AN6530, AN6531

4-Terminal Positive Adjustable Voltage Regulators

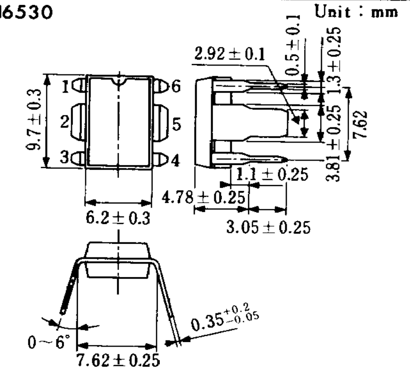
■ Outline

The AN6530 and the AN6531 are monolithic 4-terminal positive adjustable voltage regulators. They provide any stabilized output voltage between 5V and 30V with external resistance, and are best suited for power circuits with current capacity up to 0.5A. Moreover, these voltage regulators are highly reliable with various internal protection circuits. The AN6530 is in a 6-lead DIL plastic package, and the AN6531 is in a 4-lead SIL plastic package.

■ Features

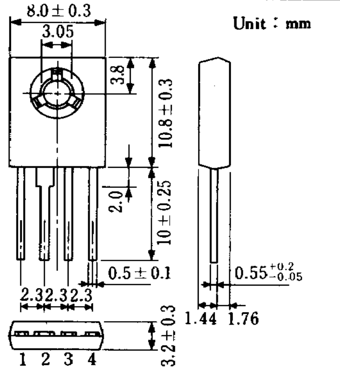
- Wide range of output voltage : 5~30V
- Output current in excess of 500mA
- Internal thermal overload protection
- Internal short-circuit protection
- Output transistor safe area compensation

AN6530



6-Lead DIL Plastic Package with Fin

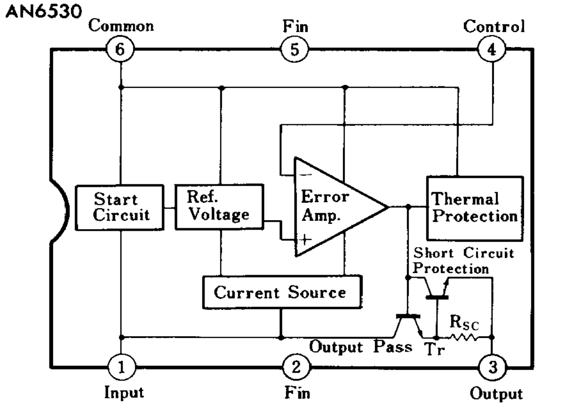
AN6531



4-Lead SIL Plastic Package

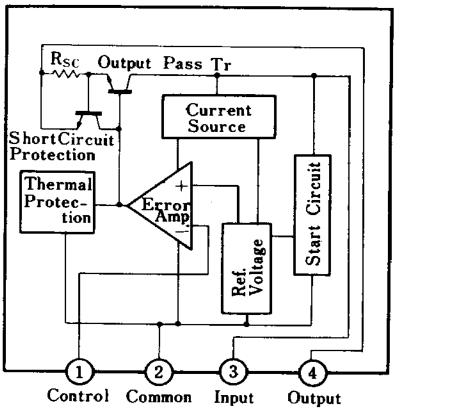
■ Block Diagrams

AN6530



Note: Pins② and ⑤ are electrically in common, and can be connected as Common like pin⑥. Always use pin ⑥ as Common.

AN6531



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■ Absolute Maximum Ratings (Ta=25℃)

Item		Symbol	Rating	Unit
Supply Voltage		V_{CC}	40	V
Supply Current		I_{CC} *1	1.5	A
Power Dissipation	AN6530	P_D	1.5*2	W
	AN6531		7.5	
Operating Ambient Temperature		T_{opr}	−20～+75	℃
Storage Temperature		T_{stg}	−55～+150	℃

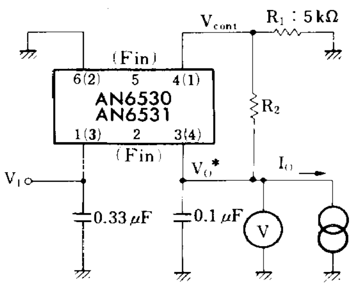
*1 The internal circuit is provided with a current limiting circuit.
*2 Maximum power dissipation value in the case where there is no heat sink (The value varies with the external heat dissipation state.)

