

Replaced by MMG2001NT1. N suffix indicates 260°C reflow capable. The PFP-16 package has had lead-free terminations from its initial release.

Gallium Arsenide CATV Integrated Amplifier Module

Features

- Specified for 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- In Tape and Reel. T1 Suffix = 1,000 Units per 16 mm, 13 inch Reel.

Applications

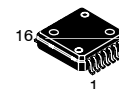
- CATV Systems Operating in the 40 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 40 to 870 MHz, CATV Integrated Forward Power Doubler Amplifier Module

MMG2001T1

**870 MHz
21 dB GAIN
132-CHANNEL
CATV INTEGRATED AMPLIFIER
MODULE**



**CASE 978-03
PFP-16**

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	4.7	°C/W

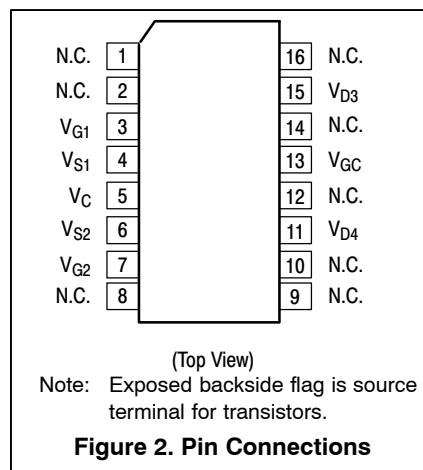
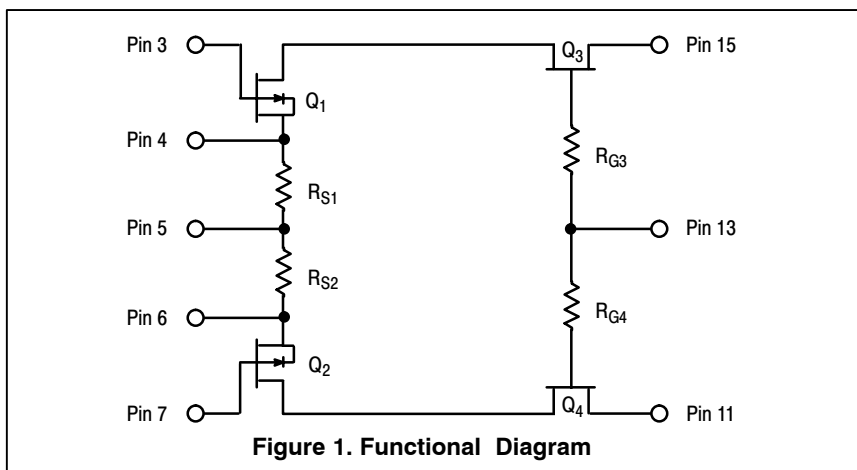


Table 3. ESD Protection Characteristics

Test Conditions	Class
Human Body Model	1 (minimum)
Machine Model	M1 (minimum)
Charge Device Model	C5 (minimum)

Table 4. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD 22-A113, IPC/JEDEC J-STD-020	3	260	°C

