



Test Procedure for the STK404-120NGEVB Evaluation Board

[Supply Voltage]

+Vcc/-Vcc : Power Supply for audio power amplifiers

+PRE (+12V) : Power Supply for +PRE

[Operation Guide]

1. Installation of the heat sink
Please refer to a thermal design tip for the amplifier.
2. Load Connection:
Connect the $R_L=6\Omega$ (Non-inductive load)
3. Power Supply Connection:
Connect the +Vcc/-Vcc/+12V (Output off : 0V)
5. Input Connection:
Connect the Oscillator (Sine wave / Output resistance 600Ω)
The gain of the evaluation board is set in 30dB.
6. Power Supply:
At first, supply DC voltage to +12V.
Next, supply DC voltage to +Vcc and -Vcc.
7. Input: ON

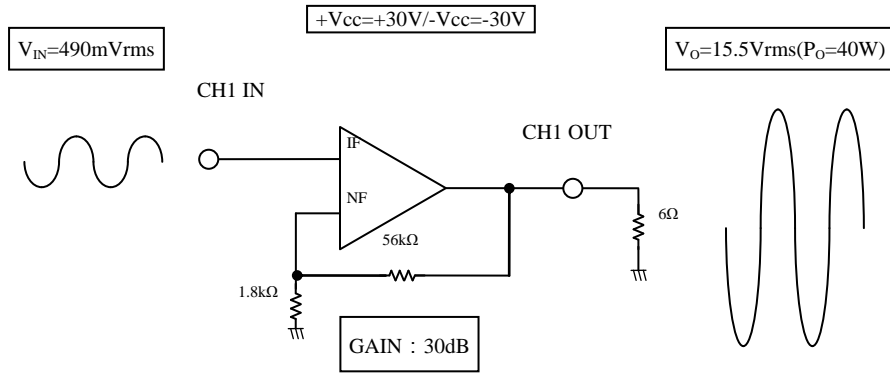


[Required Equipment]

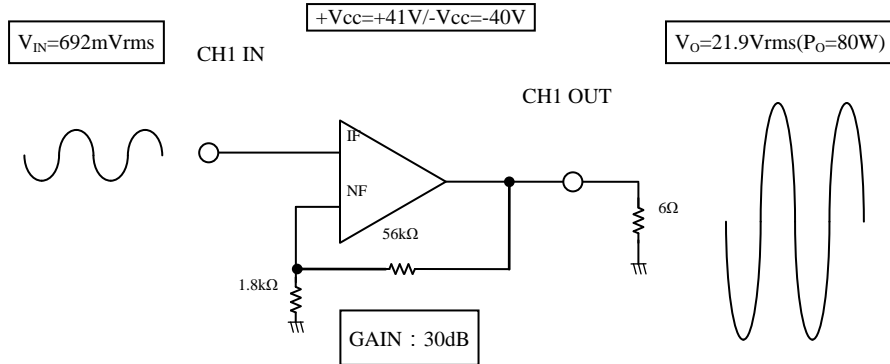
Equipment	Efficiency		
Evaluation Board	STK404-070NGEVB	STK404-120NGEVB	STK404-140NGEVB
Power supply +Vcc	60V-3A	80V-5A	100V-6A
Power supply -Vcc	60V-3A	80V-5A	100V-6A
Power supply Stand-By Control	15V-1A		
Load	6Ω(Non-inductive load)		
Measurement	Audio analyzer (Panasonic VP-7723B)		