■ Electrical Characteristics (Ta=25℃)

Item	Symbol	Test Circuit	Condition		min.	typ.	max.	Unit
Output Voltage Tolerance	V_O	1	$V_I=V_O+3\sim V_O+15V$, $I_O=5\sim350mA$, $Tj=25℃$				4	%
Line Regulation	REG_{IN}	1	$V_O=5V$, $I_O=200mA$, $V_I=7.5\sim25V$, $Tj=25℃$				1	%
			$V_O=18V$, $I_O=5mA$, $V_I=21\sim33V$, $Tj=25℃$				0.75	%
			$V_O=18V$, $I_O=200mA$, $V_I=21\sim25V$, $Tj=25℃$				0.67	%
Load Regulation	REG_L	1	$V_O=5V$, $V_I=12V$, $I_O=5\sim500mA$, $Tj=25℃$				1	%
Bias Current	I_{Bias}	2	$Tj=25℃$			3	5	mA
Control Pin Current	I_{cont}	3	$Tj=25℃$			1	8	μA
Ripple Rejection Ratio	RR	4	$V_I=8\sim18V$, $V_O=5V$, $f=120Hz$		62	80		dB
Output Noise Voltage	V_{no}	1	$V_O=5V$, $f=10Hz\sim100kHz$			40		μV
Minimum Input Output Voltage Difference	$V_{DIF(min.)}$	1	$I_O=500mA$, $Tj=25℃$			2		V
Short Circuit Current	I_{OS}	1	$V_I=35V$, $V_O=5V$, $Tj=25℃$			50	600	mA
Peak Output Current	L_{OP}	1	$V_O=5V$, $Tj=25℃$		0.4	1	1.4	A
Output Voltage Temperature Coefficient	$\Delta V_O/T_a$	1	$V_O=5V$, $I_O=5mA$	$Tj=-55\sim+25℃$		0.5		mV/℃
				$Tj=25℃\sim150℃$		−0.5		mV/℃
Control Pin Voltage	V_{cont}	1	$Tj=25℃$		4.8	5	5.2	V

Note 1. The specified condition Tj=25℃ means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.
Note 2. When not specified, $V_I=10V$, $V_O=5V$, $I_O=350mA$, $C_I=0.33\mu F$ and $C_O=0.1\mu F$.

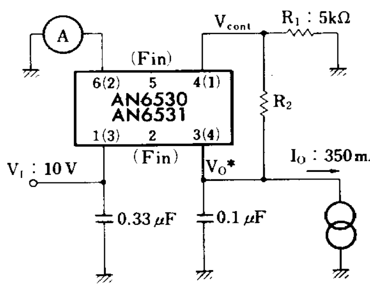
Test Circuit 1 $\left(V_O, REG_{IN}, REG_L, V_{no}, V_{DIF(min.)}, I_{OS}, I_{OP}, \Delta V_O/Ta, V_{cont}\right)$



( ) Pin No. : AN6531
● The test time should be within 10ms.

$$* \quad V_O=\frac{R_1+R_2}{R_1}V_{cont}$$

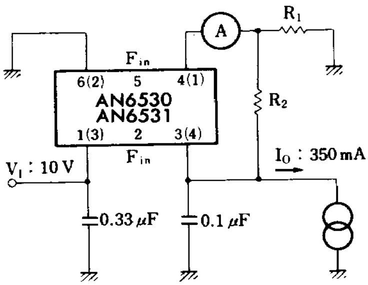
Test Circuit 2 (I_{Bias})



( ) Pin No. : AN6531
● The test time should be within 10ms.

