FLASHTUBE SPECIFICATION TERMINOLOGIES

Shokai flashtubes are made of hard glass or quartz with electrodes connected to both ends. Normally Xenon gas is filled in suitable pressure depending on the use. Tubes are straight, U-shaped, ring-shaped, helical or may be of any configuration upon request. The type of glass used depends on flash energy, spectrum, power-life and price considerations.

1. Design Anode Voltage
Flashtubes are designed for the specific anode voltage and most data on performance are given at that design voltage.

2. Minimum Anode Voltage
Specifies the lowest permissible anode voltage for reliable tube operation.

3. Maximum Anode Voltage
Specifies the maximum allowable anode voltage for safe tube operation.

4. Maximum Flash Energy
Specifies the maximum energy input permissible for any one flash. Application of energy in excess of tube's maximum energy rating may cause short life, crazing, or damage to the glass—metal seal.

Note: Energy input per flash $Ws = \frac{1}{2}CV^2$ Joule (watt-second)
C = capacitance of the main capacitor μF
V = charging voltage of the main capacitor kVdc

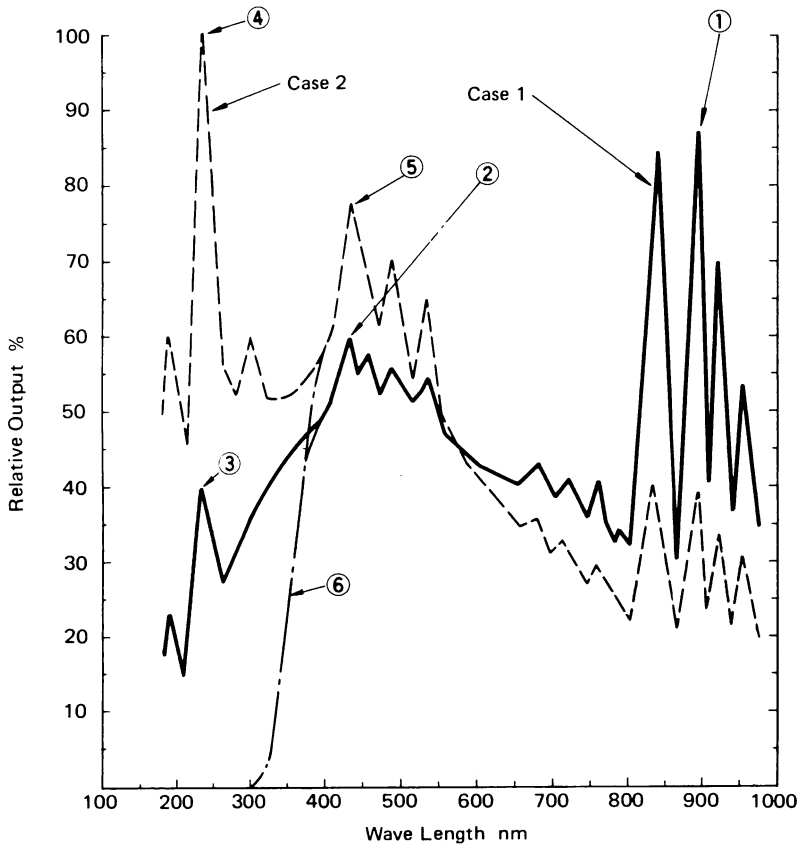
5. Average Power Input Maximum
Specifies the maximum average power input as limited by the tube's heat dissipating capacity. It is defined as follows.

Average Power Input $\overline{Pi} = Ws \times fr$ watt
Ws = energy input per flash Joule,
fr = flash rate flashes/sec.

6. Minimum Trigger Pulse Voltage
Specifies the minimum voltage of the trigger transformer's first pulse output necessary to fire the tube at minimum anode voltage. Trigger Pulse should be of negative polarity since negative pulses are normally more efficient in conventional cathode—grounded circuit. For Quench Tubes, however, positive pulses are normally more efficient.

7. Nominal Flash Life
The life of flashtubes are defined as the number of flashes before possible failure or before reaching about 80% of the initial light output at normal input.

