CERAMIC SPEAKER DRIVE AMPLIFIER

FEATURES

- **Wide Operating Voltage Range (V_{CC} = 1.8 to 5.5 V)**
- **Very Low Supply Current (I_{CC} = 1.8 mA @ V_{CC}= 2.4 V)**
- **Very Low Standby Current (I_{STBY} = 0.1 μA)**
- **Miniature Package (SOT23L-6)**
- **Very Large Output Voltage ($V_{OUT(MAX)}$ = 1.7 Vrms @ V_{CC} = 2.4 V, R_L = 620 Ω)**
- **Very Small Total Harmonic Distortion (THD = 0.1 % @ V_{OUT} = 0.8 Vrms)**
- **Needs No Output Coupling Capacitor**

APPLICATIONS

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

DESCRIPTION

The TK10415M is a very low operating voltage and current audio power amplifier to drive ceramic speakers.

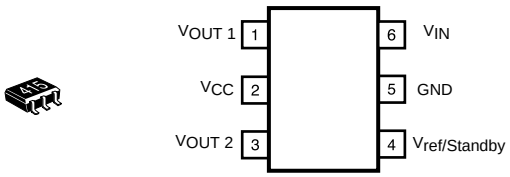
The TK10415M drives the speaker directly, because the device has a differential output that does not need an output coupling capacitor.

The voltage gain is adjustable by two external resistors.

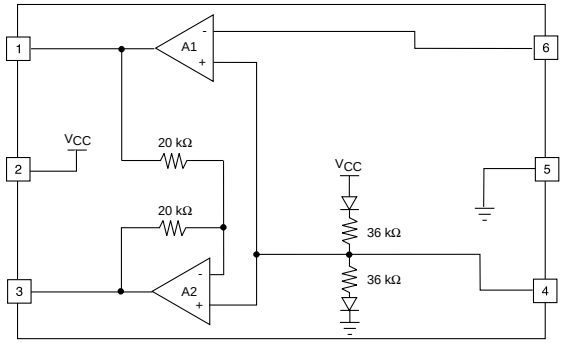
The TK10415M is available in the very small SOT23L-6 surface mount package.

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

TK10415



BLOCK DIAGRAM



ORDERING INFORMATION

TK10415M □□

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

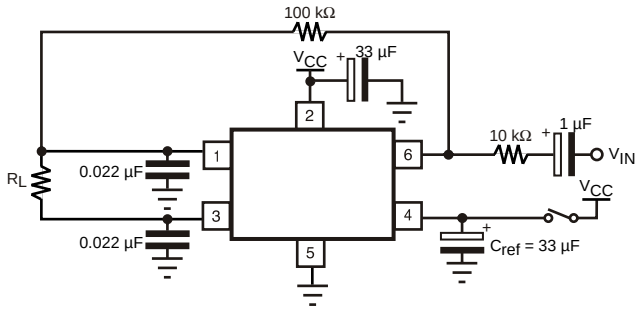
TK10415 ELECTRICAL CHARACTERISTICS

Test Conditions: V_{CC} = 2.4 V, f = 1.0 kHz, R_L = 620 Ω, T_A = 25 °C, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
I_{CC}	Supply Current	V_{CC} = 2.4 V, R_L = ∞		1.8	3.0	mA
		V_{CC} = 5.0 V, R_L = ∞		2.2	3.5	mA
I_{STBY}	Standby Supply Current	V_{CC} = 2.4 V = Pin 4, R_L = ∞		0.0	2.0	µA
I_{CONT}	Control Terminal Current	Pin 4 Sink Current, V_{Pin4} = V_{CC}		53.0	90.0	µA
V_{THS}	Standby Threshold Voltage	Pin 4	V_{CC} -0.4			V
G_{VO}	Open Circuit Voltage Gain	AMP1		60.0		dB
G_V	Voltage Gain	AMP1	17.0	20.0	23.0	dB
		AMP2	-3.0	0.0	3.0	dB
		AMP1 + AMP2	23.0	26.0	29.0	dB
THD	Total Harmonic Distortion	V_{CC} = 2.4 V, V_{OUT} = 0.8 V_{rms}		0.1	1.0	%
		V_{CC} = 5.0 V, V_{OUT} = 2.0 V_{rms}		0.1	1.0	%
$V_{OUT(MAX)}$	Maximum Output Voltage	V_{CC} = 2.4 V, THD ≤ 10%	1.2	1.7		V_{rms}
		V_{CC} = 5.0 V, THD ≤ 10%	2.6	3.7		V_{rms}
RR	Ripple Rejection Ratio	C_{ref} = 33 µF		38.0		dB
$V_{OUT(DC)}$	DC Voltage at Output Terminal	V_{OUT1}	1.00	1.20	1.40	V
		V_{OUT2}	1.00	1.20	1.40	V
$V_{OUT(OS)}$	Output Offset Voltage	V_{OUT2} - V_{OUT1}	-30.0	0.0	30.0	mV
R_L	Load Resistance		100	620		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.

