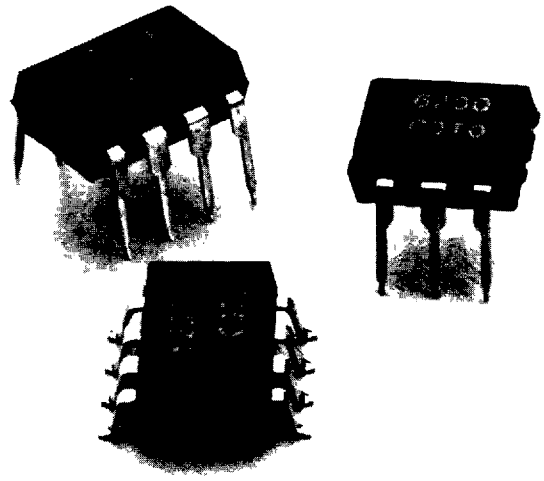
COTO WABASH

A Kearney National Company

6200 Series
High Voltage
Solid State Relays



The COTO WABASH 6200 Series High Voltage Solid State Relays offer the designer an alternative to electromechanical relays now used in a wide range of applications. The turn-on characteristics designed into this series protect against inrush current and premature failure normally associated with electromechanical contacts.

Some models are available with internal current limiting for further protection of the device and the circuit. This feature enables passage of FCC 68.302 and other regulatory surge requirements when open state overvoltage protection is provided.

Long life is assured through the use of solid state switching. There is no mechanical wear, metal transfer, or arcing.

FEATURES

- **350 Volt Switching**
- **3750 VRMS I/O Isolation**
- **Internal Current Limiting**
- **Long Life**
- **High Reliability**
- **Small size**
- **Low Power Consumption**
- **UL & CSA approved; BABT Recognition Pending**

Selection Guide

Model Number	Description	Load Current	Typ. RON	Current Limit Activation Range
		mA	Ω	mA
6201	1 Form A Low Cost	95ma	23	150 - 270
6202	1 Form A	150	20	230 - 370
6203	1 Form A	150	18	Not Available
6204	1 Form B	150	20	Not Available
6205	2 Form A	110	20	230 - 370
6206	Dual 1 Form A	150	20	230 - 370

Construction And Circuitry

The 6200 Series High Voltage relays are constructed with GaAlAs LED's optically coupled to a monolithic integrated circuit. The construction provides for an isolation of 3750 Vrms input to output.

The integrated circuit contains a photodiode array powering JFET switch controllers. The controllers drive high voltage DMOS switches. Where applicable, the current limiting circuitry is incorporated onto the monolithic chip.

APPLICATIONS

- **Process Control**
- **Instrumentation**
- **Telecommunications**
- **Modems**
- **Multiplexers**
- **Office Equipment**
- **Industrial Control**

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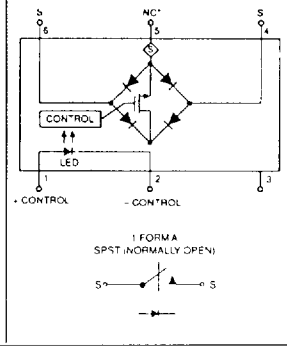
Specifications