XENON FLASHTUBE SPECTRUM



——— **Case 1**
Low Va, High C operation
700V, 1200μF, 294 Joule

– – – – – **Case 2**
High Va Low C operation
1400V, 300μF, 294 Joule

Flashtube Type: SXQ1210
(Quartz)

① Infra-red Peak for Case 1
② Visible Peak for Case 1
③ Ultra-Violet Peak for Case 1
④ Ultra-Violet Peak for Case 2
⑤ Visible Peak for Case 2
⑥ Ultra-Violet Cut off
For Pyrex #7740 or schott #8487
Hard Glass Type
Flashtube Type SFT1210PY

In case 1, Flashtube SXQ1210 is intended for use requiring mair infra-red and visible light, whereas in case 2 it is for use requiri mainly, ultra-violet and visible light.

Case 1: Low voltage, High capacitance operation. As follows.

Va = 700 V dc, C = 1200μF, Ws = 294 Joule, L = 400μH

Total resistance

$r = r_a + r_L + r_w + r_c = 0.33 + 0.08 + 0.05 + 0.05 = 0.51\Omega$

$k = \sqrt{\frac{4L}{C} - r^2} = 1.036$

$\alpha = r/2L = 637, \beta = k/2L = 1295, \alpha t_{m1} = 0.547, e^{-\alpha tm1} = 0.578$

$i_{m1} = \frac{Va}{\sqrt{L/C}} \cdot e^{-\alpha tm1} = 700$ amp

Case 2: High voltage, Low capacitance operation. As follows.

Va = 1400 Vdc, C = 300μF, Ws = 294 Joule, L = 100μH

Total resistance

$r = r_a + r_L + r_w + r_c = 0.33 + 0.03 + 0.05 + 0 = 0.41\Omega$

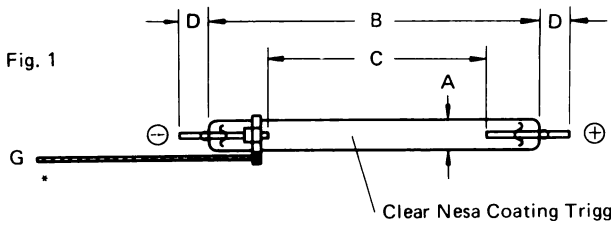
$k = \sqrt{\frac{4L}{C} - r^2} = 1.079$

$\alpha = r/2L = 2050, \beta = k/2L = 5395, \alpha t_{m1} = 0.459, e^{-\alpha tm1} = 0.63$

$i_{m1} = \frac{Va}{\sqrt{L/C}} \cdot e^{-\alpha tm1} = 1527$ amp

HARD GLASS, STRAIGHT. FOR GENERAL PHOTO FLASH.

Fig. 1



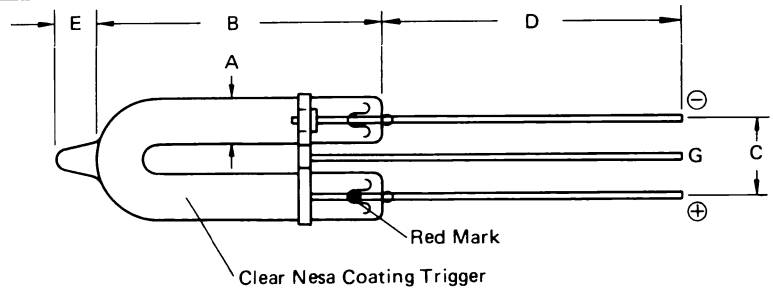
* Trigger lead wire is on the ⊖ side for standard type.

