High-Voltage, High-Current Darlington Transistor Arrays

GENERAL DESCRIPTION

The XR-2001/2002/2003/2004 are high-voltage, high-current Darlington transistor arrays consisting of seven silicon NPN Darlington pairs on a common monolithic substrate. All units feature open collector outputs and integral protection diodes for driving inductive loads. Peak inrush currents of up to 600 mA are allowed, which makes the arrays ideal for driving tungsten filament lamps. The outputs may be paralleled to achieve high load current capability although each driver has a maximum continuous collector current rating of 500 mA. The arrays are directly price competitive with discrete transistor alternatives.

FEATURES

Peak Inrush Current Capability of 600 mA.
Internal Protection Diodes for Driving Inductive Loads
Excellent Noise Immunity
Direct Compatibility with Most Logic Families
Opposing Pin Configuration Eases Circuit Board Layout

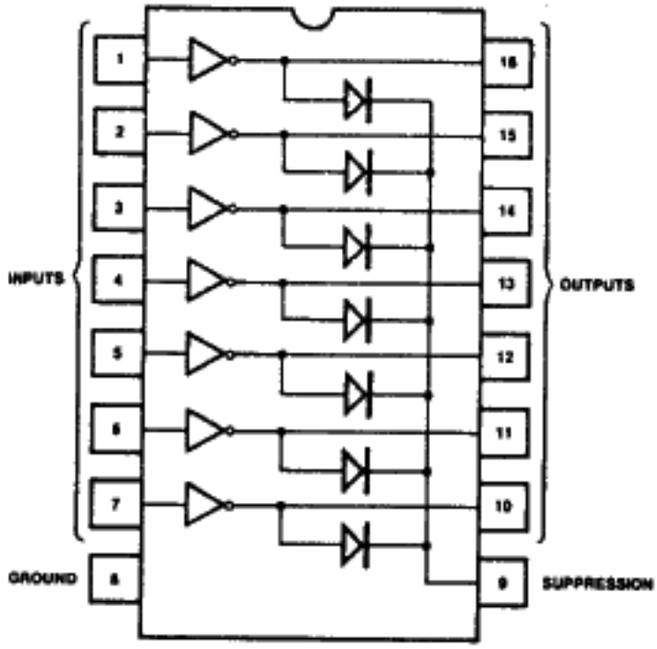
APPLICATIONS

Relay Drivers
High Current Logic Drivers
Solenoid Driver

ABSOLUTE MAXIMUM RATINGS T_A = 25°C

Output Voltage, V_{CE}	50V
Input Voltage, V_{IN}	30V
Continuous Collector Current, I_C (Each Driver)	500mA
Continuous Base Current, I_B (Each Driver)	25mA
Power Dissipation, P_D (Each Driver)	1.0W
(Total Package)	See graph
Derate Above 25°C	16 mW/°C
Storage Temperature Range	−55°C to +150°C

FUNCTIONAL BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Package	Operating Temperature
XR-2001CN	Ceramic	0°C to +70°C
XR-2002CN	Ceramic	0°C to +70°C
XR-2003CN	Ceramic	0°C to +70°C
XR-2004CN	Ceramic	0°C to +70°C

SYSTEM DESCRIPTION

The XR-2001 interfaces with bipolar digital logic (with external current limiting), or with CMOS or PMOS directly.

The XR-2002 was specifically designed to interface with 14V to 25V PMOS devices.

The XR-2003 permits operation directly with CMOS or TTL operating at a supply voltage of 5 volts. Interface requirements beyond the scope of standard logic buffers are easily handled by the XR-2003.

The XR-2004 requires less input current than the XR-2003 and the input voltage is less than that required by the XR-2002. The XR-2004 operates directly from PMOS or CMOS outputs using supply voltages of 6 to 15 volts.

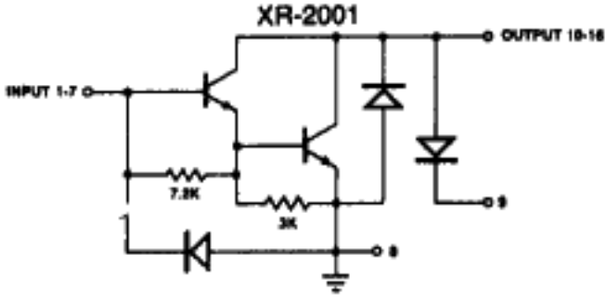
ELECTRICAL CHARACTERISTICS

Test Conditions: T_A 25°C, unless otherwise specified.