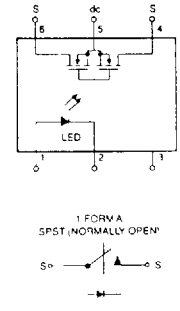
Parameter	Symbol	Test Conditions	Unit	6201 1 Form A With Current Limit Min.	6201 Typ.	6201 Max.	6202 1 Form A With Current Limit Min.	6202 Typ.	6202 Max.
INPUT CHARACTERISTICS									
LED Forward Current - Turn on, 25°C	I(Fon)	I(L) = 100mA, t = 10ms	mADC		1	2		1	2
LED Forward Current - Turn on, 70°C	I(Fon)	I(L) = 100mA, t = 10ms	mADC		2	4		2	4
LED Forward Current - Turn off	I(Foff)	I(L) = 0 2mA, V(L) = ±300V	mADC	0 2	0.9		0.2	0.9	
Recommended LED Forward Current	I(Fon)	mADC	mADC	4		20	5		20
LED Forward Voltage	V(F)	I(F) = 10mA	VDC	1 15	1 22	1 45	1 15	1 22	1 45
Reverse Voltage Withstand	V(R)	I(R) ≤10µA	VDC			10			10
OUTPUT CHARACTERISTICS									
Switching Voltage	V(L)	I(L) ≤ 50µA	V	10		400			350
Switching Current - Bidirectional	I(L)	S to S' (Note 1)	mA			95			150
Switching Current - Unidirectional	I(L)	(Note 2)	mA						250
Current Limit (Note3)	I(Lmt)	I(F) = 5mA, t = 5 ms	mA	150	210	270	230	270	370
Power Dissipation	P(Diss)		mW			500			500
Resistance - On, S (±) to S'(±)	R(On)	I(F) = 5mA, I(L) = 50mA	Ω	12	23	34	12	20	25
Resistance - On, (Note2)	R(On)	I(F) = 5mA, I(L) = 100mA	Ω				3	5	6.25
Resistance - Off State	R(Off)	I(F) = 0 mA, V(L) = 100V	GΩ		3300			3300	
Off State Leakage Current (Note 4)	I(Off)	I(F) = 0 mA, V(L) = 100V	nA		0 03	3.0		0 03	3 0
Off State Leakage Current (Note 4)	I(Off)	I(F) = 0 mA, V(L) = 350V	nA		0.35	10.0		0 35	10 0
Turn-on Time	t(On)	I(F) = 5mA, I(L) = 50 mA	ms		1.6	5.0		1.4	2.0
Turn-off Time	t(Off)	I(F) = 5mA, I(L) = 50 mA	ms		1.3	5 0		0 5	2 0
Dielectric Strength - Across Output		DC / Peak AC	V	400			350		
Capacitance - Across Output		I(F) = 0 mA, V(L) = 1V	pf					50	
Capacitance - Across Output		I(F) = 0 mA, V(L) = 50V	pf					10	
Thermal Offset Voltage		I(F) = 5mA	µV					0.2	
GENERAL CHARACTERISTICS									
Dielectric Strength - Input to Output		t = 60 sec.	Vrms	3750			3750		
Capacitance - Input to Output	CI/O	Each switch	pf		0 8			0 8	

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE
TA = 25 °C Unless Otherwise Noted

Notes:

1. Dual Form A and 2 Form A current rating is for each pole operating simultaneously
2. Specified for models 6202, 6203, & 6204 configured for unidirectional switching. Pins 4 and 6 tied together to form the (+) side of load, pin 5 connected to (-) side of load.
3. The current limit circuit is bypassed when the 6202 is connected for unidirectional switching
4. Model 6204 specified with 5mA forward current when measuring open output leakage current Unit of measurement is µA.
5. Model 6203 measured with 10 mA LED forward current Refer to Operate Time vs LED Forward Current graph for timing at other input currents





Current Limiting

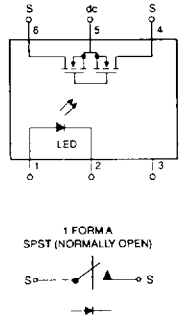
The 6201, 6202, 6205, and 6206 models have the added advantage of internal current limiting. This built in protection enables the relay and it's associated circuit to withstand potentially damaging current surges. The current limit also protects power supplies and minimizes circuit power dissipation during ground fault or other undesirable conditions.

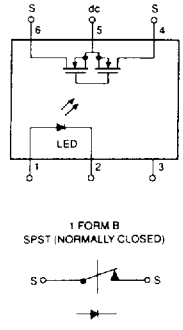
When an excessive current condition occurs, the relay's on resistance increases. This increases the voltage drop across the relay. In this state, power dissapation exceeds the recommended levels. Therefore, continuous use of this circuit is not recommended.

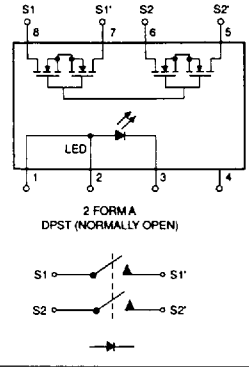
On Characteristics

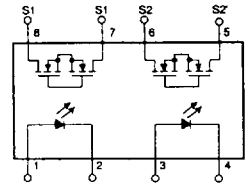
The 6201 relay utilizes a bridge rectifier, which blocks the load voltage until the DMOS switch conducts. Voltages must be higher than the two diode voltage drops, approximately 1.4 volts for current flow. (Figure 1)
On all other models, the on resistance is linear up to the knee current (Figure 2). Above the knee current, the incremental resistance decreases. On Models with current limit, a fold back effect takes place due to a negative temperature coefficient under an extended overload condition.
Models 6202, 6203, and 6204 relays can be configured to increase switching current capabilities by connecting pins 4 and 6 together to form the positive side of the output. Pin 5 becomes the negative side. (Figure 3).