Table 5. Electrical Characteristics ($V_{CC} = 24$ Vdc, $T_C = +45^\circ\text{C}$, 75 Ω system unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Frequency Range	BW	40	—	870	MHz
Power Gain	G_p	—	19	—	dB
		40 MHz	21	—	
		870 MHz	—	—	
Slope	S	—	0.8	—	dB
Gain Flatness (40 - 870 MHz, Peak to Valley)	G_F	—	0.5	—	dB
Input Return Loss ($Z_o = 75$ Ohms)	IRL	—	21	—	dB
		f = 40-160 MHz	19	—	
		f = 161-450 MHz	22	—	
		f = 451-870 MHz	—	—	
Output Return Loss ($Z_o = 75$ Ohms)	ORL	—	22	—	dB
		f = 40-400 MHz	17	—	
		f = 401-870 MHz	—	—	
Composite Second Order					dBc
($V_{out} = +48$ dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-68	-60
($V_{out} = +48$ dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-70	-62
($V_{out} = +48$ dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-74	-66
($V_{out} = +56$ dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CSO_{112}	—	-63	—
($V_{out} = +56$ dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CSO_{112}	—	-62	—
($V_{out} = +56$ dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CSO_{112}	—	-61	—
($V_{out} = +58$ dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CSO_{79}	—	-67	—
($V_{out} = +58$ dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CSO_{79}	—	-72	—
($V_{out} = +58$ dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CSO_{79}	—	-71	—
Cross Modulation Distortion @ Ch 2					dBc
($V_{out} = +48$ dBmV/ch., FM = 55 MHz)	132-Channel FLAT	XMD_{132}	—	-55	-53
($V_{out} = +48$ dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-57	-55
($V_{out} = +48$ dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-60	-58
($V_{out} = +56$ dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	XMD_{112}	—	-51	—
($V_{out} = +56$ dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	XMD_{112}	—	-53	—
($V_{out} = +56$ dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	XMD_{112}	—	-56	—
($V_{out} = +58$ dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	XMD_{79}	—	-58	—
($V_{out} = +58$ dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	XMD_{79}	—	-60	—
($V_{out} = +58$ dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	XMD_{79}	—	-65	—
Composite Triple Beat					dBc
($V_{out} = +48$ dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-56	-54
($V_{out} = +48$ dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-60	-58
($V_{out} = +48$ dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	-66	-64
($V_{out} = +56$ dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CTB_{112}	—	-58	—
($V_{out} = +56$ dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CTB_{112}	—	-59	—
($V_{out} = +56$ dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CTB_{112}	—	-62	—
($V_{out} = +58$ dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CTB_{79}	—	-64	—
($V_{out} = +58$ dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CTB_{79}	—	-69	—
($V_{out} = +58$ dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CTB_{79}	—	-72	—
Noise Figure	NF	—	4.0	4.5	dB
		50 MHz	—	4.0	4.5
		550 MHz	—	4.0	4.5
		750 MHz	—	4.0	4.5
		870 MHz	—	4.0	4.5
DC Current ($V_{DC} = 24$ V, $T_C = 45^\circ\text{C}$)	I_{DC}	410	425	440	mA

