File Number **654**

S2060, S2061 Series

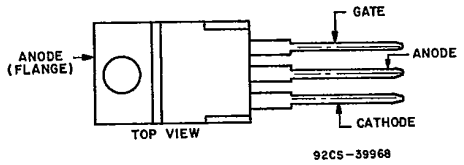
4-Ampere Sensitive-Gate Silicon Controlled Rectifiers

For Power Switching and Control Applications

Features:

- *Microampere gate sensitivity*
- *600-V capability*
- *35-A peak surge capability*
- *Low thermal resistances*
- *Surge capability curve*

TERMINAL DESIGNATIONS



JEDEC TO-220AB

The S2060 and S2061 series are sensitive-gate silicon controlled rectifiers designed for switching ac and dc currents. The SCR's are divided into two different series according to gate sensitivity. The types within each series differ in their voltage ratings; the voltage ratings are identified by suffix letters in the type designations.

These thyristors have microampere gate-current requirements which permit operation with low-level logic circuits.

All types in each series utilize the JEDEC TO-220AB package.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		S2060Q S2061Q	S2060Y S2061Y	S2060F S2061F	S2060A S2061A	S2060B S2061B	S2060C S2061C	S2060D S2061D	S2060E S2061E	S2060M S2061M	
NON-REPETITIVE PEAK REVERSE VOLTAGE R_{GK} = 1000 Ω, T_C = -40 to 125°C	V_{RSXM}	25	50	75	125	250	400	500	600	700	V
NON-REPETITIVE PEAK OFF-STATE VOLTAGE R_{GK} = 1000 Ω, T_C = -40 to 125°C	V_{DSXM}										
REPETITIVE PEAK REVERSE VOLTAGE R_{GK} = 1000 Ω, T_C = -40 to 125°C	V_{RRXM}	15	30	50	100	200	300	400	500	600	V
REPETITIVE PEAK OFF-STATE VOLTAGE R_{GK} = 1000 Ω, T_C = -40 to 125°C	V_{DRXM}										
ON-STATE CURRENT:											
Conduction angle = 180°, T_C = 100°C											
Average ac value	$I_{T(AV)}$					2.5					A
RMS value	$I_{T(RMS)}$					4					A
DC operation	$I_{T(DC)}$					2.75					A
PEAK SURGE (NON-REPETITIVE) ON-STATE CURRENT											
For one cycle of applied principal voltage 60 Hz (sinusoidal)	I_{TSM}					35					A
For more than one cycle of applied principal voltage	I_{GFM}					See Fig. 5					
PEAK GATE CURRENT (t = 10 μsec)	I_{GFM}					0.2					A
PEAK GATE REVERSE VOLTAGE	V_{GRM}					6					V
RATE OF CHANGE OF ON-STATE CURRENT: $V_{DM} = V_{DROM}$, I_{GT} = 1 mA, t_r = 0.5 μs, T_C = 110°C	di/dt					100					A/μs
GATE POWER DISSIPATION: PEAK FORWARD (for 10 μs max.)	P_{GM}					0.5					W
AVERAGE (averaging time = 10 ms max.)	$P_{G(AV)}$					0.1					W
TEMPERATURE RANGE:											
Storage	T_{stg}					-40 to +150					°C
Operating (case)	T_C					-40 to +110					°C
TERMINAL TEMPERATURE (During soldering): For 10 s max.	T_T					250					°C