6203 1 Form A No Current Limit			6204 1 Form B No Current Limit			6205 2 Form A With Current Limit			6206 Dual 1 Form A With Current Limit		
Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
	1	2		1	2		2	3		1.2	2
	2	4		2	4						
0.2	0.9		0.2	0.9		0.2	1.8		0.2	1.1	
5		20	5		20	7	10	20	5		20
1.15	1.22	1.45	1.15	1.22	1.45	1.15	1.22	1.45	1.15	1.22	1.45
		10			10			10			10
		350			350			350			350
		150			150			110			110
		250			250						
	N/A			N/A		230	270	370	230	270	370
		500			500			600			600
12	18	25	12	20	25	12	20	25	12	20	25
3	5	6.25	3	5	6.25						
	3300						3300			3300	
	0.03	3.0		9.0	300		0.03	3.0		0.03	3.0
	0.35	10.0		0.3 (NOTE 4)	1 (NOTE 4)		0.35	10.0		0.35	10.0
	0.5 (NOTE 5)	0.75		1.0	3.0		1.6	2.5		1.2	2
	0.5	2.0		2.0	3.0		0.5	2.5		0.6	2
350			350			350			350		
	50			35			50				
	10			12			10				
	0.2			0.2			0.2			0.2	
3750			3750			3750			3750		
	0.8			0.8			1.2			0.8	





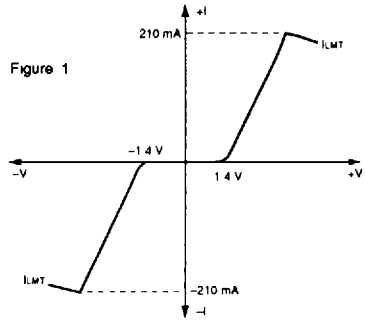




Schematic

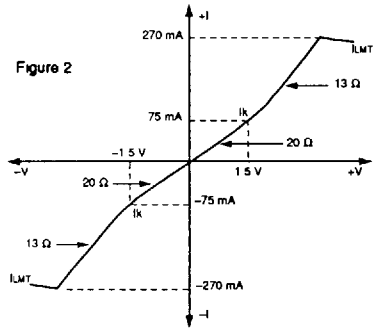
Relay Equivalent

Figure 1



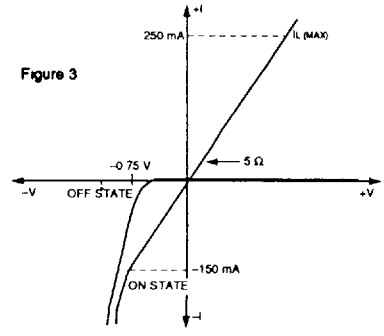
6201 Typical on Characteristics

Figure 2



Typical Bidirectional On Characteristics
6202, 6203, 6204, 6205, 6206
Current Limit for 6202, 6205, 6206 only

Figure 3



Typical Unidirectional On Characteristics
6202, 6203, 6204

Absolute Maximum Values T=25 °C	Symbol	6201	6202 6203 6204	6205	6206	Unit
INPUT						
LED Continous Forward Current	I_F	50	50	50	50	mA
Reverse Voltage ($I_R \leq 50\mu A$)	V_R	10	10	10	10	Volts
OUTPUT						
Load Voltage - DC or peak AC ($I_L \leq 50\mu A$)	V_L	400	350	350	350	Volts
DC Load Current - One Pole	I_L	95	150	150	150	mA
DC Load Current - Two Poles Simultaneously	I_L	-	-	110	110	mA
Power Dissipation	P_{DISS}	500	500	600	600	mW
ENVIRONMENTAL		**All Models**				
Operating Temperature Range *	T_O	-40 to +85				°C
Storage Temperature	T_A	-40 to + 150				°C
Pin Soldering Temperature (t = 10 sec. Max.)	T_S	260				°C

Note: Exceeding the absolute maximum values could cause permanent damage to 6200 series relays. Exposure to absolute maximums for extended periods of time could result in reliability problems.