Characteristics confirmation

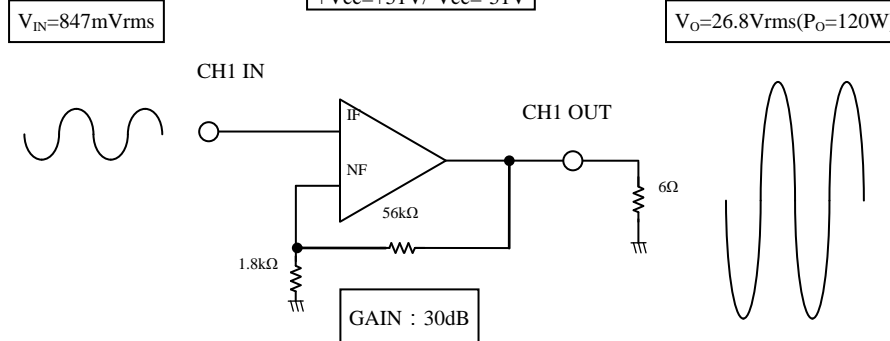
STK404-070NGEVB



STK404-120NGEVB

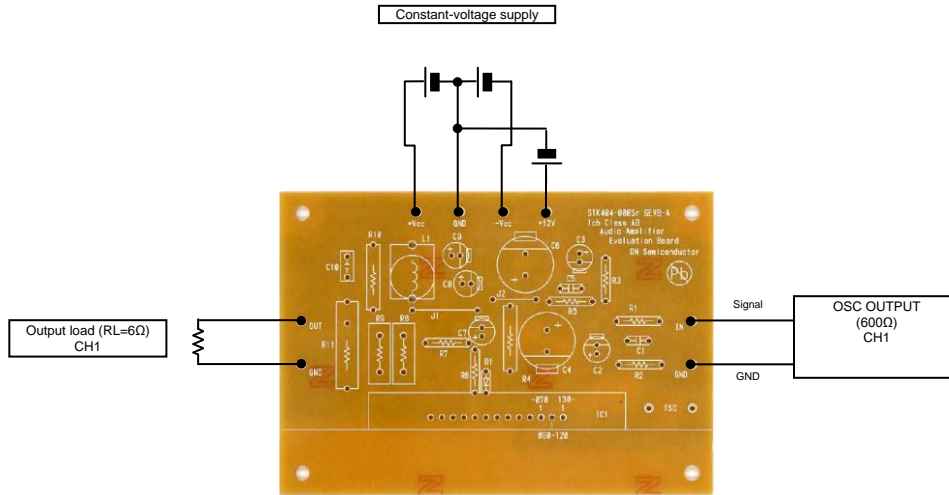


STK404-140NGEVB

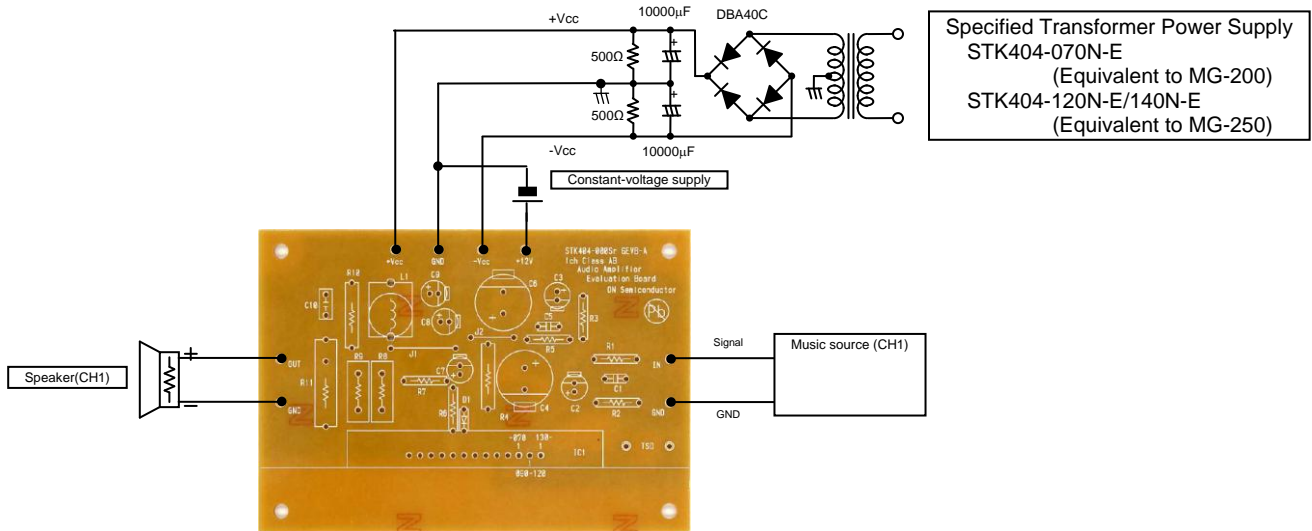




Characteristics confirmation



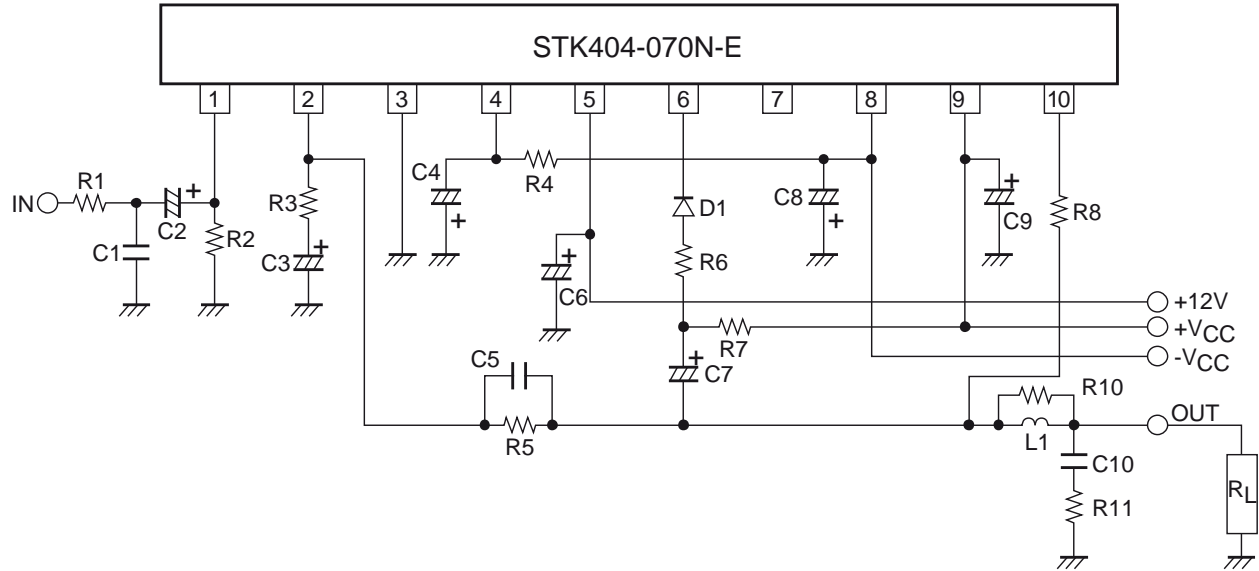
Sound quality confirmation, load short-circuit test, noise examination





