MAXIMUM RATINGS*

Rating	Symbol	Value	Unit
Input Voltage Range (V_{in} to GND)	V_{in}	−0.3 to 6.0	V
Output Voltage Range (V_{out} to GND)	V_{out}	−6.0 to 0.3	V
Output Current (Note 1)	I_{out}	100	mA
Output Short Circuit Duration (V_{out} to GND, Note 1)	t_{SC}	Indefinite	sec
Operating Junction Temperature	T_J	150	°C
Power Dissipation and Thermal Characteristics Thermal Resistance, Junction to Air Maximum Power Dissipation @ T_A = 70°C	 $R_{\theta JA}$ P_D	 256 313	 °C/W mW
Storage Temperature	T_{stg}	−55 to 150	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

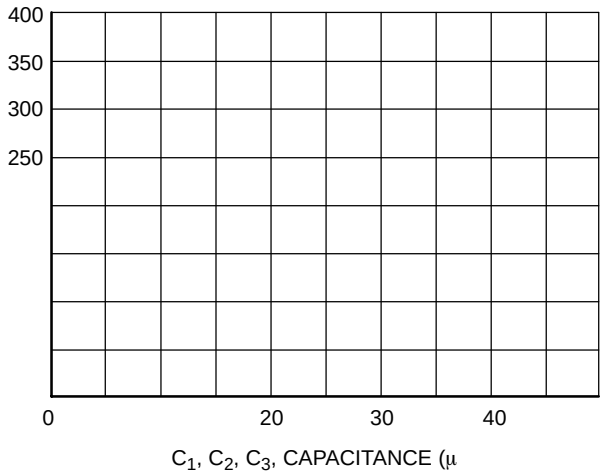
*ESD Ratings

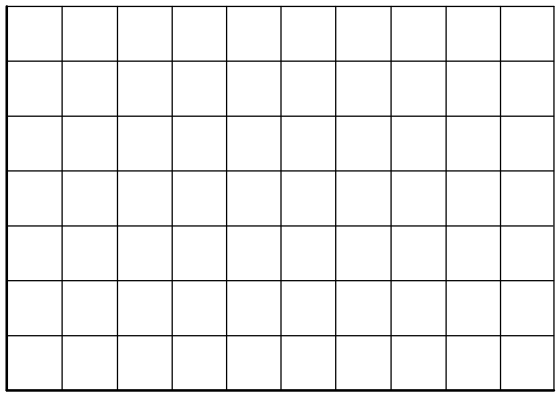
ESD Machine Model Protection up to 200 V, Class B

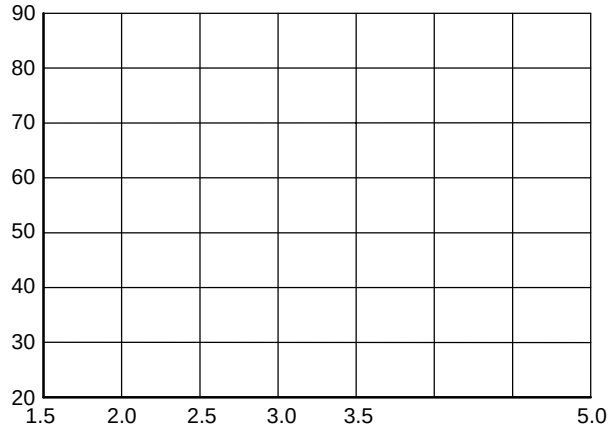
ESD Human Body Model Protection up to 2000 V, Class 2