* 6200 series relays will turn off when temperatures reach approximately 150°C

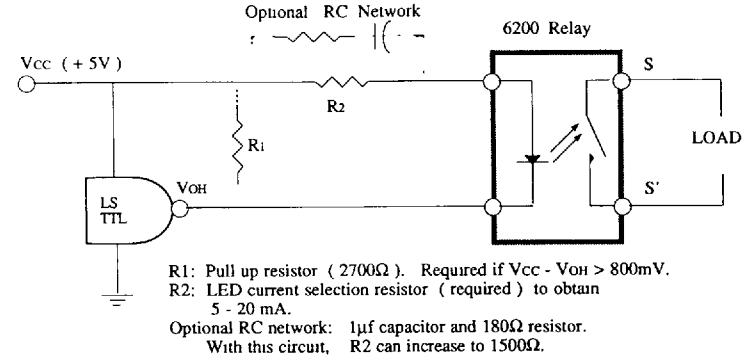
Input Current Selection

The amount of current applied to the input LED determines the amount of light produced for the photodiode array. This has a great influence on operate time. For faster operation, use higher input current or an RC network in parallel to the input resistor to furnish an additional pulse of current for turn on.

The array's efficiency is affected by temperature. In applications where the relay will be subjected to higher temperatures, (>50°C), more LED current is necessary. The recommended input current in an application subjected to high temperatures is approximately 15 - 20 milliamps.

When selecting the input resistor, all design variances must be considered. The temperature coefficient and tolerance of the resistor along with the voltage drop of the LED and variation in power supply voltage have an effect on selection.

Figure 4: Typical Drive Circuit



R1: Pull up resistor (2700Ω). Required if Vcc - VOH > 800mV.
R2: LED current selection resistor (required) to obtain 5 - 20 mA.
Optional RC network: 1μf capacitor and 180Ω resistor. With this circuit, R2 can increase to 1500Ω.

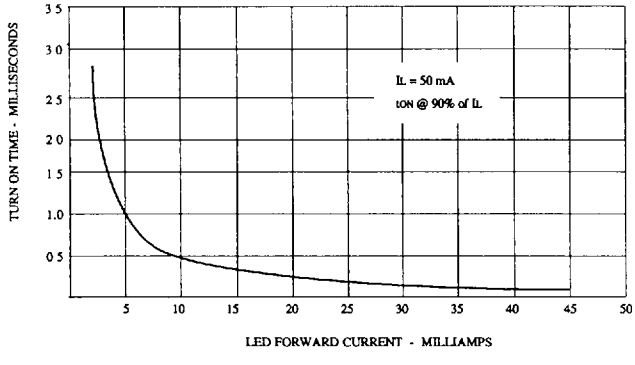


Figure 5: 6203 Operate Time vs. LED Forward Current. Contact COTO WABASH Engineering for data on other models.

Ordering Information

Radial leads for through hole mounting are standard. For surface mount gull wing leads, place a - 1 suffix after the model number.

Model	Description
6201	1 Form A, Low Cost With Current Limit
6202	1 Form A, With Current Limit
6203	1 Form A, No Current Limit
6204	1 Form B, No Current Limit
6205	2 Form A, With Current Limit
6206	Dual Form A, With Current Limit

