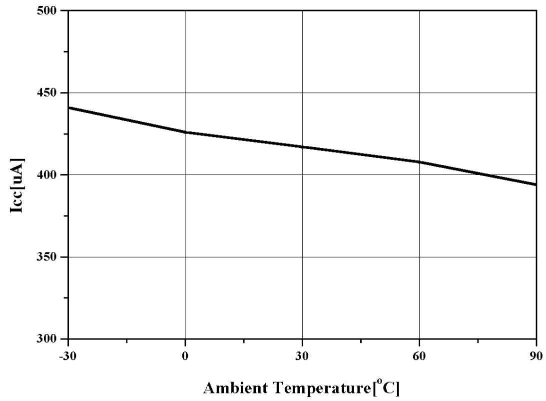


Figure 1. Supply Current

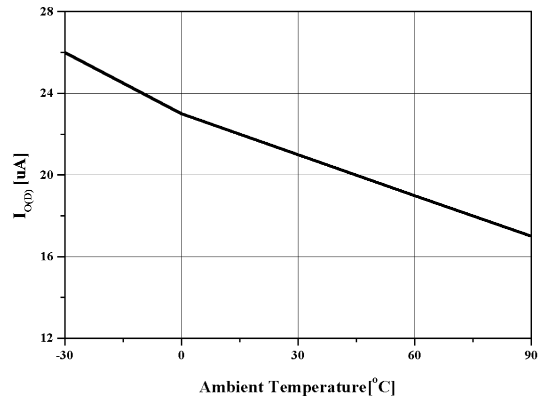


Figure 2. Differential Amp. Output Current
VR-VI=30mV, VOD=1.2V

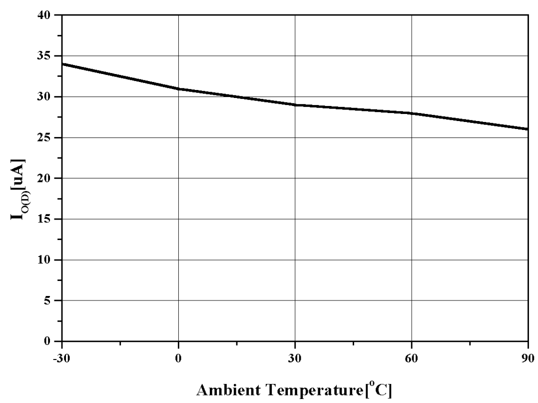


Figure 3. Differential Amp. Output Current
VR, VI=VP, VOD=0.8V

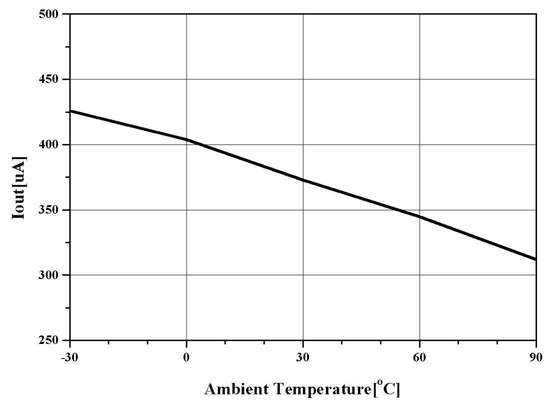


Figure 4. Output Current

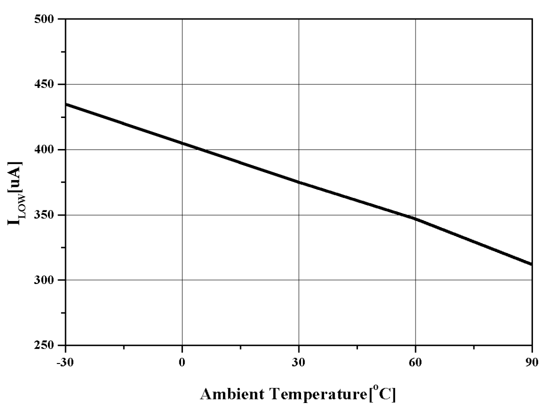


Figure 5. Output Low Current

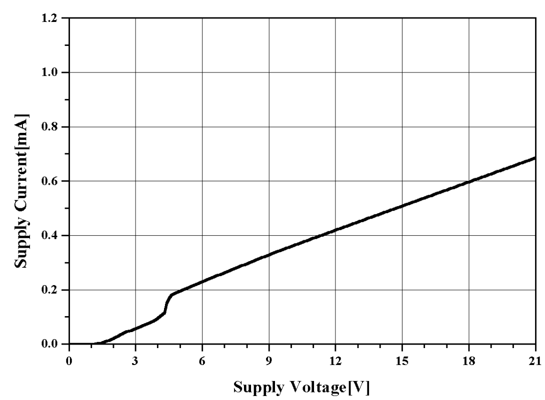


Figure 6. Vcc Voltage Vs. Supply Current 1

Typical Characteristics(Continued)

