

15W BTL×2CH AUDIO POWER AMPLIFIER

The thermal resistance θ_{j-T} of KIA6216H package designed for low thermal resistance, has a high efficiency of heat radiation.

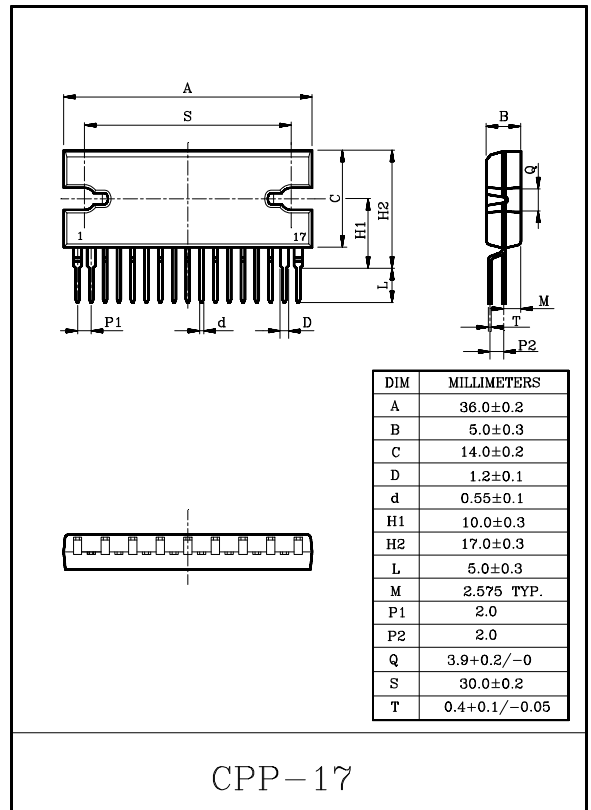
The temperature rise of chip can be reduced, and the influence from the degradation of the features due to the temperature rise at the high output can also be reduced.

This stereo audio power IC, designed for car audio use, has two built-in channels to reduce the characteristic difference between L and R channels.

In addition, the functions of stand-by and muting, and a variety of protection circuits are involved.

FEATURES

- Low Thermal Resistance.
: $\theta_{j-T}=1.5^{\circ}\text{C}/\text{W}$ (Infinite heat sink)
- High Power.
: $P_{\text{OUT}}(1)=18\text{W}(\text{Typ.})/\text{Channel}$
($V_{\text{CC}}=14.4\text{V}$, $f=1\text{kHz}$, $\text{THD}=10\%$, $R_L=4\Omega$)
: $P_{\text{OUT}}(2)=15\text{W}(\text{Typ.})/\text{Channel}$
($V_{\text{CC}}=13.2\text{V}$, $f=1\text{kHz}$, $\text{THD}=10\%$, $R_L=4\Omega$)
- Low Distortion.
: $\text{THD}=0.04\%(\text{Typ.})$
($V_{\text{CC}}=13.2\text{V}$, $f=1\text{kHz}$, $P_{\text{OUT}}=1\text{W}$, $R_L=4\Omega$, $G_V=50\text{dB}$)
- Low Noise.
: $V_{\text{NO}}=0.30\text{mV}_{\text{rms}}(\text{Typ.})$
($V_{\text{CC}}=13.2\text{V}$, $R_L=4\Omega$, $G_V=50\text{dB}$, $R_g=0\Omega$, $\text{BW}=20\text{Hz}\sim 20\text{kHz}$)
- Built-in stand-by function.
(With ④ pin set at Low, power is turned OFF.)
: $I_{\text{SB}}=1\mu\text{A}(\text{Typ.})$
- Built-in muting function.
(With ① pin set at Low, power is turned OFF.)
: $V(\text{Mute})=1\text{V}(\text{Typ.})$
- Built-in various protection circuits.
: Thermal shut down, over voltage, $\text{OUT}\rightarrow V_{\text{CC}}$ short,
OUT-GND short and OUT-OUT short.
- Operating supply voltage : $V_{\text{CC}}=9\sim 18\text{V}$.