S2060, S2061 Series

ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	LIMITS FOR ALL TYPES UNLESS OTHERWISE SPECIFIED			UNITS
		MIN.	TYP.	MAX.	
PEAK OFF-STATE CURRENT:					
Forward, $V_D = V_{DRXM}$, $R_{GK} = 1000\ \Omega$					
$T_C = 25^oC$	I_{DRXM}	–	0.1	10	μA
$T_C = 125°C$		–	10	100	
Reverse, $V_R = V_{RRXM}$, $R_{GK} = 1000\ \Omega$					
$T_C = 25^oC$	I_{RRXM}	–	0.1	10	
$T_C = 125°C$		–	10	100	
INSTANTANEOUS ON-STATE VOLTAGE: For $i_T = 4$ A and $T_C = 25^oC$ (See Fig. 14)	v_T	–	1.25	2.2	V
DC GATE TRIGGER CURRENT: $V_D = 12$ V (dc), $R_L = 30\ \Omega$, $T_C = 25^oC$:					
S2060 Series	I_{GT}	–	–	200	μA
S2061 Series		–	–	500	
For other case temperatures		See Figs. 9 & 10			
DC GATE TRIGGER VOLTAGE: $V_D = 12$ V (dc), $R_L = 30\ \Omega$, $T_C = 25^oC$	V_{GT}	–	0.5	0.8	V
For other case temperatures		See Fig. 12			
INSTANTANEOUS HOLDING CURRENT: $R_{GK} = 1000\ \Omega$, $V_D = 12$ V, I_T (INITIAL) = 50 mA, $T_C = 25^oC$:					
S2060 Series	I_H	–	1.7	3	mA
S2061 Series		–	3.9	6	
		–			
LATCHING CURRENT: $R_{GK} = 1000\ \Omega$, $V_D = 12$ V, $T_C = 25^oC$:					
S2060 Series ($I_{GT} = 200\ \mu A$)	i_L	–	1.8	4	mA
S2061 Series ($I_{GT} = 500\ \mu A$)		–	2.5	8	
		–			
CRITICAL RATE OF RISE OF OFF-STATE VOLTAGE: $V_D = V_{DRXM}$, $R_{GK} = 1000\ \Omega$, Exponential rise, $T_C = 125°C$	dv/dt	5	8	–	V/μs
GATE-CONTROLLED TURN-ON TIME: $V_D = V_{DRXM}$, $i_T = 1$ A, $R_{GK} = 1000\ \Omega$, $I_{GT} = 1$ mA, rise time = 0.1 μs, $T_C = 25^oC$	t_{gt}	–	1.7	2.5	μs
CIRCUIT COMMUTATED TURN-OFF TIME: $V_D = V_{DRXM}$, $i_T = 1$ A, $R_{GK} = 1000\ \Omega$, Pulse Duration = 50 μs, dv/dt = 5 V/μs, di/dt = −10 A/μs, $I_{GT} = 1$ mA at turn on, $T_C = 125°C$	t_q	–	30	100	μs
THERMAL RESISTANCE:					
Junction-to-Case*	$R_{\theta JC}$	–	–	3.5	°C/W
Junction-to-Ambient	$R_{\theta JA}$	–	–	60	

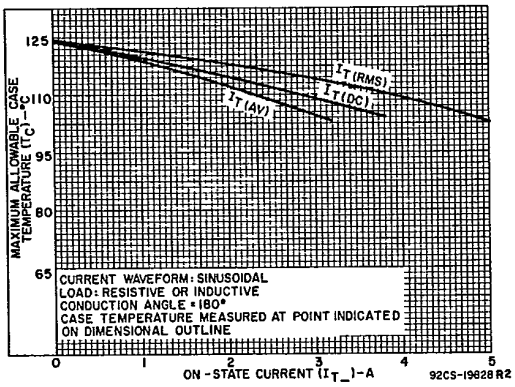


Fig. 1 — Maximum allowable case temperature vs. on-state-current for both series.

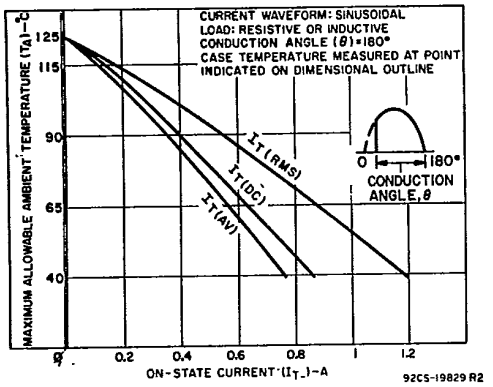


Fig. 2 — Maximum allowable ambient temperature vs. on-state current for both series.

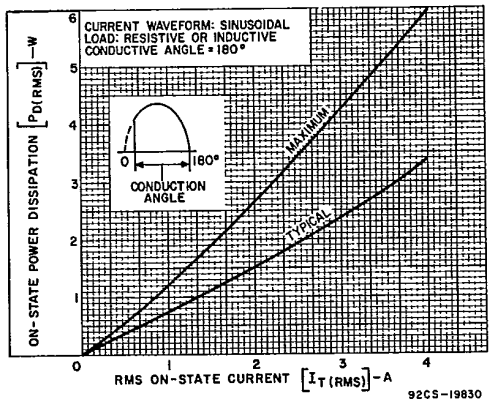


Fig. 3 — Power dissipation vs. rms-on-state current for both series.