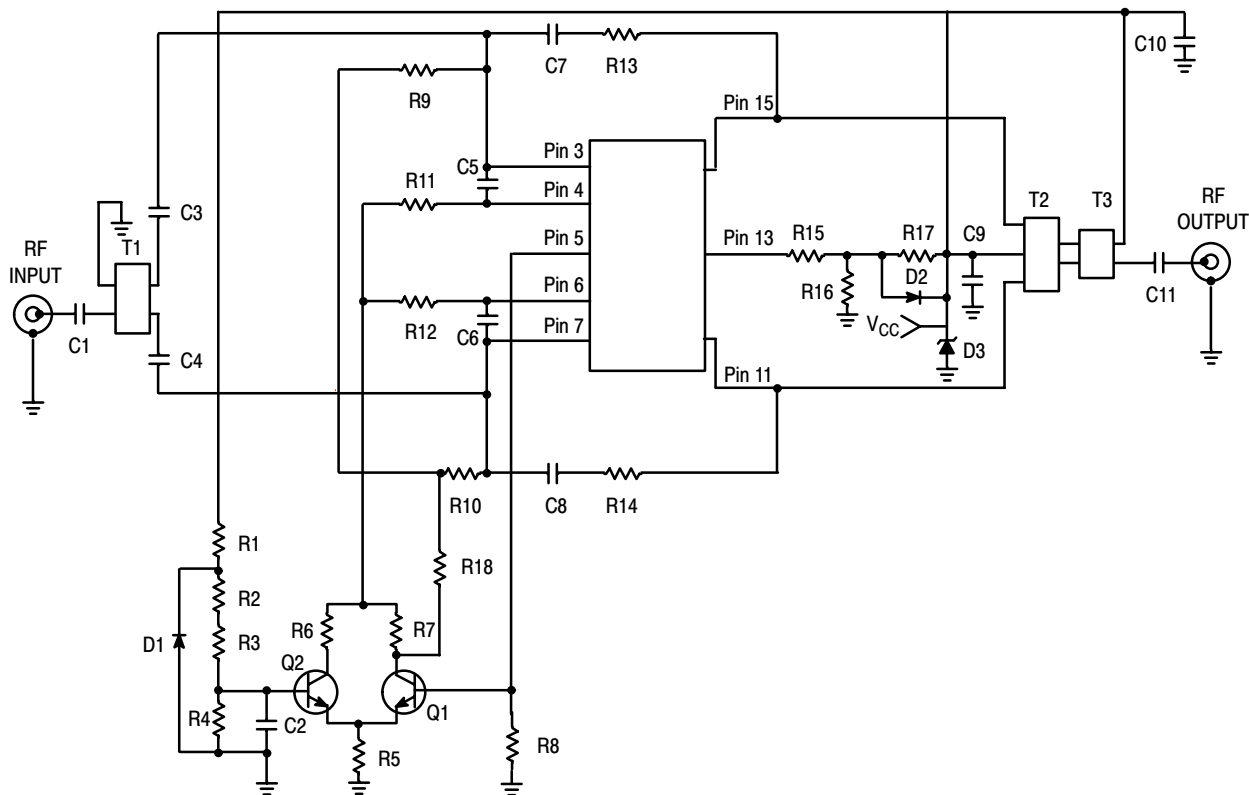
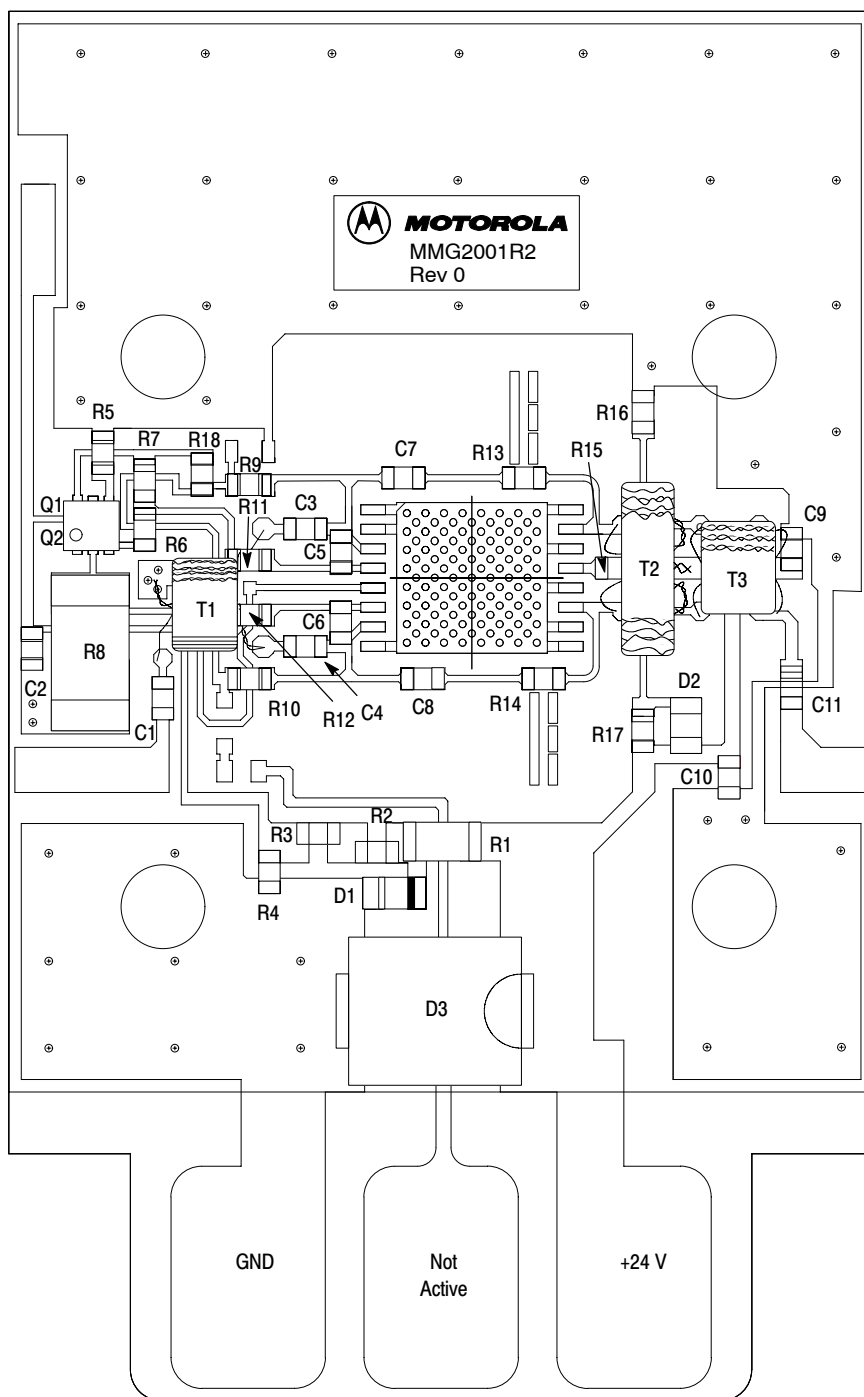


