TECHNICAL DATA

8847
8847A

HIGH-MU PLANAR TRIODES

The 8847 and 8847A are miniature, ceramic/metal, rugged planar triodes for advanced airborne and space applications up to 3.5 GHz.

The 8847A is identical to the 8847 in all respects except that the required heater power is reduced by 25%. The tube should be used where input power consumption and heat dissipation are of major concern.

Either tube may be used as an amplifier, oscillator, or frequency multiplier in the CW, grid- or plate-pulsed mode, as well as a modulator or regulator tube. In addition to low interelectrode capacitances, high transconductance and amplification factor, the 8847 and 8847A have an anode designed to enhance frequency stability and an arc-resistant cathode, both assuring stable, reliable and long-life operation under adverse conditions.

The 8847 and 8847A are supplied without radiator and may be conduction, convection, heat sink, or liquid cooled. Radiators for forced-air cooling permitting an anode dissipation up to 150 watts, can be furnished on separate order.

GENERAL CHARACTERISTICS[1]

ELECTRICAL

Cathode: Oxide Coated, Unipotential	
Heater: Voltage	6.3 ± 0.3 V
8847 Current, at 6.3 volts	1.30 A
8847A Current, at 6.0 volts	0.95 A
Transconductance (Average):	
I_b = 160 mA (200 mA/cm²)	38 mmhos
Amplification Factor (Average):	75
Direct Interelectrode Capacitances (Grounded Cathode)[2]	
Grid-Cathode	9.5 pF
Plate-Cathode	0.06 pF
Grid-Plate	1.40 pF
Cut-off Bias [3]	-30 V max.

1. Characteristics and operating values are based upon performance tests. These figures may change without notice as the result of additional data or product refinement. EIMAC Division of Varian should be consulted before using this information for final equipment.

2. Capacitance values for a cold tube as measured in a special shielded fixture. When the cathode is heated to the proper temperature, the grid-cathode capacitance will increase from the cold value by approximately 1 pF due to thermal expansion of the cathode.

3. Measured with one milliampere plate current and a plate voltage of 1 kVdc.

(Effective 6-1-70) Printed in U.S.A.

MECHANICAL

Maximum Overall Dimensions:

Length	1.370 in; 34.75 mm
Diameter	0.785 in; 19.94 mm
Net Weight	0.56 oz; 16.0 gm
Operating Position	Any

Maximum Operating Temperature:

Ceramic/Metal Seals	250°C
Anode Core	250°C
Cooling	Conduction, convection, forced-air[1] or liquid
Terminals	Coaxial, special

ENVIRONMENTAL

Shock, 11 ms, non-operating	60 G
Vibration, operating, all axes 55 to 500 Hz	10 G
Altitude, max (in suitable designed circuit)	70,000 ft.

CW RF POWER AMPLIFIER OR OSCILLATOR

MAXIMUM RATINGS/ABSOLUTE VALUES

DC PLATE VOLTAGE	2500	VOLTS
DC GRID VOLTAGE	-150	VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE		
Grid negative to cathode	-400	VOLTS
Grid positive to cathode	30	VOLTS
DC PLATE CURRENT	250	MILLIAMPERES
DC GRID CURRENT	45	MILLIAMPERES
PLATE DISSIPATION[1]	150	WATTS
GRID DISSIPATION	1.5	WATTS
FREQUENCY	3.0	GIGAHERTZ

GRID PULSED OR PLATE PULSED AMPLIFIER OR OSCILLATOR

MAXIMUM RATINGS/ABSOLUTE VALUES

DC PLATE VOLTAGE(GRID PULSED)	3000	VOLTS
PEAK PULSE PLATE VOLTAGE (PLATE PULSED)	3500	VOLTS
DC GRID VOLTAGE	-150	VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE		
Grid negative to cathode	-700	VOLTS
Grid positive to cathode	175	VOLTS
PULSE PLATE CURRENT	5.0	AMPERES
PUSLE GRID CURRENT	2.5	AMPERES
PLATE DISSIPATION[1]	150	WATTS
GRID DISSIPATION	1.5	WATTS
FREQUENCY	3.5	GIGAHERTZ
PULSE DURATION[2]	6	μsec
DUTY FACTOR[2]	.0033	

1. Using one of the EIMAC radiators shown on the cooling curves.

2. For application requiring longer pulse duration and/or higher duty cycle consult the nearest Varian Electron Tube and Devices Field Office, or the Product Manager, Eimac-Division of Varian, Salt Lake City, Utah.