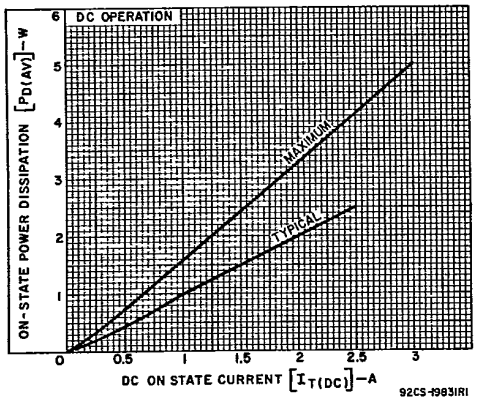


Fig. 4 — Power dissipation vs. dc on-state current for both series.

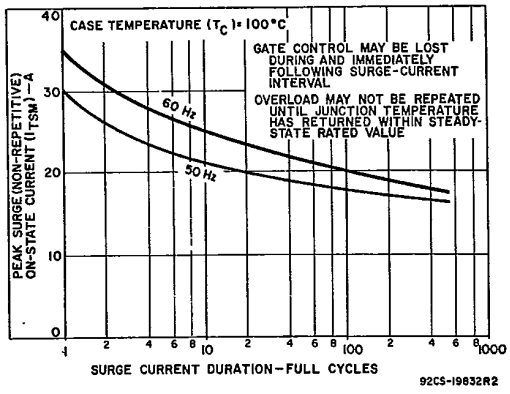


Fig. 5 — Peak surge on-state current vs. surge-current duration for both series.

S2060, S2061 Series

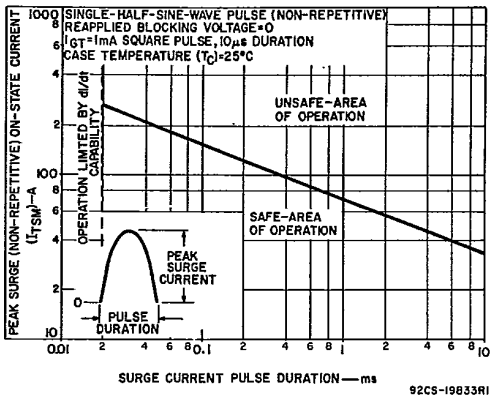


Fig. 6 — Surge capability without reapplied blocking voltage for both series.

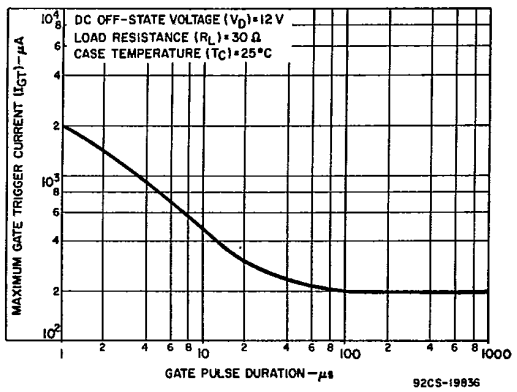


Fig. 7 — Maximum gate trigger current vs. gate pulse duration for types in the S2060 series.

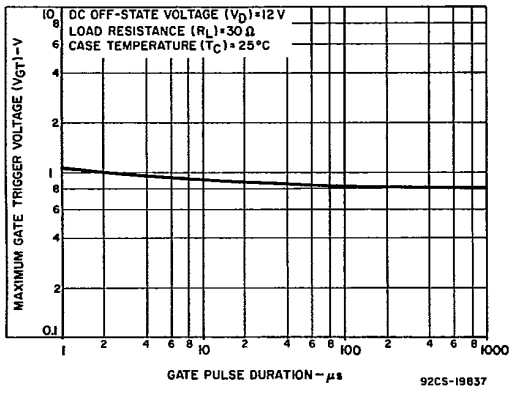


Fig. 8 — Maximum gate trigger voltage vs. gate pulse duration for types in the S2060 series.