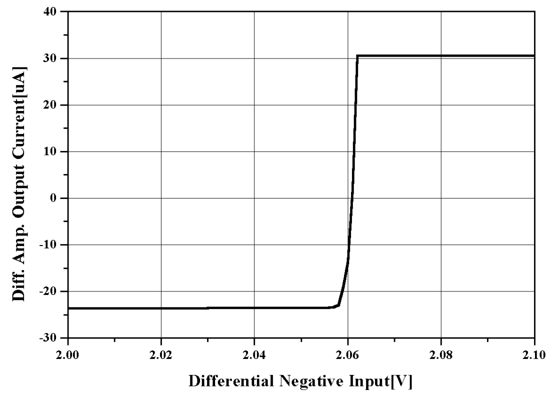


Figure 7. Differential Amp. Output Current 1

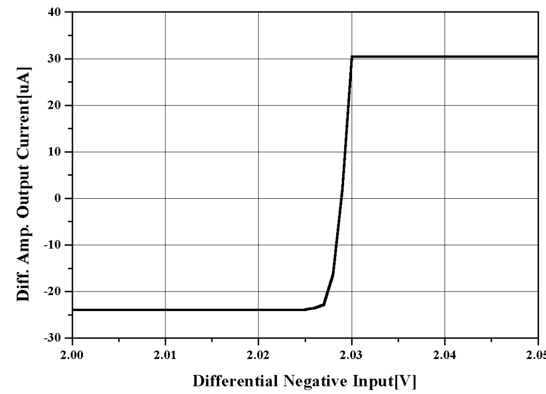


Figure 8. Differential Amp. Output

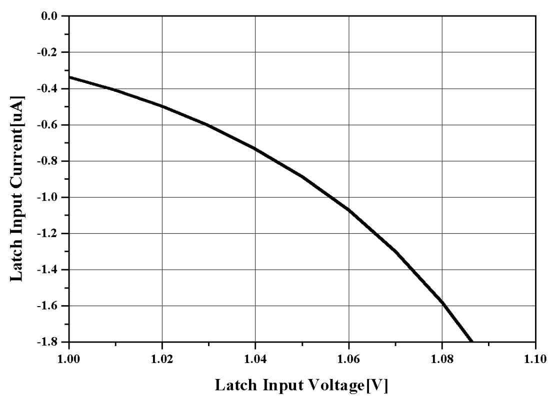


Figure 9. Latch Input Current

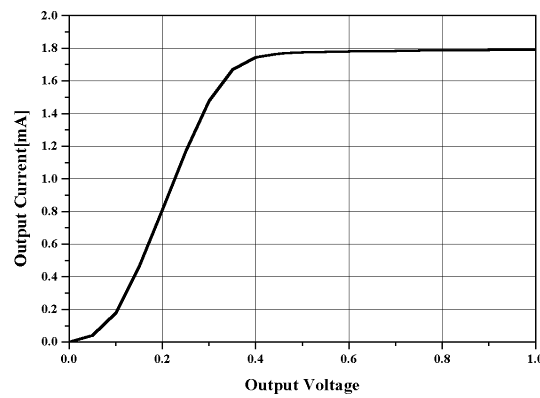


Figure 10. Output Low Current

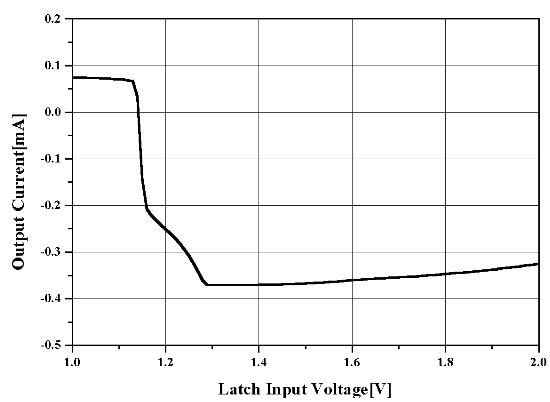


Figure 11. Output Current

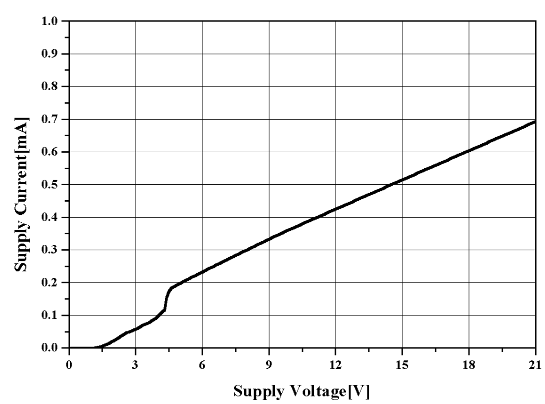


Figure 12. Vcc Voltage Vs. Supply Current 2

Typical Characteristics(Continued)

