DYNAMIC SPEAKER DRIVE AMPLIFIER

FEATURES

- **Very Wide Operating Voltage (V_{CC} = 1.8 to 5.5 V)**
- **Very Low Supply Current**
- **Very Low Standby Current**
- **Miniature Package (SOT23L-6)**
- **Adjustable Voltage Gain (V_{G1} = 0 to 40 dB)**
- **Needs No Output Coupling Capacitor**

APPLICATIONS

- **Speaker Driver for Portable Equipment**
- **Headphone Driver**
- **Toys**

DESCRIPTION

The TK10416M is a very low operating voltage and current audio power amplifier to drive dynamic speakers.

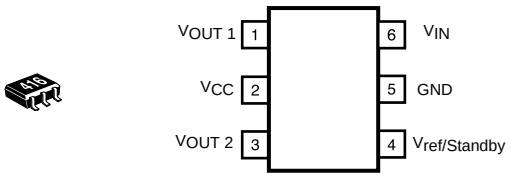
The TK10416M drives the speaker directly, because the device has a differential output that does not need an output coupling capacitor.

The voltage gain is adjustable by two external resistors.

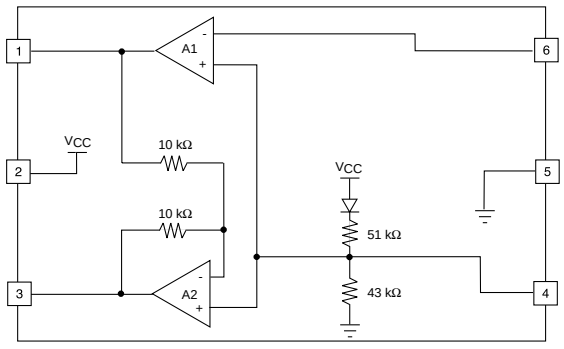
The TK10416M is available in the very small SOT23L-6 surface mount package.

The small package in conjunction with few external components save printed circuit board space.

TK10416M



BLOCK DIAGRAM



ORDERING INFORMATION

TK10416M □□

Tape/Reel Code

TAPE/REEL CODE
TL: Tape Left

ABSOLUTE MAXIMUM RATINGS

Supply Voltage ..... 6 V
Operating Voltage ..... 1.8 to 5.5 V
Power Dissipation (Notes 1 and 2)..... 400 mW
Storage Temperature Range ..... -55 to +150 °C
Operating Temperature Range .....-20 to +70 °C

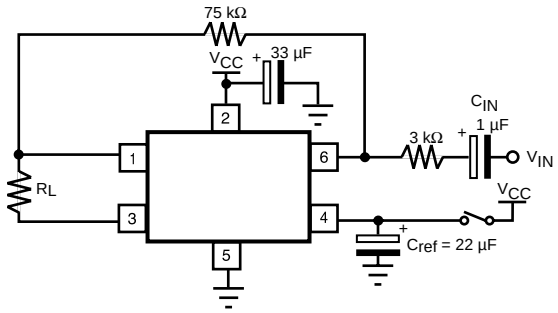
TK10416 ELECTRICAL CHARACTERISTICS

Test Conditions: V_{CC} = 3.6 V, f = 1.0 kHz, R_L = 32 Ω, T_A = 25 °C, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
I_{CC}	Supply Current	V_{CC} = 3.6 V, R_L = ∞		2.7	4.0	mA
		V_{CC} = 5.0 V, R_L = ∞		2.8	4.2	mA
$I_{CC(STBY)}$	Standby Supply Current	V_{CC} = 3.6 V = Pin 4, R_L = ∞		0.0	2.0	µA
I_{CONT}	Control Terminal Current	Pin 4 Sink Current, V_{Pin4} = V_{CC}		90	140	µA
V_{THS}	Standby Threshold Voltage	Pin 4	V_{CC} -0.4			V
G_{VO}	Open Circuit Voltage Gain	AMP1		71.0		dB
G_V	Voltage Gain	AMP1	25.0	28.0	30.0	dB
		AMP2	-3.0	0.0	+3.0	dB
		AMP1 + AMP2	31.0	34.0	36.0	dB
THD	Total Harmonic Distortion	V_{CC} = 3.6 V, P_{OUT} = 60 mW		0.5	1.0	%
		V_{CC} = 5.0 V, P_{OUT} = 120 mW		0.5	1.0	%
$P_{OUT(MAX)}$	Maximum Output Power	V_{CC} = 3.6 V, THD ≤ 10%	80	120		mW
		V_{CC} = 5.0 V, THD ≤ 10%	170	280		mW
RR	Ripple Rejection Ratio	C_{ref} = 22 µF		42.5		dB
$V_{OUT(DC)}$	DC Voltage at Output Terminal	V_{OUT1}	1.20	1.40	1.60	V
		V_{OUT2}	1.20	1.40	1.60	V
$V_{OUT(OS)}$	Output Offset Voltage	V_{OUT2} + V_{OUT1}	-30.0	0.0	+30.0	mV
R_L	Load Resistance		8	32		Ω