REPRESENTATIVE OPERATION

Grid-Pulsed rf Power Oscillator (1.6 GHz)

DC Plate Voltage	3000	Vdc
Peak Plate Current	3.0	a
DC Grid Voltage (Approx.)	-90	V
Peak Grid Current	1.0	a
Filament Voltage	6.3	V
Useful Power Output (Approx.)	3000	w
Bandwidth (1db)	40	MHz
Plate Efficiency	33%	

PULSE MODULATOR OR PULSE AMPLIFIER SERVICE

MAXIMUM RATINGS/ABSOLUTE VALUES

DC PLATE VOLTAGE	3500	VOLTS
PEAK PLATE VOLTAGE	4000	VOLTS
DC GRID VOLTAGE	-150	VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE		
Grid negative to cathode	-750	VOLTS
Grid positive to cathode	150	VOLTS
PULSE CATHODE CURRENT	7.5	AMPERES
DC PLATE CURRENT	150	MILLIAMPERES
PLATE DISSIPATION[1]	150	WATTS
GRID DISSIPATION	1.5	WATTS
PULSE DURATION	6	μs
DUTY FACTOR	.0033	
CUT-OFF MU	60	

1. Using one of the EIMAC radiators shown on the cooling curves.
2. For application requiring longer pulse duration and/or higher duty cycle consult the nearest Varian Electron Tube and Device Field Office, or the Product Manager Eimac-Division of Varian, Salt Lake City, Utah.

RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	Max.	
Heater current at 6.3 volts (8847)	1.20	1.40	A
Heater current at 6.0 volts (8847A)	0.85	1.05	A
Cathode Heating Time	60	---	sec.
Interelectrode Capacitances[1] (grounded cathode connection)			
Grid-Cathode	8.5	10.5	pF
Plate-Cathode	---	0.06	pF
Grid-Plate	1.2	1.6	pF

1. Capacitance values for a cold tube as measured in a special shielded fixture. When the cathode is heated to the proper temperature, the grid-cathode capacitance will increase from the cold value by approximately 1 pF due to thermal expansion of the cathode.

APPLICATION

COOLING - The 8847 and 8847A can be cooled by conduction, convection, forced-air or liquid cooling. The tubes are designed to permit high-temperature operation up to the limit indicated. However, if long life is the prime objective, tube terminal and seal temperatures should be kept well below 250°C. If forced-air cooling is provided, auxiliary air flow, apart from the air flowing through the radiator, should be provided to cool the tube envelope and other tube terminals. Some conduction cooling is always provided through the contact terminals. However, these terminals usually exhibit poor heat transfer, often having a temperature gradient across them as high as 50°C. Cooling curves are given for the three radiators which are suitable for use with the 8847 and 8847A.

For further details on cooling or other aspects of tube operation, refer to the "Application Notes for Planar Triodes" bulletin which can be obtained on request.

