NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC317

3-TERMINAL POSITIVE ADJUSTABLE REGULATOR

DESCRIPTION

The μPC317 is an adjustable 3-terminal positive voltage regulator, which has 1.5 A capable for the output current. The output voltage can be set any value between 1.3 V and 30 V by two external resistors.

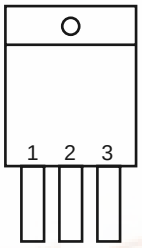
FEATURES

- Output current excess of 1.5 A
- On-chip some protection circuit (over current protection, SOA protection and thermal shut down).

PIN CONFIGURATION (Marking Side)

3-pin plastic SIP (MP-45G)

μPC317HF

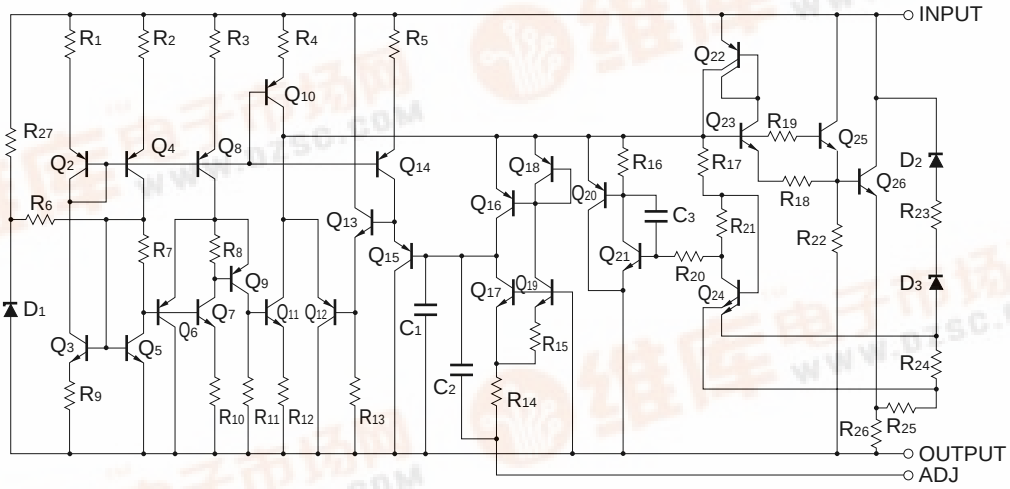


1 : ADJ
2 : OUTPUT
3 : INPUT

ORDERING INFORMATION

Part Number	Package
μPC317HF	3-pin plastic SIP (MP-45G) (isolated TO-220)

EQUIVALENT CIRCUIT



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, unless otherwise specified.)

Parameter	Symbol	Rating	Unit
Input-Output Voltage Differential	$V_{IN} - V_O$	–0.3 to +40	V
Total Power Dissipation (T_C = 25°C)	P_T	15[Note]	W
Operating Ambient Temperature	T_A	–20 to +80	°C
Operating Junction Temperature	T_J	–20 to +150	°C
Storage Temperature	T_{stg}	–65 to +150	°C
Thermal Resistance (junction to case)	$R_{th\ (J-C)}$	5	°C/W
Thermal Resistance (junction to ambient)	$R_{th\ (J-A)}$	65	°C/W

Note Internally limited.
When operating junction temperature rise up to 150°C (≤200°C), the internal circuit shutdown output voltage.