Specifications			Line No.	402	403	404	405	406	407	408	409
			Shokai lamp No.	SFT 3222	SFT 3224	SFT 3227	SFT 3534	SFT 3545	SFT 4044	SFT 4553	SFT 4562
Design Anode Voltage		Vdc		330	330	330	330	330	330	330	400
Min. Anode Voltage		Vdc		220	230	210	210	220	230	230	300
Max. Anode Voltage		Vdc		360	360	360	360	400	400	400	500
Max. Flash Energy		Joule		12	13	15	23	40	50	70	90
Normal Flash Energy		Joule		10	11	13	20	36	45	60	80
Max. Flash Rate at Max. Flash Energy		FPS		1/15	1/15	1/15	1/15	1/15	1/15	1/15	1/15
Ave. Power Input Max. (Joule × FPS)		W		0.8	0.87	1.0	1.5	2.7	3.3	4.7	6
Min. Trigger Pulse Voltage		KVP		−4	−4	−4	−4	−4	−4	−6	−6
Dimensions	A	mmϕ		3.2	3.2	3.2	3.5	3.5	4.0	4.5	4.5
Dimensions	B	mm		22	24	27	34	45	44	53	62
Dimensions	C	mm		13	15	15	20	30	29	37	47
Dimensions	D	mm		2	2	3	3	3	3	3	5
Dimensions	E	mm		/	/	/	/	/	/	/	/
Fig. No.				1	1	1	1	1	1	1	1
Ave. Flash Life at Normal Flash Energy		Flashes		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000

Note: FPS = Flashes Per Second

HARD GLASS, U-SHAPED. FOR GENERAL PHOTO FLASH.

Fig. 1



Specifications			Line No.	410	411	412
			Shokai lamp No.	SFT 106	SFT 108	SFT 110
Design Anode Voltage		Vdc		250	350	300
Min. Anode Voltage		Vdc		200	300	220
Max. Anode Voltage		Vdc		300	500	500
Max. Flash Energy		Joule		50	80	100
Normal Flash Energy		Joule		45	70	90
Max. Flash Rate at Max. Flash Energy		FPS		1/15	1/15	1/15
Ave. Power Input Max. (Joule × FPS)		W		3.3	5.3	6.7
Min. Trigger Pulse Voltage		KVP		−4	−4	−4
Dimensions	A	mmϕ		6.2	6.2	6.2
Dimensions	B	mm		32	41	47
Dimensions	C	mm		10	11	16
Dimensions	D	mm		38	38	38
Dimensions	E	mm		6 Max.	6 Max.	6 Max.
Fig. No.				1	1	1
Ave. Flash Life at Normal Flash Energy		Flashes		8,000	5,000	10,000

HARD GLASS, HELICAL & RING-SHAPED. FOR PHOTO FLASH DISPLAY.

Fig. 1

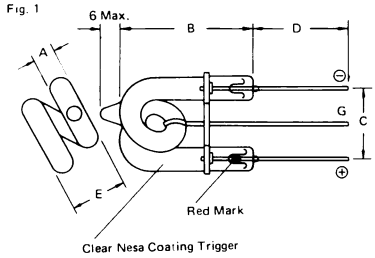
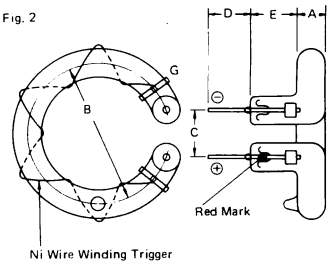


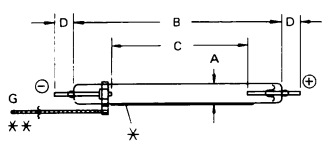
Fig. 2



Specifications	Line No.	413	414	415	416	417	418	419
	Shokai lamp No.	SFT 75F	SFT 118	SFT 218	SFT 220	SFT 60R	SFT 67RH	SFT 220H
Design Anode Voltage	Vdc	400	500	1,000	350	900	900	500
Min. Anode Voltage	Vdc	350	350	800	290	800	800	350
Max. Anode Voltage	Vdc	500	550	1,150	390	1,100	1,100	550
Max. Flash Energy	Joule	70	200	250	300	200	600	300
Normal Flash Energy	Joule	60	180	220	270	180	540	270
Max. Flash Rate at Max. Flash Energy	FPS	1/15	1/15	1/15	1/15	1/10	1/10	1/7.5
Ave. Power Input Max. (Joule × FPS)	W	4.7	13.3	16.7	20	20	60	40
Min. Trigger Pulse Voltage	KVP	−6	−6	−6	−6	−6	−6	−6
Dimensions A	mmϕ	5.7	6.2	6.2	8	8	9	8
Dimensions B	mm	27	40	42	43	60ϕ	67ϕ	43
Dimensions C	mm	14	17	21	24	12	19	24
Dimensions D	mm	38	38	38	38	38	40	38
Dimensions E	mm	13	14	15	18	14	14	18
Fig. No.		1	1	1	1	2	2	1
Ave. Flash Life at Normal Flash Energy	Flashes	10,000	10,000	10,000	10,000	10,000	10,000	10,000

HARD GLASS, STRAIGHT, U-SHAPED & HELICAL. FOR HIGH FPS TIMING & SIGNAL LIGHT.