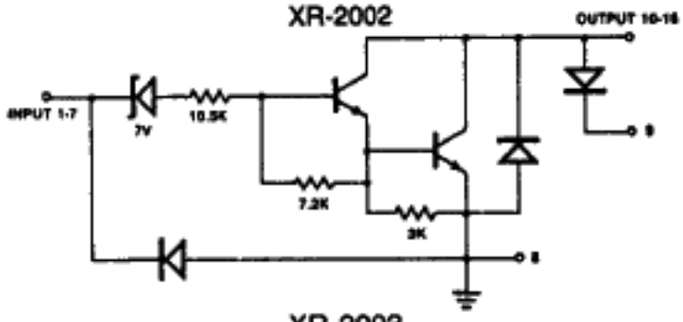
SYMBOL	PARAMETERS	LIMITS MIN	LIMITS TYP	LIMITS MAX	UNITS	CONDITIONS
I_{CEX}	Output Leakage Current					
	XR-2002			100	µA	V_{CE} = 50 V, T_A = 70°C
	XR-2004			500	µA	V_{CE} = 50 V, T_A = 70°C, V_{IN} = 6V
				500	µA	V_{CE} = 50 V, T_A = 70°C, V_{IN} = 1V
V_{CE}	Collector-Emitter Saturation Voltage		1.25	1.6	V	I_C = 350mA, I_B = 500µA
			1.1	1.3	V	I_C = 200mA, I_B = 350µA
			0.9	1.1	V	I_C = 100mA, I_B = 250µA
I_{IN}	Input Current (on)					
	XR-2002		0.85	1.25	mA	V_{IN} = 17V
	XR-2003		0.93	1.35	mA	V_{IN} = 3.85V
	XR-2004		0.35	0.5	mA	V_{IN} = 5V
			1.0	1.45	mA	V_{IN} = 12V
I_{IN}	Input Current (off)	50	65		µA	I_C = 500µA, T_A = 70°C
V_{IN}	Input Voltage					
	XR-2002			13	V	V_{CE} = 2 V, I_C = 300mA
	XR-2003			2.4	V	V_{CE} = 2 V, I_C = 200mA
				2.7	V	V_{CE} = 2 V, I_C = 250mA
				3.0	V	V_{CE} = 2 V, I_C = 300mA
	XR-2004			5.0	V	V_{CE} = 2 V, I_C = 125mA
				6.0	V	V_{CE} = 2 V, I_C = 200mA
				7.0	V	V_{CE} = 2 V, I_C = 275mA
				8.0	V	V_{CE} = 2 V, I_C = 350mA
h_{FE}	D-C Forward Current Transfer Ratio					
	XR-2001	1000				V_{CE} = 2 V, I_C = 350mA
C_{IN}	Input Capacitance		15	30	pF	
I_R	Clamp Diode Leakage Current			50	µA	V_R = 50V
V_F	Clamp Diode Forward Voltage		1.7	2.0	V	I_F = 350mA
t_{PLH}	Turn-On Delay		0.25	1.0	µS	0.5 E_{IN} to 0.5 E_{OUT}
t_{PHL}	Turn-Off Delay		0.25	1.0	µS	0.5 E_{IN} to 0.5 E_{OUT}

SCHEMATIC DIAGRAMS (One of 7 Identical Drivers is shown for each device.)

