

SANYO Semiconductors DATA SHEET

STK415-100-E 2-Channel Power Switching Audio Power IC, 60W+60W

Overview

The STK415-100-E is a class H audio power amplifier hybrid IC that features a built-in power supply switching circuit. This IC provides high efficiency audio power amplification by controlling (switching) the supply voltage supplied to the power devices according to the detected level of the input audio signal.

Applications

• Audio power amplifiers.

Features

- Pin-to-pin compatible outputs ranging from 80W to 180W.
- Can be used to replace the STK416-100 series (3-channel models) and the class-AB series (2, 3-channel models) due to its pin compatibility.
- Pure complementary construction by new Darlington power transistors
- Output load impedance: $R_L = 8\Omega$ to 4Ω supported
- Using insulated metal substrate that features superlative heat dissipation characteristics that are among the highest in the industry.

Series Models

	STK415-090-E	STK415-090-E STK415-100-E STK415-120-E STK415-130-E STK415									
Output 1 (10%/1kHz)	80W×2 channels	90W×2 channels	120W×2 channels	150W×2 channels	180W×2 channels						
Output 2 (0.8%/20Hz to 20kHz)	50W×2 channels	60W×2 channels	80W×2 channels	100W×2 channels	120W×2 channels						
Max. rated V _H (quiescent)	±60V	±65V	±73V	±80V	±80V						
Max. rated V _L (quiescent)	±41V	±42V	±45V	±46V	±51V						
Recommended operating V_H (8 Ω)	±37V	±39V	±46V	±51V	±52V						
Recommended operating V _L (8Ω)	±27V	±29V	±32V	±34V	±32V						
Dimensions (excluding pin height)		64.0mm×31.1mm×9.0mm									

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Specifications

Absolute maximum ratings at Ta=25°C (excluding rated temperature items), Tc=25°C unless otherwise specified

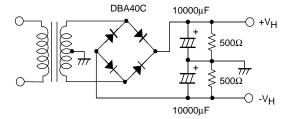
Parameter	Symbol	Conditions	Ratings	Unit
V _H maximum quiescent supply voltage 1	V _H max (1)	When no signal	±65	V
V _H maximum supply voltage 2	V _H max (2)	R _L ≥6Ω	±57	V
V _H maximum supply voltage 3	V _H max (3)	R _L ≥4Ω	±46	V
V _L maximum quiescent supply voltage 1	V _L max (1)	When no signal	±42	V
V _L maximum supply voltage 2	V _L max (2)	R _L ≥6Ω	±37	V
V _L maximum supply voltage 3	V _L max (3)	$R_L \ge 4\Omega$	±29	V
Maximum voltage between V _{H and} V _L *4	V _H -V _L max	No loading	60	V
Standby pin maximum voltage	Vst max		-0.3 to +5.5	V
Thermal resistance	θј-с	Per power transistor	1.8	°C/W
Junction temperature	Tj max	Both the Tj max and Tc max conditions must be met.	150	°C
IC substrate operating temperature	Tc max		125	°C
Storage temperature	Tstg		-30 to +125	°C
Allowable load shorted time *3	ts	V_{H} =±39V, V_{L} =±29V, R_{L} =8 Ω , f=50Hz, P_{O} =60W, 1-channel active	0.3	s

Electrical Characteristics at Tc=25°C, RL=8Ω (non-inductive load), Rg=600Ω, VG=40dB, VZ=15V

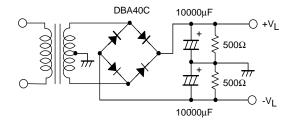
				Cond							
Parameter	Symbol		V (V)	f (Hz)	Po (W)	THD (%)		min	typ	max	unit
Output power	P _O (1)	V _H V _L	±39 ±29	20 to 20k		0.8		60			
	P _O (2)	V _H V _L	±32 ±24	1k		0.8	R _L =4Ω		60		W
Total harmonic distortion	THD	V _H V _L	±39 ±29	20 to 20k	60				0.4		%
Frequency characteristics	fL, fH	V _H V _L	±39 ±29		1.0		+0 -3dB		20 to 50k	(Hz
Input impedance	ri	V _H V _L	±39 ±29	1k	1.0				55		kΩ
Output noise voltage *2	VNO	V _H V _L	±47 ±31				Rg=2.2kΩ			1.0	mVrms
Quiescent current	Icco	V _H	±47 ±31				R _L =∞			30 100	mA
Output neutral voltage	VN	V _H V _L	±47 ±31					-70	0	+70	mV
Pin 17 voltage when standby ON *7	VST ON	V _H V _L	±39 ±29				Standby		0	0.6	V
Pin 17 voltage when standby OFF *7	VST OFF	V _H V _L	±39 ±29				Operating	2.5	3.0		V

[Remarks]

- *1: Unless otherwise specified, use a constant-voltage power supply to supply power when inspections are carried out.
- *2: The output noise voltage values shown are peak values read with a VTVM. However, an AC stabilized (50Hz) power supply should be used to minimize the influence of AC primary side flicker noise on the reading.
- *3: Use the designated transformer power supply circuit shown in the figure below for the measurements of allowable load shorted time and output noise voltage.
- *4: Design circuits so that (|VH|-|VI|) is always less than 40V when switching the power supply with the load connected.
- *5: Set up the VL power supply with an offset voltage at power supply switching (VL-VO) of about 8V as an initial target.
- *6: Please connect –Pre V_{CC} pin (#5 pin) with the stable minimum voltage and connect so that current does not flow in by reverse bias.
- *7: Use the standby pin (pin 17) so that the applied voltage never exceeds the maximum rating. The power amplifier is turned on by applying +2.5V to +5.5V to the standby pin (pin 17).
- *8: Thermal design must be implemented based on the conditions under which the customer's end products are expected to operate on the market.
- *9: A thermoplastic adhesive resin is used for this hybrid IC.



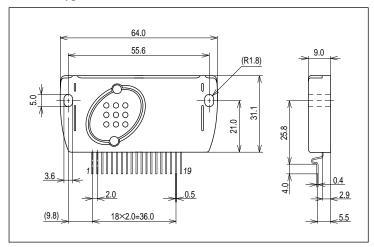
Designated transformer power supply (MG-250 equivalent)



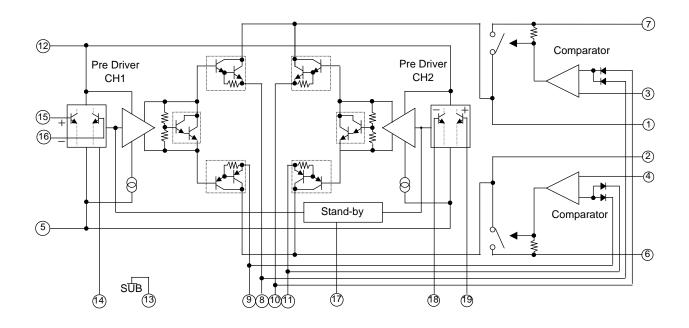
Designated transformer power supply (MG-200 equivalent)