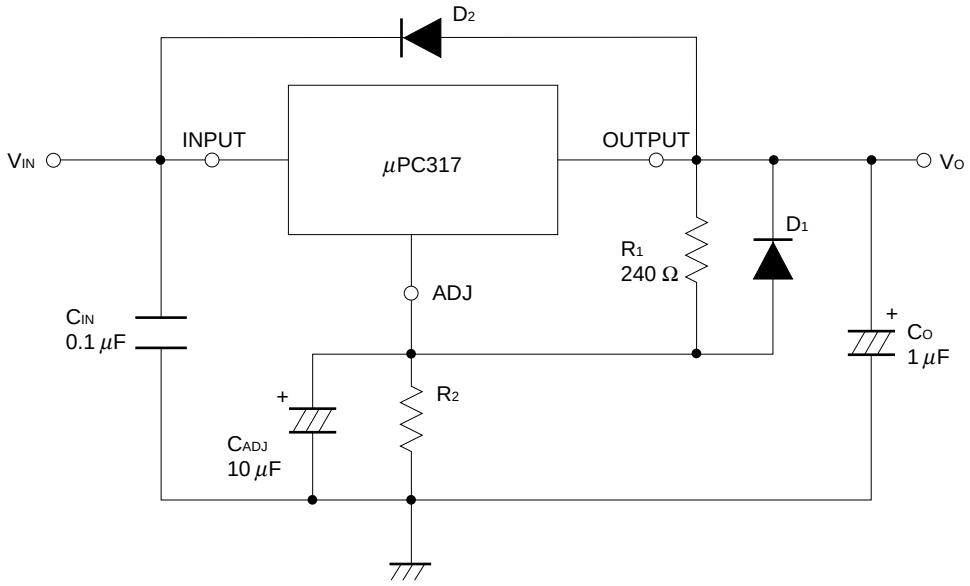
Caution Product quality may suffer if the absolute maximum rating is exceeded even momentarily for any parameter. That is, the absolute maximum ratings are rated values at which the product is on the verge of suffering physical damage, and therefore the product must be used under conditions that ensure that the absolute maximum ratings are not exceeded.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Input-Output Voltage Differential	$V_{IN} - V_O$	3		38.7	V
Input Voltage	V_{IN}	4.3		40	V
Output Voltage	V_O	1.3		30	V
Output Current	I_O	0.01		1.5	A
Operating Junction Temperature	T_J	–20		+125	°C

Caution The recommended operating range may be exceeded without causing any problems provided that the absolute maximum ratings are not exceeded. However, if the device is operated in a way that exceeds the recommended operating conditions, the margin between the actual conditions of use and the absolute maximum ratings is small, and therefore thorough evaluation is necessary. The recommended operating conditions do not imply that the device can be used with all values at their maximum values.

TYPICAL CONNECTION



Remark R_1, R_2 : Resistor to set the output voltage.

$$V_O = (1 + \frac{R_2}{R_1}) \bullet V_{REF} + I_{ADJ} \bullet R_2 \fallingdotseq (1 + \frac{R_2}{R_1}) \bullet V_{REF}$$

V_O (V)	R_2 (Ω : TYP.)
1.25	0
2.5	240
5.0	720
12	2064
24	4368
30	5520

C_{IN} : Need to stop the oscillation for the long input wiring length.

C_O : Need to stop the oscillation for the long output wiring length.
Improve the transient stability of the output voltage when the lord current is suddently changed.

C_{ADJ} : Improve the ripple rejection and the oscillate rejection.

D_1 : Protect against C_{ADJ} from output short.

D_2 : Need for $V_{IN} < V_O$.

ELECTRICAL CHARACTERISTICS

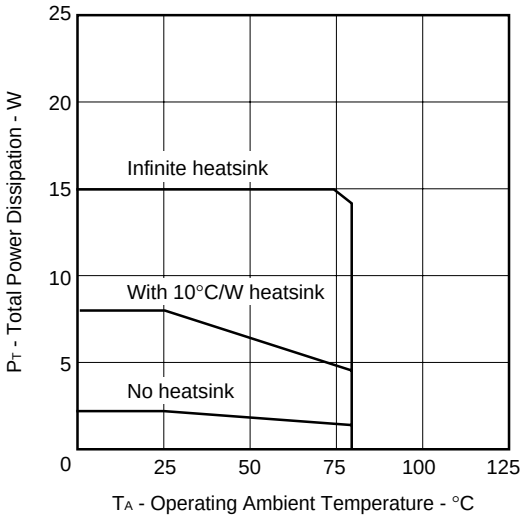
(V_{IN} – V_O = 5 V, I_O = 0.5 A, 0°C ≤ T_J ≤ +125°C, unless otherwise specified.)