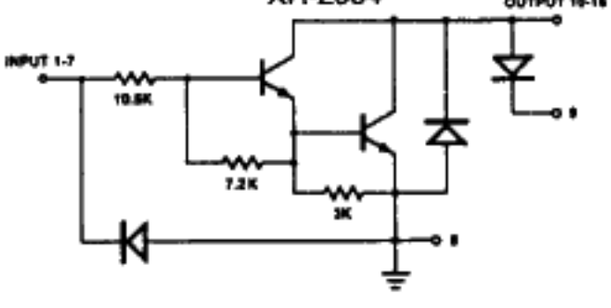
XR-2001



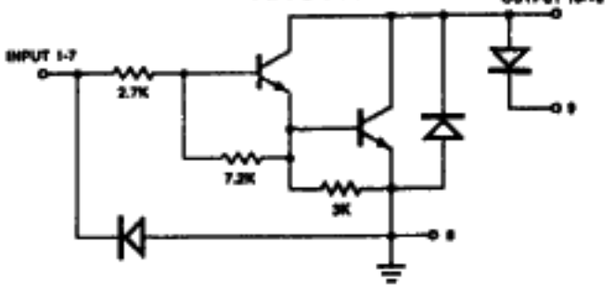
XR-2002



XR-2004

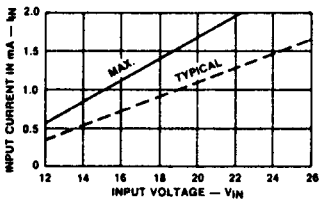


XR-2003

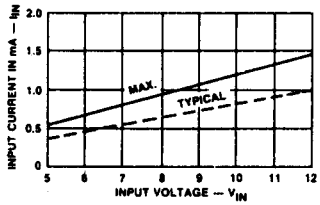


CHARACTERISTIC CURVES

(a) XR-2002



(b) XR-2004



(c) XR-2003

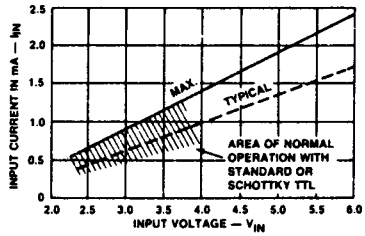


Figure 1. Input Current as a Function of Input Voltages

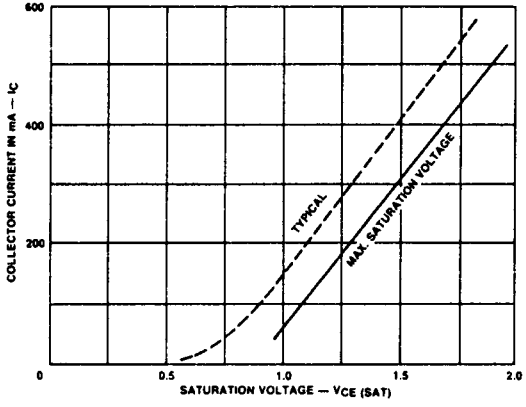


Figure 2. Collector Current as a Function of Saturation Voltage.

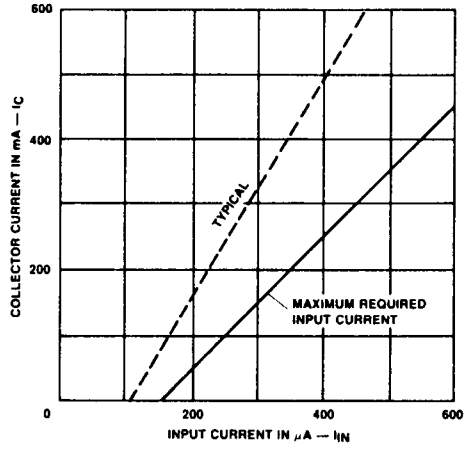


Figure 3. Collector Current as a Function of Input Current

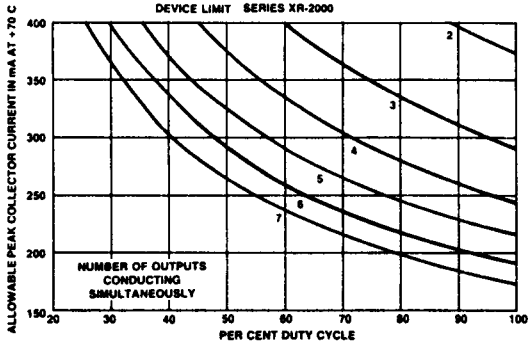


Figure 4. Peak Collector Current as a Function of Duty Cycle and Number of Outputs

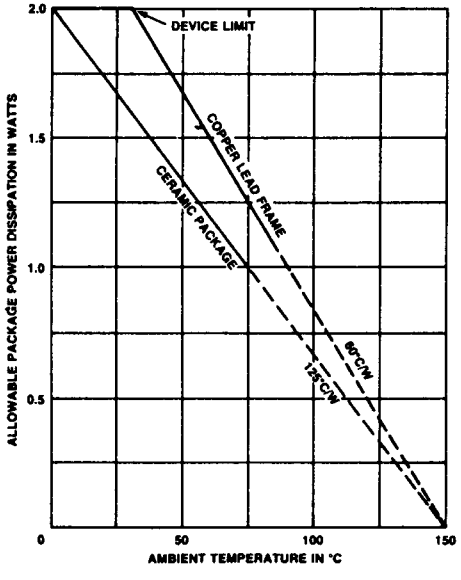


Figure 5. Allowable Average Power Dissipation as a Function of Ambient Temperature