Package Dimensions

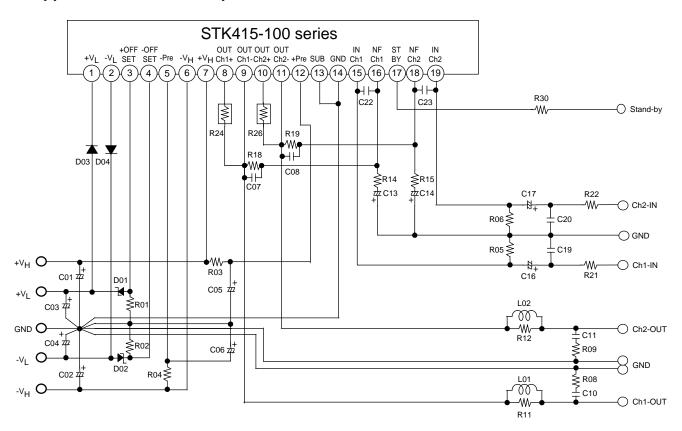
unit:mm (typ)



Internal Equivalent Circuit



Application Circuit Example

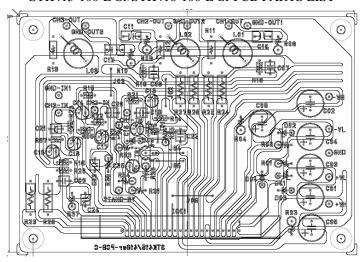


Recommended Values for Application Parts (for the test circuit)