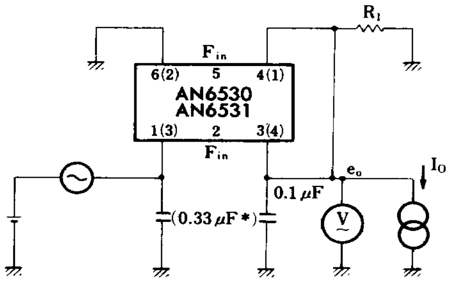
$$* \quad V_O=\frac{R_1+R_2}{R_1}V_{cont}$$

Test Circuit 3 (I_{cont})



● The test time should be within 10ms.

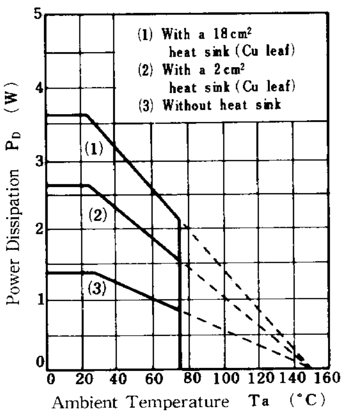
Test Circuit 4 (RR)



* When the input block oscillates, 0.33μF can be omitted.

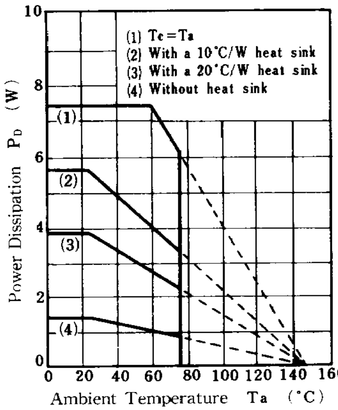
AN6530 Character

$P_D - Ta$



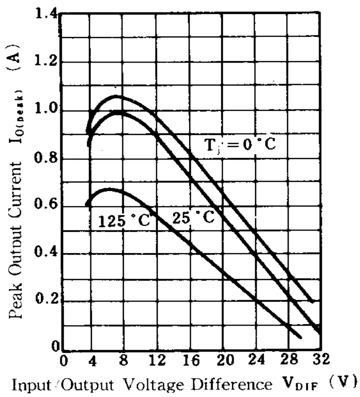
AN6531 Character

$P_D - Ta$

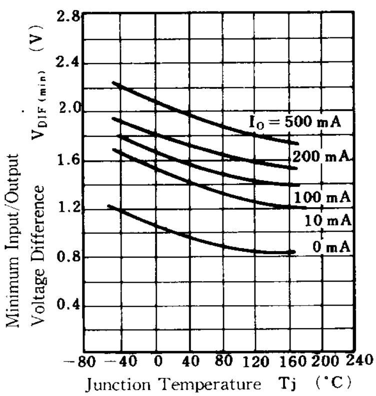


Common Character Chart

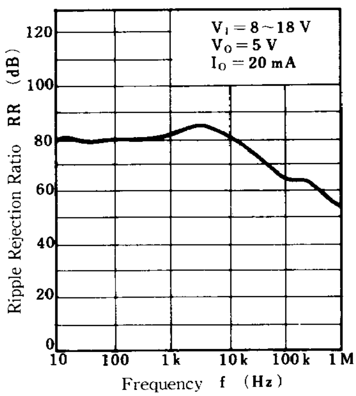
$I_{O(peak)} - V_{DIF}$



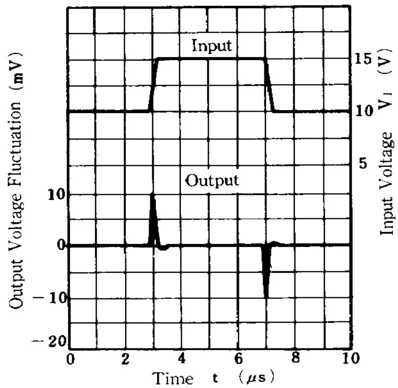
$V_{DIF(min)} - T_j$



RR − f



Line Transient Response



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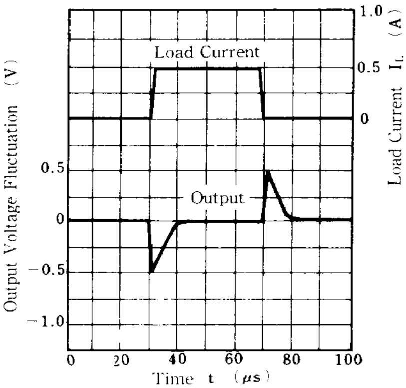
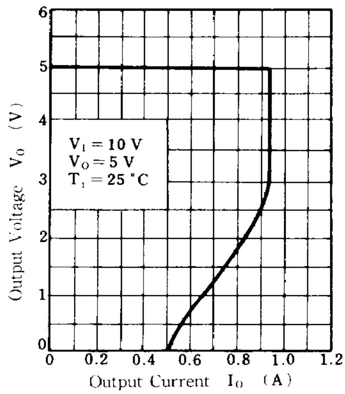
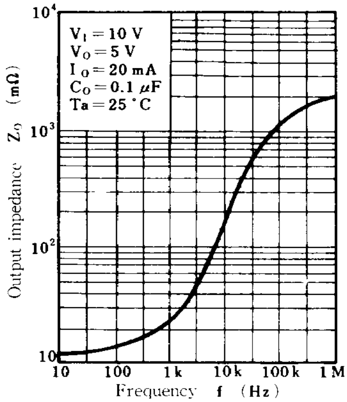