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MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Peak Supply Voltage (0.2sec)	V _{CC} surge	50	V
DC Supply Voltage	V _{CC} DC	25	V
Operating Supply Voltage	V _{CC} opr	18	V
Output Current (Peak)	I _{O(Peak)}	9	A
Power Dissipation	P _D	50	W
Operating Temperature	T _{opr}	-30~85	°C
Storage Temperature	T _{stg}	-55~150	°C

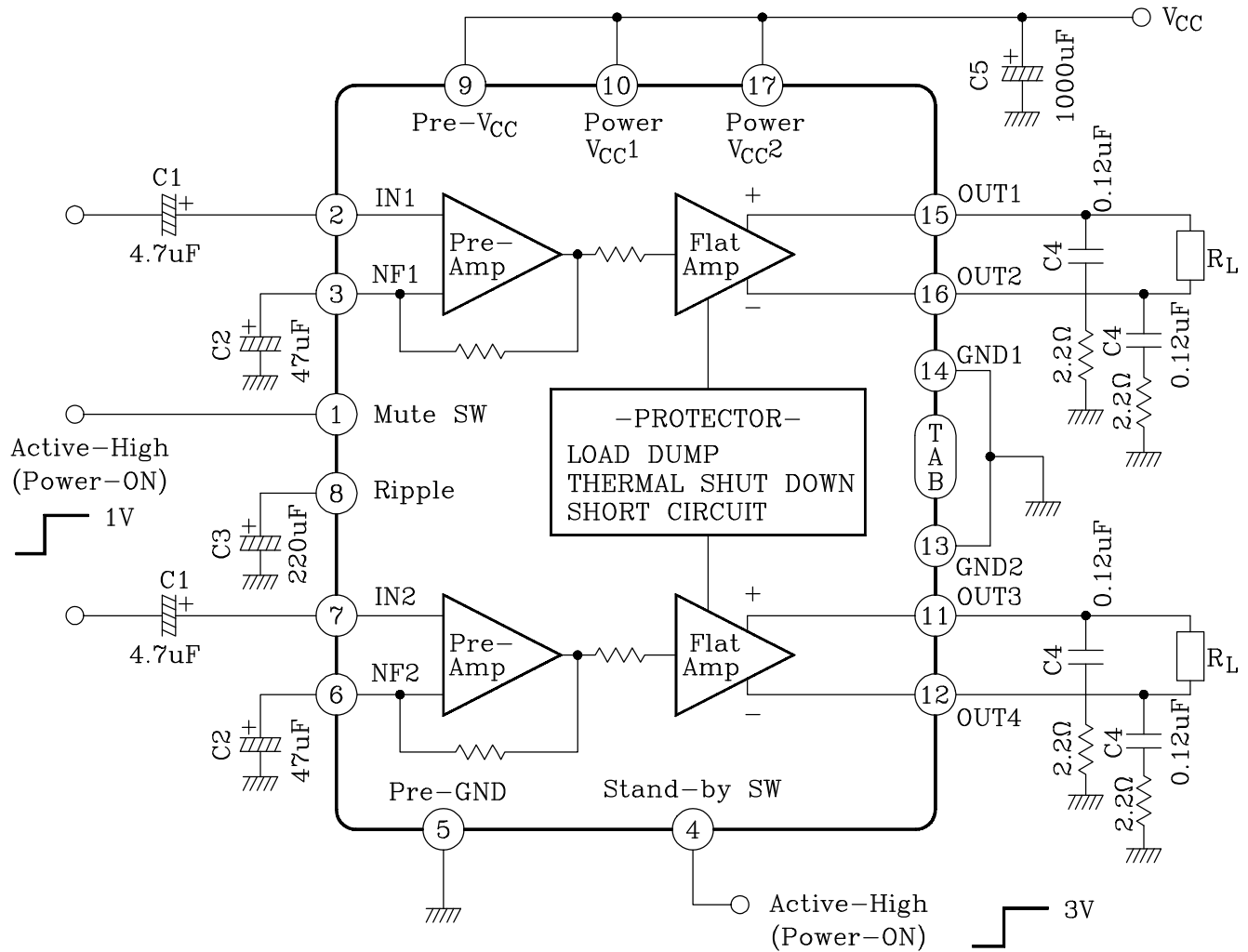
ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{CC}=13.2V, R_L=4Ω, f=1kHz, Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Supply Current	I _{CCQ}	-	V _{IN} =0	-	120	250	mA
Output Power	P _{OUT(1)}	-	V _{CC} =14.4V, THD=10%	-	18	-	W
	P _{OUT(2)}	-	THD=10%	11	15	-	
Total Harmonic Distortion	THD	-	P _{OUT} =1W	-	0.04	0.4	%
Voltage Gain	G _V	-	-	48	50	52	dB
Output Noise Voltage	V _{NO}	-	R _g =0Ω, BW=20Hz~20kHz	-	0.30	0.70	mV _{rms}
Ripple Rejection Ratio	R.R	-	f _{RIP} =100Hz, R _g =600Ω V _{RIP} =0dBm	40	54	-	dB
Input Resistance	R _{IN}	-	-	-	30	-	kΩ
Output Offset Voltage	V _{offset}	-	V _{IN} =0	-0.3	0	0.3	mV
Current at Stand-by State	I _{SB}	-	-	-	1	10	μA
Cross Talk	C.T	-	R _g =600Ω, V _{OUT} =0dBm	-	60	-	dB
④ Pin Control Voltage	V _{SB}	-	Stand-by→OFF(Power→ON)	2.5	-	V _{CC}	V
① Pin Control Voltage	V _(MUTE)	-	Mute→ON (Power→OFF)	-	1.0	2.0	V