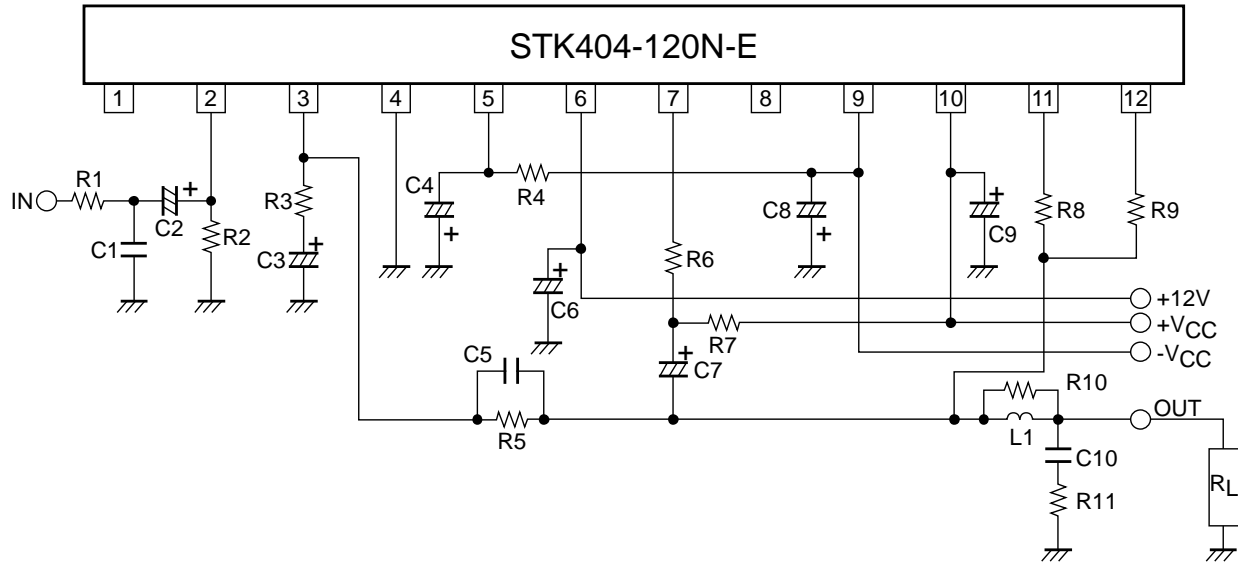
Test Circuit

STK404-070N-E



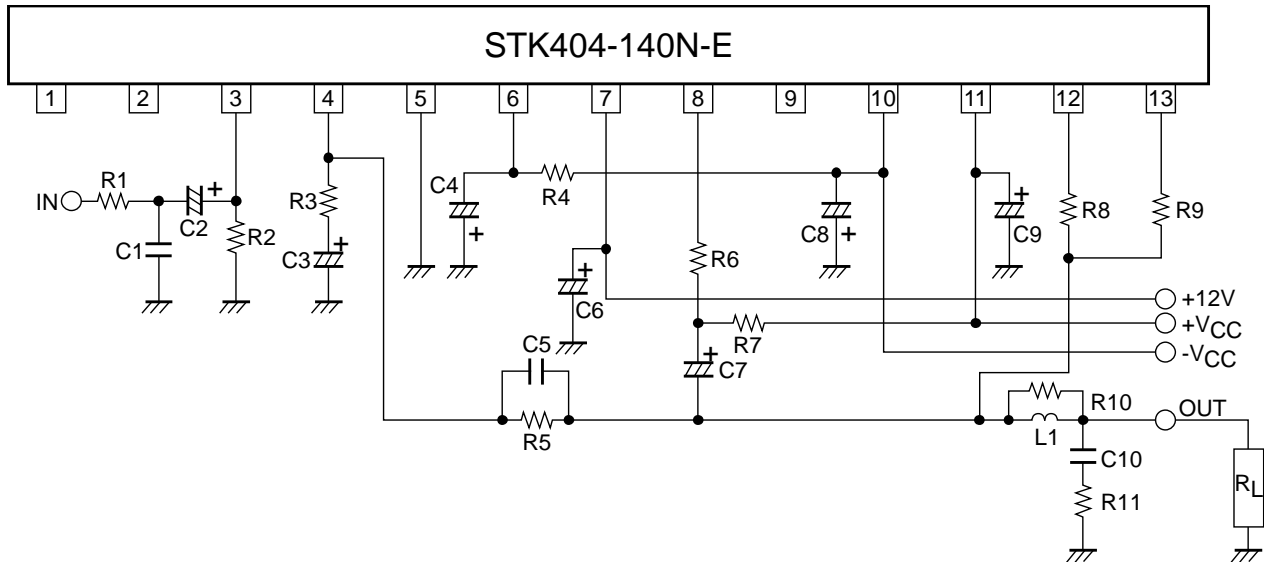
Test Circuit

STK404-120N-E





Test Circuit STK404-140N-E

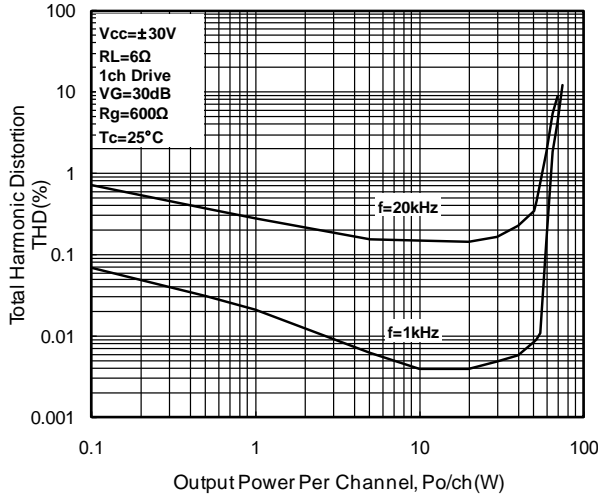




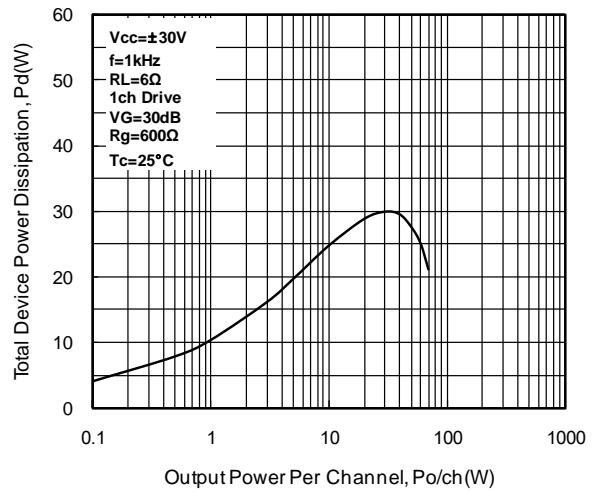
Characteristic of Evaluation Board

STK404-070N-E

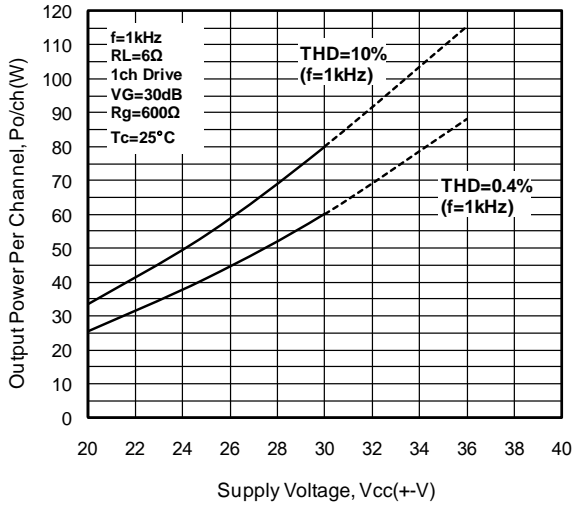
THD-Po
STK404-070N-E



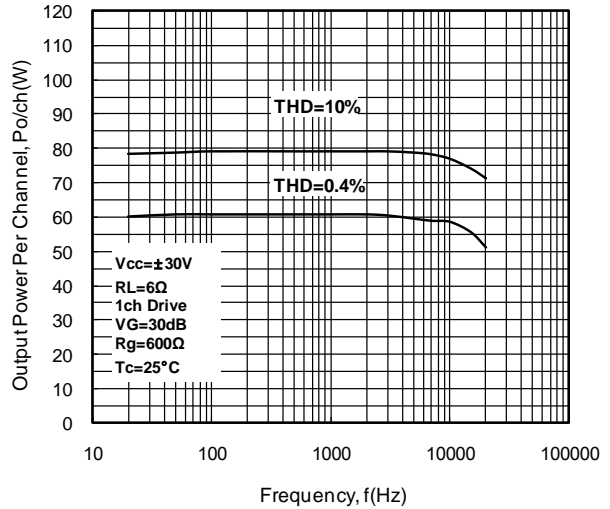
Pd-Po
STK404-070N-E



Po-Vcc
STK404-070N-E



Po-f
STK404-070N-E

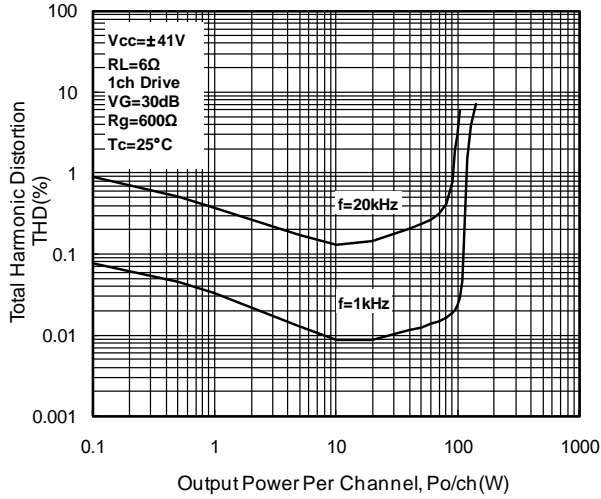




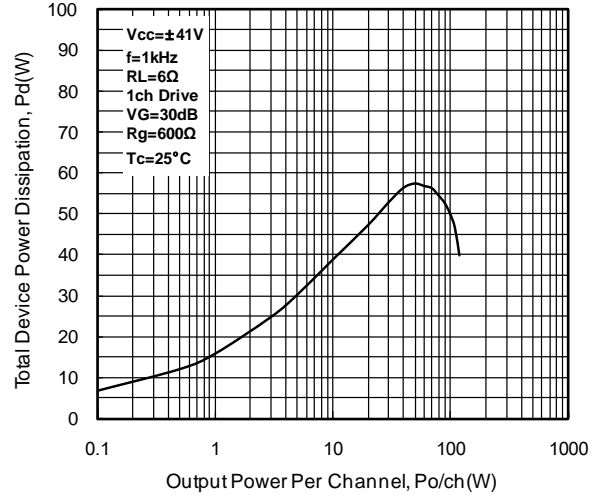
Characteristic of Evaluation Board

STK404-120N-E

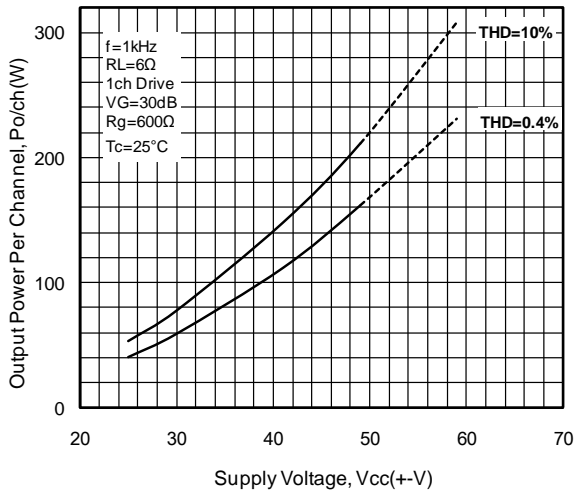
THD-Po
STK404-120N-E



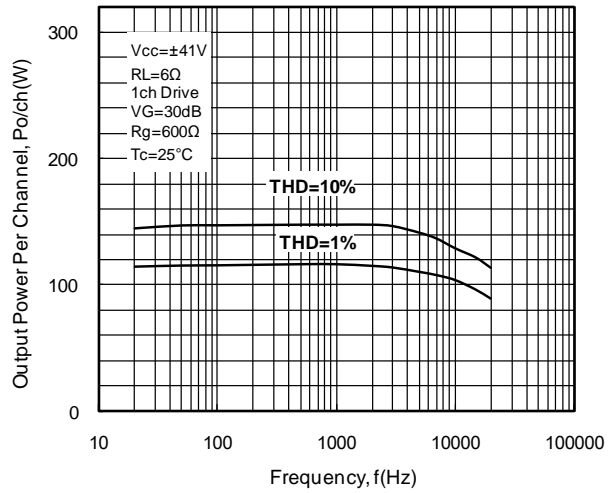
Pd-Po
STK404-120N-E



Po-Vcc
STK404-120N-E



Po-f
STK404-120N-E

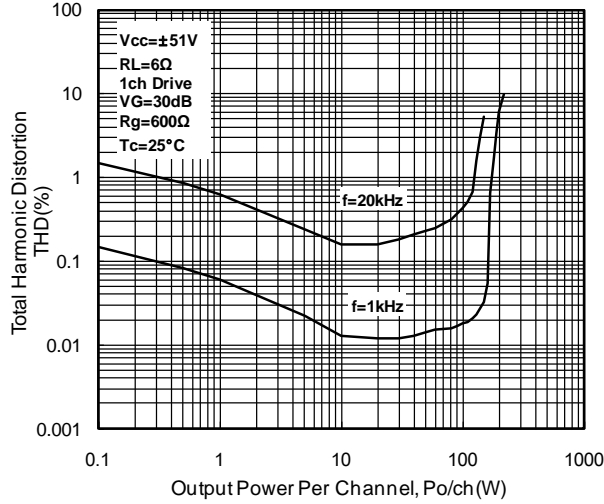




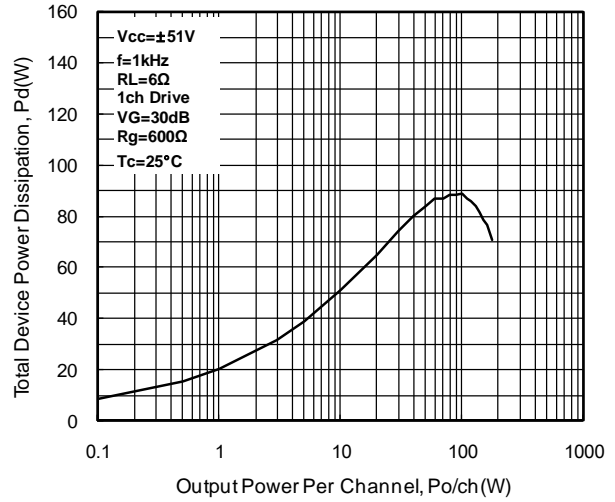
Characteristic of Evaluation Board

STK404-140N-E

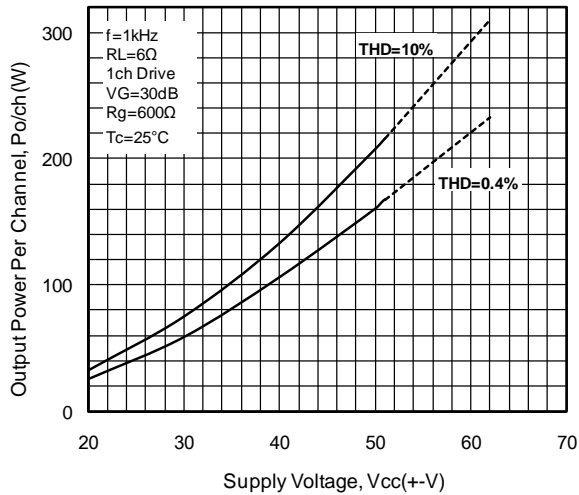
THD-Po
STK404-140N-E



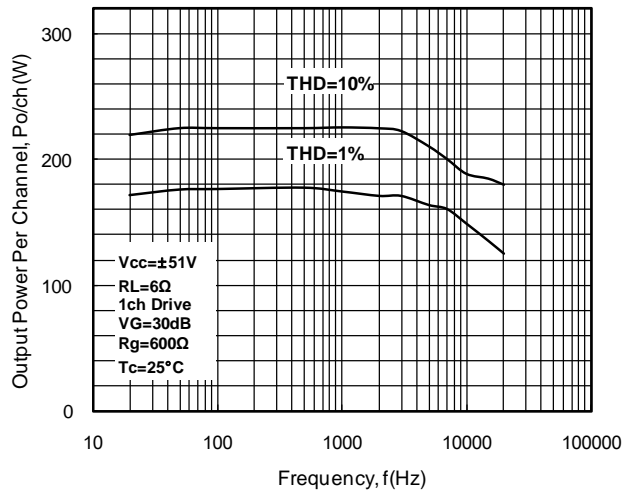
Pd-Po
STK404-140N-E



Po-Vcc
STK404-140N-E



Po-f
STK404-140N-E





A Thermal Design Tip For STK404-070N-E Amplifier

[Thermal Design Conditions]

The thermal resistance (θ_{c-a}) of the heat-sink which manages the heat dissipation inside the Hybrid IC will be determined as follow:

(Condition 1) The case temperature (T_c) of the Hybrid IC should not exceed 125°C

$$P_d \times \theta_{c-a} + T_a < 125^\circ\text{C} \dots\dots\dots (1)$$

Where T_a : the ambient temperature for the system

