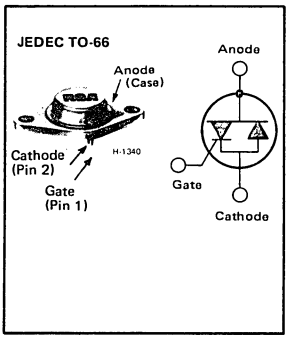
RCA
Solid State
Division

Thyristors / Rectifiers

S3800 Series



ITR's (Integrated Thyristor/Rectifiers)

Power Integrated Circuits for Color and Monochrome TV Horizontal Deflection

Voltage / Package	400 V Type	500 V Type	550 V Type	600 V Type	650 V Type	700 V Type	750 V Type
TO-66	S3800D (41023)	S3800E (41019)	S3800EF (41022)	S3800M (41021)	S3800MF (41018)	S3800S (41020)	S3800SF (41017)

Numbers in parentheses are former RCA type numbers.

The S3800 series are all-diffused power integrated circuits that incorporate a silicon controlled rectifier and a silicon rectifier on a common pellet. S3800SF, S3800MF, and S3800E are used as bipolar switches to control horizontal yoke current during the beam trace interval; S3800S, S3800M, S3800EF, and S3800D are used as commutating switches to initiate trace-retrace switching.

Application Features:

- **Operation from supply voltages between 150 and 270 V (nominal)**
- **Ability to handle high beam current (average 1.6 mA dc)**
- **Ability to supply as much as 7 mJ of stored energy to the deflection yoke, which is sufficient for 29-mm-neck picture tubes and 35-mm-neck picture tubes operated at 25 kV (nominal value)**
- **Highly reliable circuit that can also be used as a low-voltage power supply**

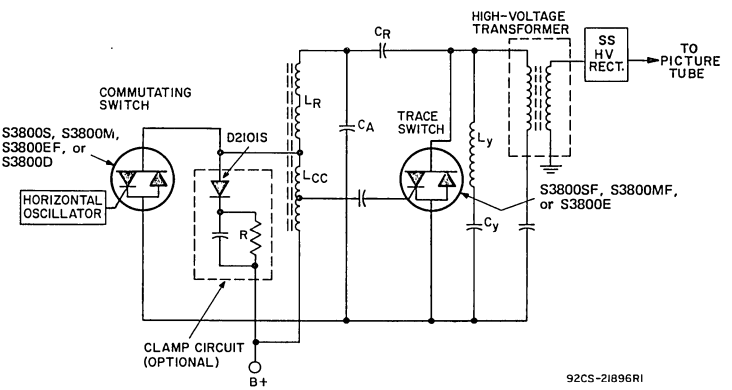


Fig. 1—Simplified schematic diagram of horizontal output circuit.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		S3800SF	S3800MF	S3800E	S3800S	S3800M	S3800EF	S3800D	
Non-Repetitive Peak Off-State Voltage: Gate open	V_{DSOM}	800*	700*	550*	750*	650*	600*	500*	V
Repetitive Peak Off-State Voltage: Gate open	V_{DROM}								
$T_C = 80^oC$		750	650	500	700	600	550	400	V
Repetitive Peak Reverse Voltage: Gate open	V_{RROM}	0	0	0	0	0	0	0	V
On-State Current: $T_C = 60^oC$, 50 Hz sine wave, conduction angle = 180^o:									
Average DC	$I_{T(AV)}$	3.2	3.2	3.2	3.2	3.2	3.2	3.2	A
RMS	$I_{T(RMS)}$	5	5	5	5	5	5	5	A
Peak Surge (Non-Repetitive): For one cycle of applied voltage, 50 Hz	I_{TSM}	50	50	50	50	50	50	50	A
Critical Rate of Rise of On-State Current: For $V_D = V_{DROM}$ rated value, I_{GT} = 50 mA, 0.1 μs rise time	di/dt	200	200	200	200	200	200	200	A/μs
Fusing Current (for ITR protection): $T_J = -40$ to 80^oC, t = 1 to 8.3 ms	I^2t	6							A^2s
Gate Power Dissipation: Peak (forward or reverse) for 10 μs duration; max. reverse gate bias = −35 V for S3800SF, MF, E; −8 V for S3800S, M, EF, D	P_{GM}	25	25	25	25	25	25	25	W
Temperature Range■:									
Storage	T_{stg}	−40 to 150							°C
Operating (case)	T_C	−40 to 80							°C

*Protection against transients above this value must be provided. Transients generated by arcing may persist for as long as 10 cycles.