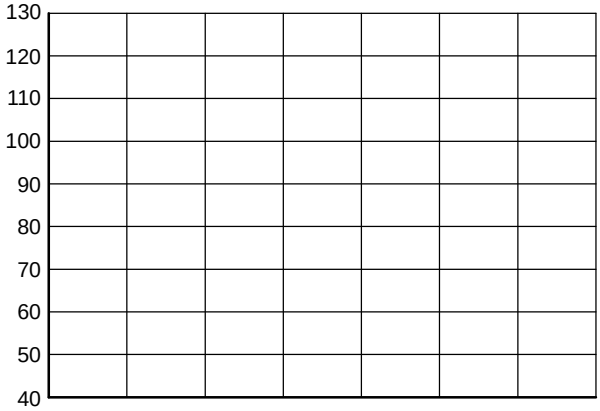
ELECTRICAL CHARACTERISTICS (V_{in} = 5.0 V for MAX828 $C_1 = C_2$ = 10 μF, for MAX829 $C_1 = C_2$ = 3.3 μF, T_A = −40°C to 85°C, typical values shown are for T_A = 25°C unless otherwise noted. See Figure 20 for test setup.)

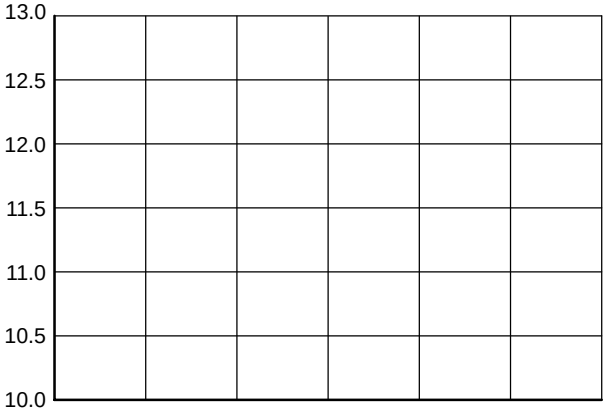
Characteristic	Symbol	Min	Typ	Max	Unit
Operating Supply Voltage Range (R_L = 10 k)	V_{in}	1.5 to 5.5	1.15 to 6.0	−	V
Supply Current Device Operating (R_L = ∞) T_A = 25°C MAX828 MAX829 T_A = 85°C MAX828 MAX829	I_{in}	 − − − −	 68 118 73 128	 90 200 100 200	μA
Oscillator Frequency T_A = 25°C MAX828 MAX829 T_A = −40°C to 85°C MAX828 MAX829	$f_{6.6\ 364.08\ 5.96\ -1.24o\ 85}$				