(Condition 2) The junction temperature of each power transistor should not exceed 150°C

$$P_d \times \theta_{c-a} + P_d/N \times \theta_{j-c} + T_a < 150^\circ\text{C} \dots\dots\dots (2)$$

Where N : the number of transistors (two for 1 channel , ten for channel)

θ_{j-c} : the thermal resistance of each transistor (see specification)

Note that the power consumption of each power transistor is assumed to be equal to the total power dissipation (P_d) divided by the number of transistors (N).

From the formula (1) and (2), we will obtain:

$$\theta_{c-a} < (125 - T_a)/P_d \dots\dots\dots (1)'$$

$$\theta_{c-a} < (150 - T_a)/P_d - \theta_{j-c}/N \dots\dots\dots (2)'$$

The value which satisfies above formula (1)' and (2)' will be the thermal resistance for a desired heat-sink.

Note that all of the component except power transistors employed in the Hybrid IC comply with above conditions.

[Example of Thermal Design]

Generally, the power consumption of actual music signals are being estimated by the continuous signal of 1/8 P_O max. (Note that the value of 1/8 P_O max may be varied from the country to country.)

(Sample of STK404-070N-E ; 40W×1ch)

If V_{CC} is ±30V, and R_L is 6Ω, then the total power dissipation (P_d) of inside Hybrid IC is as follow;

$$P_d = 19.6\text{W (at 5W output power, 1/8 of } P_O \text{ max)}$$

There are two (2) transistors in Audio Section of this Hybrid IC, and thermal resistance (θ_{j-c}) of each transistor is 3.0°C/W. If the ambient temperature (T_a) is guaranteed for 50°C, then the thermal resistance (θ_{c-a}) of a desired heat-sink should be;