■Temperature measurement point is shown on the DIMENSIONAL OUTLINE.

ELECTRICAL CHARACTERISTICS, *At Maximum Ratings and at Indicated Case Temperature (T_C)*

CHARACTERISTIC	SYMBOL	LIMITS				UNITS
		S3800SF, S3800MF S3800E		S3800S, S3800M, S3800EF, S3800D		
		TYP.	MAX.	TYP.	MAX.	
Peak Forward Off-State Current: Gate open, V_{DO} = Rated V_{DROM} $T_C = 85^oC$	I_{DOM}	0.5	1.5	0.5	1.5	mA
Instantaneous On-State Voltage: $T_C = 25^oC$						
SCR, I_T = 30 A	V_T	2.2	3	2.2	3	V
Rectifier, I_F = 3 A	V_F	–	1.6	–	1.6	
DC Gate Trigger Current: $T_C = 25^oC$	I_{GT}	15	40	15	45	mA
DC Gate Trigger Voltage: $T_C = 25^oC$	V_{GT}	1.8	4	1.8	4	V
Critical Rate of Rise of Off-State Voltage: $T_C = 70^oC$	dv/dt	850(MIN.)▲		850(MIN.)▲		V/μs
Circuit-Commutated Turn-Off Time†: $T_C = 70^oC$						
Minimum negative bias during turn-off time = −20 V, rate of reapplied voltage (dv/dt) = 175 V/μs	t_q	–	2.4	–	–	μs
Minimum negative bias during turn-off time = −2.5 V, rate of reapplied voltage (dv/dt) = 400 V/μs		–	–	–	4.2	
Thermal Resistance: Junction-to-Case	$R_{\theta JC}$	–	4	–	4	°C/W

▲ Up to 500 V max. (with negative bias from −2.5 V to −4.0 V).

† This parameter, the sum of reverse recovery time and gate recovery time, is measured from the zero crossing of current to the start of the reapplied voltage. Knowledge of the current, the reapplied voltage, and the case temperature is necessary when measuring t_q. In the worst conditions (high line, zero-beam, off-frequency, minimum auxiliary load, etc.), turn-off time must not fall below the given values. Turn-off time increases with temperature; therefore, case temperature must not exceed 70^oC.

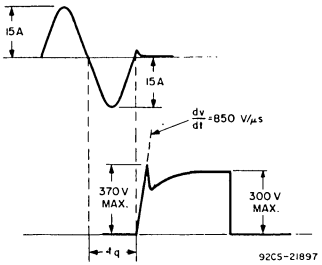


Fig. 2– Circuit-commutated turn-off time in commutating ITR.

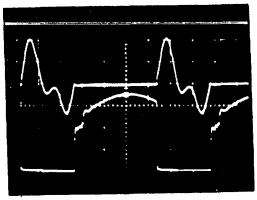


Fig. 3– Typical deflection-circuit waveforms for commutating ITR.

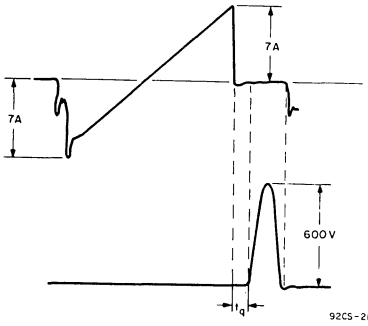


Fig. 4– Circuit-commutated turn-off time in trace ITR.

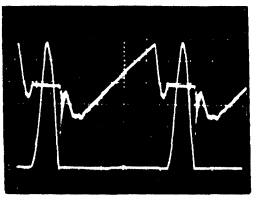


Fig. 5– Typical deflection-circuit waveforms for trace ITR.

TERMINAL CONNECTIONS

Pin 1 – Gate
Pin 2 – Cathode
Case, Mounting Flange – Anode