Fig. 1



* Ag Paint Ribbon Trigger

** Trigger Lead Wire is on the ⊖ side for standard type. It can be installed on the ⊕ side upon request.

Fig. 2

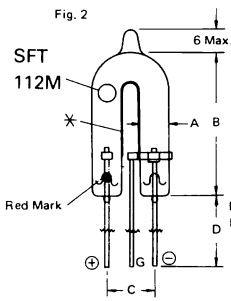
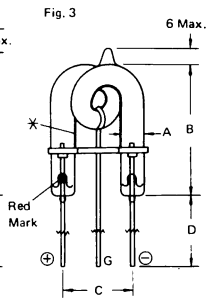
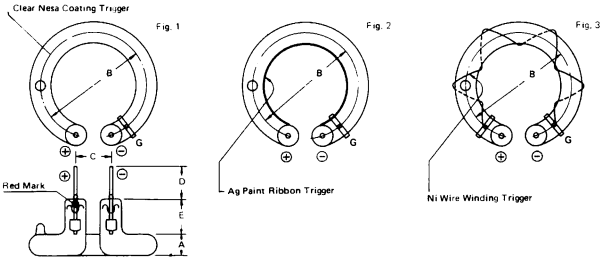


Fig. 3



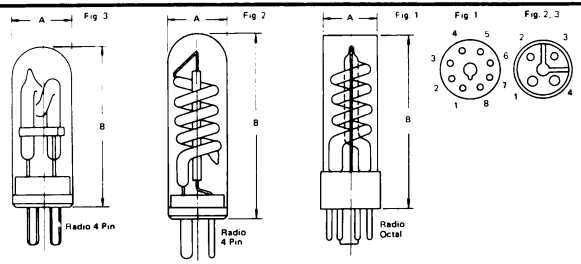
Specifications	Line No.	420	421	422	423	424	425	426	427
	Shokai lamp No.	SFT 3522T	SFT 3534T	SFT 4044T	SFT 106MS	SFT 112M	SFT 1210	SFT 151M	SFT 151MH
Design Anode Voltage	Vdc	300	300	300	300	300	300	450	450
Min. Anode Voltage	Vdc	250	250	250	200	250	250	350	350
Max. Anode Voltage	Vdc	350	350	400	400	400	400	550	550
Max. Flash Energy For Single Shot	Joule	12	20	45	45	45	/	200	250
Normal Flash Energy For High FPS Shot	Joule	0.004	0.006	0.012	0.02	0.023	0.05	0.075	0.1
Max. Flash Rate at Normal Flash Energy	FPS	250	250	250	250	300	100	200	200
Ave. Power Input Max. (Joule × FPS)	W	1.0	1.5	3	5	10	5	15	20
Min. Trigger Pulse Voltage	KVP	−4	−4	−4	−4	−6	−4	−6	−6
Dimensions A	mmϕ	3.5	3.5	4.0	6.2	6.0	6.2	6.2	6.2
Dimensions B	mm	22	34	44	32	38	35	43	43
Dimensions C	mm	13	20	29	10	12	12	18	18
Dimensions D	mm	3	3	3	38	38	38	38	38
Dimensions E	mm	/	/	/	/	(Non polarity)		/	/
Fig. No.		1	1**	1	2	2	2 (No Trigger coating)	3	3
Ave. Flash Life at Normal Flash Energy	Flashes	100 Hrs	100 Hrs	100 Hrs	100 Hrs	100 Hrs	50 Hrs	100 Hrs	100 Hrs

HARD GLASS, RING-SHAPED. FOR STUDIO FLASH LIGHT.