Recommended Value Description Larger than Recommended Smaller than Recommended Value Root, Value Recommended Valu				, , , , , , , , , , , , , , , , , , ,	
R01, R02 1.5κΩ Determine the current flowing into the power switching circuit correlation circuit (comparator), (3nA to 10nA at V _H power switching) requencies.	Symbol		Description	=	
Circuit (comparator), (3mA to 10mA at V _H power frequencies. Trequencies. Trequency. Treq	D01 D02		Determine the current flowing into the newer awitching		
R03, R04 100Ω/IW Ripple filtering resistors Decreased pass-through Increased pass-through Increased pass-through Increase in ripple components that pass into the input side from the power line desirable). R08, R09 4.7Ω/IW Oscillation prevention capacitors VN offset (Ensure R05-R18, R06-R19 when changing.)	K01, K02	1.3822		· ·	· ·
R03, R04 100Ω/1W Ripple filtering resistors Used with C05 and C06 to form a ripple filter.) Decreased pass-through Current at high frequencies. Current at high frequency voltage gain. Current at high frequency voltage gain. Curre			• •		_
R05, R06 56kΩ Input bias resistors VN offset (Ensure R05=R19, R06=R19 when changing.)	D00 D04	4000/414/	57	,	,
R05, R06 56KΩ Input bias resistors (Vittually determine the input impedance.) VN offset (Ensure R05=R19, R06=R19 when changing.)	R03, R04	10022/170	11	· -	•
(Virtually determine the input impedance.) (Ensure R05=R18, R06=R19 when changing.)	B05 B00			-	current at nigh frequencies.
R08, R09 4.7/Δ/1W Oscillation prevention resistor	R05, R06	56KΩ	·		
R11, R12		. =		(Ensure R05=R18, R06=R19	when changing.)
R14,R15 S60Ω Used with R18 and R19 to determine the voltage gain VC, (VG should desirably be determined by the R14 and R15 value.) R18,R19 S6kΩ Used with R14 and R15 to determine the voltage gain VG. R21,R22 1kΩ Input filtering resistor Power of the Community of the Communi	R08, R09	4.7Ω/1₩	Oscillation prevention resistor	-	-
VG. (VG should desirably be determined by the R14 and R15 value.)	R11, R12	4.7Ω	Oscillation prevention resistor	-	-
R18, R19 S6kΩ Used with R14 and R15 to determine the voltage gain VG.	R14,R15	560Ω	Used with R18 and R19 to determine the voltage gain	Likely to oscillate	None
R18, R19 S6kΩ Used with R14 and R15 to determine the voltage gain VG			VG. (VG should desirably be determined by the R14	(VG<40dB)	
R21, R22			and R15 value.)		
R21, R22 1kΩ Input filtering resistor Decrease in maximum output power unaway. Likely to cause thermal runaway. R30 Remarks '7 Use a limiting resistor is desirable) Decrease in maximum output power unaway. Likely to cause thermal runaway. C01, C02 100µF/ 100V Oscillation prevention capacitors. • Insert the capacitors as close to the IC as possible to decrease the power impedance for reliable IC operation (use of electrolytic capacitors are desirable). Oscillation prevention capacitors. • Insert the capacitors as close to the IC as possible to decrease the power impedance for reliable IC operation (use of electrolytic capacitors are desirable). Increase in ripple components that pass into the input side from the power line. C05, C06 100µF/ 100V Decoupling capacitors. • Insert the capacitors are desirable). Increase in ripple components that pass into the input side from the power line. C05, C06 100µF/ 100V Decoupling capacitors. • Iliminate ripple components that pass into the input side from the power line. (Used with R03 and R04 to form a ripple filter.) Increase in ripple components that pass into the input side from the power line. C07, C08 3pF Oscillation prevention capacitor Likely to oscillate C10, C11 0.1µF Socillation prevention capacitor (Mylar capacitors are recommended.) Increase in low-frequency voltage gain, with higher pop noise at power-on. Dec	R18, R19	$56k\Omega$	Used with R14 and R15 to determine the voltage gain	-	-
R24, R26 0.22Ω±10%, SW Output emitter resistors (Use of cement resistor is desirable) Decrease in maximum output power Decrease in low-frequency voltage gain Decrease in low-frequency voltage Decrease in low-frequency voltage Decrease			VG.		
R30 Remarks *7 Use a limiting resistor is desirable) Output power runaway.	R21, R22	1kΩ	Input filtering resistor	-	-
R30 Remarks *7 Use a limiting resistor according to the voltage applied to the standby pin so that it remains within the rating.	R24, R26	0.22Ω±10%,	Output emitter resistors	Decrease in maximum	Likely to cause thermal-
C01, C02 100μF/ Oscillation prevention capacitors. • Insert the capacitors as close to the IC as possible to decrease the power impedance for reliable IC operation (use of electrolytic capacitors are desirable). C03, C04 100μF/ Oscillation prevention capacitors. • Insert the capacitors as close to the IC as possible to decrease the power impedance for reliable IC operation (use of electrolytic capacitors are desirable). C05, C06 100μF/ Decoupling capacitors. Eliminate ripple components that pass into the input side from the power line. (Used with R03 and R04 to form a ripple filter.) C07, C08 3pF Oscillation prevention capacitor C10, C11 0.1μF Oscillation prevention capacitor C13, C14 22μF/ NF capacitors are recommended.) C13, C14 22μF/ Oscillation prevention capacitor Using gain, with higher ex/ft_=1/2π •C13•R14) C16, C17 2.2μF/ Input filter capacitor (block DC current) C19, C20 470pF Input filter capacitor		5W	(Use of cement resistor is desirable)	output power	runaway.
100V Insert the capacitors as close to the IC as possible to decrease the power impedance for reliable IC operation (use of electrolytic capacitors are desirable).	R30	Remarks *7	Use a limiting resistor according to the voltage applied to	the standby pin so that it remain	ns within the rating.
decrease the power impedance for reliable IC operation (use of electrolytic capacitors are desirable).	C01, C02	100μF/	Oscillation prevention capacitors.		
operation (use of electrolytic capacitors are desirable). C03, C04 100μF/ Oscillation prevention capacitors. • Insert the capacitors as close to the IC as possible to decrease the power impedance for reliable IC operation (use of electrolytic capacitors are desirable). C05, C06 100μF/ Decoupling capacitors. Eliminate ripple components that pass into the input side from the power line. (Used with R03 and R04 to form a ripple filter.) C07, C08 3pF Oscillation prevention capacitor C10, C11 0.1μF Oscillation prevention capacitor (Mylar capacitors are recommended.) C13, C14 22μF/ NF capacitor (Mylar capacitors the low cutoff frequency; ex/ft_=1/2π •C13•R14) C16, C17 2.2μF/ Input coupling capacitor (block DC current) C19, C20 470pF Input filter capacitor		100V	 Insert the capacitors as close to the IC as possible to 		
Cossider			decrease the power impedance for reliable IC	-	-
C03, C04 100μF/ SoV Socillation prevention capacitors. Insert the capacitors as close to the IC as possible to decrease the power impedance for reliable IC operation (use of electrolytic capacitors are desirable). Increase in ripple components that pass into the input side from the power line. Increase in ripple components that pass into the input side from the power line. (Used with R03 and R04 to form a ripple filter.) Likely to oscillate			operation (use of electrolytic capacitors are		