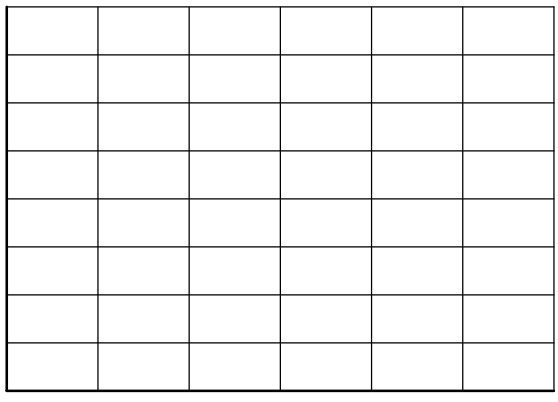

400
350
300
250
0
20
30
40
C1, C2, C3, CAPACITANCE (μ




90
80
70
60
50
40
30
20
1.5
2.0
2.5
3.0
3.5
5.0


130
120
110
100
90
80
70
60
50
40


13.0
12.5
12.0
11.5
11.0
10.5
10.0



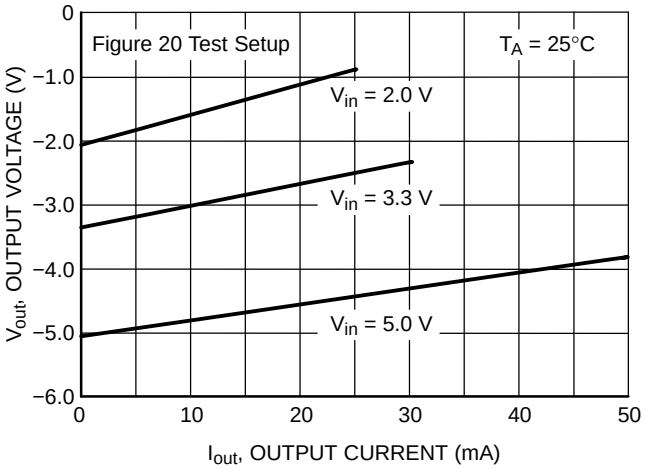


Figure 14. Output Voltage vs. Output Current MAX828

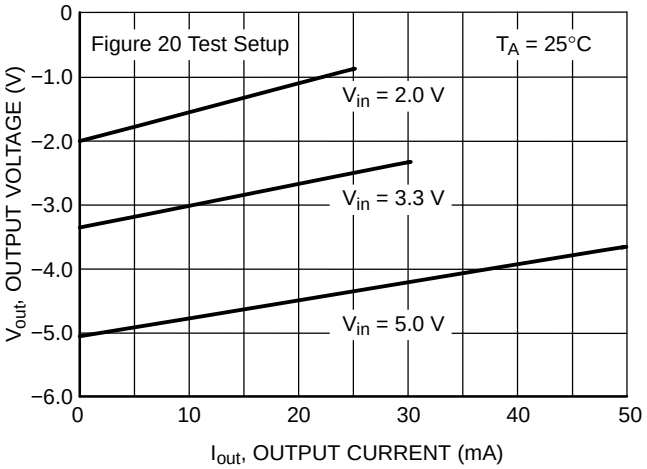


Figure 15. Output Voltage vs. Output Current MAX829

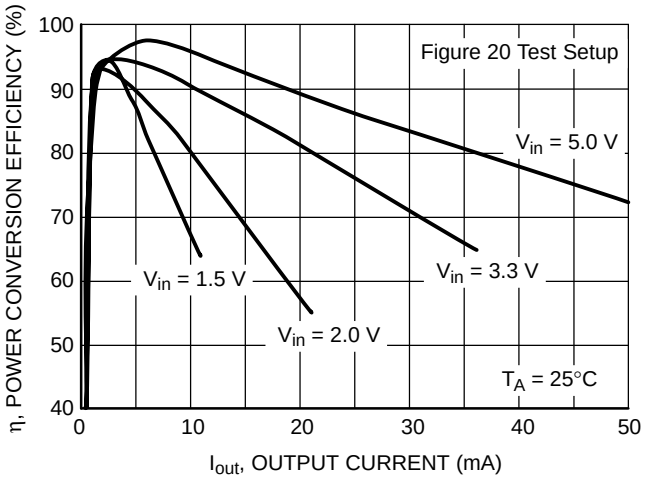


Figure 16. Power Conversion Efficiency vs. Output Current MAX828

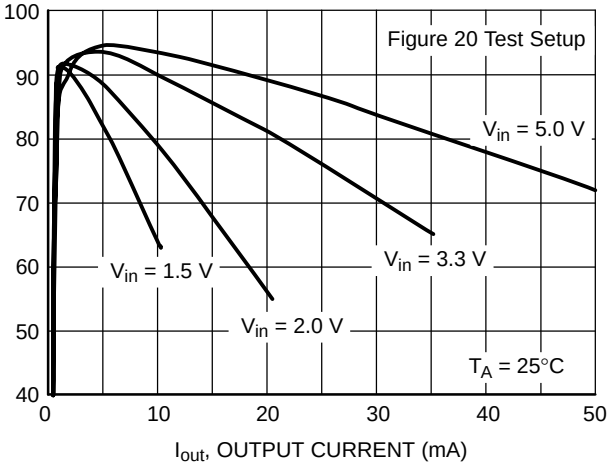


Figure 17. Power Conversion Efficiency vs. Output Current MAX829

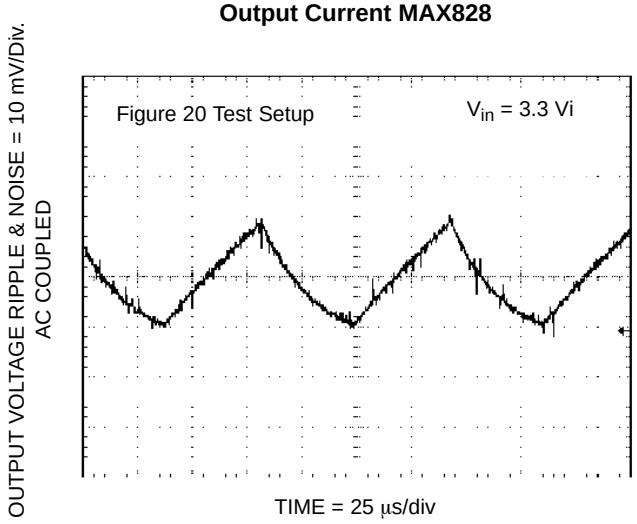


Figure 18. Output Voltage Ripple and Noise MAX828

TIME = 10 μs/div

Figure 19. Output Voltage Ripple and Noise MAX829

MAX828: $C_1 = C_2 = C_3 = 10\ \mu F$
MAX829: $C_1 = C_2 = C_3$

Capacitor Selection