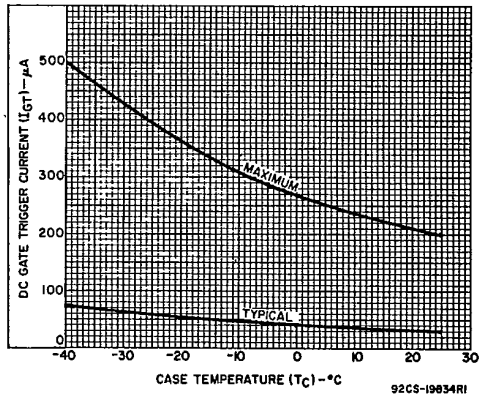


Fig. 9 — DC gate trigger current vs. case temperature for S2060 series.

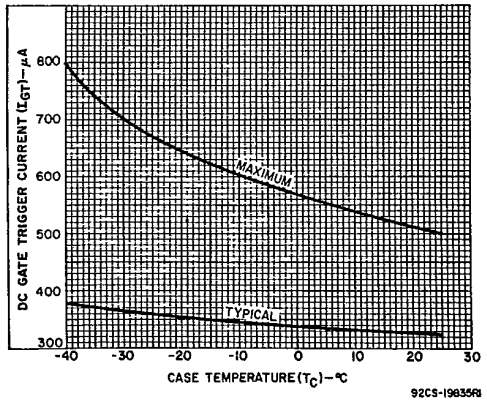


Fig. 10 — DC gate trigger current vs. case temperature for S2061 series.

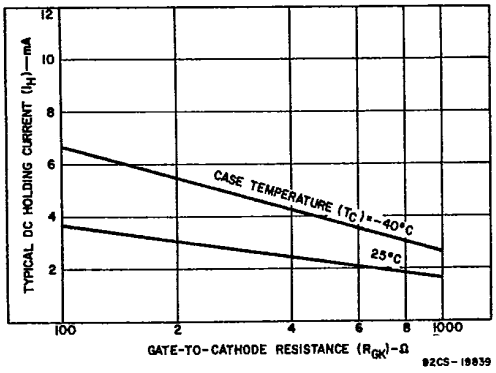


Fig. 11 — DC holding current vs. gate-cathode resistance for the S2060 series.

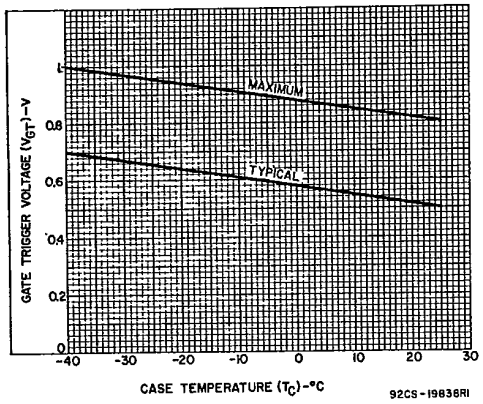


Fig. 12 — Gate trigger voltage vs. case temperature for all series.

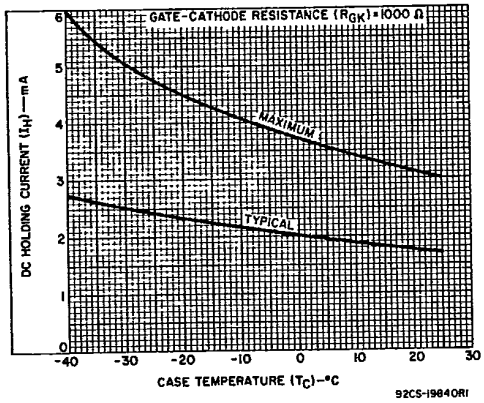


Fig. 13 — DC holding current vs. case temperature for the S2060 series.

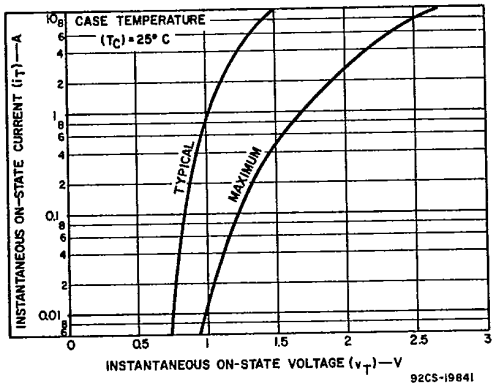


Fig. 14 — Instantaneous on-state current vs. on-state voltage for both series.