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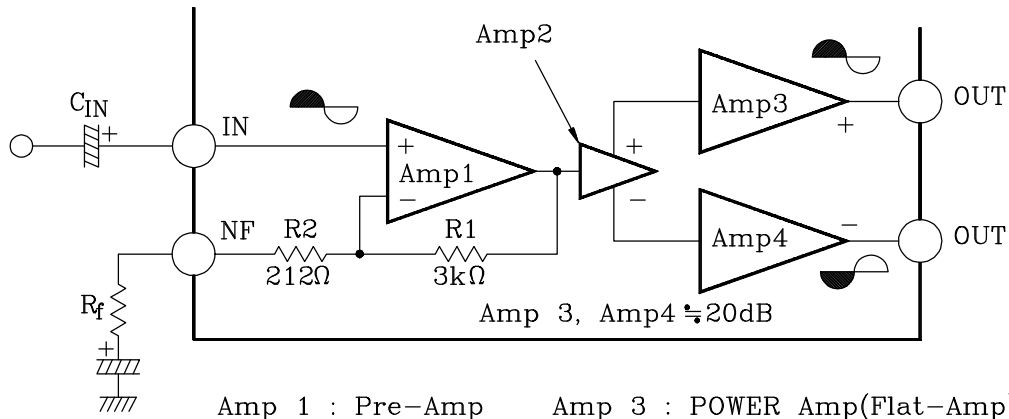
BLOCK DIAGRAM AND TEST CIRCUIT
(KIA6216H ($G_V=50\text{dB}$))



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CAUTIONS AND APPLICATION METHOD
(Description is made only on the single channel.)

1. Voltage Gain Adjustment



Amp 1 : Pre-Amp Amp 3 : POWER Amp(Flat-Amp)
Amp 2 : Phase Amp Amp 4 : POWER Amp(Flat-Amp)

(Fig.1)

This IC has the amplifier construction as shown in Fig.1. The Pre-Amp(Amp 1) is provided to the primary stage, and the input voltage is amplified by the Flat Amps, Amp 3 and Amp 4 of each channel through the phase Amp (Amp 2).

Since the input offset is prevented by Pre-Amp when Vcc is set to ON, this circuit can remarkably reduce the pop noise.