In order to maintain the lowest output resistance and output ripple voltage, it is recommended that low ESR capacitors be used. Additionally, larger values of C_1 will lower the output resistance and larger values of C_2 will reduce output voltage ripple. (See Equation 3).

Table 1 shows various values of C_1, C_2 and C_3 with the corresponding output resistance values at 25°C. Table 2 shows the output voltage ripple for various values of C_1, C_2 and C_3. The data in Tables 1 and 2 was measured not calculated.

Table 1. Output Resistance vs. Capacitance ($C_1 = C_2 = C_3$), V

The MAX828 / 829 primary function is a voltage inverter. The device will convert 5.0 V into −5.0 V with light loads. Two capacitors are required for the inverter to function. A third capacitor, the input bypass capacitor, may be required depending on the power source for the inverter. The performance for this device is illustrated below.

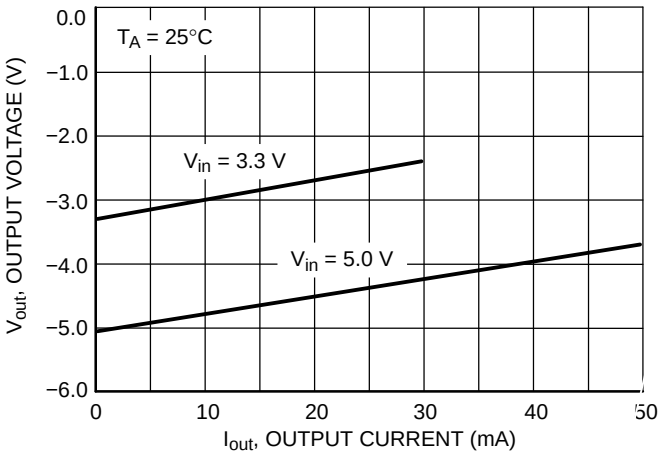


Figure 25. Voltage Inverter Load Regulation Output Voltage vs. Output Current MAX828

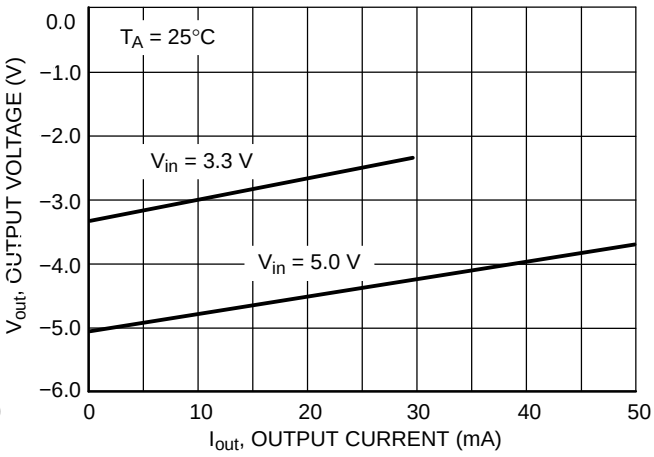
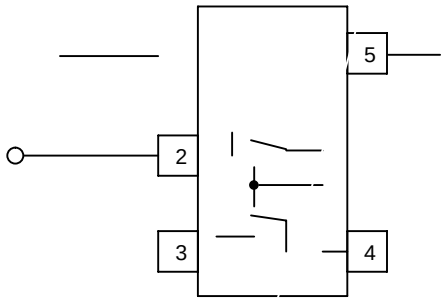