TYPICAL APPLICATIONS

XR-2002

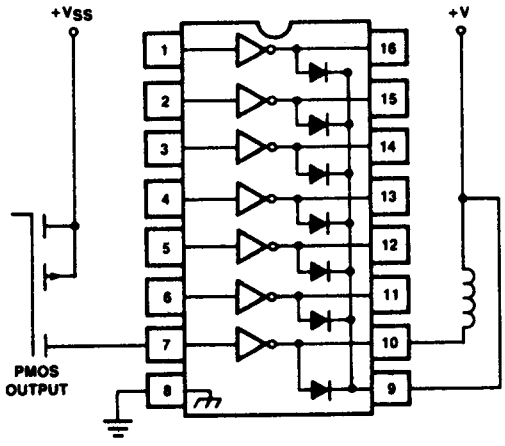


Figure 6. PMOS to Load

XR-2003

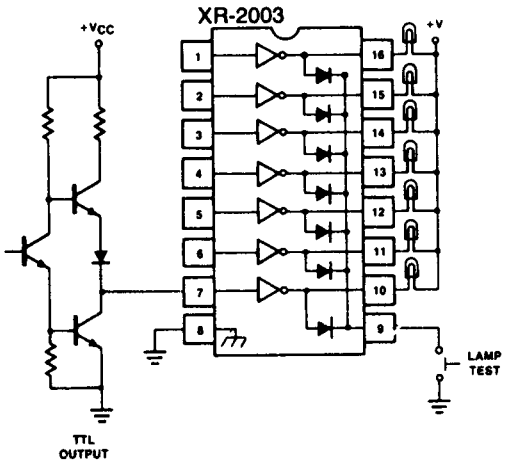


Figure 7. TTL to Load

XR-2004

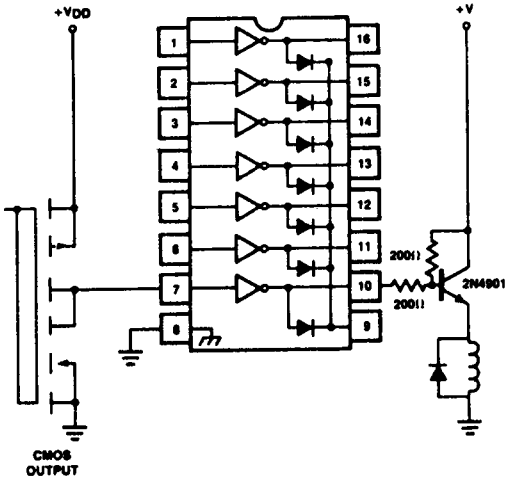


Figure 8. Buffer for Higher Current Loads

XR-2003

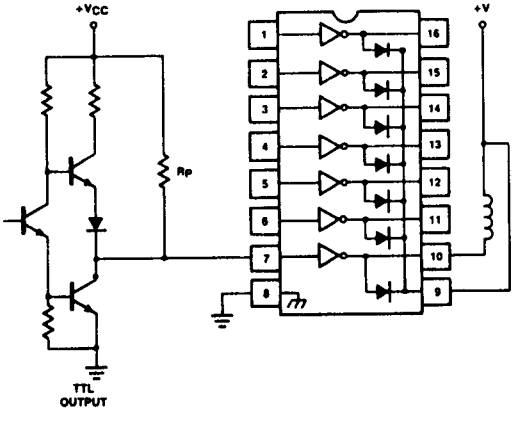


Figure 9. Use of Pull-up Resistors to Increase Drive Current

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EXAR

XR-1488/1489A

Quad Line Driver/Receiver

GENERAL DESCRIPTION

The XR-1488 is a monolithic quad line driver designed to interface data terminal equipment with data communications equipment in conformance with the specifications of EIA Standard No. RS232C. This extremely versatile integrated circuit can be used to perform a wide range of applications. Features such as output current limiting, independent positive and negative power supply driving elements, and compatibility with all DTL and TTL logic families greatly enhance the versatility of the circuit.