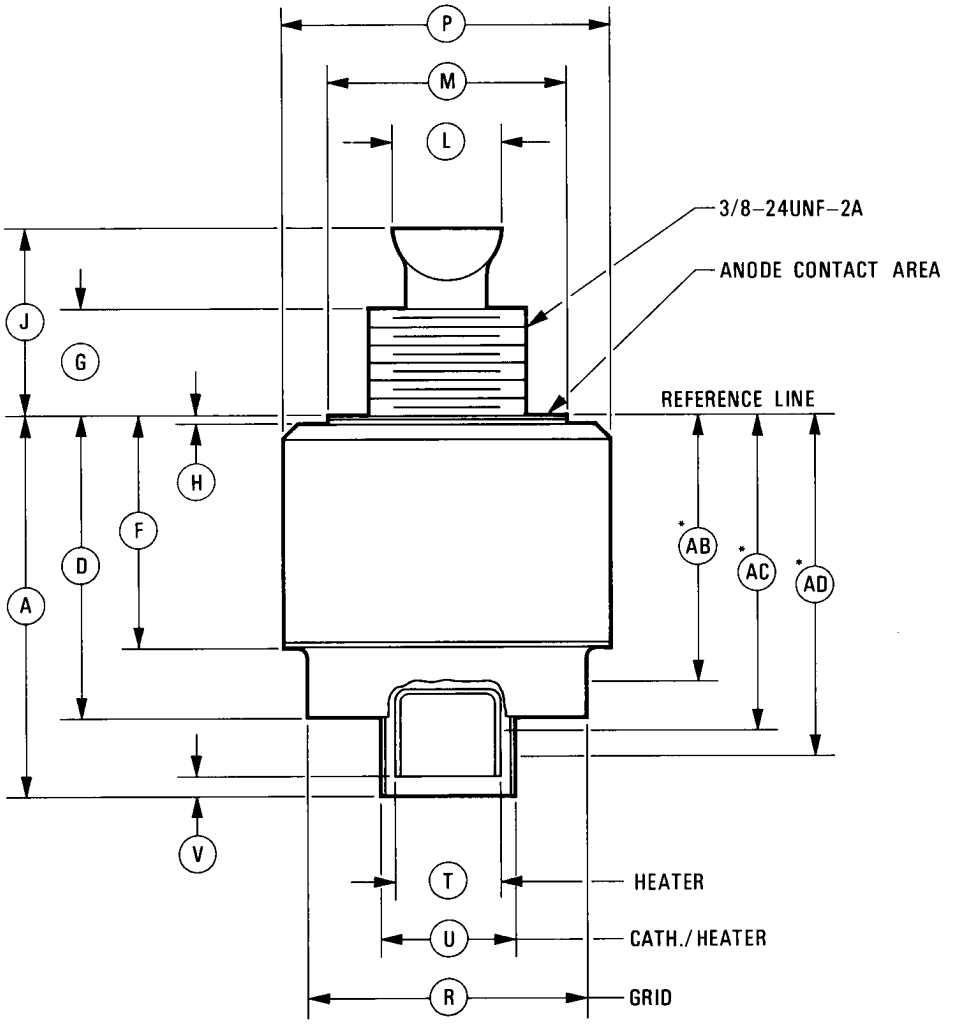
DIMENSIONAL DATA

DIM.	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	--	1.020	--	--	25.91	--
D	0.740	0.800	--	18.80	20.32	--
F	--	0.570	--	--	14.48	--
G	0.150	0.170	--	3.81	4.32	--
H	--	0.040	--	--	1.02	--
J	--	0.350	--	--	8.90	--
L	--	0.260	--	--	6.60	--
M	0.545	0.570	--	13.84	14.48	--
P	0.775	0.785	--	19.69	19.94	--
R	0.650	0.670	--	16.51	17.02	--
T	0.210	0.225	--	5.33	5.72	--
U	0.310	0.330	--	7.87	8.38	--
V	--	0.040	--	--	1.07	--
AB	0.590	0.740	--	14.99	18.80	--
AC	0.760	0.885	--	19.30	22.48	--
AD	0.800	0.975	--	20.32	24.77	--

NOTES:
1. REF. DIMENSIONS ARE FOR INFO. ONLY & ARE NOT REQUIRED FOR INSPECTION PURPOSES.

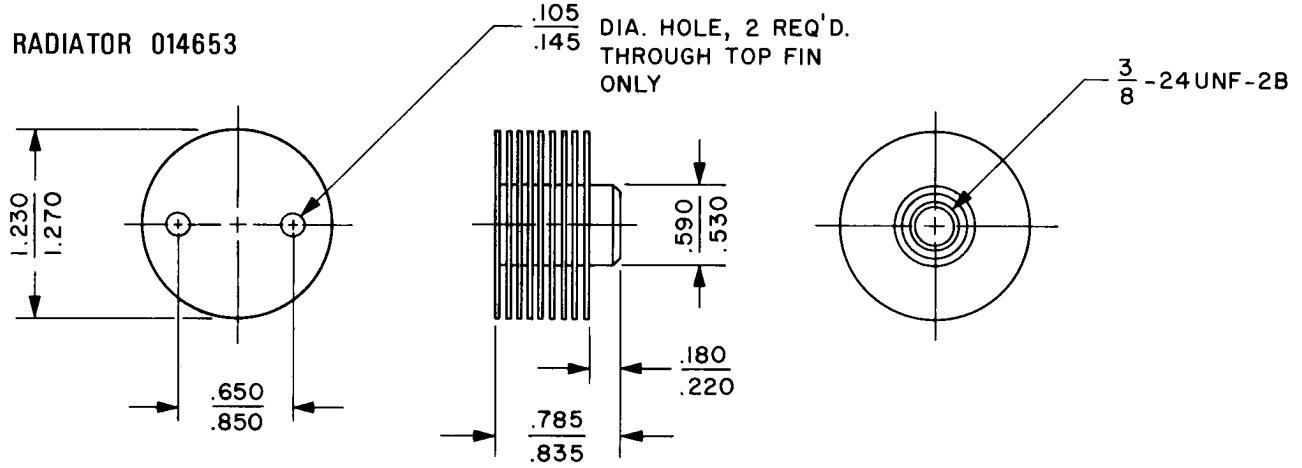
NOTES:

1. ANODE FLANGE IS ELECTRICAL CONTACT. STUD IS FOR HEAT TRANSFER.
2. (*) DISTANCE FROM REFERENCE SURFACE TO THE CENTER OF CONTACT AREA.
3. METRIC EQUIVALENTS ARE TO THE NEAREST .01 mm, ARE GIVEN FOR GENERAL INFORMATION ONLY, AND ARE BASED ON 1 INCH = 25.4 mm.
4. CONCENTRICITY BETWEEN GRID TERMINAL AND CATHODE/HEATER TERMINAL RESPECTIVELY TO THE ANODE STUD TO BE 0.020 TIR MAX. MEASUREMENT TO BE MADE WITH EIMAC GAGE JA-21685G WHICH MUST SEAT AGAINST THE ANODE FLANGE.