Figure 26. Voltage Inverter Load Regulation Output Voltage vs. Output Current MAX829



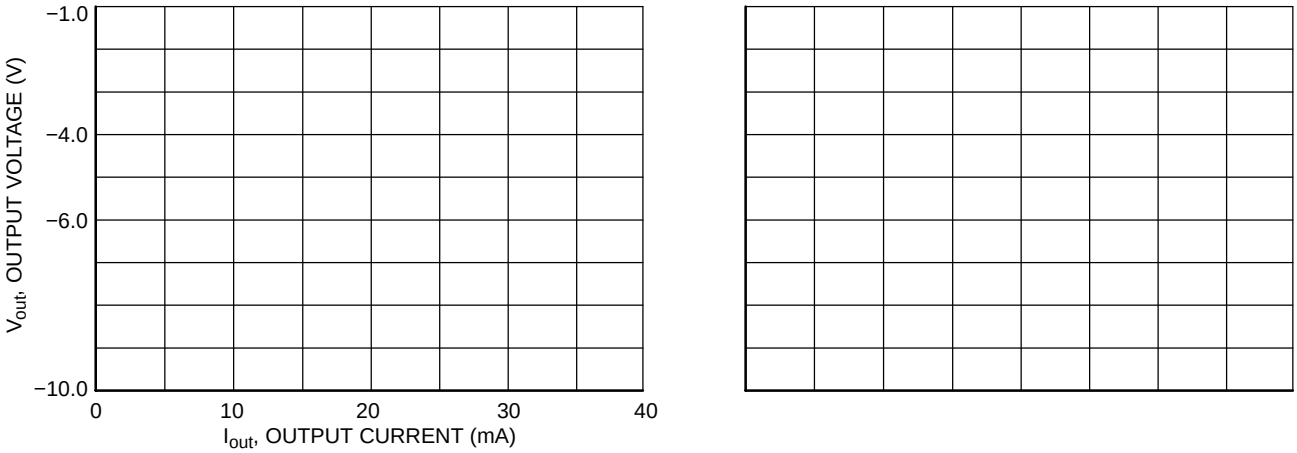
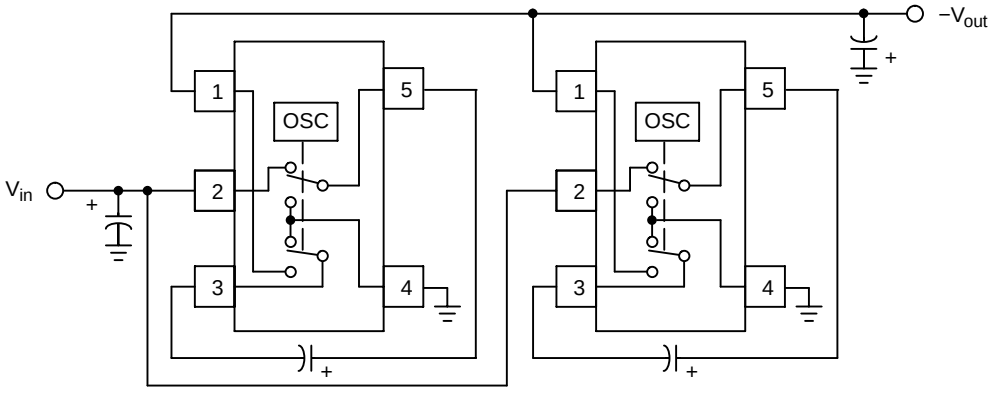