SoV Insert the capacitors as close to the IC as possible to decrease the power impedance for reliable IC operation (use of electrolytic capacitors are desirable). Co5, Co6 100μF/ 100V Decoupling capacitors. Eliminate ripple components that pass into the input side from the power line. (Used with R03 and R04 to form a ripple filter.) Co7, Co8 3pF Oscillation prevention capacitor Likely to oscillate C10, C11 0.1μF Oscillation prevention capacitor Likely to oscillate C13, C14 22μF/ 10V (Changes the low cutoff frequency; ex/f _L =1/2π •C13•R14) Pop noise at power-on. C16, C17 2.2μF/ 50V Input coupling capacitor (block DC current) Input filter capacitor Input filter capac			desirable).		
decrease the power impedance for reliable IC operation (use of electrolytic capacitors are desirable). C05, C06 100μF/ Decoupling capacitors. Eliminate ripple components that pass into the input side from the power line. (Used with R03 and R04 to form a ripple filter.) C07, C08 3pF Oscillation prevention capacitor C10, C11 0.1μF Oscillation prevention capacitor (Mylar capacitors are recommended.) C13, C14 22μF/ NF capacitor (Changes the low cutoff frequency; ex/f _L =1/2π •C13•R14) C16, C17 2.2μF/ Input coupling capacitor (block DC current) C19, C20 470pF Input filter capacitor	C03, C04	100μF/	Oscillation prevention capacitors.		
operation (use of electrolytic capacitors are desirable). C05, C06 100μF/ Decoupling capacitors. Eliminate ripple components that pass into the input side from the power line. (Used with R03 and R04 to form a ripple filter.) C07, C08 3pF Oscillation prevention capacitor C10, C11 0.1μF Oscillation prevention capacitor (Mylar capacitors are recommended.) C13, C14 22μF/ NF capacitor (Changes the low cutoff frequency; ex/ft_=1/2π •C13•R14) C16, C17 2.2μF/ Input coupling capacitor (block DC current) C19, C20 470pF Input filter capacitor		50V	• Insert the capacitors as close to the IC as possible to		
Cost			decrease the power impedance for reliable IC	-	-
C05, C06 100 μF/ 100 V Eliminate ripple components that pass into the input side from the power line. (Used with R03 and R04 to form a ripple filter.) C07, C08 3pF Oscillation prevention capacitor C10, C11 0.1 μF Oscillation prevention capacitor (Mylar capacitors are recommended.) C13, C14 22 μF/ 10V (Changes the low cutoff frequency; ex/fL=1/2π •C13•R14) C16, C17 2.2 μF/ 50V Input components that pass into the input filter. Increase in ripple components that pass into the input from the power line. Increase in ripple components that pass into the input from the power line. Increase in ripple components that pass into the input from the power line. Increase in ripple components that pass into the input from the power line. Increase in ripple components that pass into the input filter.) Likely to oscillate Likely to oscillate Likely to oscillate Voltage gain, with higher pop noise at power-on. Decrease in low-frequency voltage gain voltage gain Total Plant State Plant Plan			operation (use of electrolytic capacitors are		
100V Eliminate ripple components that pass into the input side from the power line. (Used with R03 and R04 to form a ripple filter.) C07, C08 3pF Oscillation prevention capacitor C10, C11 0.1μF Oscillation prevention capacitor (Mylar capacitors are recommended.) C13, C14 22μF/ NF capacitor (Changes the low cutoff frequency; voltage gain, with higher ex/fL=1/2π •C13•R14) C16, C17 2.2μF/ Input coupling capacitor (block DC current) C19, C20 470pF Input filter capacitor			desirable).		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	C05, C06	100μF/	Decoupling capacitors.	Increase in ripple component	s that pass into the input side
		100V	Eliminate ripple components that pass into the input	from the power line.	
C07, C08 3pF Oscillation prevention capacitor Likely to oscillate C10, C11 $0.1\mu F$ Oscillation prevention capacitor Likely to oscillate C13, C14 $22\mu F$ / 10V NF capacitor (Changes the low cutoff frequency; ex/fL=1/2π •C13•R14) Increase in low-frequency voltage gain, with higher pop noise at power-on. Decrease in low-frequency voltage gain C16, C17 $2.2\mu F$ / 50V Input coupling capacitor (block DC current) - C19, C20 470pF Input filter capacitor			side from the power line.		
C10, C11 $0.1\mu F$ Oscillation prevention capacitor (Mylar capacitors are recommended.) Likely to oscillate C13, C14 $22\mu F/$ NF capacitor (Changes the low cutoff frequency; ex/f _L =1/2π •C13•R14) Increase in low-frequency voltage gain, with higher pop noise at power-on. Decrease in low-frequency voltage gain C16, C17 $2.2\mu F/$ Input coupling capacitor (block DC current) - - C19, C20 470pF Input filter capacitor			(Used with R03 and R04 to form a ripple filter.)		
(Mylar capacitors are recommended.) C13, C14 22μF/ 10V (Changes the low cutoff frequency; voltage gain, with higher ex/f _L =1/2π •C13•R14) C16, C17 2.2μF/ 50V C19, C20 470pF (Mylar capacitors are recommended.) Increase in low-frequency voltage gain, with higher pop noise at power-on.	C07, C08	3pF	Oscillation prevention capacitor	Likely to oscillate	
C13, C14 22μF/ 10V (Changes the low cutoff frequency; voltage gain, with higher pop noise at power-on. C16, C17 C19, C20 C20, C20 C19, C20 C20, C20	C10, C11	0.1μF	Oscillation prevention capacitor	Likely to oscillate	
10V (Changes the low cutoff frequency; voltage gain, with higher pop noise at power-on. C16, C17 2.2μF/ Input coupling capacitor (block DC current) C19, C20 470pF Input filter capacitor			(Mylar capacitors are recommended.)		
10V (Changes the low cutoff frequency; voltage gain, with higher pop noise at power-on. C16, C17 2.2μF/ Input coupling capacitor (block DC current) C19, C20 470pF Input filter capacitor	C13, C14	22μF/	NF capacitor	Increase in low-frequency	Decrease in low-frequency
ex/f _L =1/2π •C13•R14) pop noise at power-on. C16, C17 2.2μF/ Input coupling capacitor (block DC current) 50V C19, C20 470pF Input filter capacitor		•	(Changes the low cutoff frequency;	, , ,	• •
C16, C17 2.2μF/ Input coupling capacitor (block DC current) 50V C19, C20 470pF Input filter capacitor					
50V C19, C20 470pF Input filter capacitor	C16, C17	2.2uF/	•		
C19, C20 470pF Input filter capacitor	,	•	, , , , , , , , , , , , , , , , , , , ,	-	-
	C19, C20		Input filter capacitor		
	,	~F-	(Used with R21 and R22 to form a filter that suppresses	_	_
high-frequency noises.)					
C22, C23 100pF Oscillation prevention capacitor Likely to oscillate.	C22, C23	100pF		Likely to oscillate.	<u> </u>
D01, D02 15V Determine the offset voltage at V _L ↔V _H power. Decreased distortion at Increased distortion at	+	15V	Determine the offset voltage at V _I ↔V _H power.	Decreased distortion at	Increased distortion at
power switching time power switching time.			State Etc. Hits.		
D03, D04 3A/60V Reverse current prevention diodes	D03, D04	3A/60V	Reverse current prevention diodes		
(FRD is recommended.)			•	-	-
L01, L02 3μH Oscillation prevention inductance None Likely to oscillate.	L01, L02	ЗμН	Oscillation prevention inductance	None	Likely to oscillate.