Specifications \ Line No.		428	429	430	431	432	433
Shokai lamp No.		SFT 36R	SFT 48R	SFT 52R	SFT 67RL	SFT 75R	SFT 90R
Design Anode Voltage	Vdc	316	330	316	400	560	500
Min. Anode Voltage	Vdc	200	210	200	350	360	400
Max. Anode Voltage	Vdc	350	350	350	450	730	1,000
Max. Flash Energy	Joule	220	150	470	500	800	1,000
Normal Flash Energy	Joule	200	135	420	450	720	900
Max. Flash Rate at Max. Flash Energy	FPS	1/10	1/10	1/10	1/10	1/10	1/10
Ave. Power Input Max. (Joule × FPS)	W	20	15	42	50	80	100
Min. Trigger Pulse Voltage	KVP	−5	−4	−5	−6	−6	−6
Dimensions A	mmϕ	8	6.5	12	9	12	12
Dimensions B	mmϕ	36	48	52	67	75	90
Dimensions C	mm	16	12	16	19	16	20
Dimensions D	mm	40	30	40	40	40	40
Dimensions E	mm	15	14	20	14	20	38
Fig. No.		2	1	2	3	1	3
Ave. Flash Life at Normal Flash Energy	Flashes	10,000	10,000	10,000	10,000	10,000	10,000

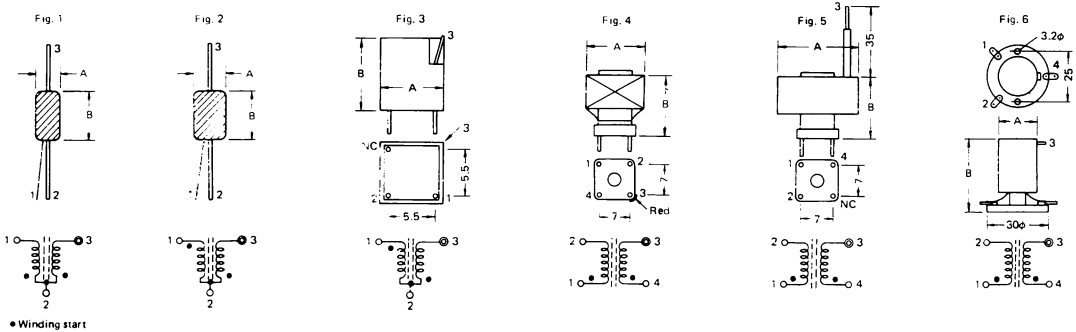
HARD GLASS, SPECIAL. FOR PHOTO FLASH DISPLAY.



Base Pin Connections			
Type	SFT 120	SFT 250	SFT 426
–	4	4	4
+	2	1	2
Trigger	3	6	3

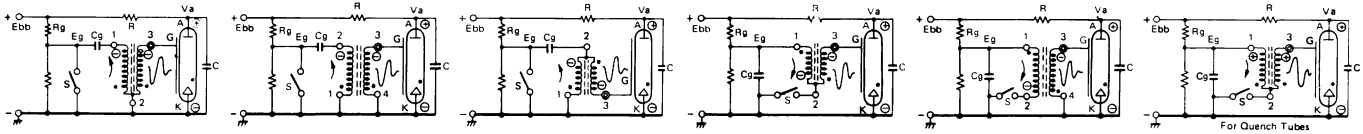
			Line No.	442	443	444
			Shokai lamp No.	SFT 120	SFT 250	SFT 426
Specifications						
Design Anode Voltage		Vdc		500	2,000	900
Min. Anode Voltage		Vdc		350	1,400	800
Max. Anode Voltage		Vdc		550	2,400	1,100
Max. Flash Energy		Joule		200	300	400
Normal Flash Energy		Joule		180	270	360
Max. Flash Rate at Max. Flash Energy		FPS		1/10	1/10	1/10
Ave. Power Input Max. (Joule × FPS)		W		20	30	40
Min. Trigger Pulse Voltage		KVP		−6	−10	−10
Dimensions	A	mmϕ		31	29	31
Dimensions	B	mm		70	90	73
Dimensions	C	mm				
Dimensions	D	mm				
Dimensions	E	mm				
Fig. No.				3	1	2
Ave. Flash Life at Normal Flash Energy		Flashes		8,000	8,000	5,000