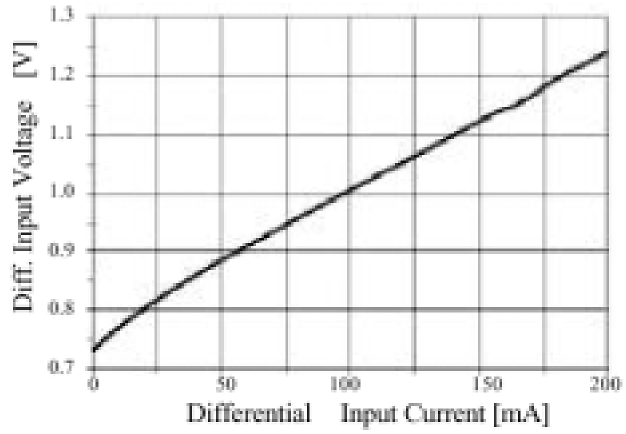


Figure 13. Differential Input Clamp Voltage

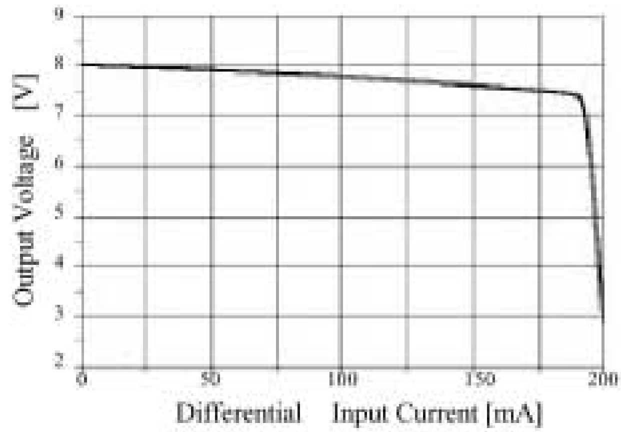


Figure 14. Latch Off Supply Voltage

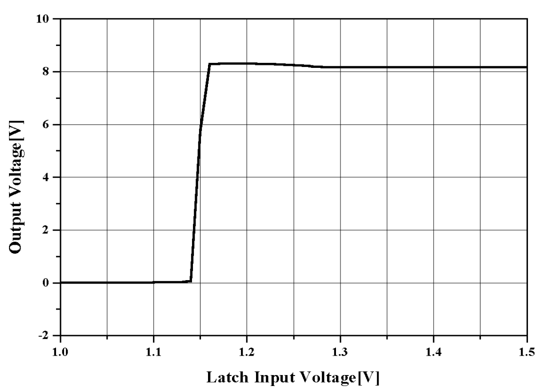


Figure 15. Latch On Input Voltage

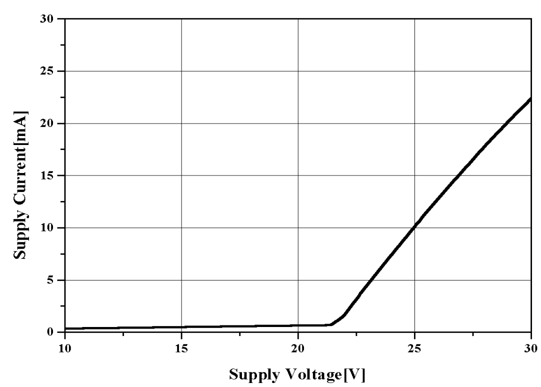


Figure 16. Maximum Supply

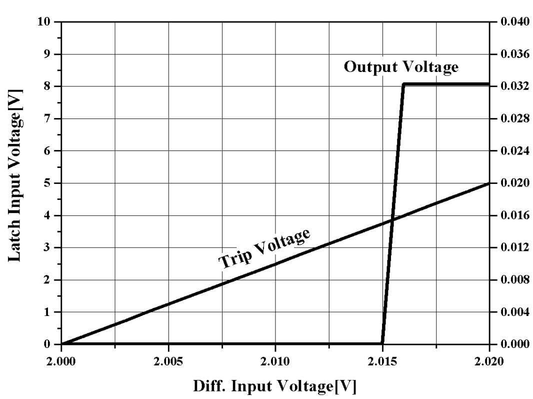


Figure 17. Trip & Output