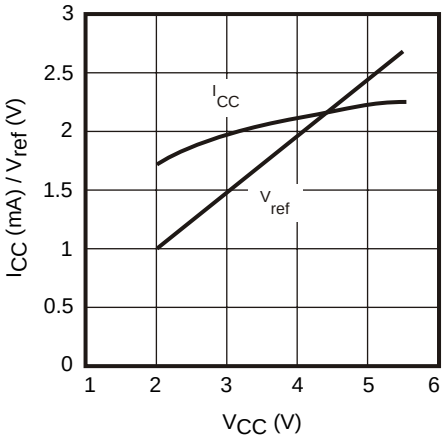
TEST CIRCUIT



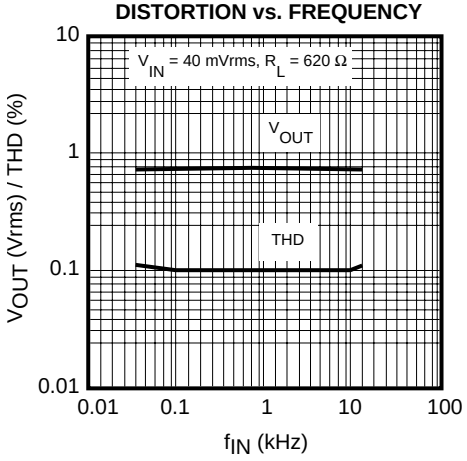
TYPICAL PERFORMANCE CHARACTERISTICS

V_{CC} = 5 V, T_A = 25 °C, unless otherwise specified.

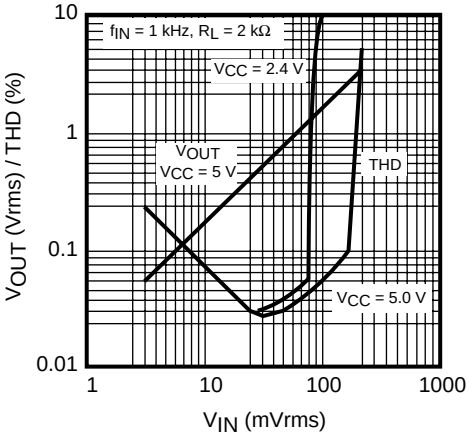
SUPPLY CURRENT and REFERENCE VOLTAGE vs. SUPPLY VOLTAGE



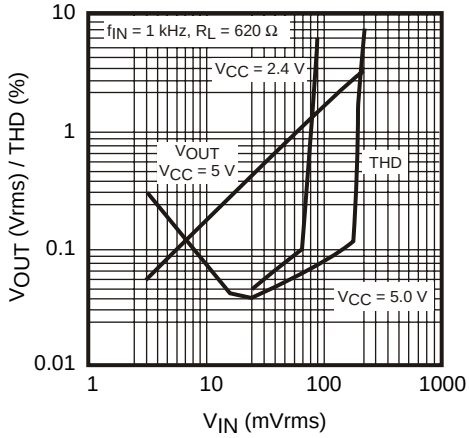
OUTPUT VOLTAGE AND DISTORTION vs. FREQUENCY