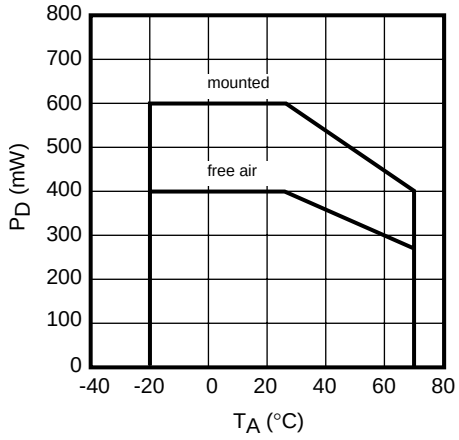
Note 1: Power dissipation is 400 mW in free air. Derate at 3.2 mW/°C for operation above 25 °C.
Note 2: Power dissipation is 600 mW when mounted. Derate at 4.8 mW/°C for operation above 25 °C.

TEST CIRCUIT

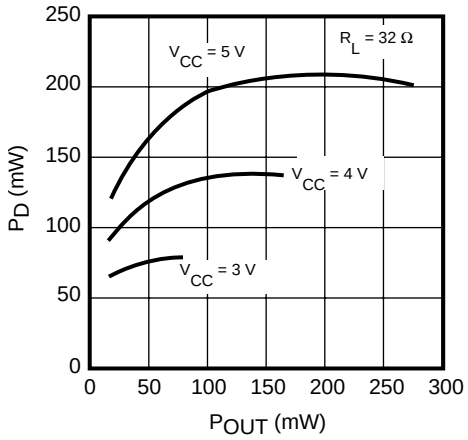


TYPICAL PERFORMANCE CHARACTERISTICS

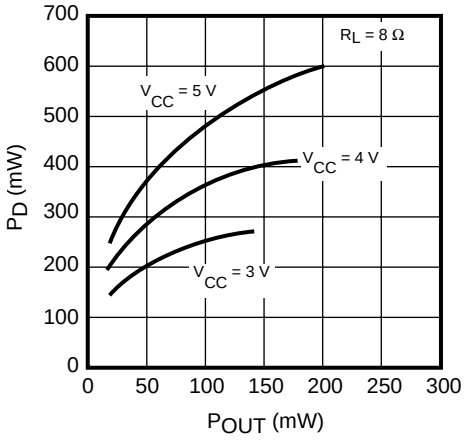
POWER DISSIPATION vs. TEMPERATURE



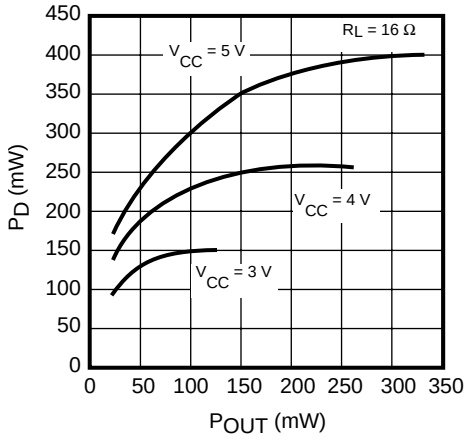
POWER DISSIPATION vs. OUTPUT POWER



POWER DISSIPATION vs. OUTPUT POWER