$$\begin{aligned} \text{From (1)'} \quad \theta_{c-a} &< (125 - 50)/19.6 \\ &< 3.83 \end{aligned}$$

$$\begin{aligned} \text{From (2)'} \quad \theta_{c-a} &< (150 - 50)/19.6 - 3.0/2 \\ &< 3.60 \end{aligned}$$

Therefore, in order to satisfy both (1)' and (2)', the thermal resistance of a desired Heat-sink will be 3.60°C/W.

[Note]

Above are reference only. The samples are operated with a constant power supply. Please verify the conditions when your system is actually implemented.



A Thermal Design Tip For STK404-120N-E Amplifier

[Thermal Design Conditions]

The thermal resistance (θ_{c-a}) of the heat-sink which manages the heat dissipation inside the Hybrid IC will be determined as follow:

(Condition 1) The case temperature (T_c) of the Hybrid IC should not exceed 125°C

$$P_d \times \theta_{c-a} + T_a < 125^\circ\text{C} \dots\dots\dots (1)$$

Where T_a : the ambient temperature for the system

(Condition 2) The junction temperature of each power transistor should not exceed 150°C

$$P_d \times \theta_{c-a} + P_d/N \times \theta_{j-c} + T_a < 150^\circ\text{C} \dots\dots\dots (2)$$

Where N : the number of transistors (two for 1 channel , ten for channel)

θ_{j-c} : the thermal resistance of each transistor (see specification)

Note that the power consumption of each power transistor is assumed to be equal to the total power dissipation (P_d) divided by the number of transistors (N).