OUTPUT VOLTAGE AND DISTORTION vs. INPUT VOLTAGE 1



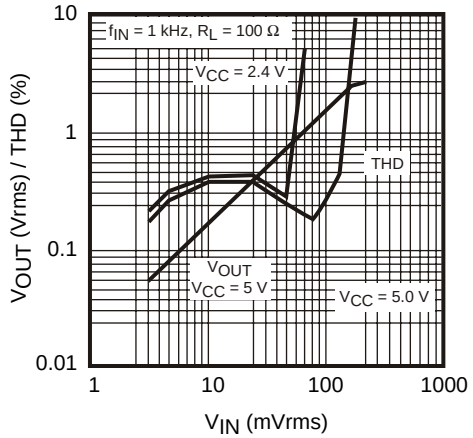
OUTPUT VOLTAGE AND DISTORTION vs. INPUT VOLTAGE 2



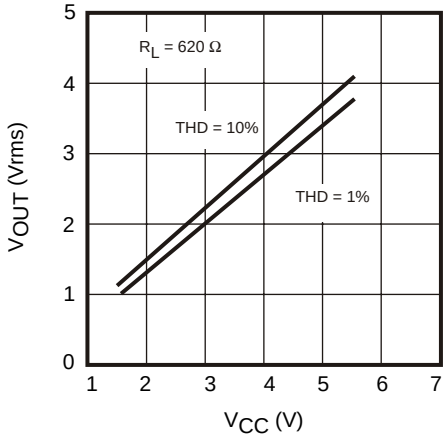
TYPICAL PERFORMANCE CHARACTERISTICS (CONT.)

V_{CC} = 5 V, T_A = 25 °C, unless otherwise specified.

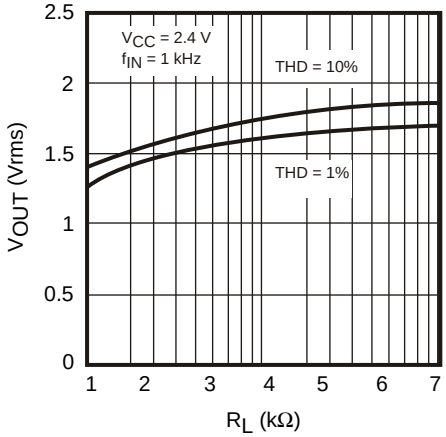
OUTPUT VOLTAGE AND DISTORTION vs. INPUT VOLTAGE 3



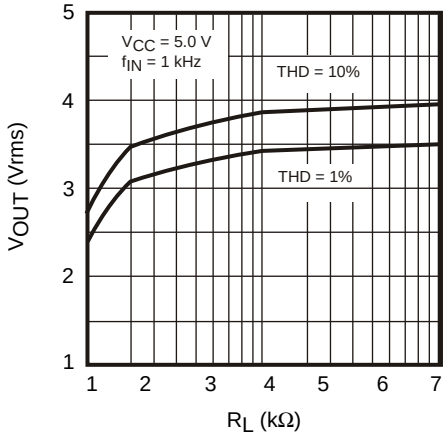
MAXIMUM OUTPUT VOLTAGE vs. SUPPLY VOLTAGE



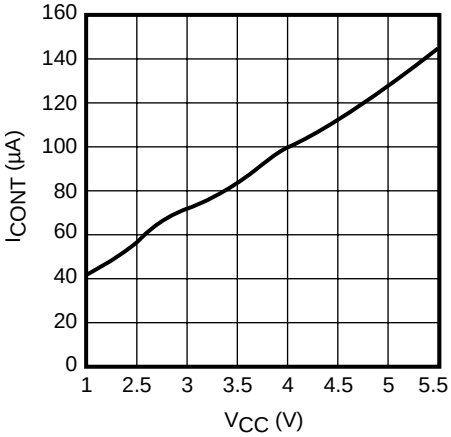
MAXIMUM OUTPUT VOLTAGE vs. LOAD RESISTANCE 1