Figure 3. MMG2001T1 50-870 MHz Test Circuit Schematic

Table 6. MMG2001T1 50-870 MHz Test Circuit Component Designations and Values

Designation	Description
C1, C7, C8, C11	220 pF Chip Capacitors (0603)
C2, C3, C4, C9, C10	0.01 μ F Chip Capacitors (0603)
C5, C6	1.8 pF Chip Capacitors (0603)
D1	5.1 V Zener Diode, On/MM3Z5V1T1
D2	27 V Zener Diode, On/MM3Z27VT1
D3	Transient Voltage Suppressor, On/1.5k27A/1.5SMC27AT3
Q1, Q2	Dual Transistors Package, On/MBT3904DW1T1
R1	2.2 k Ω , 1/4 W Chip Resistor (1206)
R2	680 Ω Chip Resistor (0603)
R3	180 Ω Chip Resistor (0603)
R4	1600 Ω Chip Resistor (0603)
R5	820 Ω Chip Resistor (0603)
R6	120 Ω Chip Resistor (0603)
R7	1.5 k Ω Chip Resistor (0603)
R8	8 Ω , 1 W Chip Resistor (2512)
R9, R10, R15	470 Ω Chip Resistors (0603)
R11, R12	18 Ω Chip Resistors (0603)
R13, R14	680 Ω Chip Resistors (0603)
R16	2.4 k Ω Chip Resistor (0603)
R17	6.2 k Ω Chip Resistor (0603)
R18	0 Ω Chip Resistor (0603)
T1	Input Transformer, 77PC016E080
T2	Output Transformer, 77PC016E071
T3	Output Transformer, 77PC016E072
PCB	FR4, 62 mil, $\epsilon_r = 4.81$



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 4. MMG2001T1 50-870 MHz Test Circuit Component Layout

