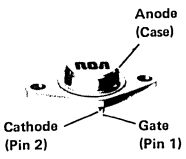
RCA
Solid State
Division

S3701M



JEDEC TO-66 H-1340

5-Ampere Silicon Controlled Rectifier

For Applications in Pulse Power Supplies
To Drive GaAs Laser Diodes

Features:

- High peak-current capability
- Good current-spreading attributes
- Symmetrical gate-cathode construction for uniform current density, rapid electrical conduction, and efficient heat dissipation
- Controlled minimum holding current
- Hermetic construction
- Low thermal resistance

Type S3701M° is a silicon controlled rectifier intended for use in circuits which generate pulses to drive injection laser diodes. A simplified circuit of a laser pulser is shown in Fig. 1. Detailed information on circuits of this type is given in RCA Application Note AN-4469, "Solid-State Pulse Power Supplies for RCA GaAs Injection Lasers."

The conventional SCR turn-on time, turn-off time, and on-state voltage do not correlate with circuit performance in a laser pulser operating with extremely short, high-current pulses. Therefore, a functional test in a simulated pulser circuit is used to control the S3701M for laser pulser application.

The S3701M SCR is designed for the good current-spreading and delay-time characteristics necessary to provide high-peak-current pulses to drive the laser diode. An additional significant characteristic of this device is its well controlled holding current, which assures operation only at currents sufficiently high to meet the circuit requirements.

° Formerly RCA type 40768.

MAXIMUM RATINGS, *Absolute-Maximum Values:*
Case temperature (T_C) = 25°C, unless otherwise specified

REPETITIVE PEAK OFF-STATE VOLTAGE:			
Gate open	V_{DROM}	600	V
RMS ON-STATE CURRENT (Conduction angle = 180°)	$I_{T(RMS)}$	5	A
REPETITIVE PEAK ON-STATE CURRENT (0.2 μs Pulse Width):	I_{PM}		
Free-air cooling, f = 500 Hz		75	A
Free-air cooling, f = 5000 Hz		40	A
Infinite heat sink, f = 10,000 Hz		40	A
Infinite heat sink, f = 1,000 Hz		75	A
GATE POWER DISSIPATION:			
PEAK (For 10 μs pulse)	P_{GM}	25	W
TEMPERATURE RANGE:			
Storage	T_{stg}	-40 to 125	°C
Operating (Case)	T_C	-40 to 100	°C
TERMINAL TEMPERATURE (During soldering): For 10 s max. (terminals and case)	T_T	225	°C

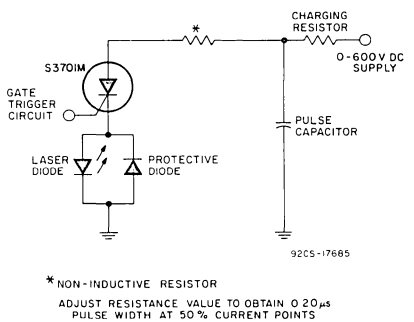


Fig. 1—Simplified laser pulser circuit. (See AN-4469 for specific circuits.)

ELECTRICAL CHARACTERISTICS

At Maximum Ratings and at Indicated Case Temperature (T_C) Unless Otherwise Specified

CHARACTERISTIC	SYMBOL	LIMITS Min.	LIMITS Max.	UNITS
Peak Off-State Current:				
Gate open, $v_D = V_{DROM}$, $T_C = 25^oC$	I_{DROM}	–	0.65	mA
$T_C = 75^oC$		–	1.2	
DC Gate-Trigger Current: $T_C = 25^oC$	I_{GT}	–	35	mA
DC Gate-Trigger Voltage: $T_C = 25^oC$	V_{GT}	–	4	V
DC Holding Current:				
Gate open, $T_C = 25^oC$	I_{HO}	15	–	mA
$T_C = 75^oC$		10	–	
Critical Rate-of-Rise of Off-State Voltage:				
For $v_D = V_{DROM}$, exponential voltage rise, gate open, $T_C = 75^oC$	dv/dt	200	–	V/μs
Source Voltage for Functional Test (See Fig. 2):				
I_p = 75A, C = 0.022μF, $R_s = 2\Omega$, f = 60Hz, pulse duration = 0.2μs, $T_C = 25^oC$	V_s	–	550	V
Thermal Resistance:				
Junction-to-Case	$R_{\theta JC}$	–	7	°C/W
Junction-to-Ambient	$R_{\theta JA}$	–	40	

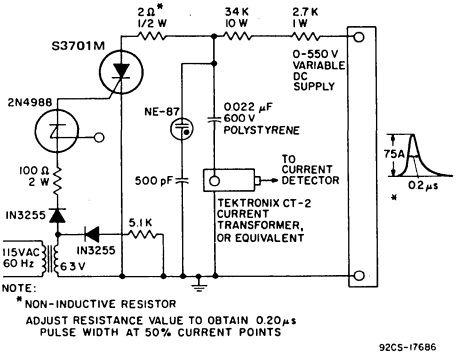


Fig. 2—Functional test circuit.

TERMINAL CONNECTIONS

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