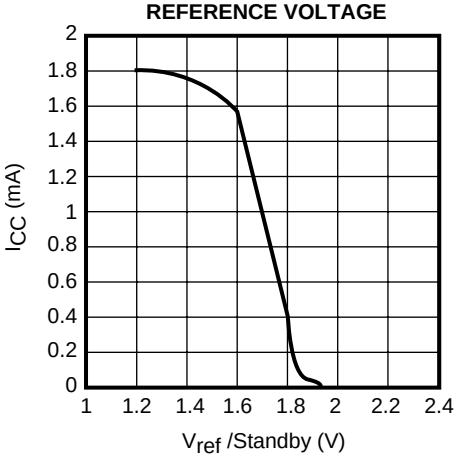
MAXIMUM OUTPUT VOLTAGE vs. LOAD RESISTANCE 2



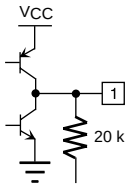
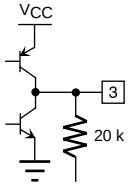
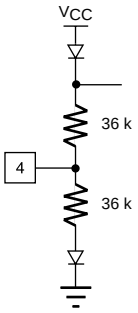
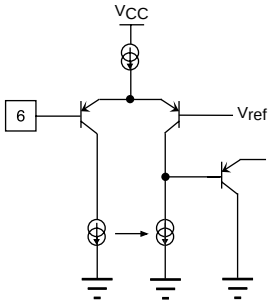
CONTROL CURRENT vs. SUPPLY VOLTAGE



SUPPLY CURRENT vs. REFERENCE VOLTAGE



PIN FUNCTION DESCRIPTIONS

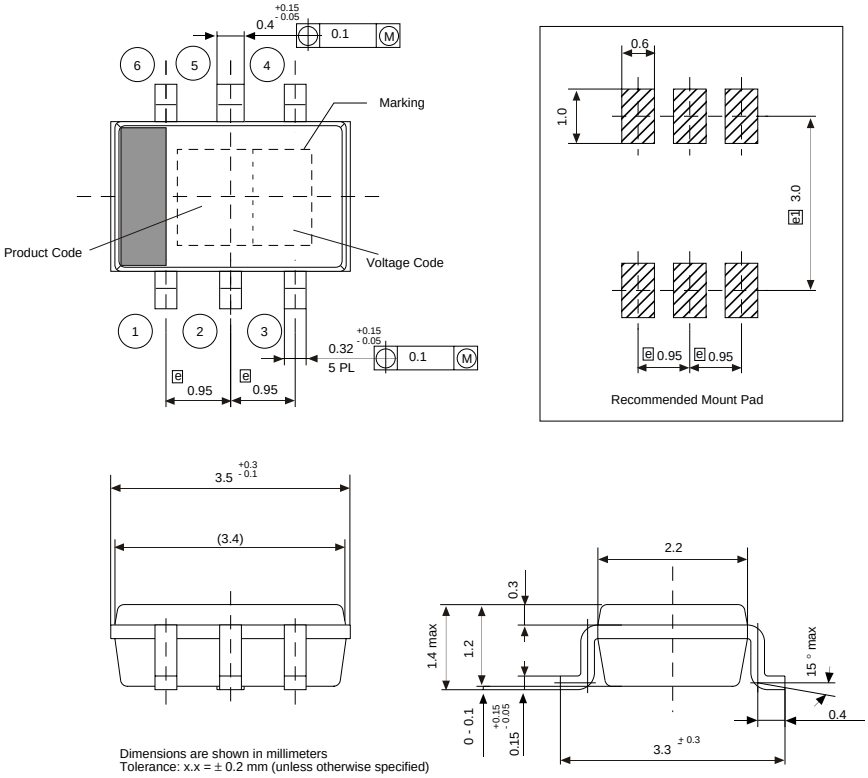
PIN NO.	SYMBOL	TERMINAL VOLTAGE (V)	INTERNAL EQUIVALENT CIRCUIT	DESCRIPTION
1	V_{OUT1}	1/2 V_{CC}		A1 amplifier output terminal
2	V_{CC}	V_{CC}	—	Supply input terminal
3	V_{OUT2}	1/2 V_{CC}		A2 amplifier output terminal
4	V_{ref}	1/2 V_{CC}		Reference voltage terminal. When this terminal is V_{CC}, the 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}	1/2 V_{CC}		A1 amplifier input terminal.

NOTES

NOTES

PACKAGE OUTLINE

SOT-23L-6(a) (SOT-23L)



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

Marking Information

	Marking
TK10415	415

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