TRIGGER TRANSFORMERS (Old Type TR6KN is Superseded by TR6KS/RH1)



Line No.	463	464	465	466	467	468	469	470
Shokai lamp No. / Specifications	STR 4KN	STR 6KS/RH1	STR 8KS/TC8	STR 4KM	STR 6KM	STR 10KM	STR 15K	STR 20K
Max. Input Energy mJ (μF/Vdc)	1.48 (0.033/300)	2.1 (0.047/300)	2.1 (0.047/300)	1.47 (0.047/250)	1.47 (0.047/250)	4.5 (0.1/300)	6.1 (0.1/350)	20 (0.2/450)
Normal Input Energy mJ (μF/Vdc)	0.8 (0.033/220)	1.1 (0.047/220)	1.47 (0.047/250)	0.9 (0.047/200)	0.9 (0.047/200)	3.1 (0.1/250)	4.5 (0.1/300)	16 (0.2/400)
Peak Output Voltage of First Pulse at Normal Energy KVP	−4	−6	−8	−4	−6	−10	−15	−20
First Output Pulse Width to1 μs	0.7	0.9	1.0	0.7	0.8	1.4	3.0	4.6
Dimensions A mm	7φ	8φ	7.5	14φ	18φ	19φ	20φ	20φ
Dimensions B mm	16 Max.	12 Max.	8.5	15	15	15	35	35
Fig. No.	1	2	3	4	4	5	6	6

Typical Trigger Circuits



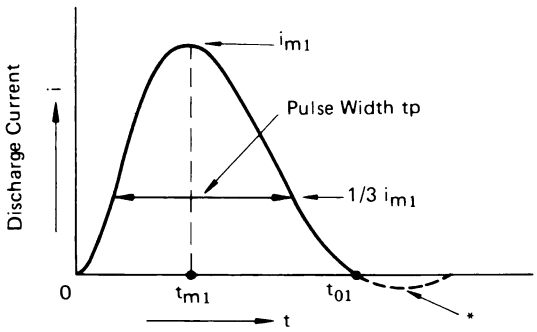
Note: Pulse Test Condition: Output Impedance Z_L = 100MΩ 15 PF (= typical trigger impedance of flashtubes)

(6) RMS Current at Flash Interval T sec.

$$I_{rms} = \sqrt{\frac{1}{T}\int_0^T i^2 dt} = Va/k\sqrt{\frac{1-e^{-(2\pi\cdot\beta/\alpha)}}{\alpha\{(\beta/\alpha)^2+1\}}}\cdot\frac{1}{\sqrt{T}}\ \text{Amp}$$

(7) t~i Curve & Pulse Width

$$i = 2\,Va/k\cdot e^{-\alpha t}\cdot\sin\beta t$$



Form of light output curve is nearly equivalent to that of discharge current.

$t_{m1} = \alpha t_{m1}/\alpha$, $t_{01} = \pi/\beta$

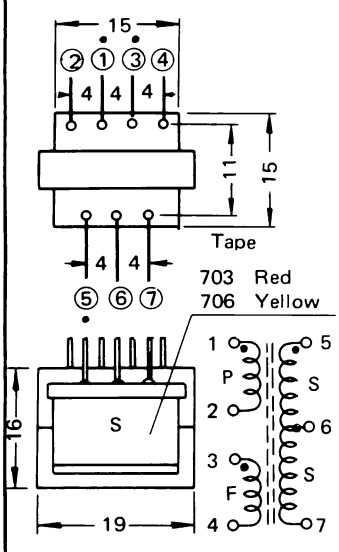
tp: Obtained from t~i curve $= 2.7\sqrt{LC}$

* : Reverse Current $\fallingdotseq 0$ (For $k \gtrapprox {}^{0}_{1.4}$)

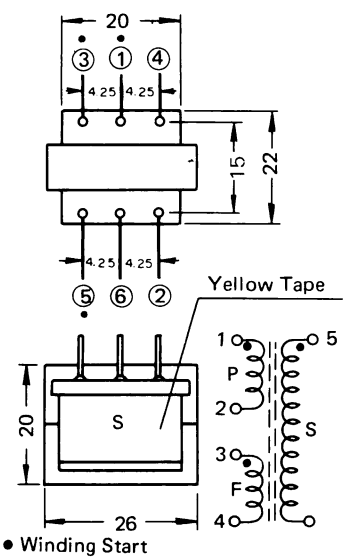
OSCILLATION TRANSFORMERS FOR DC-DC CONVERTER