From the formula (1) and (2), we will obtain:

$$\theta_{c-a} < (125 - T_a)/P_d \dots\dots\dots (1)'$$

$$\theta_{c-a} < (150 - T_a)/P_d - \theta_{j-c}/N \dots\dots\dots (2)'$$

The value which satisfies above formula (1)' and (2)' will be the thermal resistance for a desired heat-sink.

Note that all of the component except power transistors employed in the Hybrid IC comply with above conditions.

[Example of Thermal Design]

Generally, the power consumption of actual music signals are being estimated by the continuous signal of 1/8 $P_{O\ max}$. (Note that the value of 1/8 $P_{O\ max}$ may be varied from the country to country.)

(Sample of STK404-120N-E ; 80W×1ch)

If V_{CC} is ±41V, and R_L is 6Ω, then the total power dissipation (P_d) of inside Hybrid IC is as follow;

$$P_d = 37.5\text{W (at 10W output power, 1/8 of } P_{O\ max})$$

There are four (2) transistors in Audio Section of this Hybrid IC, and thermal resistance (θ_{j-c}) of each transistor is 1.7°C/W. If the ambient temperature (T_a) is guaranteed for 50°C, then the thermal resistance (θ_{c-a}) of a desired heat-sink should be;

$$\begin{aligned} \text{From (1)'} \quad \theta_{c-a} &< (125 - 50)/37.5 \\ &< 2.00 \end{aligned}$$

$$\begin{aligned} \text{From (2)'} \quad \theta_{c-a} &< (150 - 50)/37.5 - 1.7/2 \\ &< 1.82 \end{aligned}$$

Therefore, in order to satisfy both (1)' and (2)', the thermal resistance of a desired Heat-sink will be 1.82°C/W.

[Note]

Above are reference only. The samples are operated with a constant power supply. Please verify the conditions when your system is actually implemented.



A Thermal Design Tip For STK404-140N-E Amplifier

[Thermal Design Conditions]

The thermal resistance (θ_{c-a}) of the heat-sink which manages the heat dissipation inside the Hybrid IC will be determined as follow:

(Condition 1) The case temperature (T_c) of the Hybrid IC should not exceed 125°C

$$P_d \times \theta_{c-a} + T_a < 125^\circ\text{C} \dots\dots\dots (1)$$

Where T_a : the ambient temperature for the system

(Condition 2) The junction temperature of each power transistor should not exceed 150°C

$$P_d \times \theta_{c-a} + P_d/N \times \theta_{j-c} + T_a < 150^\circ\text{C} \dots\dots\dots (2)$$

Where N : the number of transistors (two for 1 channel , ten for channel)

θ_{j-c} : the thermal resistance of each transistor (see specification)

Note that the power consumption of each power transistor is assumed to be equal to the total power dissipation (P_d) divided by the number of transistors (N).

From the formula (1) and (2), we will obtain:

$$\theta_{c-a} < (125 - T_a)/P_d \dots\dots\dots (1)'$$

$$\theta_{c-a} < (150 - T_a)/P_d - \theta_{j-c}/N \dots\dots\dots (2)'$$

The value which satisfies above formula (1)' and (2)' will be the thermal resistance for a desired heat-sink.

Note that all of the component except power transistors employed in the Hybrid IC comply with above conditions.

[Example of Thermal Design]

Generally, the power consumption of actual music signals are being estimated by the continuous signal of 1/8 P_O max. (Note that the value of 1/8 P_O max may be varied from the country to country.)

(Sample of STK404-140N-E ; 120W×1ch)

If V_{CC} is $\pm 51V$, and R_L is 6Ω , then the total power dissipation (P_d) of inside Hybrid IC is as follow;

$$P_d = 57.2W \text{ (at 15W output power, 1/8 of } P_O \text{ max)}$$

There are four (2) transistors in Audio Section of this Hybrid IC, and thermal resistance (θ_{j-c}) of each transistor is 1.1°C/W. If the ambient temperature (T_a) is guaranteed for 50°C, then the thermal resistance (θ_{c-a}) of a desired heat-sink should be;

$$\begin{aligned} \text{From (1)'} \quad \theta_{c-a} &< (125 - 50)/57.2 \\ &< 1.31 \end{aligned}$$

$$\begin{aligned} \text{From (2)'} \quad \theta_{c-a} &< (150 - 50)/57.2 - 1.1/2 \\ &< 1.19 \end{aligned}$$

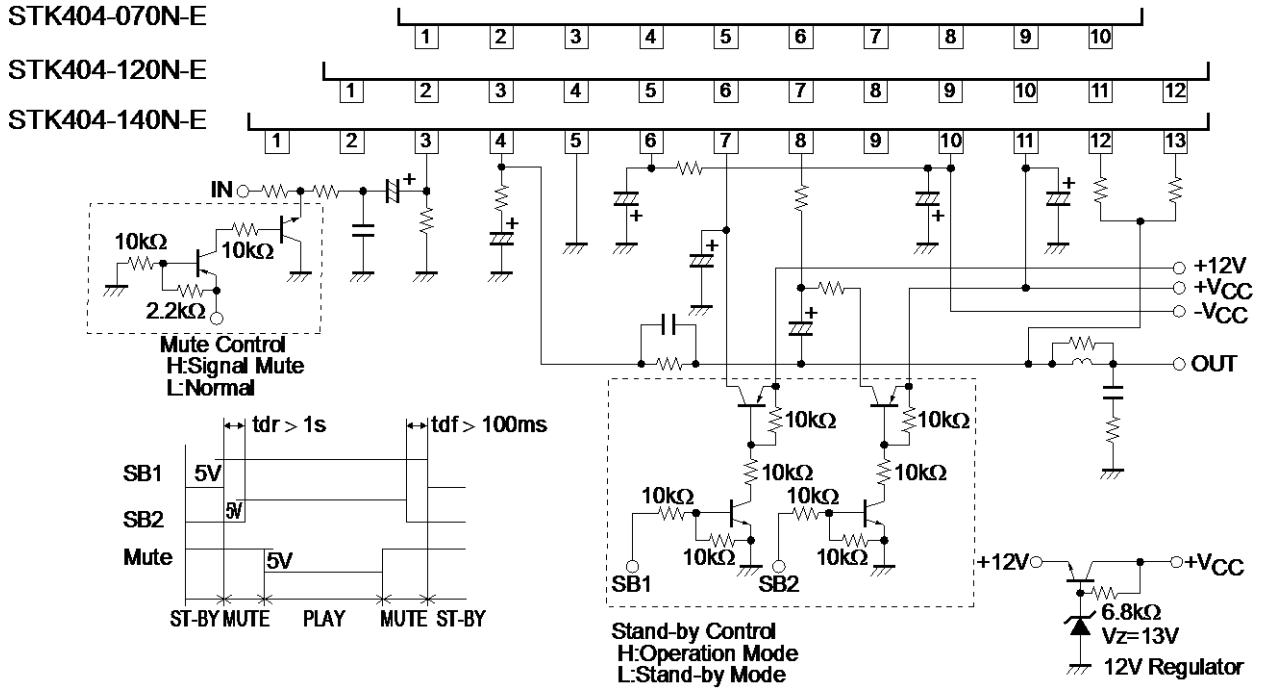
Therefore, in order to satisfy both (1)' and (2)', the thermal resistance of a desired Heat-sink will be 1.19°C/W.