Typical Characteristics(Continued)

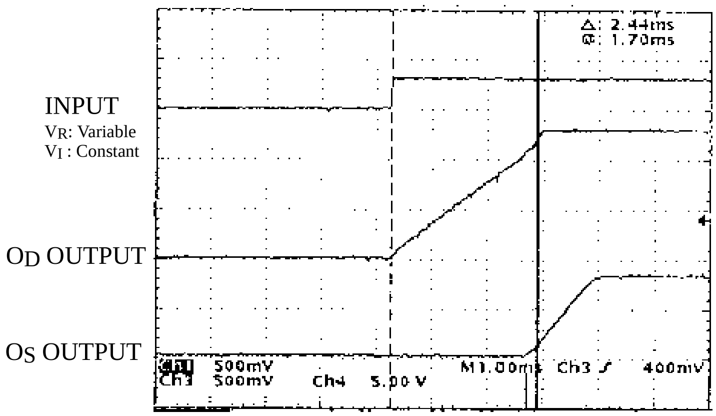


Figure 18. Output Response Time

Application Circuit

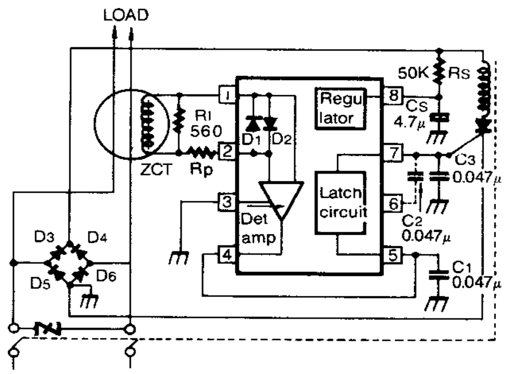


Figure 1. Full Wave Application Circuit

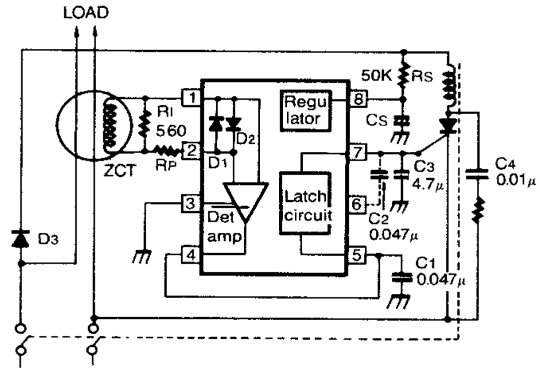


Figure 2. Half Wave Application Circuit

Application Note

(refer to full wave application circuit Fig. 1)