Figure 28. Cascade Load Regulation,

Curve	V_{in} (V)	Diodes
A	3.0	1N4148
B	3.0	MBRA120E

Curve	V_{in} (V)	Diodes	MAX828 R_{out}
A	3.0	1N4148	32.5
B	3.0	MBRA120E	27.1

Curve	V_{in} (V)	Diodes	MAX828 R_{out} (Ω)	MAX829 R_{out} (Ω)
A	3.0	1N4148	110	111
B	3.0	MBRA120E	96.5	96.7
C	5.0	1N4148	84.5	87.3
D	5.0	MBRA120E	78.2	77.1



MAX828 Capacitors = 10 μF
MAX829 Capacitors = 3.3 μF

Figure 42. Paralleling Devices for Increased Negative Output Current

An increase in converter output current capability with a reduction in output resistance can be obtained by paralleling two or more devices. The output current capability is approximately equal to the number of devices paralleled. A single shared output capacitor is sufficient for proper operation but each device does require it's own pump capacitor. Note that the output ripple frequency will be complex since the oscillators are not synchronized. The output resistance is approximately equal to the output resistance of one device divided by the total number of devices paralleled. The performance characteristics for a converter consisting of two paralleled devices is shown below.

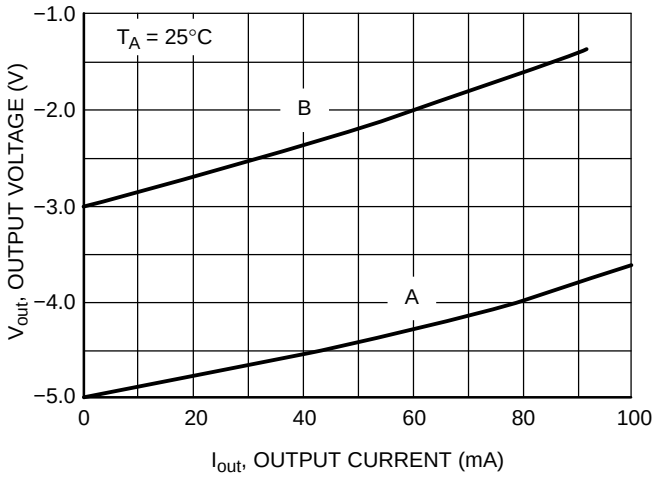


Figure 43. Parallel Load Regulation, Output Voltage vs. Output Current MAX828

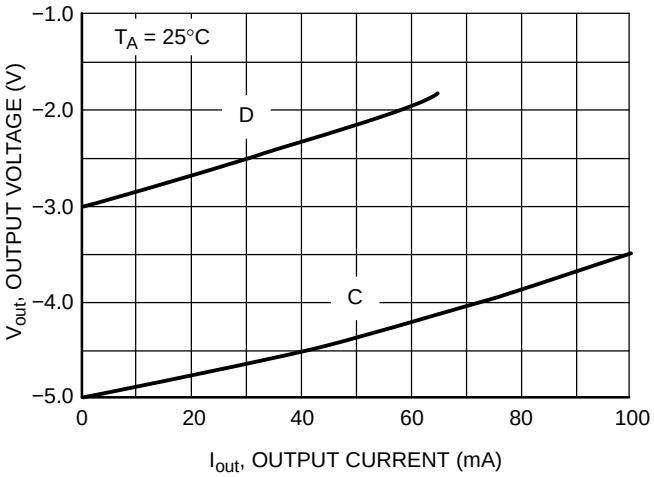