The XR-1489A is a monolithic quad line receiver designed to interface data terminal equipment with data communications equipment. the XR-1489A quad receiver along with its companion circuit, the XR-1488 quad driver, provide a complete interface system between DTL or TTL logic levels and the RS232C defined voltage and impedance levels.

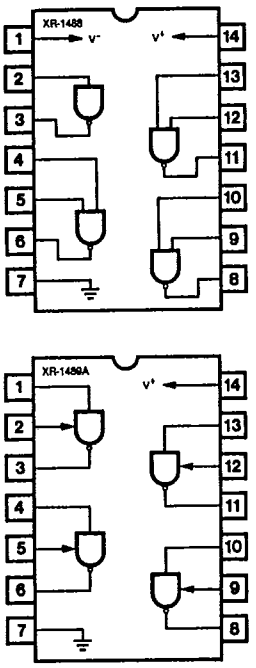
ABSOLUTE MAXIMUM RATINGS

Power Supply	
XR-1488	±15 Vdc
XR-1489A	+10 Vdc
Power Dissipation	
Ceramic Package	1000 mW
Derate above +25°C	6.7 mW/°C
Plastic Package	650 mW/°C
Derate above +25°C	5 mW/°C

ORDERING INFORMATION

Part Number	Package	Operating Temperature
XR-1488N	Ceramic	0°C to +70°C
XR-1488P	Plastic	0°C to +70°C
XR-1489AN	Ceramic	0°C to +70°C
XR-1489AP	Plastic	0°C to +70°C