[Note]

Above are reference only. The samples are operated with a constant power supply. Please verify the conditions when your system is actually implemented.

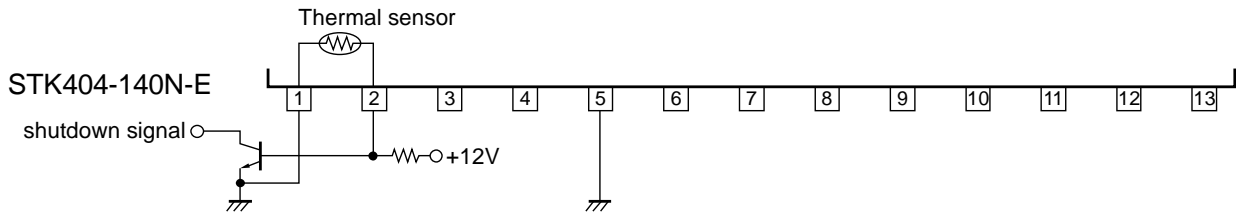
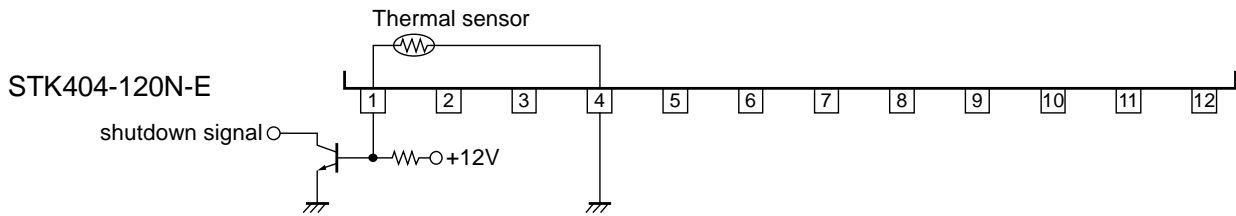


STK404-000N-Ese Stand-by control & Mute control Application



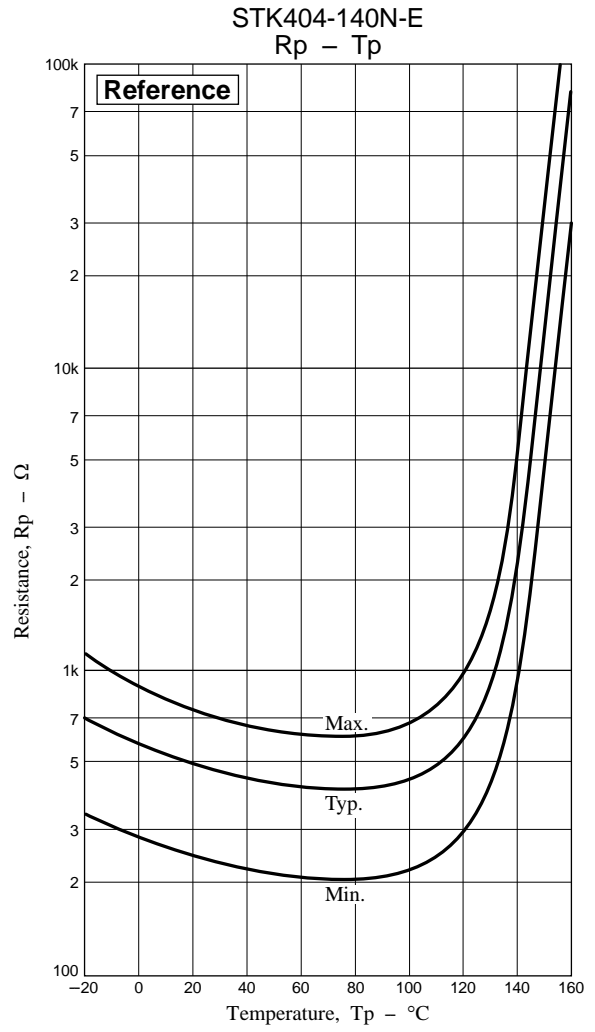
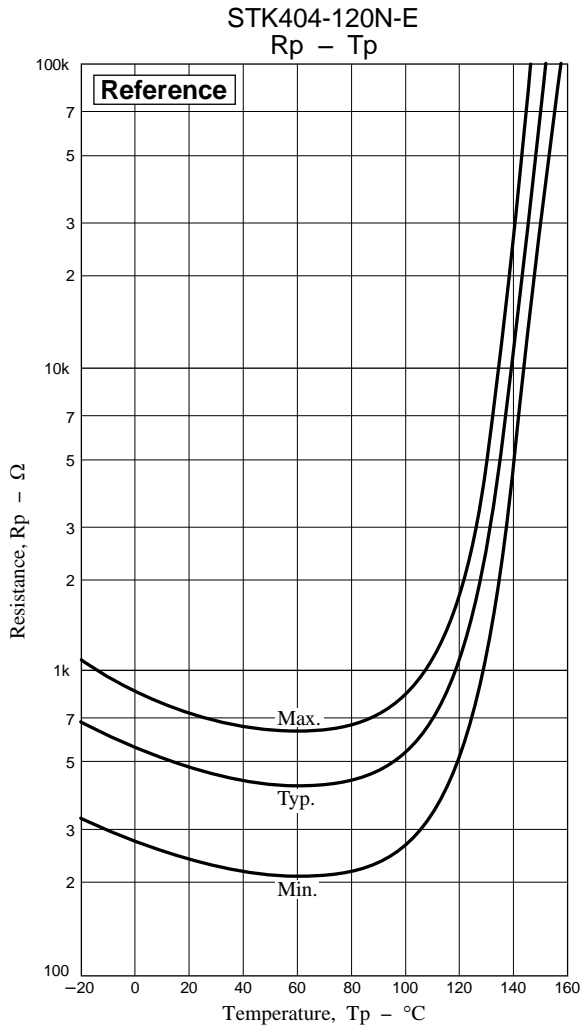
STK404-000N-Esr Thermal shut down Application