Sample PCB Trace Pattern

 $STK415\text{-}100\text{-}E\text{-}Sr/STK416\text{-}100\text{-}E\text{-}Sr\ PCB\ PARTS\ LIST$



Parts List

STK415, 416-100Sr PCB Parts List

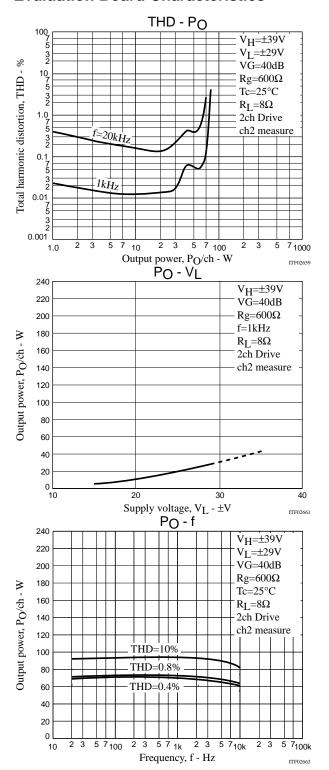
R01, R02 FR01, R02 FRX1SJ** 1.5kΩ, 1W 1.5kΩ, 1W R03, R04 100Ω, 1W ERC1SJ101 enabled enabled R05, R06, (R07), R18, R18, (R20) 56kΩ, 1/6W RN16S63FK enabled enabled R08, R09, (R10) 4,7Ω, 1W ERX1SJ4R7 enabled enabled R11, R12, (R13) 4,7Ω, 1/W RN16S**FK 560Ω, 1/6W 560Ω, 1/6W R14, R15, (R15) 1 √2 RN16S**FK 560Ω, 1/6W 560Ω, 1/6W R21, R22, (R23) 1 kΩ, 1/6W RN16S**FK 660Ω, 1/6W 560Ω, 1/6W R24, R26, (R28) 0.22Ω±10%, SW BPR56CFR22J Short Short R24, R26, (R28) 0.22Ω±10%, SW BPR56CFR22J enabled enabled R35, R36, R37 Short Short Short Short C01, C02, C05, C05 100µF, 100V 100MV100HC enabled enabled C07, C08, (C09) 3pF DD104-6383ROK50 enabled enabled C10, C11, (C11, C15) 2.2µF, 100V ECQ-V1H104JZ enabled enabled C16, C17, (C18) 2.2µF, 50V SOMV2R2HC enabled enabled <td< th=""><th>Р</th><th>CB No.</th><th>PARTS</th><th>RATING</th><th>STK415 (416) -090-E, -100-E, -120-E, 130-E</th><th>STK415-140-E</th></td<>	Р	CB No.	PARTS	RATING	STK415 (416) -090-E, -100-E, -120-E, 130-E	STK415-140-E
R05, R06, (R07), R18, R19, (R20) 56kΩ, 1/6W RN16S563FK enabled enabled R08, R09, (R10) 4.7Ω, 1/W ERX1SJ4R7 enabled enabled R11, R12, (R13) 4.7Ω, 1/4W RN14S4R7FK enabled enabled R14, R15, (R16) - RN16S***FK 560Ω, 1/6W 560Ω, 1/6W R21, R22, (R23) 1kΩ, 1/6W RN16S102FK enabled enabled R25, R27, (R29) 0.22Ω±10%, 5W BPR56CFR22J Short Short R24, R26, (R28) 0.22Ω±10%, 5W BPR56CFR22J enabled enabled R35, R36, R37 - - Short Short Short C01, C02, C05, C05, C06 100µF, 100V 100MV100HC enabled enabled C03, C04 100µF, 50V 50MV100HC enabled enabled C10, C11, (C12) 0.1µF, 100V ECQ-V1H104JZ enabled enabled C10, C11, (C12) 0.1µF, 100V ECQ-V1H104JZ enabled enabled C19, C20, (C21) 470pF DD104-63B471K50 enabled	R01, R02		-	ERX1SJ***	1.5kΩ, 1W	1.5kΩ, 1W
R19, (R20) 56kΩ, 1/6W RN16S569FK enabled enabled R08, R09, (R10) 4.7Ω, 1W ERX1SJ4R7 enabled enabled R11, R12, (R13) 4.7Ω, 1/4W RN1484R7FK enabled enabled R11, R12, (R16) - RN16S***FK 560Ω, 1/6W 560Ω, 1/6W R21, R22, (R23) 1kΩ, 1/6W RN16S***FK 600, 1/6W 560Ω, 1/6W R24, R26, (R28) 0.22Ω±10%, 5W BPR56CFR22J Short Short R24, R26, (R28) 0.22Ω±10%, 5W BPR56CFR22J enabled enabled R35, R36, R37 - - Short Short C01, C02, C05, C06 100µF, 100V 100MV100HC enabled enabled C03, C04 100µF, 50V 50MV100HC enabled enabled C07, C08, (C09) 3pF DD104-63B3ROK50 enabled enabled C10, C11, (C12) 0.1µF, 100V 10MV220HC enabled enabled C13, C14, (C15) 22µF, 50V 50MV2R2HC enabled enabled C1	R03, R04		100Ω, 1W	ERG1SJ101	enabled	enabled
R11, R12, (R13) 4.7Ω, 1/4W RN14S4R7FK enabled enabled R14, R15, (R16) - RN16S***FK 560Ω, 1/6W 560Ω, 1/6W R21, R22, (R23) 1kΩ, 1/6W RN16S102FK enabled enabled R25, R27, (R29) 0.22Ω±10%, 5W BPR56CFR22J Short Short R24, R26, (R28) 0.22Ω±10%, 5W BPR56CFR22J enabled enabled R35, R36, R37 - - Short Short C01, C02, C05, C06 100µF, 100V 100MV100HC enabled enabled C03, C04 100µF, 50V 50MV100HC enabled enabled C07, C08, (C09) 3pF DD104-63B3ROK50 enabled enabled C10, C11, (C12) 0.1µF, 100V ECQ-V1H104JZ enabled enabled C13, C14, (C15) 22µF, 10V 10MV220HC enabled enabled C16, C17, (C18) 2.2µF, 50V 50MV2R2HC enabled enabled C19, C20, (C21) 470pF DD104-63B471K50 enabled enabled <		R07), R18,	56kΩ, 1/6W	RN16S563FK	enabled	enabled
R14, R15, (R16) - RN16S**FK 560Ω, 1/6W 560Ω, 1/6W R21, R22, (R23) 1kΩ, 1/6W RN16S102FK enabled enabled R24, R26, (R28) 0.22Ω±10%, 5W BPR56CFR22J Short Short R24, R26, (R28) 0.22Ω±10%, 5W BPR56CFR22J enabled enabled R35, R36, R37 - - Short Short Short C01, C02, C05, C06 100µF, 100V 100MV100HC enabled enabled C03, C04 100µF, 50V 50MV100HC enabled enabled C07, C08, (C09) 3pF DD104-6383ROK50 enabled enabled C10, C11, (C12) 0.1µF, 100V ECQ-V1H104JZ enabled enabled C13, C14, (C15) 22µF, 10V 10MV220HC enabled enabled C16, C17, (C18) 2.2µF, 50V 50MV2R2HC enabled enabled C19, C20, (C21) 470pF DD104-638471K50 enabled enabled C101, D2, L023 100pF DD104-638101K50 enabled enabled <td>R08, R09, (F</td> <td>R10)</td> <td>4.7Ω, 1W</td> <td>ERX1SJ4R7</td> <td>enabled</td> <td>enabled</td>	R08, R09, (F	R10)	4.7Ω, 1W	ERX1SJ4R7	enabled	enabled
R21, R22, (R23) 1kΩ, 1/6W RN16S102FK enabled enabled R25, R27, (R29) 0.22Ω±10%, 5W BPR56CFR22J Short Short R24, R26, (R28) 0.22Ω±10%, 5W BPR56CFR22J enabled enabled R35, R36, R37 - - Short Short Short C01, C02, C05, C06 100μF, 100V 100MV100HC enabled enabled C03, C04 100μF, 50V 50MV100HC enabled enabled C07, C08, (C09) 3pF DD104-63B3ROK50 enabled enabled C10, C11, (C12) 0.1μF, 100V ECQ-V1H104JZ enabled enabled C13, C14, (C15) 22μF, 10V 10MV220HC enabled enabled C13, C14, (C18) 2.2μF, 50V 50MV2R2HC enabled enabled C19, C20, (C21) 470pF DD104-63B471K50 enabled enabled C22, C23, (C24) 100pF DD104-63B401K50 enabled enabled D01, D02 - - GZA15X (SANYO) GZA18X (SANYO)	R11, R12, (F	213)	4.7Ω, 1/4W	RN14S4R7FK	enabled	enabled
R25, R27, (R29) 0.22Ω±10%, 5W BPR56CFR22J Short Short R24, R26, (R28) 0.22Ω±10%, 5W BPR56CFR22J enabled enabled R35, R36, R37 - - Short Short C01, C02, C05, C06 100µF, 100V 100MV100HC enabled enabled C03, C04 100µF, 50V 50MV100HC enabled enabled C07, C08, (C09) 3pF DD104-63B3ROK50 enabled enabled C10, C11, (C12) 0.1µF, 100V ECQ-V1H104JZ enabled enabled C13, C14, (C15) 22µF, 10V 10MV220HC enabled enabled C13, C14, (C18) 2.2µF, 50V 50MV2R2HC enabled enabled C19, C20, (C21) 470pF DD104-63B471K50 enabled enabled C22, C23, (C24) 100pF DD104-63B101K50 enabled enabled D01, D02 - - GZA15X (SANYO) GZA18X (SANYO) D03, D04 IF (AV)=3A/60V enabled enabled Stand-By R30	R14, R15, (F	(16)	-	RN16S***FK	560Ω, 1/6W	560Ω, 1/6W
R24, R26, (R28) 0.22Ω±10%, 5W BPR56CFR22J enabled enabled R35, R36, R37 - - Short Short C01, C02, C05, C06 100µF, 100V 100MV100HC enabled enabled C03, C04 100µF, 50V 50MV100HC enabled enabled C07, C08, (C09) 3pF DD104-63B3R0K50 enabled enabled C10, C11, (C12) 0.1µF, 100V ECQ-V1H104JZ enabled enabled C13, C14, (C15) 22µF, 10V 10MV220HC enabled enabled C15, C17, (C18) 2.2µF, 50V 50MV2R2HC enabled enabled C19, C20, (C21) 470pF DD104-63B471K50 enabled enabled C22, C23, (C24) 100pF DD104-63B101K50 enabled enabled D01, D02 - - GZA15X (SANYO) GZA18X (SANYO) D03, D04 IF (AV)=3A/60V enabled enabled enabled L01, L02, (L03) 3µH enabled enabled enabled R32 <td< td=""><td>R21, R22, (F</td><td>223)</td><td>1kΩ, 1/6W</td><td>RN16S102FK</td><td>enabled</td><td>enabled</td></td<>	R21, R22, (F	223)	1kΩ, 1/6W	RN16S102FK	enabled	enabled