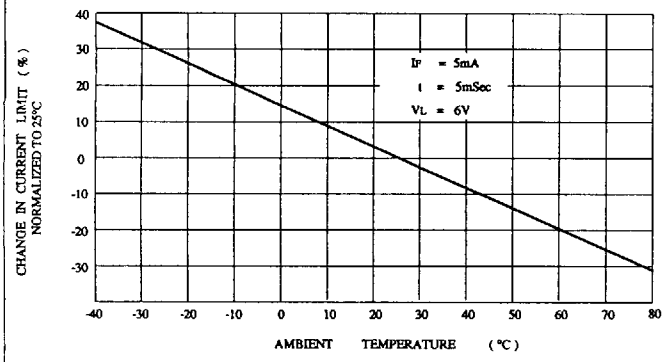


Figure 6: Change in Current Limit
vs.
Ambient Temperature

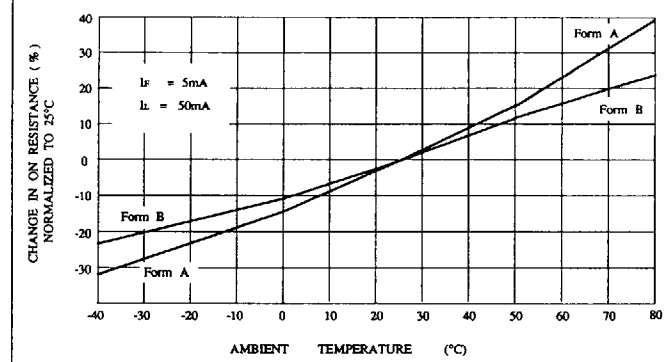


Figure 7: On Resistance
vs
Ambient Temperature

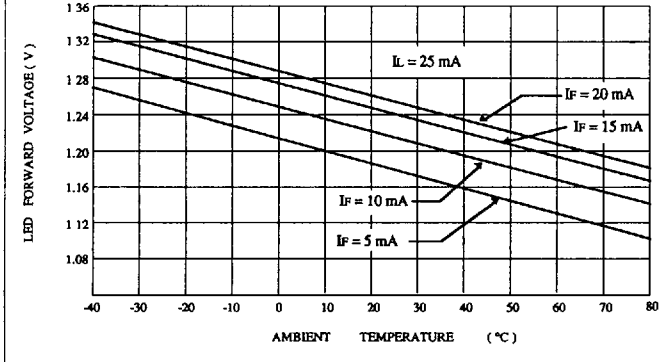


Figure 8: LED Forward Voltage
vs.
Ambient Temperature

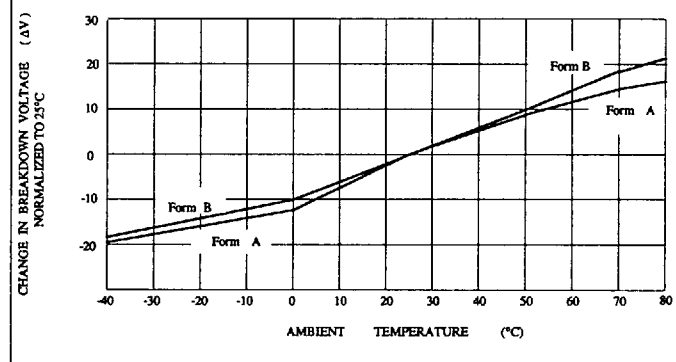


Figure 9: Change in Breakdown Voltage
vs
Ambient Temperature

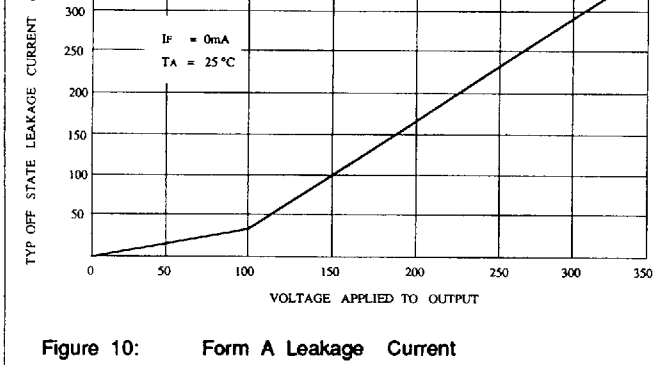


Figure 10: Form A Leakage Current
vs.
Voltage Applied to Output

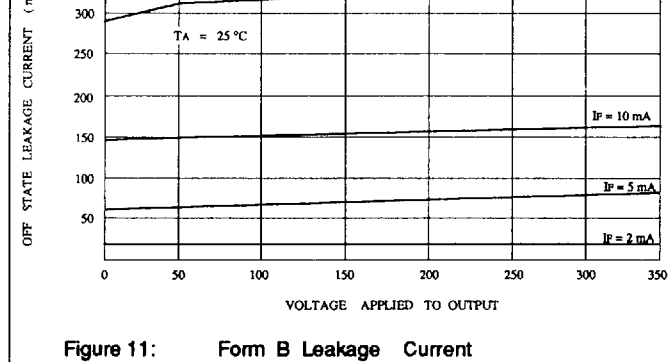


Figure 11: Form B Leakage Current
vs.
Voltage Applied to Output