Specifications	Line No.	483	484	485	486	487	488	489	490	491
	Type No.	SMK 501 (S-11B)	SMK 503 703	SMK 506 706	SMK 612	SMK 612A	SMK 624	SMK 624A	SMK 0612	SMK 1224
Design Input Voltage	Vdc	1.5	3	6	12	12	24	24	6/12	12/24
Design Output Voltage	Vdc	330	330	330	350	350	400	350	350	350
Ferrite Core Size	mm	EE13	EE19	EE19	EE26	EES19	EE28	EES19	EE19	EES19
Max. Power Output	W	2	7	7	15	13	20	13	7	13
Oscillation Frequency	KHz	15	15	15	15	15	15	15	15	15
Winding Ratio	Ns/Np	266	121.5	57.4	30	30	18	15	60/30	30/15

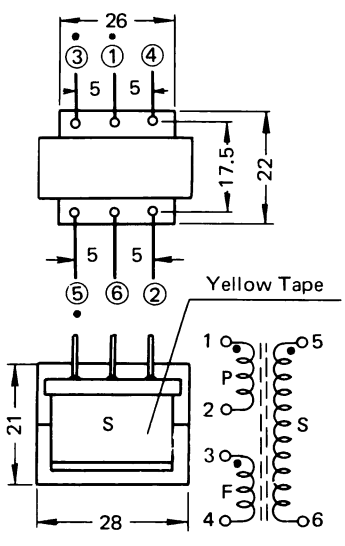
SMK 703, 706