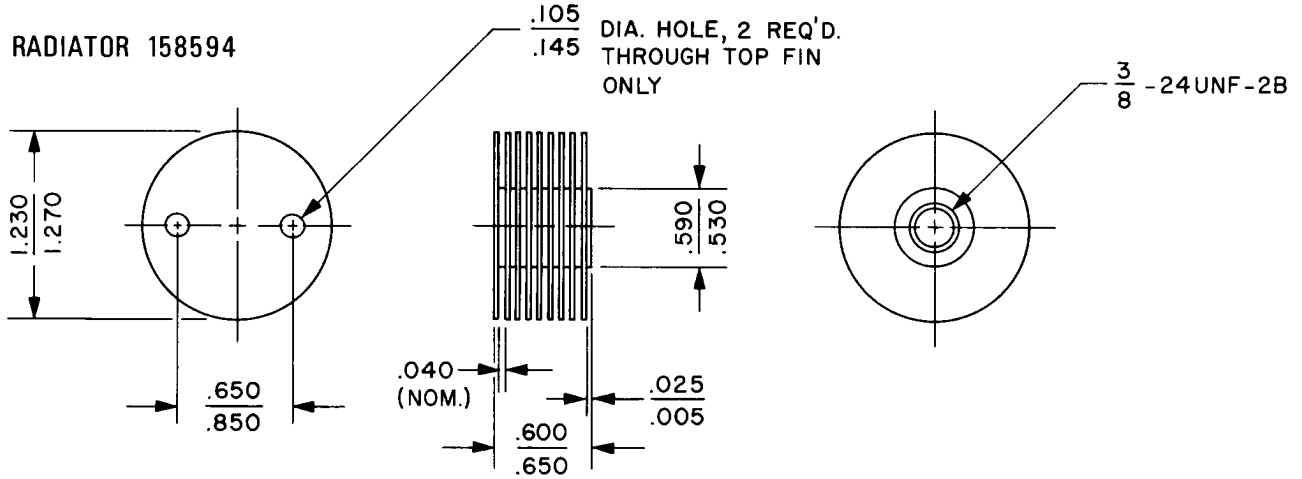


EIMAC RADIATORS

RADIATOR 014653



RADIATOR 158594



RADIATOR 158593

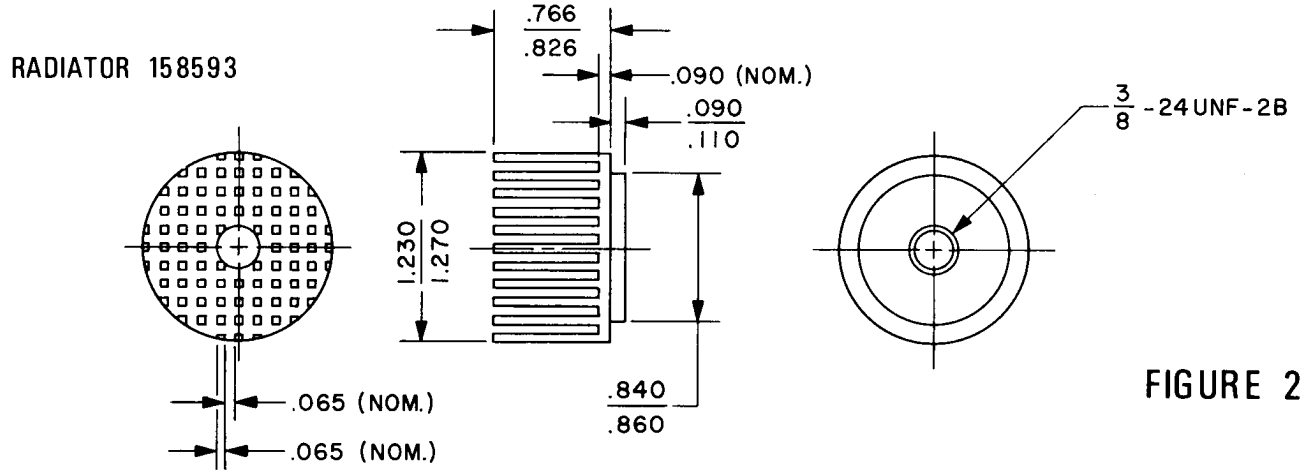


FIGURE 2

FIGURE 3

COMBINED CORRECTION FACTORS FOR INLET AIR TEMPERATURE AND ALTITUDE

(RELATIVE TO 25°C AND SEA LEVEL)