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Unit
Line Regulation	REG_{IN}	T_A = 25°C, 3 V ≤ (V_{IN} – V_O) ≤ 40 V, I_O = 0.1 A[Note]			0.01	0.04	%/V
		3 V ≤ (V_{IN} – V_O) ≤ 40 V, I_O = 0.1 A[Note]			0.02	0.07	%/V
Load Regulation	REG_L	T_J = 25°C	V_O ≤ 5 V		5	25	mV
		10 mA ≤ I_O ≤ 1.5 A[Note]	V_O ≥ 5 V		0.1	0.5	%
		10 mA ≤ I_O ≤ 1.5 A[Note]	V_O ≤ 5 V		20	70	mV
			V_O ≥ 5 V		0.3	1.5	%
Thermal Regulation	REG_{TH}	T_A = 25°C, 0.2 ms ≤ t ≤ 20 ms			0.01	0.07	%/W
ADJ pin Output Current	I_{ADJ}				50	100	μA
I_{ADJ} Change	ΔI_{ADJ}	10 mA ≤ I_O ≤ 1.5 A, P_T ≤ 15 W			0.4	5	μA
Reference Voltage	V_{REF}	10 mA ≤ I_O ≤ 1.5 A, P_T ≤ 15 W		1.20	1.25	1.30	V
Temperature Stability of V_{REF}	$\Delta V_{REF}/\Delta T$				0.7		%
Minimum Load Current	$I_{OMIN.}$	V_{IN} – V_O = 40 V			4.7	10	mA
Peak Output Current	I_{Opeak}	5 V ≤ (V_{IN} – V_O) ≤ 15 V		1.5	2.2	2.9	A
		V_{IN} – V_O = 40 V		0.15	0.8		A
Output Noise Voltage (RMS)	V_n	T_A = 25°C, 10 Hz ≤ f ≤ 10 kHz			0.001		%
Ripple Rejection	R • R	T_A = 25°C, ΔV_{IN} = 1 $V_{r.m.s}$	C_{ADJ} = 0		48		dB
		f = 120 Hz, V_O = 10 V	C_{ADJ} = 10 μF	56	65		dB

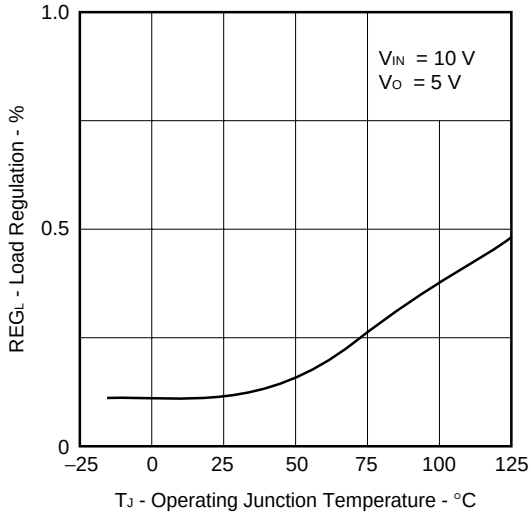
Note Measured at constant junction temperature, using pulse testing with a low duty cycle.
PW = 10 ms, Duty Cycle ≤ 2 %

TYPICAL CHARACTERISTICS (T_A = 25°C, unless otherwise specified. Reference Values.)