Figure 44. Parallel Load Regulation, Output Voltage vs. Output Current MAX829

Curve	V_{in} (V)	R_{out} (Ω)
A	5.0	13.3
B	3.0	17.3
C	5.0	14.4
D	3.0	17.3

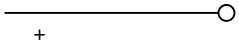


Figure 48. Positive Output Voltage Doubler with High Current Capability

All of the previously shown converter circuits ha outputs. Applications requiring multiple outputs can be constructed by incorporating combinations of the form converter shown above combines Figures 24 and 36 to form a negative output inverter with a positive output d ent combinations of load regulation are shown below. In Figures 52 and 53 the positive doubler has a constant I while the negative inverter has the variable load. In Figures 54 and 55 the negative inverter has the constant I_{out} = 15 he positive doubler has the variable load.

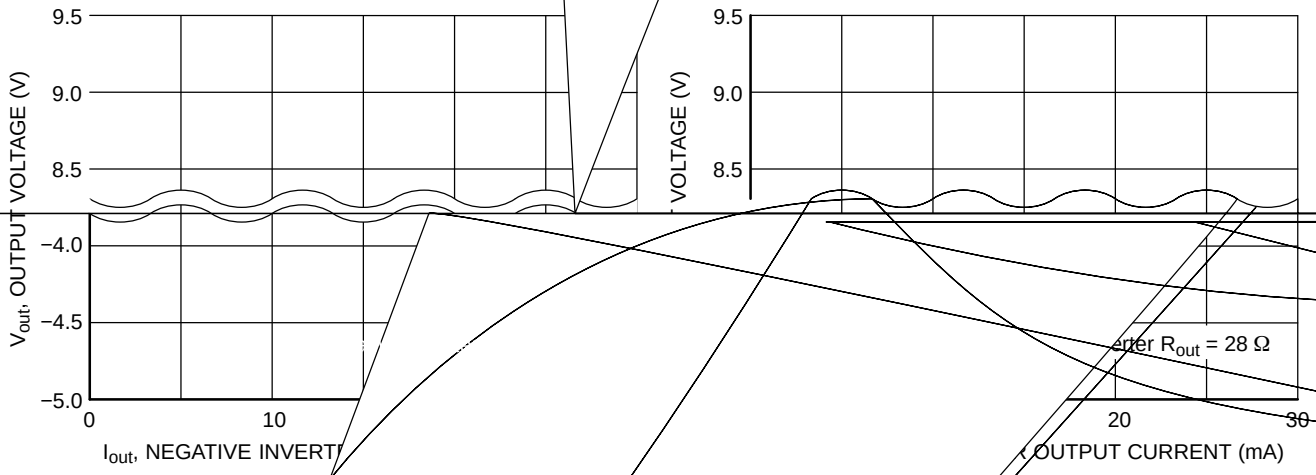
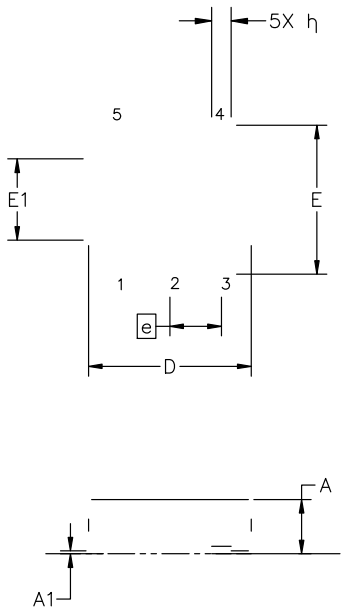


Figure 52. Negative Output Voltage vs

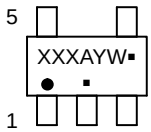
Inverter Load Regulation, vs. Output Current, MAX829

TSOP−5 3.00x1.50x0.95, 0.95P
CASE 483
ISSUE P

DATE 01 APR 2024



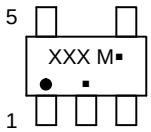
GENERIC
MARKING DIAGRAM*



Analog

XXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)



Discrete/Logic

XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

OUR Pb−FREE
STRATEGY AND SOLDERING DETAILS, PLAN

FORMATION ON