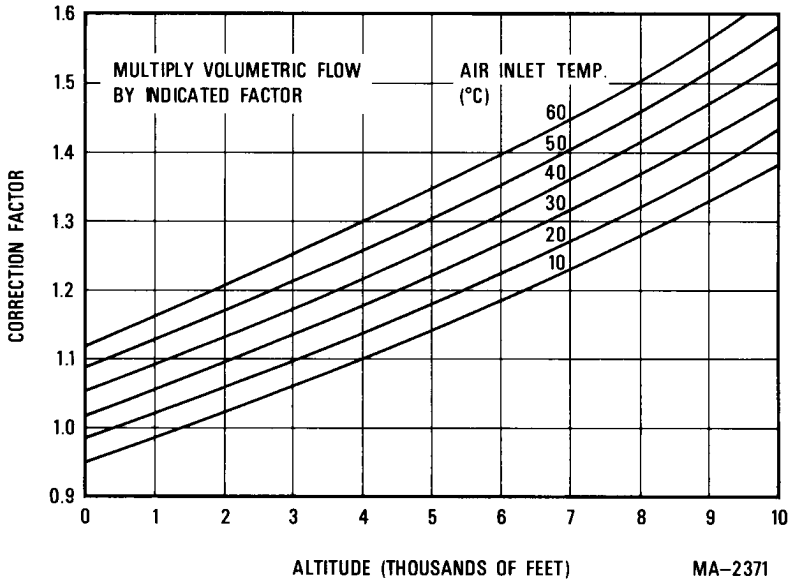
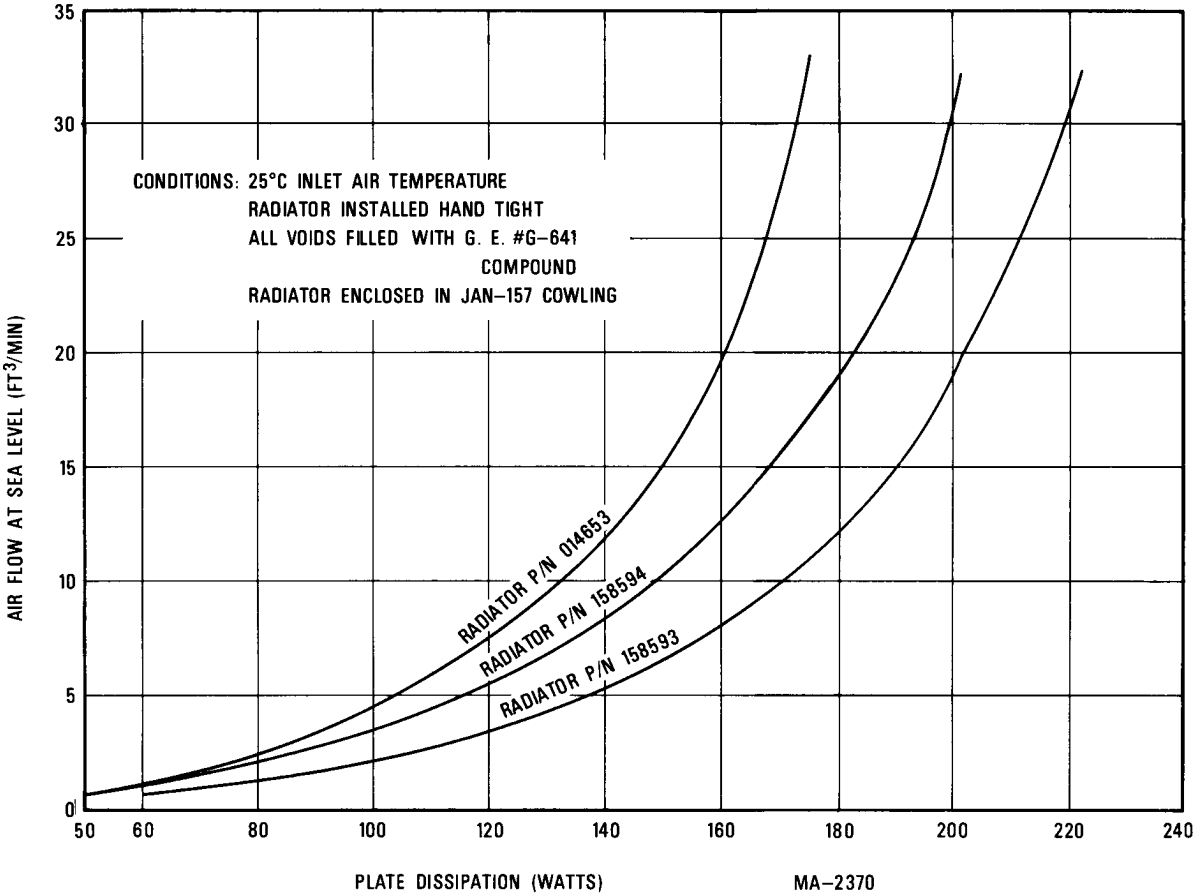