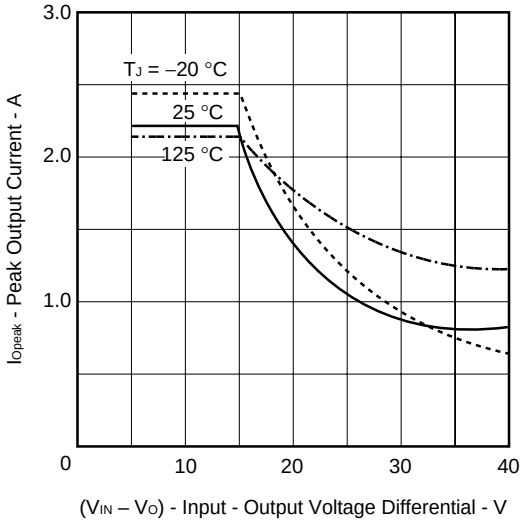
P_T vs T_A



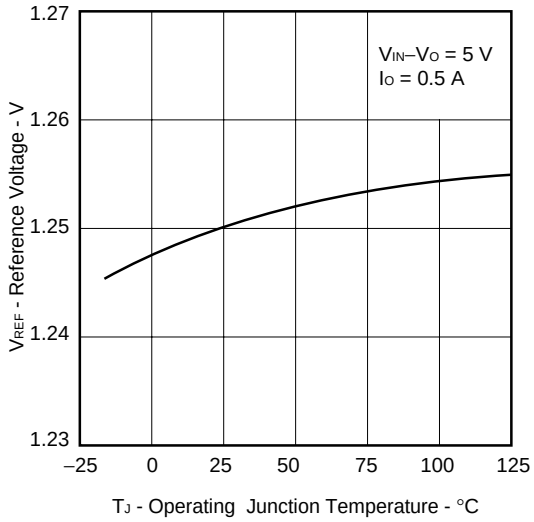
REG_L vs T_J



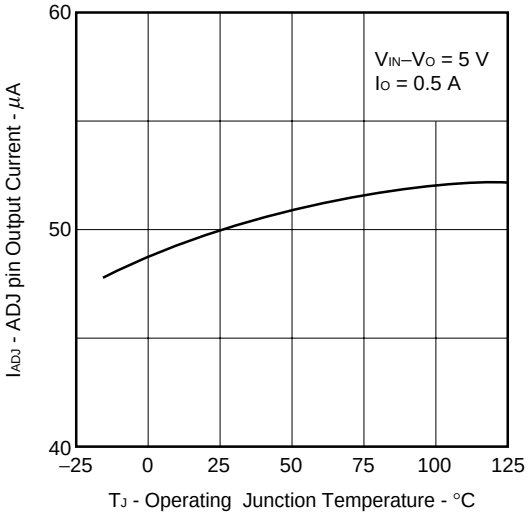
I_{Opeak} vs (V_{IN} – V_O)