R35, R36, R37 - - Short Short C01, C02, C05, C06 100μF, 100V 100MV100HC enabled enabled C03, C04 100μF, 50V 50MV100HC enabled enabled C07, C08, (C09) 3pF DD104-63B3ROK50 enabled enabled C10, C11, (C12) 0.1μF, 100V ECQ-V1H104JZ enabled enabled C13, C14, (C15) 22μF, 10V 10MV220HC enabled enabled C16, C17, (C18) 2.2μF, 50V 50MV2R2HC enabled enabled C19, C20, (C21) 470pF DD104-63B471K50 enabled enabled C22, C23, (C24) 100pF DD104-63B101K50 enabled enabled D01, D02 - - GZA15X (SANYO) GZA18X (SANYO) D03, D04 IF (AV)=3A/60V enabled enabled enabled L01, L02, (L03) 3μH enabled enabled enabled Stand-By R30 3.3kΩ, 1/6W RN16S332FK enabled enabled R33	R25, R27, (F	(29)	0.22Ω±10%, 5W	BPR56CFR22J	Short	Short
CO1, CO2, CO5, CO6 100μF, 100V 100MV100HC enabled enabled CO3, CO4 100μF, 50V 50MV100HC enabled enabled CO7, CO8, (CO9) 3pF DD104-63B3ROK50 enabled enabled C10, C11, (C12) 0.1μF, 100V ECQ-V1H104JZ enabled enabled C13, C14, (C15) 22μF, 10V 10MV220HC enabled enabled C16, C17, (C18) 2.2μF, 50V 50MV2R2HC enabled enabled C19, C20, (C21) 470pF DD104-63B471K50 enabled enabled C22, C23, (C24) 100pF DD104-63B401K50 enabled enabled D01, D02 - - GZA15X (SANYO) GZA18X (SANYO) D03, D04 IF (AV)=3A/60V enabled enabled enabled L01, L02, (L03) 3μH enabled enabled enabled Stand-By R30 3.3kΩ, 1/6W RN16S332FK enabled enabled R33 33kΩ, 1/6W RN16S333FK enabled enabled <	R24, R26, (F	(28)	0.22Ω±10%, 5W	BPR56CFR22J	enabled	enabled
CO3, CO4 100μF, 50V 50MV100HC enabled enabled CO7, C08, (CO9) 3pF DD104-63B3ROK50 enabled enabled C10, C11, (C12) 0.1μF, 100V ECQ-V1H104JZ enabled enabled C13, C14, (C15) 22μF, 10V 10MV220HC enabled enabled C16, C17, (C18) 2.2μF, 50V 50MV2R2HC enabled enabled C19, C20, (C21) 470pF DD104-63B471K50 enabled enabled C22, C23, (C24) 100pF DD104-63B101K50 enabled enabled D01, D02 - - GZA15X (SANYO) GZA18X (SANYO) D03, D04 IF (AV)=3A/60V enabled enabled enabled L01, L02, (L03) 3μH enabled enabled enabled Stand-By R30 3.3kΩ, 1/6W RN16S332FK enabled enabled R33 33kΩ, 1/6W RN16S333FK enabled enabled R34 2kΩ, 1/6W RN16S202FK enabled enabled P05	R35, R36, R	37	-	-	Short	Short
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	C01, C02, C	05, C06	100μF, 100V	100MV100HC	enabled	enabled
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	C03, C04		100μF, 50V	50MV100HC	enabled	enabled
C13, C14, (C15) 22μF, 10V 10MV220HC enabled enabled C16, C17, (C18) 2.2μF, 50V 50MV2R2HC enabled enabled C19, C20, (C21) 470pF DD104-63B471K50 enabled enabled C22, C23, (C24) 100pF DD104-63B101K50 enabled enabled D01, D02 - - GZA15X (SANYO) GZA18X (SANYO) D03, D04 IF (AV)=3A/60V enabled enabled L01, L02, (L03) 3μH enabled enabled Stand-By R30 3.3kΩ, 1/6W RN16S332FK enabled enabled R32 1kΩ, 1/6W RN16S33FK enabled enabled R33 33kΩ, 1/6W RN16S33FK enabled enabled R34 2kΩ, 1/6W RN16S202FK enabled enabled C25 47μF, 10V 10MV47HC enabled enabled D05 - GMB01 (Ref.) enabled enabled Jumper 20mm enabled enabled	C07, C08, (C	09)	3pF	DD104-63B3ROK50	enabled	enabled
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	C10, C11, (C	(12)	0.1μF, 100V	ECQ-V1H104JZ	enabled	enabled
C19, C20, (C21) 470pF DD104-63B471K50 enabled enabled C22, C23, (C24) 100pF DD104-63B101K50 enabled enabled D01, D02 - - GZA15X (SANYO) GZA18X (SANYO) D03, D04 IF (AV)=3A/60V enabled enabled L01, L02, (L03) 3μH enabled enabled Stand-By R30 3.3kΩ, 1/6W RN16S332FK enabled enabled R32 1kΩ, 1/6W RN16S102FK enabled enabled R33 33kΩ, 1/6W RN16S333FK enabled enabled R34 2kΩ, 1/6W RN16S202FK enabled enabled C25 47μF, 10V 10MV47HC enabled enabled D05 - GMB01 (Ref.) enabled enabled Jumper 20mm enabled enabled J02, J03, J06 Jumper 10mm enabled enabled	C13, C14, (C	(15)	22μF, 10V	10MV220HC	enabled	enabled
C22, C23, (C24) 100pF DD104-63B101K50 enabled enabled D01, D02 - - GZA15X (SANYO) GZA18X (SANYO) D03, D04 IF (AV)=3A/60V enabled enabled L01, L02, (L03) 3μH enabled enabled Stand-By R30 3.3kΩ, 1/6W RN16S332FK enabled enabled R32 1kΩ, 1/6W RN16S102FK enabled enabled R33 33kΩ, 1/6W RN16S333FK enabled enabled R34 2kΩ, 1/6W RN16S202FK enabled enabled C25 47μF, 10V 10MV47HC enabled enabled D05 - GMB01 (Ref.) enabled enabled Jumper 20mm enabled enabled J02, J03, J06 Jumper 10mm enabled enabled	C16, C17, (C	(18)	2.2μF, 50V	50MV2R2HC	enabled	enabled
D01, D02 - - GZA15X (SANYO) GZA18X (SANYO) D03, D04 IF (AV)=3A/60V enabled enabled L01, L02, (L03) 3μH enabled enabled Stand-By R30 3.3kΩ, 1/6W RN16S332FK enabled enabled R32 1kΩ, 1/6W RN16S102FK enabled enabled R33 33kΩ, 1/6W RN16S333FK enabled enabled R34 2kΩ, 1/6W RN16S202FK enabled enabled C25 47μF, 10V 10MV47HC enabled enabled D05 - GMB01 (Ref.) enabled enabled J01 Jumper 20mm enabled enabled J02, J03, J06 Jumper 10mm enabled enabled	C19, C20, (C	21)	470pF	DD104-63B471K50	enabled	enabled
D03, D04 IF (AV)=3A/60V enabled enabled L01, L02, (L03) 3μH enabled enabled Stand-By R30 3.3kΩ, 1/6W RN16S332FK enabled enabled R32 1kΩ, 1/6W RN16S102FK enabled enabled R33 33kΩ, 1/6W RN16S333FK enabled enabled R34 2kΩ, 1/6W RN16S202FK enabled enabled C25 47μF, 10V 10MV47HC enabled enabled D05 - GMB01 (Ref.) enabled enabled J01 Jumper 20mm enabled enabled J02, J03, J06 Jumper 10mm enabled enabled	C22, C23, (C	24)	100pF	DD104-63B101K50	enabled	enabled
L01, L02, (L03)3μΗenabledenabledStand-ByR30 $3.3k\Omega$, 1/6WRN16S332FKenabledenabledR32 $1k\Omega$, 1/6WRN16S102FKenabledenabledR33 $33k\Omega$, 1/6WRN16S333FKenabledenabledR34 $2k\Omega$, 1/6WRN16S202FKenabledenabledC25 47μ F, 10V10MV47HCenabledenabledD05-GMB01 (Ref.)enabledenabledTR1-2SC2274 (Ref.)enabledenabledJ01Jumper20mmenabledenabledJ02, J03, J06Jumper10mmenabledenabled	D01, D02		-	-	GZA15X (SANYO)	GZA18X (SANYO)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	D03, D04		IF (AV)=3A/60V		enabled	enabled
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	L01, L02, (L0	03)	3μΗ		enabled	enabled
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Stand-By	R30	3.3kΩ, 1/6W	RN16S332FK	enabled	enabled
R34 2kΩ, 1/6W RN16S202FK enabled enabled C25 47μF, 10V 10MV47HC enabled enabled D05 - GMB01 (Ref.) enabled enabled TR1 - 2SC2274 (Ref.) enabled enabled J01 Jumper 20mm enabled enabled J02, J03, J06 Jumper 10mm enabled enabled		R32	1kΩ, 1/6W	RN16S102FK	enabled	enabled
C25 47μF, 10V 10MV47HC enabled enabled D05 - GMB01 (Ref.) enabled enabled TR1 - 2SC2274 (Ref.) enabled enabled J01 Jumper 20mm enabled enabled J02, J03, J06 Jumper 10mm enabled enabled		R33	33kΩ, 1/6W	RN16S333FK	enabled	enabled
D05 - GMB01 (Ref.) enabled enabled TR1 - 2SC2274 (Ref.) enabled enabled J01 Jumper 20mm enabled enabled J02, J03, J06 Jumper 10mm enabled enabled		R34	2kΩ, 1/6W	RN16S202FK	enabled	enabled
TR1 - 2SC2274 (Ref.) enabled enabled J01 Jumper 20mm enabled enabled J02, J03, J06 Jumper 10mm enabled enabled	R33 R34 C25	47μF, 10V	10MV47HC	enabled	enabled	
J01 Jumper 20mm enabled enabled J02, J03, J06 Jumper 10mm enabled enabled		D05	-	GMB01 (Ref.)	enabled	enabled
J02, J03, J06 Jumper 10mm enabled enabled		TR1	-	2SC2274 (Ref.)	enabled	enabled
	J01		Jumper	20mm	enabled	enabled
J04, J05 Jumper 7mm enabled enabled	J02, J03, J06	3	Jumper	10mm	enabled	enabled
	J04, J05		Jumper	7mm	enabled	enabled