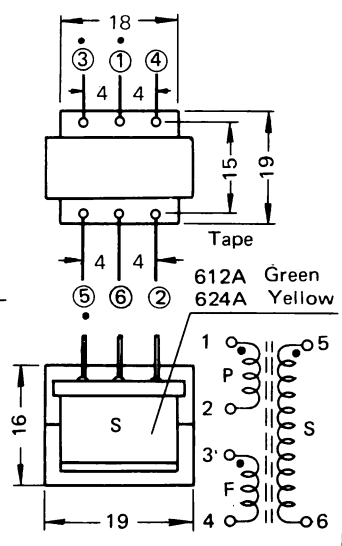
SMK 612



SMK 624

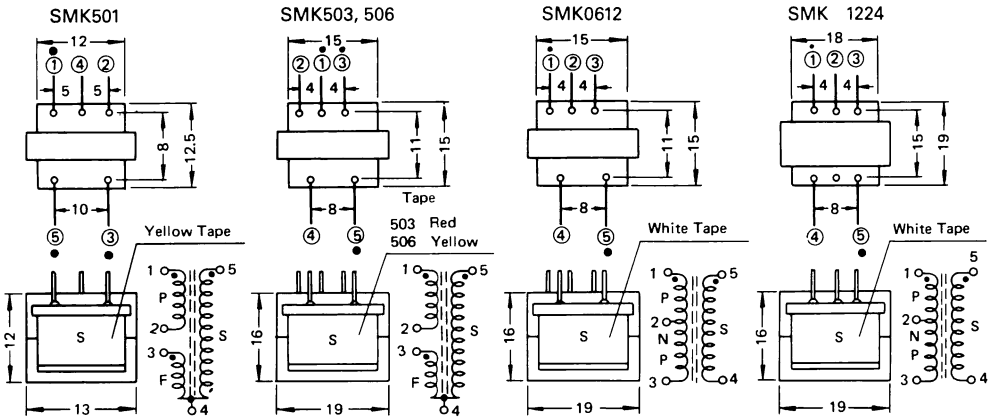


SMK 612A, 624A

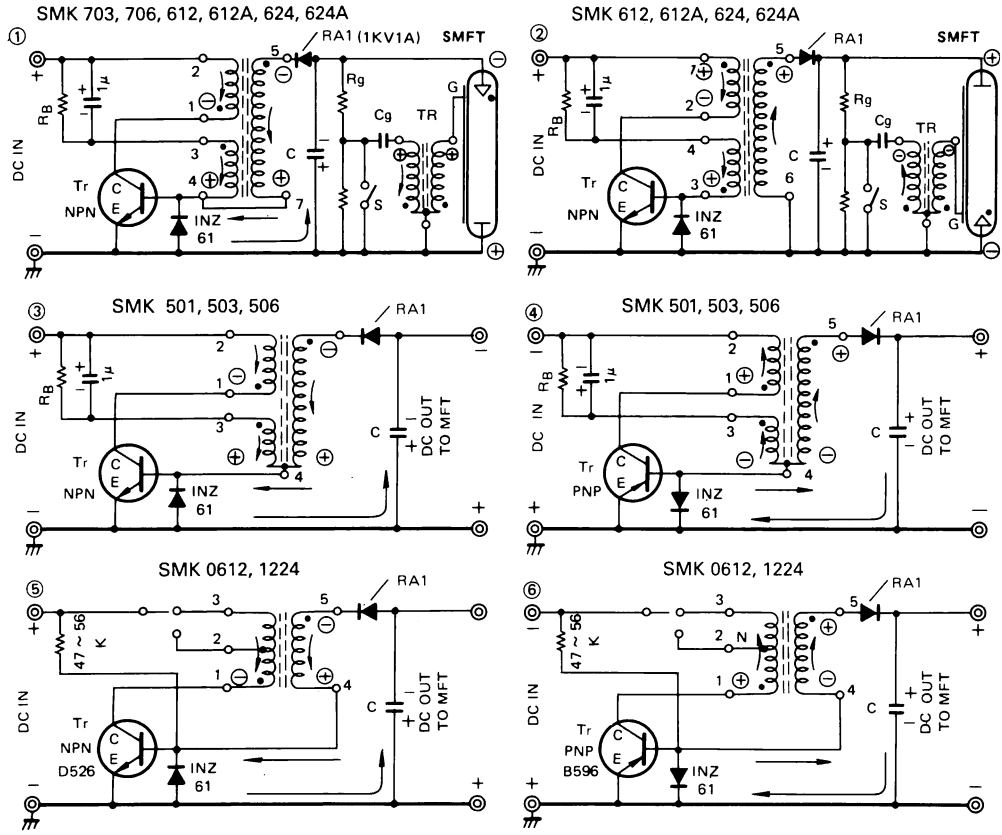


• Winding Start

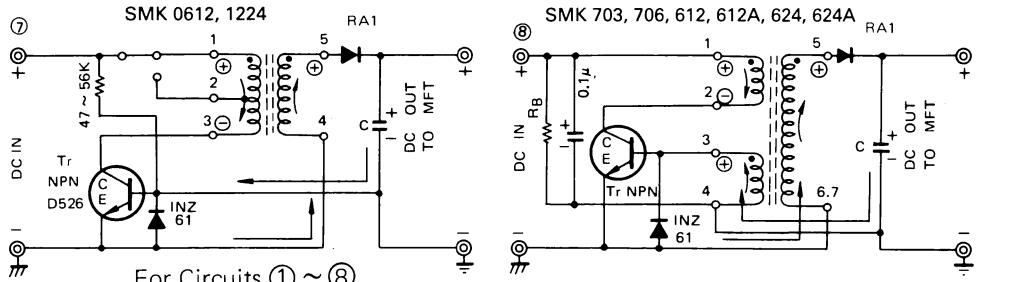
OSCILLATION TRANSFORMERS Continued



TYPICAL OSCILLATION CIRCUITS



OTHER REFERENCE CIRCUITS (TR NPN – ⊕DC OUT)



For Circuits ① ~ ⑧

Tr, R_B \ DC IN	1.5V	3V	6V	12,24V
Silicon NPN	C2500(0.9W) × 2	C2500 × 2,C2270(10W)	C2270,D526(30W),D553(40W)	D526,D553,D717(80W)
Silicon PNP	B893(0.8W) × 2	B893 × 2,A1120(10W)	A1120,B596(30W),B553(40W)	B596,B553
R_B KΩ	0.25 ~ 0.33	0.5	1	1 ~ 2