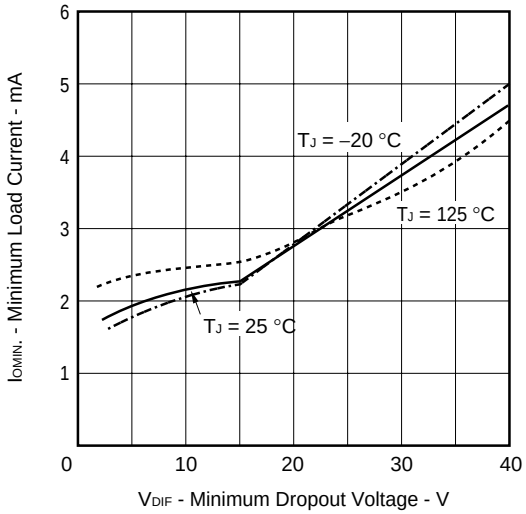
V_{REF} vs T_J



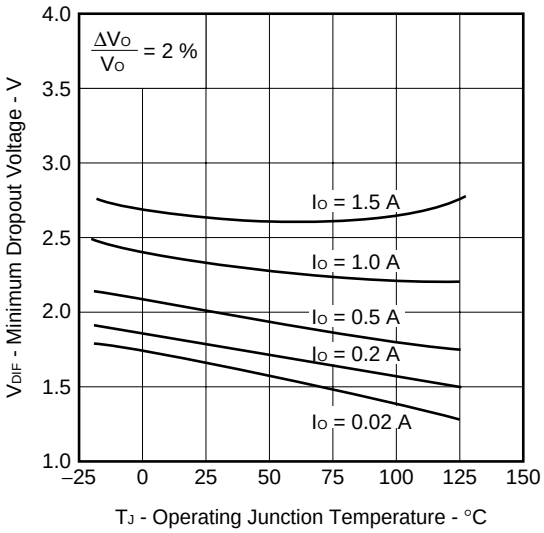
I_{ADJ} vs T_J



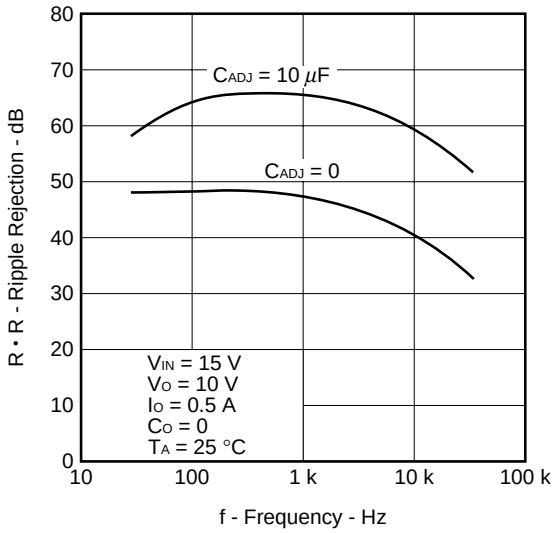
$I_{OMIN.}$ vs V_{DIF}



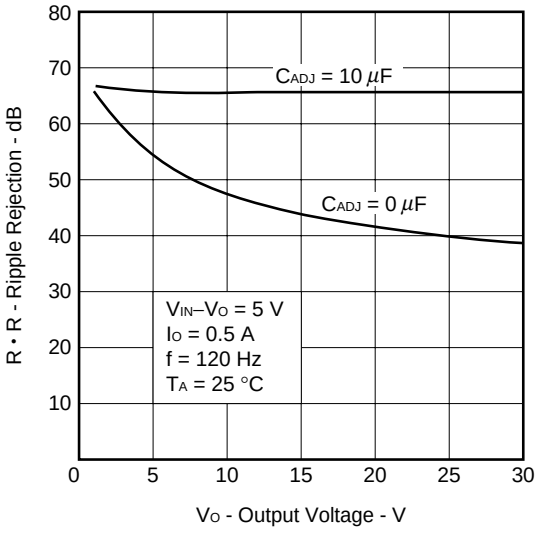
V_{DIF} vs T_J



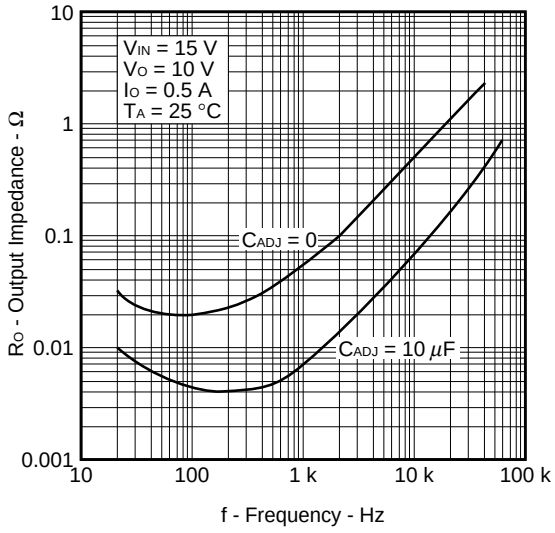
R • R vs f



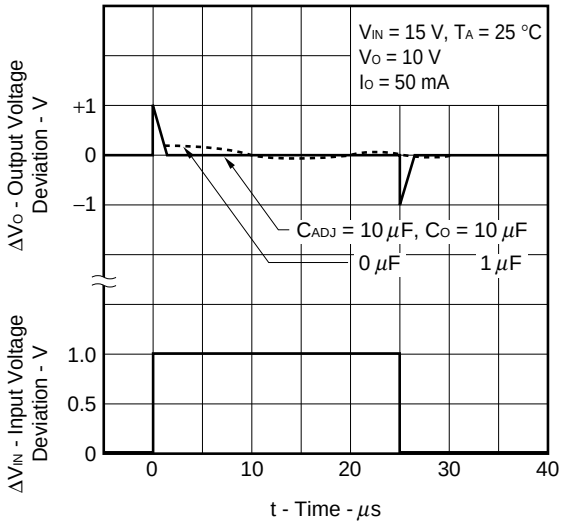
R • R vs V_O



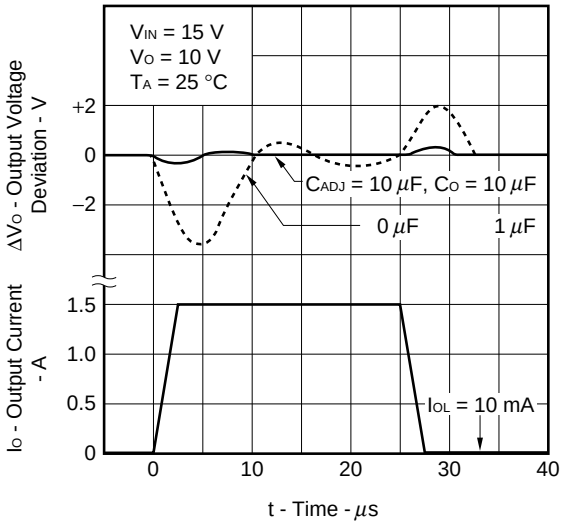
R_O vs f



LINE TRANSIENT RESPONSE

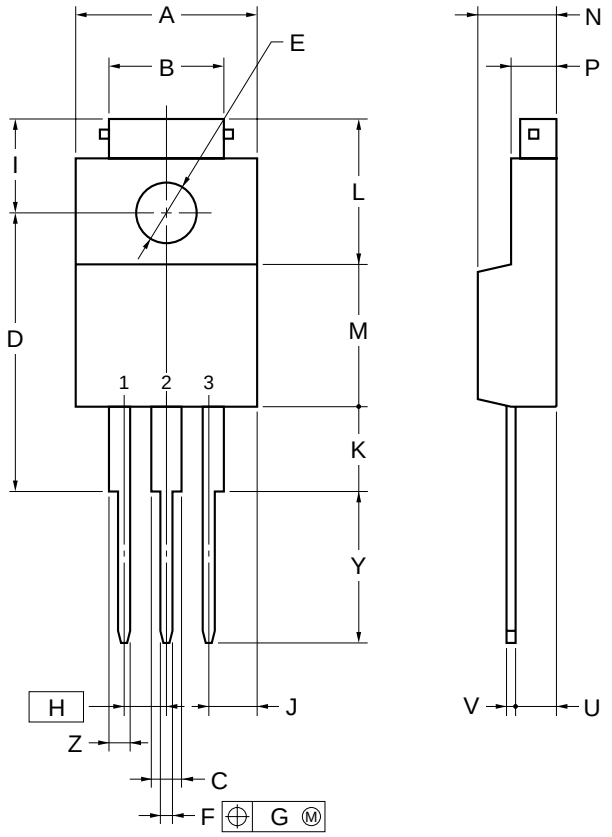


LOAD TRANSIENT RESPONSE



PACKAGE DRAWING

3PIN PLASTIC SIP (MP-45G)



NOTE

Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	10.0±0.2
B	7.0±0.2
C	1.50±0.2
D	17.0±0.3
E	φ3.3±0.2
F	0.75±0.10
G	0.25
H	2.54 (T.P.)
I	5.0±0.3
J	2.46±0.2
K	5.0±0.2
L	8.5±0.2
M	8.5±0.2
N	4.5±0.2
P	2.8±0.2
U	2.4±0.5
V	0.65±0.10
Y	8.9±0.7
Z	1.30±0.2

P3HF-254B-4

RECOMMENDED SOLDERING CONDITIONS

When soldering these products, it is highly recommended to observe the conditions as shown below. If other soldering processes are used, or if the soldering is performed under different conditions, please make sure to consult with our sales offices.

For more details, refer to our document "**SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (C10535E).**

Type of Through-hole Devices

μPC317HF: 3-pin plastic SIP (MP-45G)(isolated TO-220)

Process	Conditions
Wave soldering (only to leads)	Solder temperature: 260°C or below, Flow time: 10 seconds or less.
Partial heating method	Pin temperature: 300°C or below, Heat time: 3 seconds or less (per each lead).

Caution For through-hole device, the wave soldering process must be applied only to leads, and make sure that the package body does not get jet soldered.

REFERENCE DOCUMENTS

QUALITY GRADES ON NEC SEMICONDUCTOR DEVICES	C11531E
SEMICONDUCTOR DEVICE MOUNTING THCHNOLOGY MANUAL	C10535E
SEMICONDUCTORS SELECTION GUIDE – Products and Packages – (CD-ROM)	X13769X
SEMICONDUCTORS SELECTION GUIDE	X10679E
NEC SEMICONDUCTOR DEVICE RELIABILITY/QUALITY CONTROL SYSTEM -THREE TERMINAL REGULATOR	IEI-1212

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  - Specific: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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