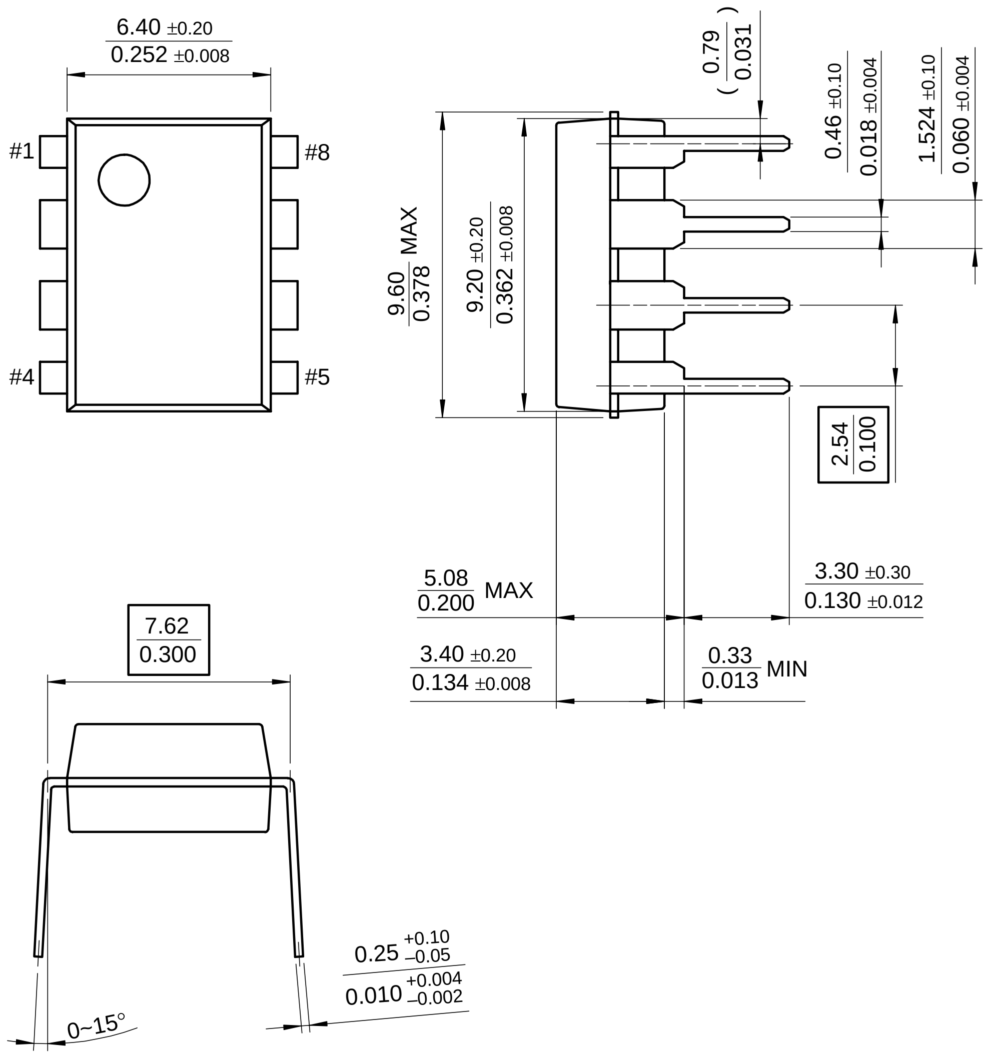
The Fig 1 shows the KA2803B connected in a typical leakage current detector system.
The power is applied to the V_{CC} terminal (Pin 8) of the KA2803B directly from the power line.
The resistor R_S and capacitor C_S are chosen so that pin 8 voltage is at least 12V.
The value of C_S is recommended above 1µF at this time.
If the leakage current is at the load, it is detected by the zero current transformer (ZCT).
The output voltage signal of ZCT is amplified by the differential amplifier of the KA2803B internal circuit and appears as half cycle sine wave signal referred to input signal at the output of the amplifier.
The amplifier closed loop gain is fixed about 1000 times with internal feedback resistor to compensate for zero current transformer (ZCT) Variations.
The resistor R_L should be selected so that the breaker satisfies the required sensing current.
The protection resistor R_P is not usually used put when the high current is injected at the breaker, this resistor should be used to protect the earth leakage detector IC the KA2803B.
The range of R_P is from several hundredΩ to several kΩ.
The capacitor C_1, is for the noise canceller and standard value of C_1 is 0.047µF. Also the capacitor C_2 is noise canceller capacitance but it is not usually used.
When high noise is only appeared at this system 0.047µF capacitor may be connected between pin 6 and pin 7.
The amplified signal is finally appeared to the Pin 7 with pulse signal through the internal latch circuit of the KA2803B.
This signal drives the gate of the external SCR which energizes the trip coil which opens the circuit breaker.
The trip time of breaker is decided by the capacitor C_3 and the mechanism breaker.
This capacitor should be selected under 1µF for the required trip time.
The full wave bridge supplies power to the KA2803B during both the positive and negative half cycles of the line voltage.
This allows the hot and neutral lines to be interchanged.
If your application want the detail information, request it on our application circuit designer of KA2803B.