The total closed loop gain G_v of this IC can be obtained by expression below when the closed loop voltage gain of Amp 1 is G_{v1} .

$$G_{v1} = 20 \log \frac{R_1 + (R_f + R_2)}{R_f + R_2} \quad (\text{dB}) \quad \dots \dots \dots (1)$$

The closed loop voltage gain of POWER Amp (Amp 3 and 4) is fixed at

$$G_{v3} \cong G_{v4} = 20 \text{dB}$$

Therefore the total closed loop voltage gain G_v is obtained through BTL connection by the expression below.

$$G_v = G_{v1} + G_{v3} + 6(\text{dB}) \quad \dots \dots \dots (2)$$

For example, when $R_f = 0 \Omega$, G_v is obtained by the expression (1) and (2) as shown below.

$$G_v \cong 24 + 20 + 6 = 50 \text{dB}$$

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The voltage gain is reduced when R_f is increased. (Fig.2)

With the voltage gain reduced, since (1) the oscillation stability is reduced, and (2) the pop noise changes when V_{cc} is set to ON, refer to the items 3 and 4.

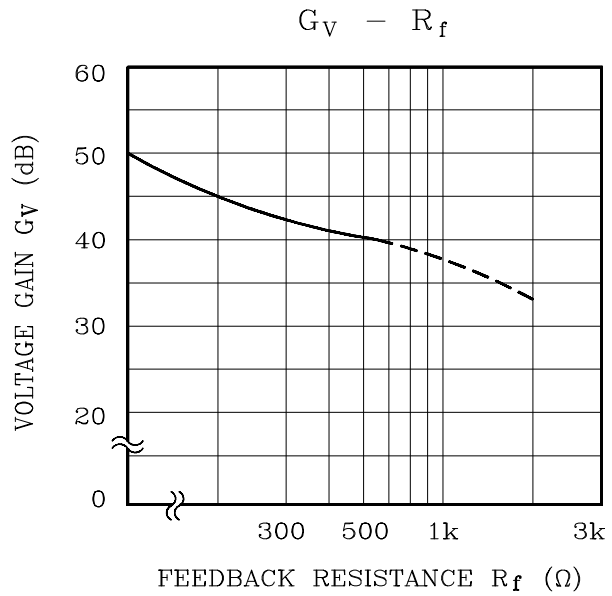
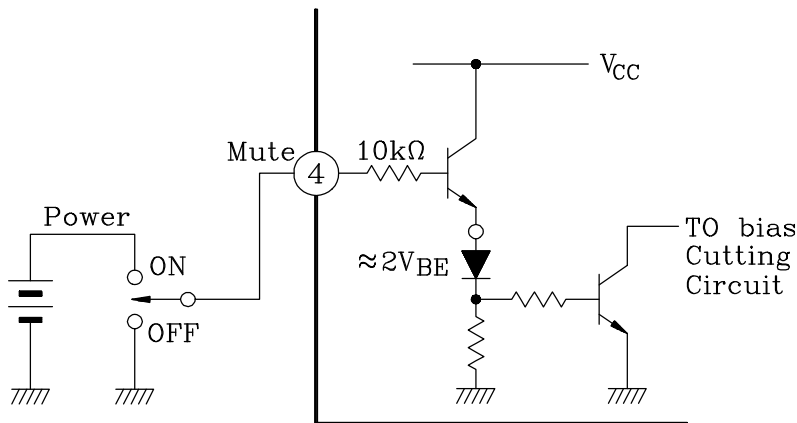


Fig-2.

2. Stand-by SW Function

By means of controlling ④ pin (Stand-by terminal) to High and Low, the power supply can be set to ON and OFF.

The threshold voltage of ④ pin is set about 3V (Typ.), and the power supply current is about $1\mu A$ (Typ.) at the stand-by state.



(Fig.3) With ④ Pin set to High, Power is turned ON.