TYPICAL CHARACTERISTICS

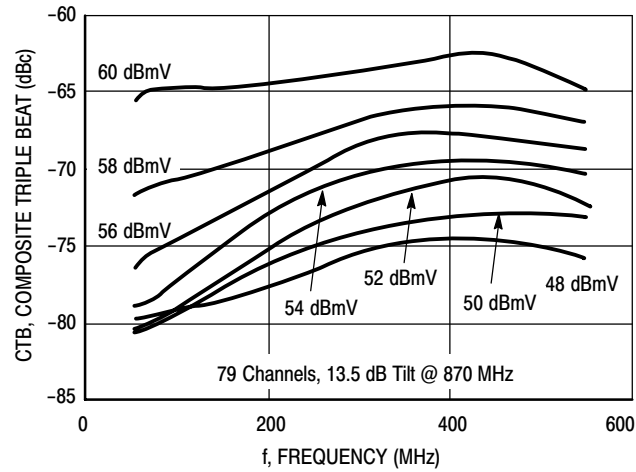


Figure 5. Composite Triple Beat versus Frequency

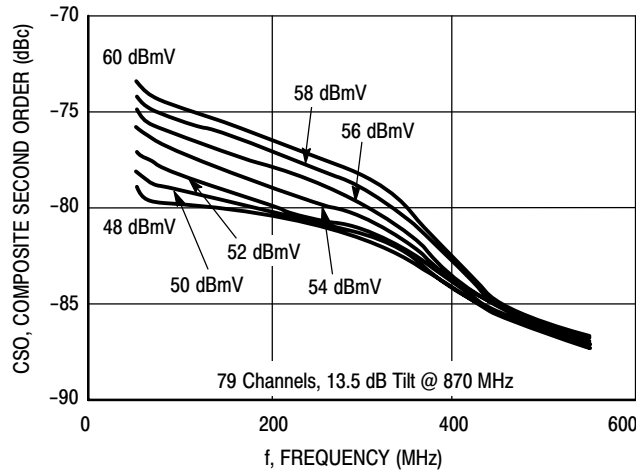


Figure 6. Composite Second Order versus Frequency

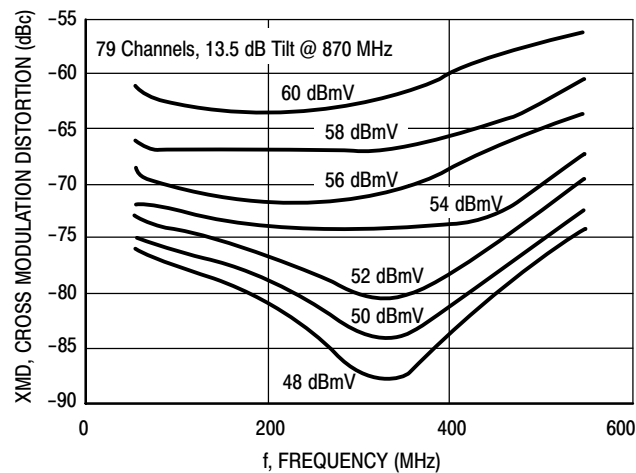


Figure 7. Cross Modulation Distortion versus Frequency

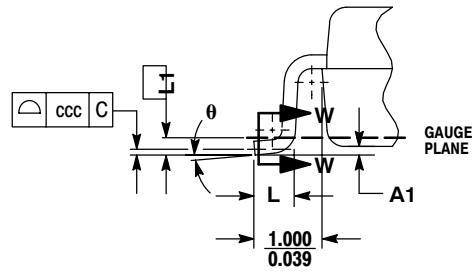
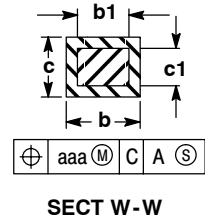
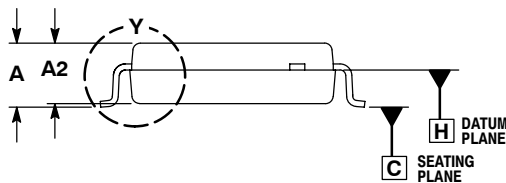
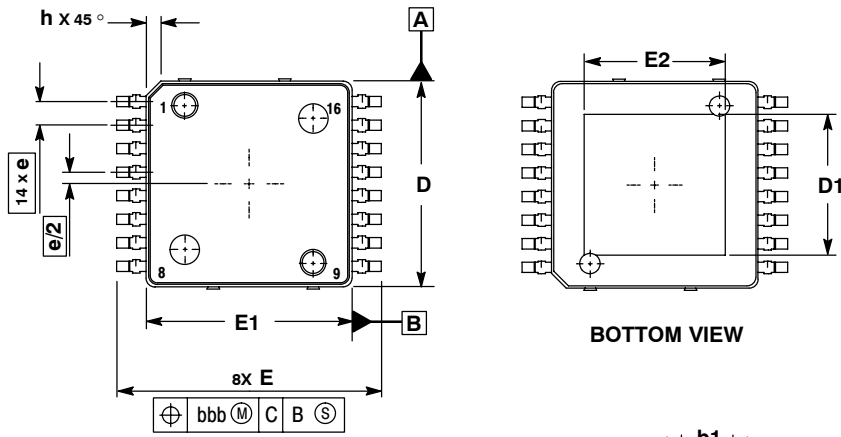
ARCHIVE INFORMATION

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PACKAGE DIMENSIONS



NOTES:

1. CONTROLLING DIMENSION: MILLIMETER.
2. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DATUM PLANE -H- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.250 PER SIDE. DIMENSIONS D AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
5. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS 0.127 TOTAL IN EXCESS OF THE b DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS -A- AND -B- TO BE DETERMINED AT DATUM PLANE -H-.

DIM	MILLIMETERS	
	MIN	MAX
A	2.000	2.300
A1	0.025	0.100
A2	1.950	2.100
D	6.950	7.100
D1	4.372	5.180
E	8.850	9.150
E1	6.950	7.100
E2	4.372	5.180
L	0.466	0.720
L1	0.250 BSC	
b	0.300	0.432
b1	0.300	0.375
c	0.180	0.279
c1	0.180	0.230
e	0.800 BSC	
h	---	0.600
θ	0°	7°
aaa	0.200	
bbb	0.200	
ccc	0.100	

CASE 978-03
ISSUE C
PFP-16

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