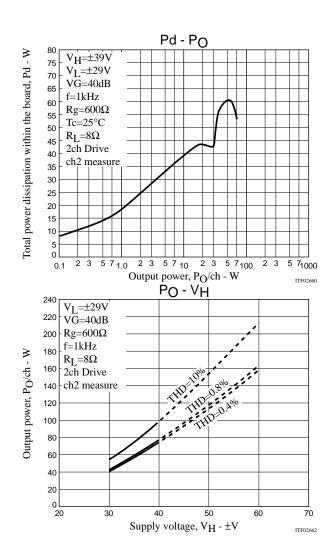
^(*1) STK416-100Sr (3ch AMP) doesn't mount parts of ().

Pin Assignments [STK433-000/-100/-200 Sr & STK415/416-100 Sr Pin Layout]

[STK433-000/-100/-200 Sr & S	<u> 5TK</u> 4	1 15/	416	-100) Sr	Pin	Lay	out_															
2ch class-AB					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
ZCII Class-AB										2ch	clas	sAB/	2.00r	nm									
STK433-030-E 30W/JEITA					-	-	+	0	0	0	0	+			1	N	S	N	ı				
STK433-040-E 40W/JEITA					Р	V	V	U	U	U	U	Р	s	G	N	F	Т	F	N				
STK433-060-E 50W/JEITA					R	С	С	Т	Т	Т	Т	R	U	N	/	/	Α	/	/				
STK433-070-E 60W/JEITA					Е	С	С	/	/	/	/	Е	В	D	С	С	N	С	С				
								С	С	С	С				Н	Н	D	Н	Н				
STK433-090-E 80W/JEITA								Н	Н	Н	Н		G		1	1	ī	2	2				
STK433-100-E 100W/JEITA								1	1	2	2		N		•		В	_	_				
STK433-120-E 120W/JEITA								+	<u> </u>	+	_		D				Y						
STK433-130-E 150W/JEITA								'		ļ '							l '						
311433-130-E 130W/3EITA	+-				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	10	19
3ch class-AB	-				ı	2	3	4	э		<u> </u>		_		11	12	13	14	15	16	17	10	19
	+-					1					r clas	1	∠.uur	IIII)	1				_	_			Τ.
STK433-230A-E 30W/JEITA					-	-	+	0	0	0	0	+			1	N	S	N	1		N	0	0
STK433-240A-E 40W/JEITA					Р	V	V	U	U	U	U	Р	S	G	N	F	Т	F	N	N	F	U	U
STK433-260A-E 50W/JEITA					R	С	С	Т	Т	Т	Т	R	U	Ν	/	/	Α	/	/	/	/	Т	Т
STK433-270-E 60W/JEITA					E	С	С	/	/	/	/	Е	В	D	С	С	N	С	С	С	С	/	/
STK433-290-E 80W/JEITA								С	С	С	С		•		Н	Н	D	Н	Н	Н	Н	С	С
STK433-300-E 100W/JEITA								Н	Н	Н	Н		G		1	1	-	2	2	3	3	Н	Н
STK433-320-E 120W/JEITA								1	1	2	2		Ν				В					3	3
STK433-330-E 150W/JEITA								+	-	+	-		D				Υ					+	-
2sh slass II	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19				
2ch class-H		2ch classH/2.00mm																					
STK415-090-E 80W/JEITA	+	-	+	-	-	-	+	0	0	0	0	+			1	N	S	N	ı				
STK415-100-E 90W/JEITA	V	V	0	0	Р	V	V	U	U	U	U	Р	s	G	N	F	Т	F	N				
STK415-120-E 120W/JEITA	L	L	F	F	R	Н	Н	Т	Т	Т	Т	R	U	N	/	/	Α	/	/				
STK415-130-E 150W/JEITA			F	F	Е			/	/	/	/	Е	В	D	С	С	N	С	С				
STK415-140-E 180W/JEITA			s	s				С	С	С	С				н	Н	D	Н	Н				
			E	E				Н	Н	Н	Н		G		1	1	ı	2	2				
			Т	T				1	1	2	2		N			-	В						
								+	_	+	_		D				Υ						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
3ch class-H				l .	_						h clas						L						
STK416-090-E 80W/JEITA	+	Ι.	+	l	Ι.	Γ.	+	0	0	0	0	+			Ιī	N	s	N	ı		N	0	0
STK416-100-E 90W/JEITA	V	V	0	0	P	V	V	U	U	U	U	P	s	G	N	F	T	F	N	N	F	U	U
STK416-120-E 120W/JEITA	ľ	L	F	F	R	H	Н	T	Т	Т	T	R	U	N	/	/	A	',	/	/	/	T	Т
STK416-130-E 150W/JEITA	-	_	l F	l '	E	''	''	,	,	,	/	E	В	D	c	C	N	c	c	C	C	,	,
311(410-130-L 130)V/JEHA			S	S	-			C	c	c	c		_	U	Н	Н	D	Н	Н	Н	Н	c	C
			E	E				_	Н	Н	Н		• G		1	1	١	2	н 2	3	3		Н
								H										_	4	3	J	Н	
			Т	Т				1	1	2	2		N				В					3	3
	Щ.							+	_	+	-		D				Υ		L			+	-

Evaluation Board Characteristics





[Thermal Design Example for STK415-100-E ($R_L = 8\Omega$)]

The thermal resistance, θc -a, of the heat sink for total power dissipation, Pd, within the hybrid IC is determined as follows.

Condition 1: The hybrid IC substrate temperature, Tc, must not exceed 125°C.

$$Pd \times \theta c - a + Ta < 125^{\circ}C \qquad (1)$$

Ta: Guaranteed ambient temperature for the end product

Condition 2: The junction temperature, Tj, of each power transistor must not exceed 150°C.

$$Pd \times \theta c - a + Pd/N \times \theta j - c + Ta < 150^{\circ}C \qquad (2)$$

N: Number of power transistors

 θ i-c: Thermal resistance per power transistor

However, the power dissipation, Pd, for the power transistors shall be allocated equally among the number of power transistors.

The following inequalities result from solving equations (1) and (2) for θ c-a.

$$\theta c-a < (125 - Ta)/Pd$$
 (1)' $\theta c-a < (150 - Ta)/Pd - \theta j-c/N$ (2)'

Values that satisfy these two inequalities at the same time represent the required heat sink thermal resistance.

When the following specifications have been stipulated, the required heat sink thermal resistance can be determined from formulas (1)' and (2)'.