Mechanical Dimensions

Package

Dimensions in

8-DIP

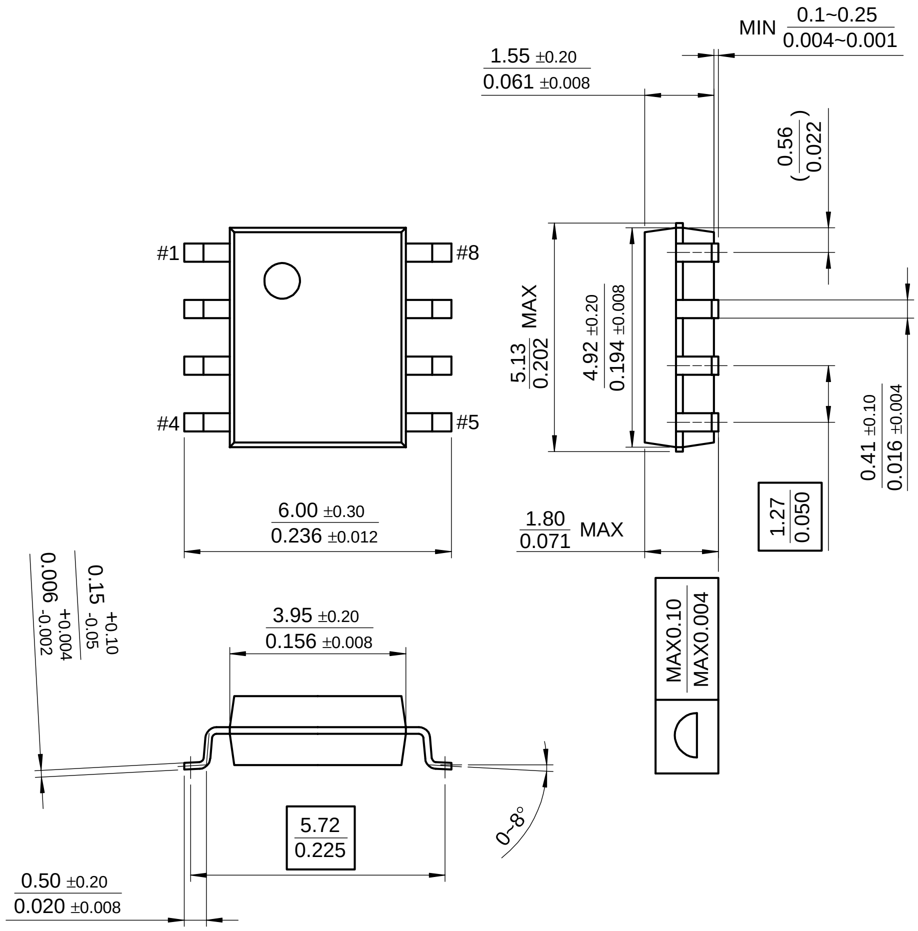


Mechanical Dimensions (Continued)

Package

Dimensions in

8-SOP



Ordering Information

Product Number	Package	Operating Temperature
KA2803B	8-DIP	-20 ~ + 80°C
KA2803BD	8-SOP	

7/11/01 0.0m 001
Stock#DSxxxxxxxx