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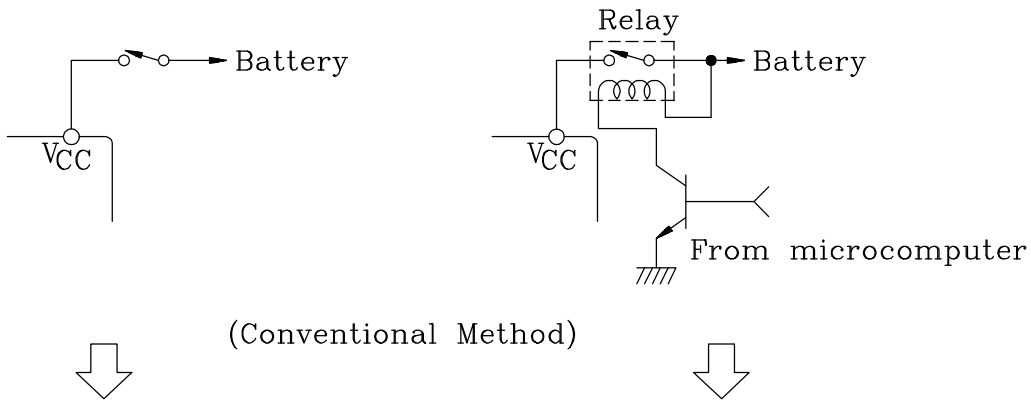
④ pin control voltage : V_{SB}

Stand-By	Power	$V_{SB}(V)$
ON	OFF	0~2
OFF	ON	3~ V_{CC}

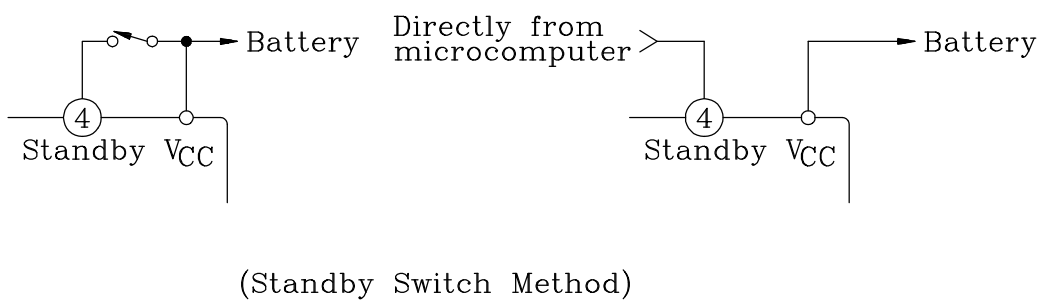
~Advantage of Stand-by SW~

- (1) Since V_{CC} can directly be controlled to ON/OFF by the microcomputer, the switching relay can be omitted.
- (2) Since the control current is microscopic, the switching relay of small current capacity is satisfactory for switching.