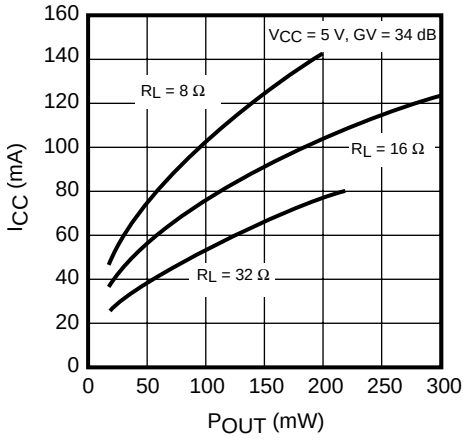


POWER DISSIPATION vs. OUTPUT POWER

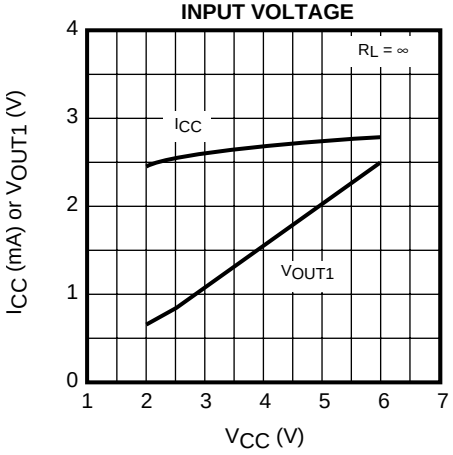


TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

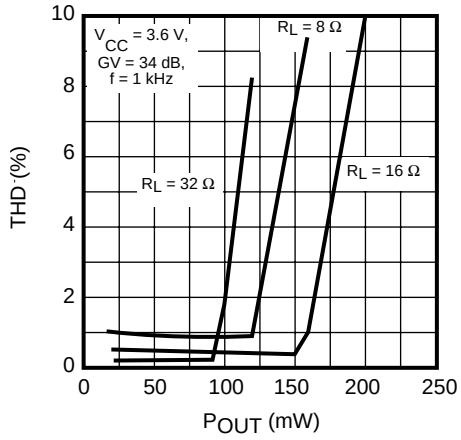
SUPPLY CURRENT vs. OUTPUT POWER



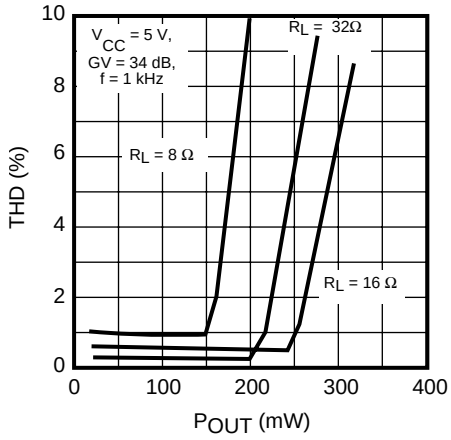
SUPPLY CURRENT AND OUTPUT VOLTAGE vs. INPUT VOLTAGE



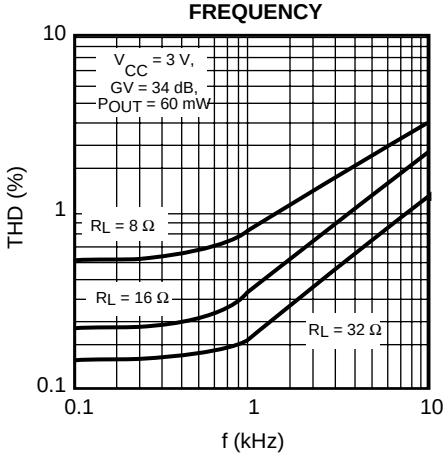
TOTAL HARMONIC DISTORTION vs. OUTPUT POWER



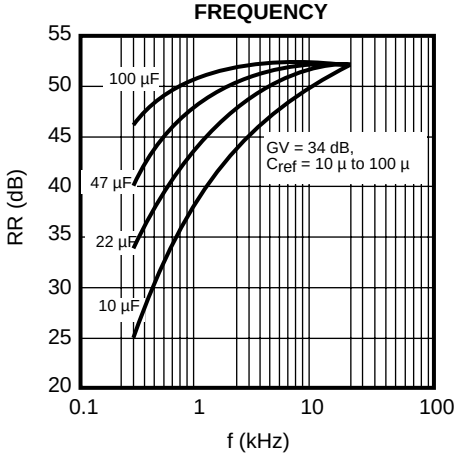
TOTAL HARMONIC DISTORTION vs. OUTPUT POWER