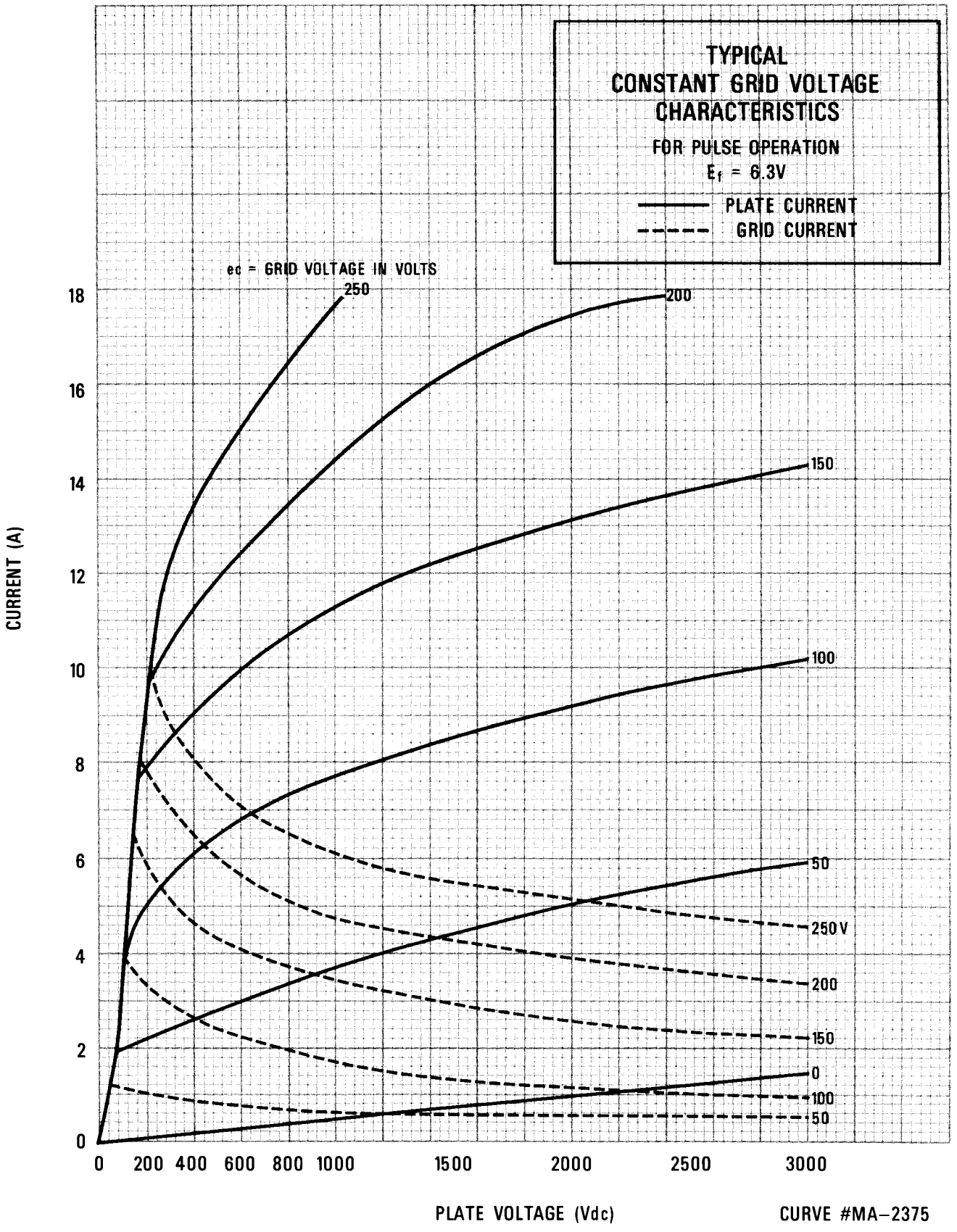
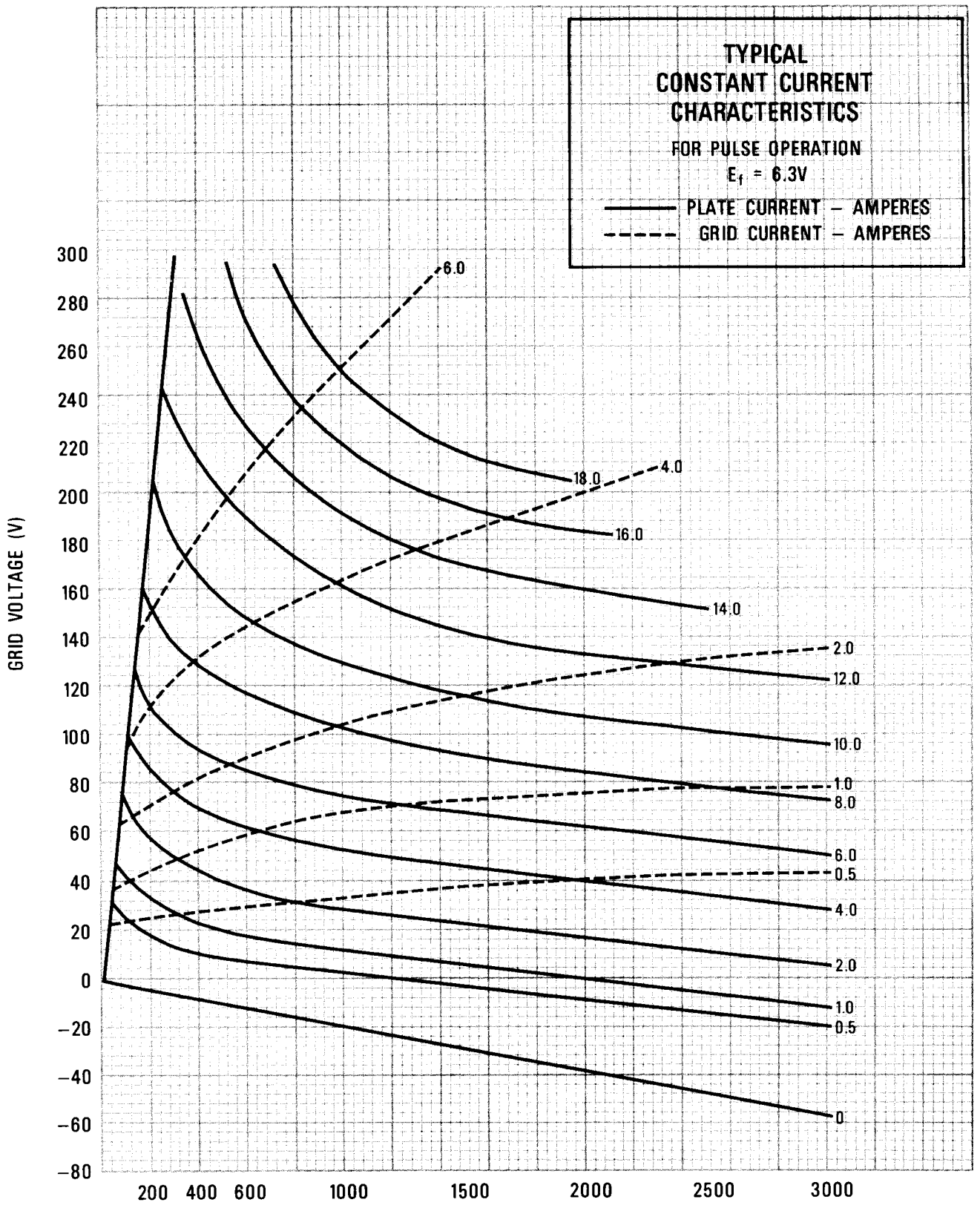