STK404-070N-E No thermal sensor



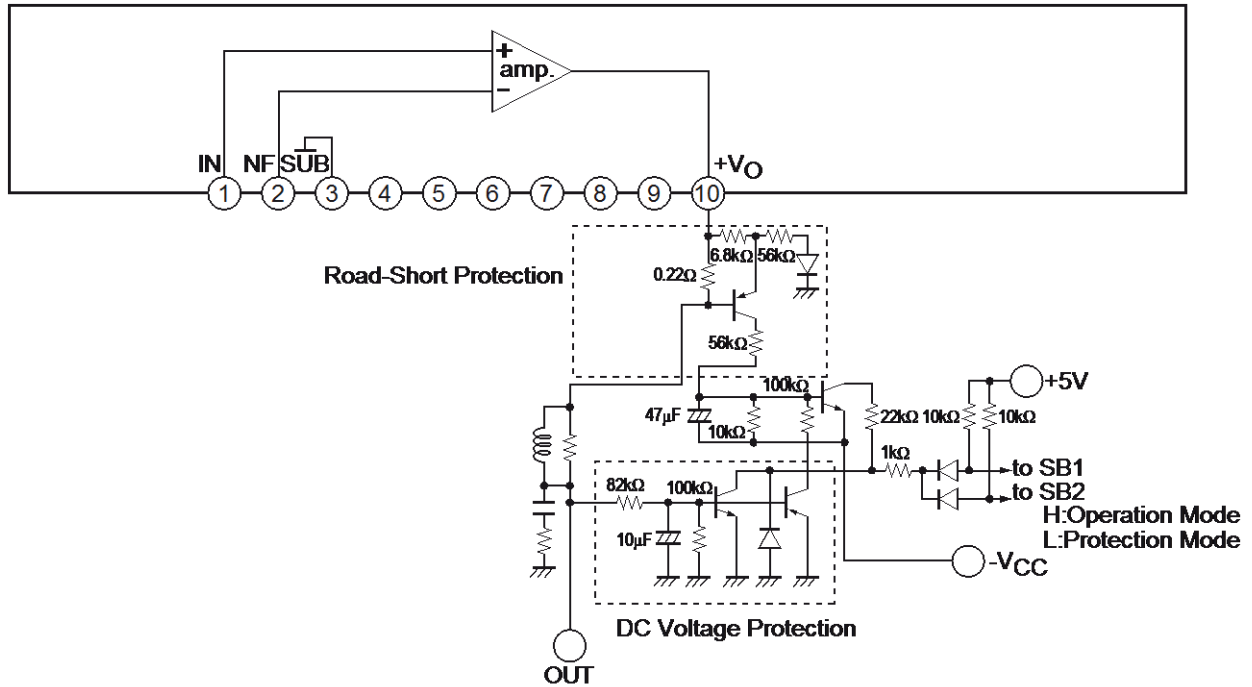


Thermal Sensor Characteristic

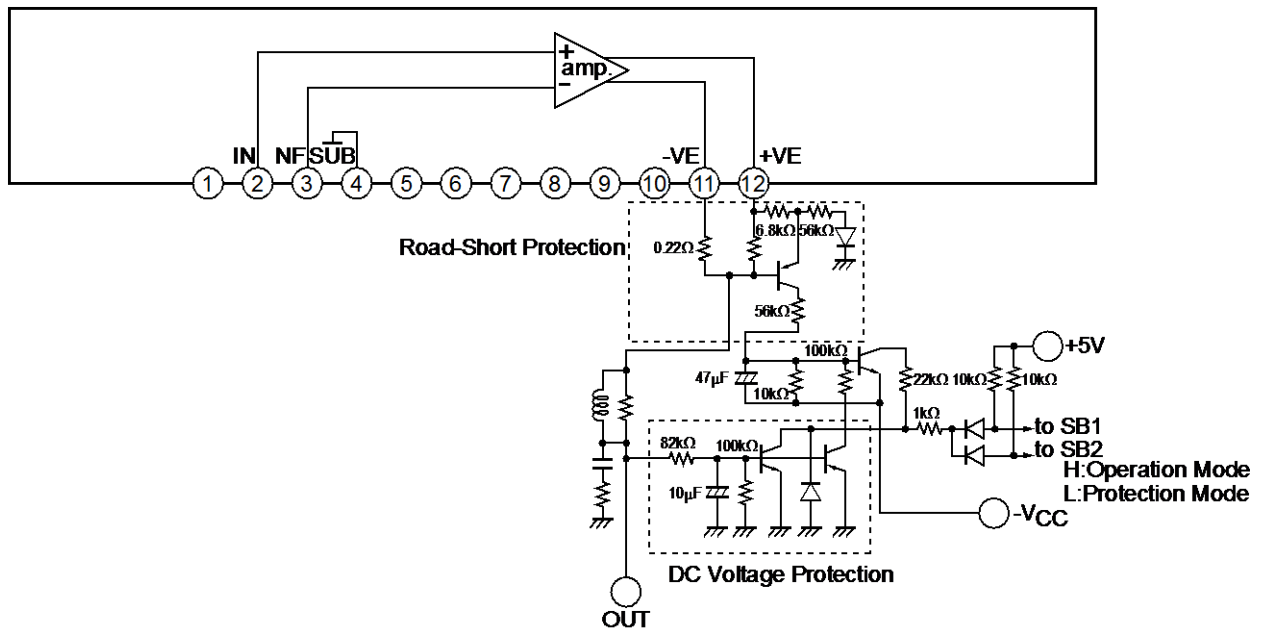




STK404-070N-E Road-Short & DC Voltage Protection Application



STK404-120N-E Road-Short & DC Voltage Protection Application





STK404-140N-E Road-Short & DC Voltage Protection Application