FUNCTIONAL BLOCK DIAGRAMS



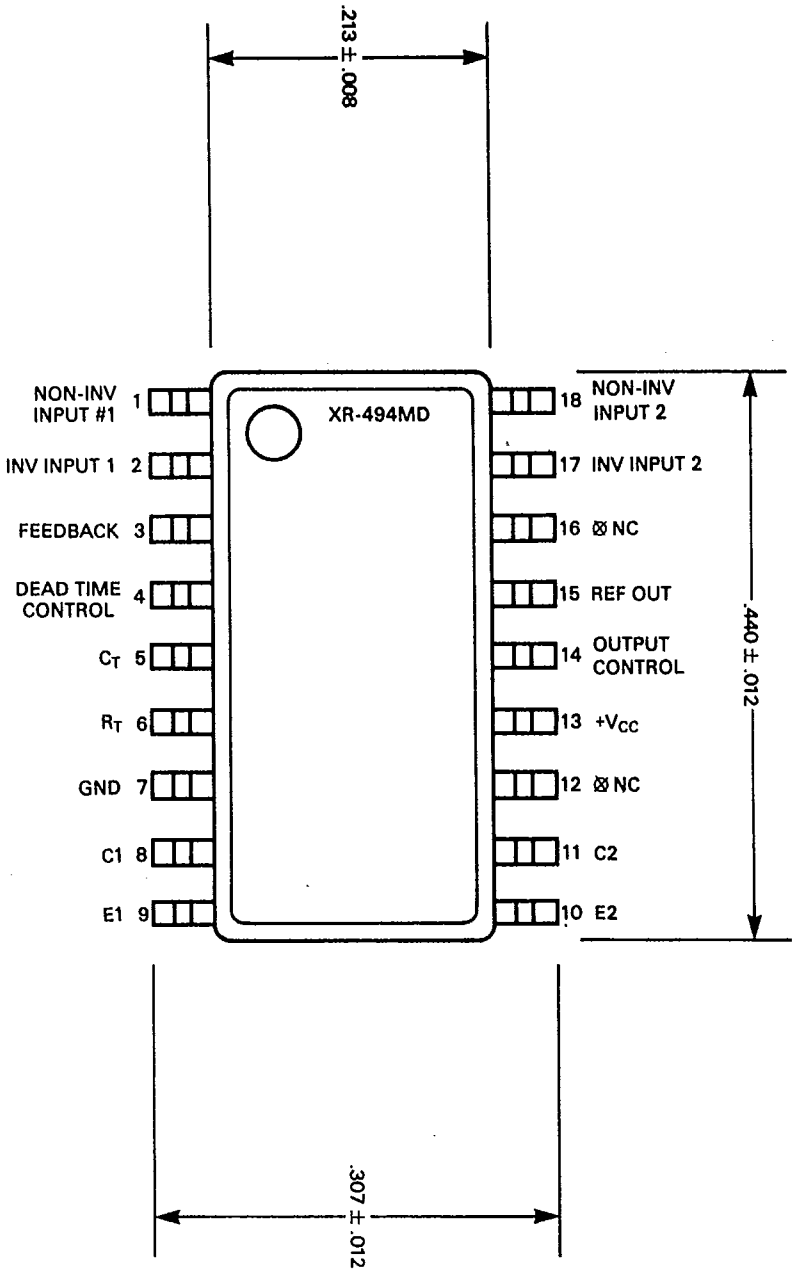
SYSTEM DESCRIPTION

The XR-1488 and XR-1489A are a matched set of quad line drivers and line receivers designed for interfacing between TTL/DTL and RS232C data communication lines.

The XR-1488 contains four independent split supply line drivers, each with a ±10 mA current limited output. For RS232C applications, the slew rate can be reduced to the 30 V/μS limit by shunting the output to ground with a 410 pF capacitor. The XR-1489A contains four independent line receivers, designed for interfacing RS232C to TTL/DTL. Each receiver features independently programmable switching thresholds with hysteresis, and input protection to ±30 V. The output can typically source 3 mA and sink 20 mA.

XR-494

T-58-11-31



EXAR

XR-1468/1568

Dual-Polarity Tracking Voltage Regulator

GENERAL DESCRIPTION

The XR-1468/1568 is a dual polarity tracking voltage regulator, internally trimmed for symmetrical positive and negative 15V outputs. Current output capability is 100 mA, and may be increased by adding external pass transistors. The device is intended for local "on-card" regulation, which eliminates the distribution problems associated with single point regulation.

The XR-1468CN and XR-1568N are guaranteed over the 0°C to 70°C commercial temperature range. The XR-1568M is rated over the full military temperature range of −55°C to +125°C.

FEATURES

Internally Set for ±15V Outputs
±100 mA Peak Output Current
Output Voltages Balanced Within 1% (XR-1568)
0.06% Line and Load Regulation
Low Stand-By Current
Output Externally Adjustable from ±8 to ±20 Volts
Externally Adjustable Current Limiting
Remote Sensing

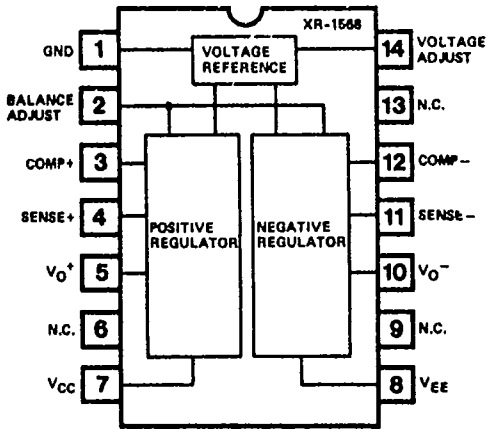
APPLICATIONS

Main Regulation in Small Instruments
On-Card Regulation in Analog and Digital Systems
Point-of-Load Precision Regulation

ABSOLUTE MAXIMUM RATINGS

Power Supply	±30 Volts
Minimum Short-Circuit Resistance	4.0 Ohms
Load Current, Peak	±100 mA
Power Dissipation	
Ceramic (N) Package	1.0 Watt
Derate Above +25°C	6.7 mW/°C
Operating Temperature	
XR-1568M	−55°C to +125°C
XR-1568/XR-1468C	0°C to +70°C
Storage Temperature	−65°C to +150°C

FUNCTIONAL BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Temperature	Output Offset	Package
XR-1568M	−55°C to +125°C	±150 mV max	Ceramic
XR-1568N	0°C to +70°C	±150 mV max	Ceramic
XR-1468CN	0°C to +70°C	±300 mV max	Ceramic

SYSTEM DESCRIPTION

The XR-1468/1568 is a dual polarity tracking voltage regulator combining two separate regulators with a common reference element in a single monolithic circuit, thus providing a very close balance between the positive and negative output voltages. Outputs are internally set to ±15 Volts but can be externally adjusted between ±8.0 to ±20 Volts with a single control. The circuit features ±100 mA output current, with externally adjustable current limiting, and provision for remote voltage sensing.

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