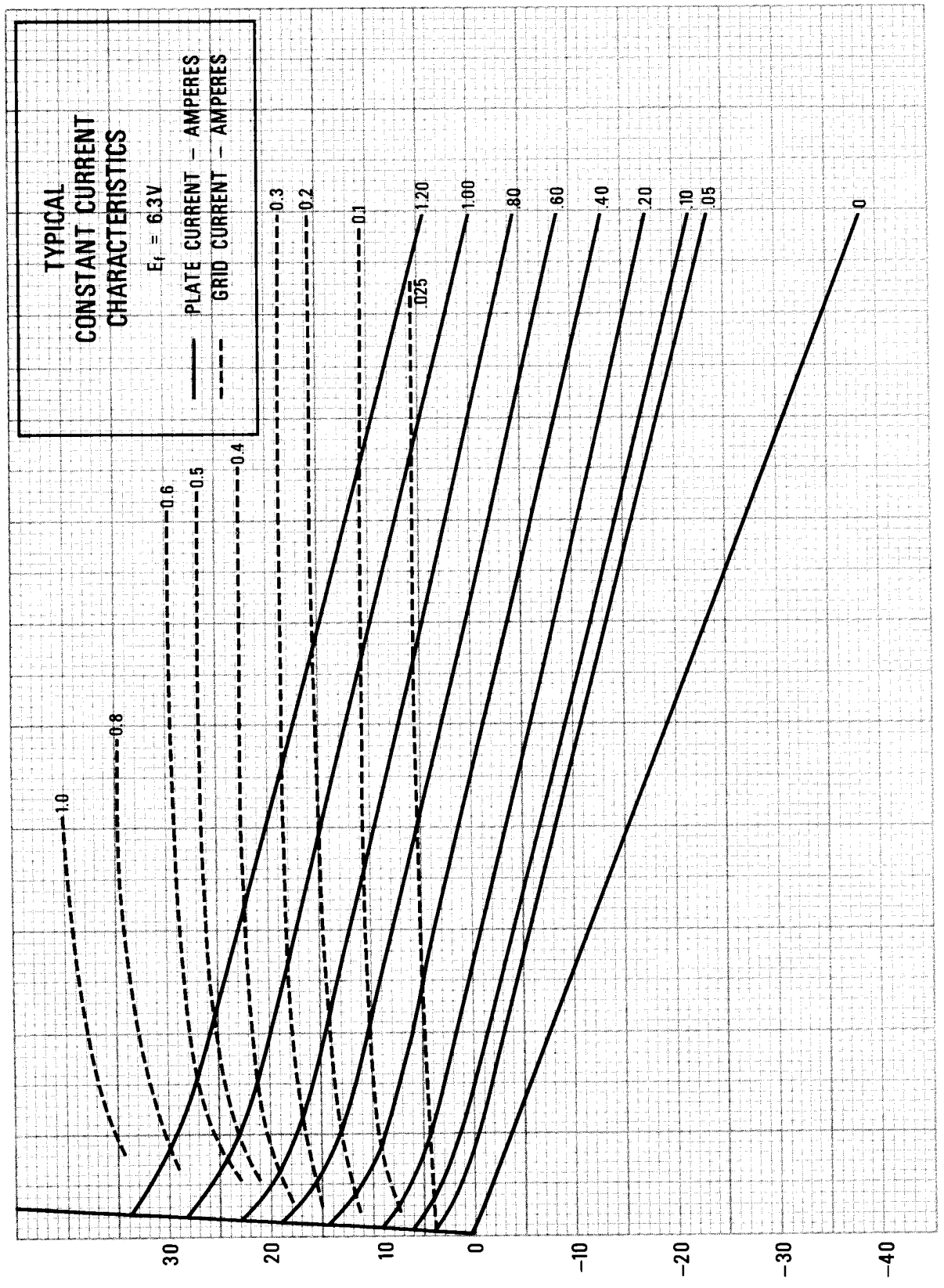
FIGURE 4

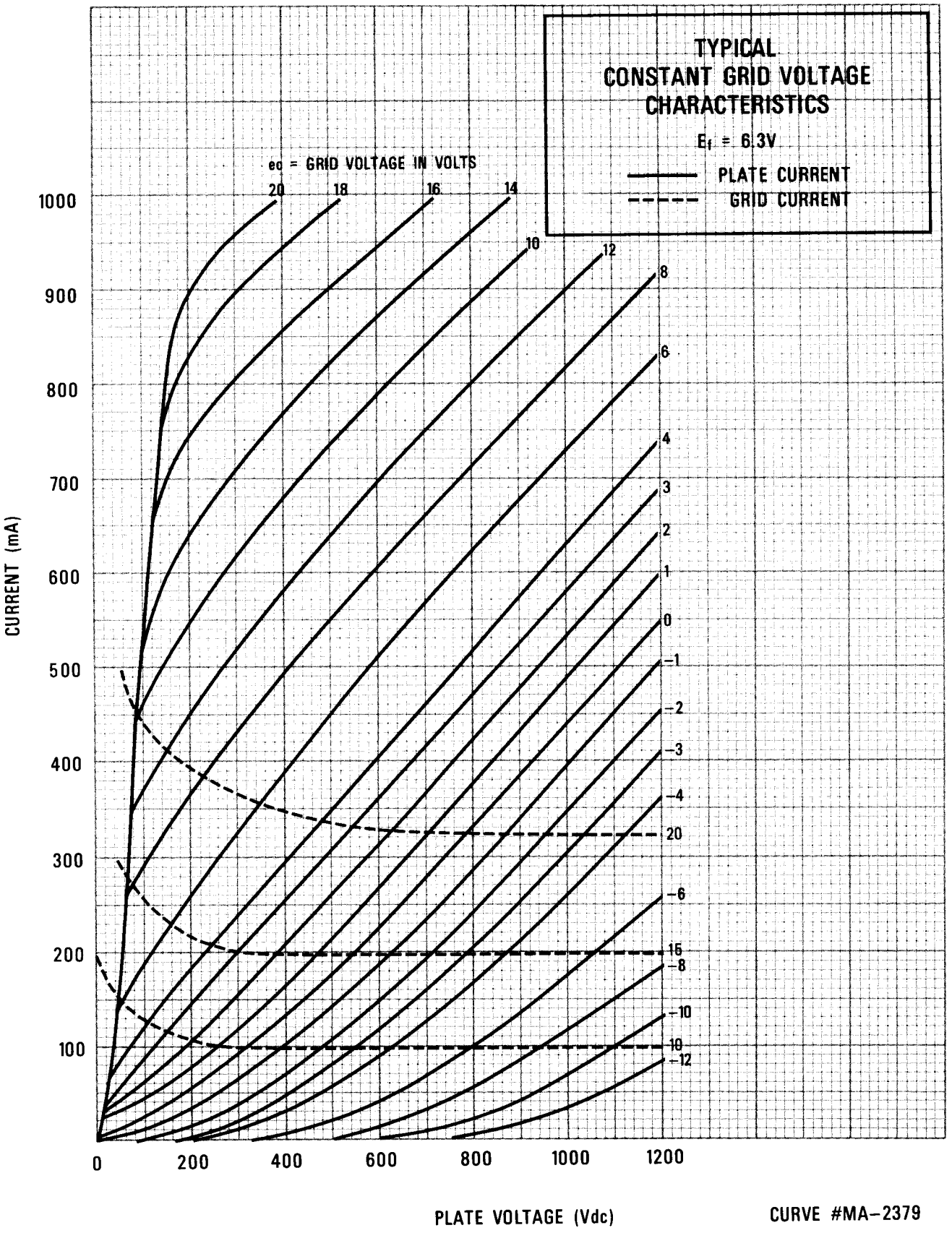
PLATE DISSIPATION VARIATION WITH COOLING AIR FLOW




TYPICAL
CONSTANT GRID VOLTAGE
CHARACTERISTICS
FOR PULSE OPERATION
E_f = 6.3V
PLATE CURRENT
GRID CURRENT
ec = GRID VOLTAGE IN VOLTS
250
200
150
100
50
250V
200
150
100
50
0
CURRENT (A)
0
2
4
6
8
10
12
14
16
18
0
200
400
600
800
1000
1500
2000
2500
3000
PLATE VOLTAGE (Vdc)
CURVE #MA-2375


TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
FOR PULSE OPERATION
E_f = 6.3V
PLATE CURRENT – AMPERES
GRID CURRENT – AMPERES
GRID VOLTAGE (V)
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
−20
−40
−60
−80
200
400
600
1000
1500
2000
2500
3000
PLATE VOLTAGE (Vdc)
6.0
4.0
18.0
16.0
14.0
2.0
12.0
10.0
1.0
8.0
6.0
0.5
4.0
2.0
1.0
0.5
0
CURVE #MA–2374


TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
E_f = 6.3V
PLATE CURRENT – AMPERES
GRID CURRENT – AMPERES
1.0
0.8
0.6
0.5
0.4
0.3
0.2
0.1
.025
1.20
1.00
.80
.60
.40
.20
.10
.05
0
30
20
10
0
−10
−20
−30
−40
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GRID VOLTAGE (V)
PLATE VOLTAGE (Vdc)
CURVE #MA–2380



CURVE #MA-2379