Large current capacity switch



Small current capacity switch

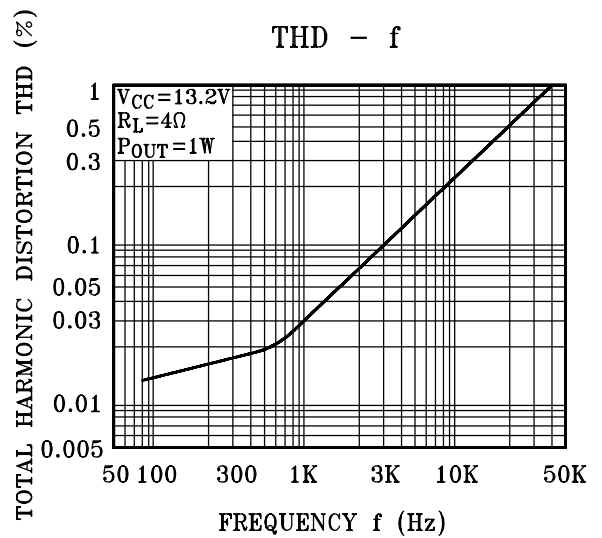
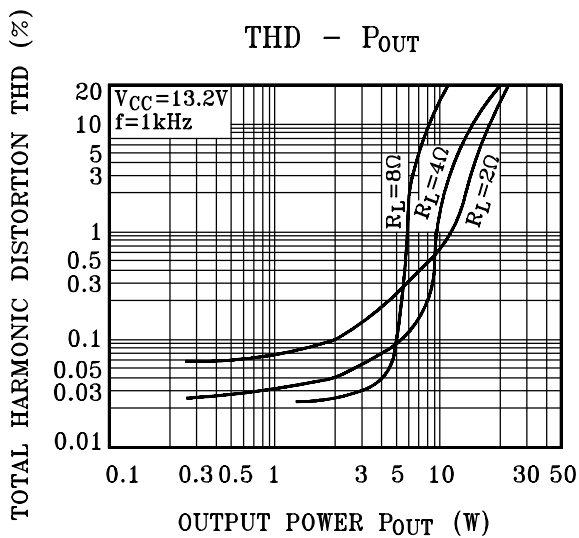
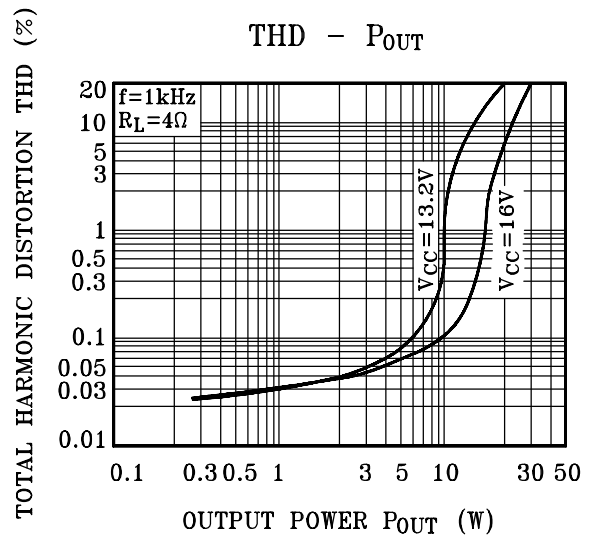
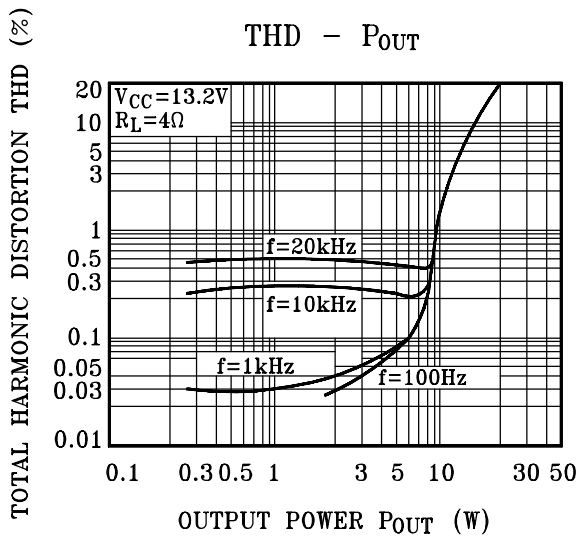


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6. External Part List And Description.

NAME OF PART	RECOMMENDED VALUE	OBJECT	INFLUENCE		REMARKS
			SMALLER THAN RECOMMENDED VALUE	LARGER THAN RECOMMENDED VALUE	
C ₁	4.7 μ F	DC Blocking	Related to pop noise at V _{CC} →ON.		Related to gain. Refer to item 4.
C ₂	47 μ F	Feedback Condenser	Related to pop noise at V _{CC} →ON.		
			Determination of low cut-off frequency. $C_2 = \frac{1}{2\pi f_L \cdot R_f}$		
C ₃	220 μ F	Ripple Reduction	Time constant is small at V _{CC} →ON or OFF.	Time constant is large at V _{CC} →ON or OFF.	
C ₄	0.12 μ F	Oscillation Prevention	Made liable to oscillate.	Oscillation allowance improved.	Refer to item 3.
C ₅	1000 μ F	Ripple Filter	For filtering power supply hum and ripple. Large at using AC rectified power supply. Small at using DC power supply.		

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