Load Transient Response



Output Current Limit

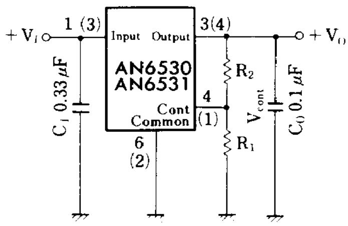


$Z_O - f$



■ Basic Regulator Circuit

cuit

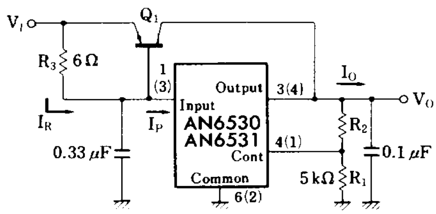


- $V_O = V_{cont}\left(\frac{R_1 + R_2}{R_1}\right)$
  ($V_{cont} \simeq 5$ V, $R_1 = 5$ kΩ)
- C_I is necessary when the line of V_I is long.
- C_O improves the transient response.

Pin No. in ( ) are for AN6531.

■ Application Circuit

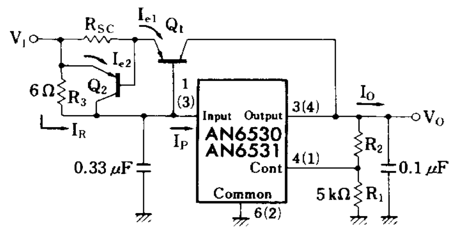
(1) Current Boost Circuit



$$R_3 = \frac{V_{BE(Q1)} \cdot \beta}{(\beta + 1) I_P - I_O}$$

Pin No. in ( ) are for AN6531.

(2) Current Boost Circuit (With Current Limiting Circuit)



$$R_{SC} = \frac{V_{BE(Q2)}}{I_{e1\,(max.)}}$$

$$R_3 = \frac{V_{BE(Q1)} + I_{e1} R_{SC}}{I_O - I_{e1}}$$

$$I_{e2\,(max.)} = I_{P(max.)} - \frac{V_{BE(Q1)} + V_{BE(Q2)}}{R_3}$$