Supply voltage
 Load resistance
 Guaranteed ambient temperature
 Ta

[Example]

When the IC supply voltage, V_H =±39V, V_L =±29V and R_L is 8Ω , the total power dissipation, Pd, within the hybrid IC, will be a maximum of 60W at 1kHz for a continuous sine wave signal according to the Pd-Po characteristics. For the music signals normally handled by audio amplifiers, a value of 1/8Po max is generally used for Pd as an estimate of the power dissipation based on the type of continuous signal. (Note that the factor used may differ depending on the safety standard used.)

This is:

Pd
$$\approx 37.0$$
W (when 1/8PO max. = 7.5W, PO max. = 60W).

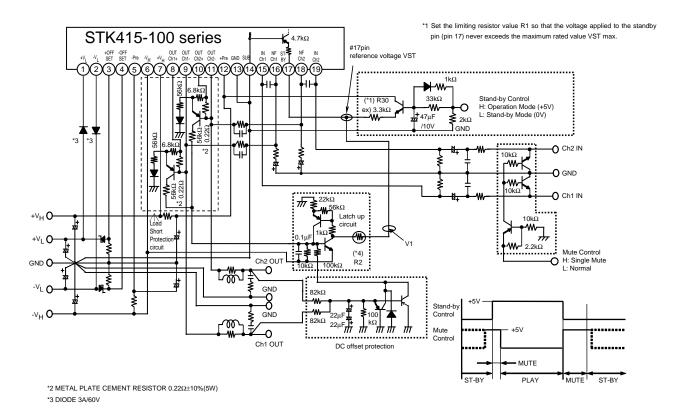
The number of power transistors in audio amplifier block of these hybrid ICs, N, is 4, and the thermal resistance per transistor, θ_{j-c} , is 2.1° C/W. Therefore, the required heat sink thermal resistance for a guaranteed ambient temperature, Ta, of 50° C will be as follows.

From formula (1)'
$$\theta c\text{-a} < (125 - 50)/37.0 \\ < 2.02$$
 From formula (2)'
$$\theta c\text{-a} < (150 - 50)/37.0 - 1.8/4 \\ < 2.25$$

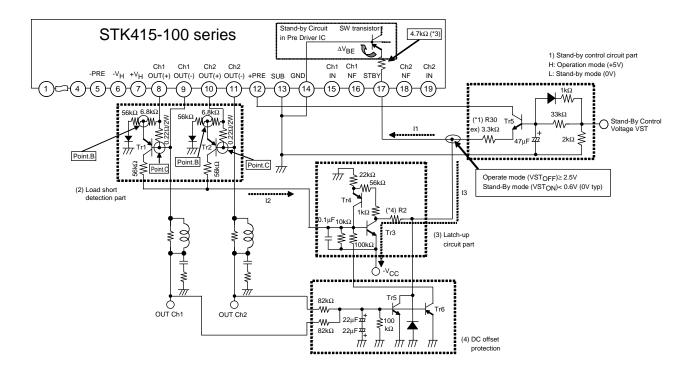
Therefore, the value of 2.02°C/W, which satisfies both of these formulae, is the required thermal resistance of the heat sink.

Note that this thermal design example assumes the use of a constant-voltage power supply, and is therefore not a verified design for any particular user's end product.

STK415-100 Series Stand-by control, Mute control, Load-short protection & DC offset protection application



STK415-100 Series Application explanation



The protection circuit application for the STK415-100sr consists of the following blocks (blocks (1) to (4)).

- (1) Standby control circuit block
- (2) Load short-circuit detection block
- (3) Latch-up circuit block
- (4) DC voltage protection block

1) Standby control circuit block

Concerning pin 17 reference voltage VST

<1> Operation mode

The switching transistor of the predriver IC turns on when the pin 17 reference voltage, VST, becomes greater than or equal to 2.5V, placing the amplifier into the operation mode.

Example: When VST (min.) = 2.5V

I1 is approximately equal to 0.40mA since VST = (*2) × IST + 0.6V \rightarrow 2.5V = 4.7k Ω × IST + 0.6V.

<2> Standby mode

The switching transistor of the predriver IC turns off when the pin 17 reference voltage, VST, becomes lower than or equal to 0.6V (typ. 0V), placing the amplifier into the standby mode.

Example: When VST = 0.6V

I1 is approximately equal to 0mA since VST = (*2) × IST + 0.6V \rightarrow 0.6V = 4.7k Ω × IST + 0.6V.

(*1) Limiting resistor

Determine the value of R1 so that the voltage VST applied to the standby pin (pin 17) falls within the rating (+2.5V to 5.5V (typ. 3.0V)).

- (*2) The standby control voltage must be supplied from the host including microcontrollers.
- (*3) A $4.7k\Omega$ limiting resistor is also incorporated inside the hybrid IC (at pin 17).

2) Load short-circuit detection block

Since the voltage between point B and point C is less than 0.6V in normal operation mode ($V_{BE} < 0.6V$) and TR1 (or TR2) is not activated, the load short-circuit detection block does not operate.

When a load short-circuit occurs, however, the voltage between point B and point C becomes larger than 0.6V, causing TR1 (or TR2) to turn on $(V_{BE} > 0.6V)$, and current I2 to flows.

3) Latch-up circuit block

TR3 is activated when I2 is supplied to the latch-up circuit.

When TR3 turns on and current I3 starts flowing, VST goes down to 0V (standby mode), protecting the power amplifier.

Since TR3 and TR4 configure a thyristor, once TR3 is activated, the IC is held in the standby mode.

To release the standby mode and reactivate the power amplifier, it is necessary to set the standby control voltage (*2) temporarily low (0V). Subsequently, when the standby control is returned to high, the power amplifier will become active again.

(*4) The I3 value varies depending on the supply voltage. Determine the value of R2 using the formula below, so that I1 is equal to or less than I3.

 $I1 \le I3 = V_{CC}/R2$

4) DC offset protection block

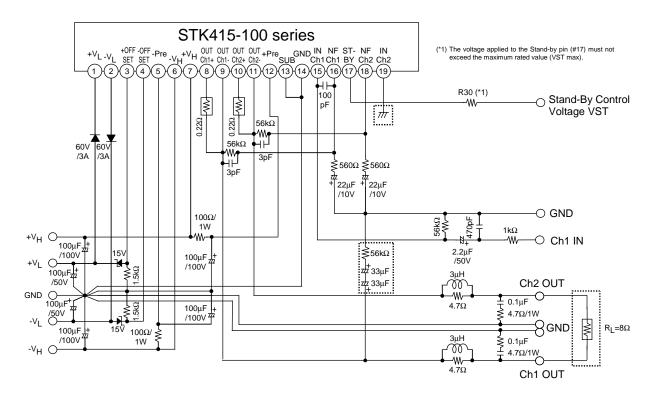
The DC offset protection circuit is activated when $\pm 0.5 V$ (typ) voltage is applied to either "OUT CH1" or "OUT CH2," and the hybrid IC is shut down (standby mode).

To release the IC from the standby mode and reactivate the power amplifier, it is necessary to set the standby control voltage temporarily low (0V).

Subsequently, when the standby control is returned to high (+5V), for example, the power amplifier will become active again.

The protection level must be set using the $82k\Omega$ resistor. Furthermore, the time constant must be determined using $22\mu//22\mu$ capacitors to prevent the amplifier from malfunctioning due to the audio signal.

STK415-100 Series BTL Application



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