TOTAL HARMONIC DISTORTION vs. FREQUENCY

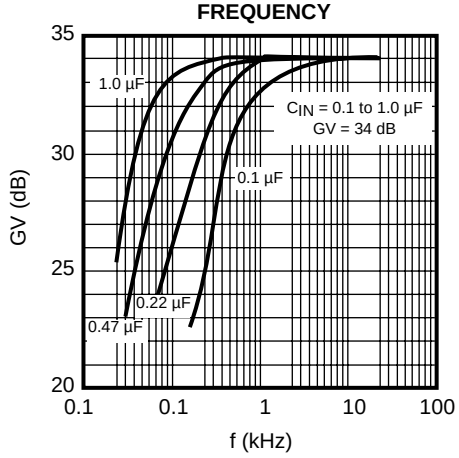


RIPPLE REJECTION RATIO vs. FREQUENCY

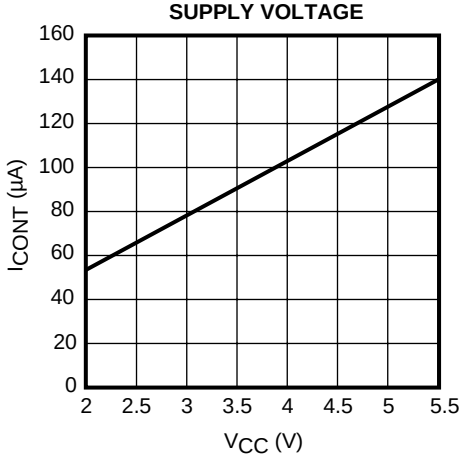


TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

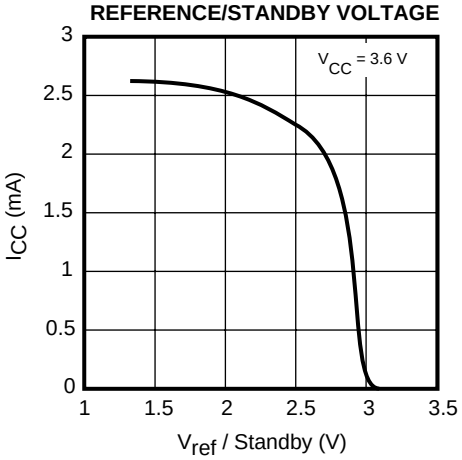
VOLTAGE GAIN vs. FREQUENCY



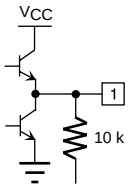
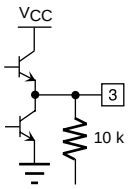
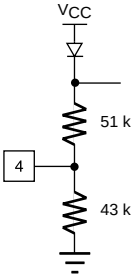
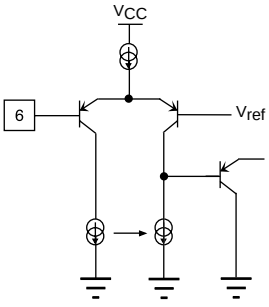
CONTROL TERMINAL CURRENT vs. SUPPLY VOLTAGE



SUPPLY CURRENT vs. REFERENCE/STANDBY VOLTAGE



PIN FUNCTION DESCRIPTION

PIN NO.	SYMBOL	TERMINAL VOLTAGE (V)	INTERNAL EQUIVALENT CIRCUIT	DESCRIPTION
1	V_{OUT1}	V_{OUT} (Note 1)		A1 amplifier output terminal
2	V_{CC}	V_{CC}		Supply input terminal
3	V_{OUT2}	V_{OUT} (Note 1)		A2 amplifier output terminal
4	V_{ref} / Standby	V_{OUT} (Note 1)		Reference voltage terminal. When this terminal is V_{CC}, the device is in the standby mode and the supply current is down to under 0.1 µA.
5	GND	0 V		Ground terminal
6	V_{IN}	V_{OUT} (Note 1)		A1 amplifier input terminal

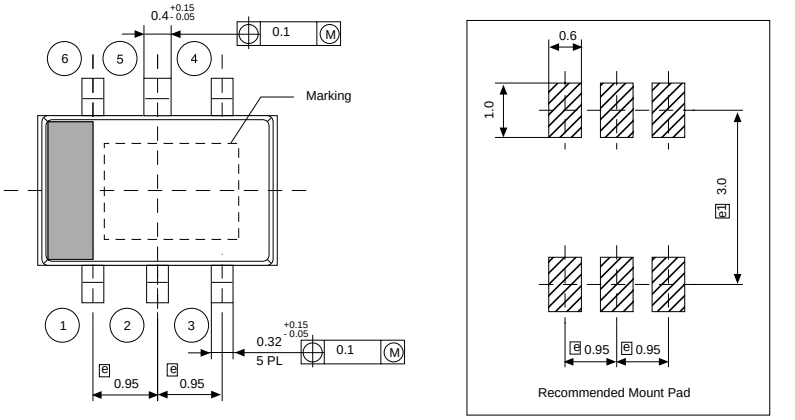
Note 1: Terminal voltage with no input signal is calculated by the following equation:

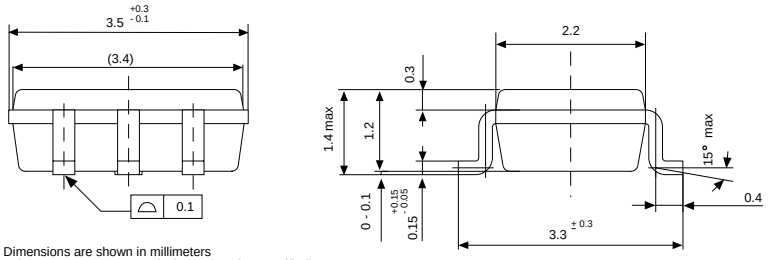
$$V_{OUT} = (V_{CC} - 0.56)\ X\ \frac{43\ k}{43\ k + 51\ k}$$

NOTES

PACKAGE OUTLINE

SOT23L-6





Dimensions are shown in millimeters
Tolerance: x.x = ± 0.2 mm (unless otherwise specified)

Marking Information

	Marking
TK10416	416

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