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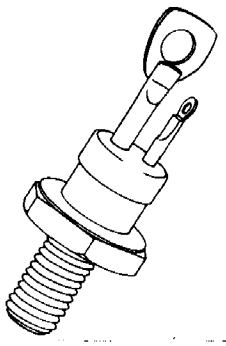
SCR

C140(2N3649-53)

C141(2N3654-58)

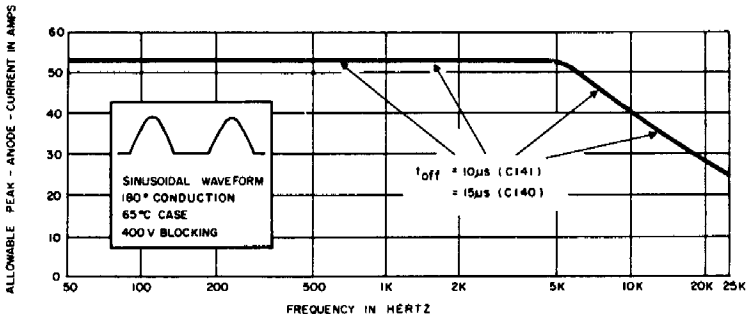
C140 and C141 Series of Silicon Controlled Rectifiers are reverse blocking triode thyristor semiconductor devices designed primarily for high-frequency power switching applications which require blocking voltages up to 400 volts and load currents up to 35 amperes RMS, at frequencies up to 25 kHz.



For line commutated applications (phase control, AC switching) at power line frequencies, up to 35 amperes RMS, the following preferred SCR types are recommended: C35 (Pub. #160.20), and C137 (Pub. #160.45).

The C140 and C141 Series feature:

- Contoured junction surfaces for high-voltage stability
- Shorted emitters for high dv/dt (200V/μsec)
- Distributed gates for high di/dt (400A/μsec)



Equipment designers can use the C140 and C141 SCR's in demanding applications such as:

- **Choppers**
- **Inverters**
- **Regulated power supplies**
- **Cycloconverters**
- **Ultrasonic generators**
- **High frequency lighting**
- **Sonar transmitters**
- **Induction heaters**
- **Radio transmitters**

This specification sheet uses a simpligied and easy-to-use rating system which graphically presents:

- **Case Temperature**
- **Peak Anode Current**
- **dv/dt and Turn-off Times**

for rectangular and sinusoidal anode-current waveforms

Quality Semi-Conductors

TYPE	DC FORWARD BLOCKING VOLTAGE V_{FO} (1) $T_C = -65°C$ to $+120°C$	PEAK FORWARD VOLTAGE PFV (1) $T_C = -65°C$ to $+120°C$	DC REVERSE VOLTAGE V_{RO} (1) $T_C = -65°C$ to $+120°C$	NON-REPETITIVE PEAK REVERSE VOLTAGE (Half Sine Wave) V_{ROM} (non-rep) (1) $T_C = -65°C$ to $+120°C$
C140F (2N3649) C141F (2N3654)	50 volts*	50 volts*	50 volts*	75 volts*
C140A (2N3650) C141A (2N3655)	100 volts*	100 volts*	100 volts*	150 volts*
C140B (2N3651) C141B (2N3656)	200 volts*	200 volts*	200 volts*	300 volts*
C140C (2N3652) C141C (2N3657)	300 volts*	300 volts*	300 volts*	400 volts*
C140D (2N3653) C141D (2N3658)	400 volts*	400 volts*	400 volts*	500 volts*

Turn-On Current Limit (See Chart 10) ——— 400 amperes per μsec*
RMS Forward Current, On-State ——— 35 amperes
DC Forward Current, On-State, $T_C = 40°C$ ——— 25 amperes*
Peak Rectangular Surge Forward Current (5.0msec width, $t_r = 50\mu sec$) I_{FM} (surge) ——— 180 amperes*
I^2t (for fusing) ——— 165 ampere² seconds (for times ≧ 1.0 millisecond)
Peak Gate Power Dissipation, P_{GM} ——— 40 watts*
Average Gate Power Dissipation, $P_{G(AV)}$ ——— 1.0 watt*
Peak Reverse Gate Voltage, V_{GRM} ——— 10 volts*
Peak Forward Gate Current, I_{GFM} ——— 6.4 amperes*
Reverse Recovery Energy ——— 0.002 watt sec.
Storage Temperature, T_{stg} ——— $-65°C$ to $+150°C$*
Operating Temperature, T_C ——— $-65°C$ to $+120°C$*
Stud Torque ——— 30 Lb-in (35 Kg-Cm)

CHARACTERISTICS

TEST	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
PULSE CIRCUIT COMMUTATED TURN-OFF TIME	t_{off} (pulse)					See Charts 1 and 4. $T_C = +115°C$, $I_{FM} = 100$ amps, Approx. Sinusoidal current waveform ($t_i = 1.0$ μsec, $t_p = 2.05\ ^{+0.5}_{-0}$ μsec), No delay reactor, Pulse rep. rate = 400 Hz. V_{FXM} = Rated, $V_{RXM} \leqq 200$ volts, $v_{RX} = 30$ volts. Rate of rise of reapplied forward blocking voltage (dv/dt) = 200 volts/μsec (linear ramp). Gate supply: 20 volts open circuit, 20 ohms, 1.5 μsec square wave pulse, Rise time = 0.1 μsec max.
C140 (2N3649-53)		—	—	15*	μsec	
C141 (2N3654-58)		—	—	10*	μsec	
CONVENTIONAL CIRCUIT COMMUTATED TURN-OFF TIME	t_{off}					$T_C = +120°C$, $I_{FM} = 10$ amps (50 μsec pulse), Rectangular current waveform, Test repetition rate = 60 Hz, V_{FXM} = Rated, V_{RXM} = Rated (see Chart 1), $v_{RX} = 15$ volts (see Chart 1), Rate of rise of current ≦ 10 amps/μsec, Rate of fall of current ≦ 5 amps/μsec, Rate of rise of reapplied forward blocking voltage (dv/dt) = 200 volts/μsec (linear ramp), Gate bias = 0 volts, 100 ohms (during turn-off time interval)
C140 (2N3649-53)		—	—	15*	μsec	
C141 (2N3654-58)		—	—	10*	μsec	

CHARACTERISTICS (Cont.)

TEST	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
DC REVERSE OR FORWARD BLOCKING CURRENT (1)	I_{RO} or I_{FO}					$T_C = +25°C$
C140F (2N3649) C141F (2N3654)		—	1.0	6.0	mAdc	$V_{RO} = V_{FO} = 50V$ DC
C140A (2N3650) C141A (2N3655)		—	1.0	6.0	mAdc	$V_{RO} = V_{FO} = 100V$ DC
C140B (2N3651) C141B (2N3656)		—	1.0	6.0	mAdc	$V_{RO} = V_{FO} = 200V$ DC
C140C (2N3652) C141C (2N3657)		—	1.0	5.5	mAdc	$V_{RO} = V_{FO} = 300V$ DC
C140D (2N3653) C141D (2N3658)		—	1.0	4.0	mAdc	$V_{RO} = V_{FO} = 400V$ DC
DC REVERSE OR FORWARD BLOCKING CURRENT (1)	I_{RO} or I_{FO}					$T_C = +120°C$
C140F (2N3649) C141F (2N3654)		—	5.0	6.0*	mAdc	$V_{RO} = V_{FO} = 50V$ DC
C140A (2N3650) C141A (2N3655)		—	5.0	6.0*	mAdc	$V_{RO} = V_{FO} = 100V$ DC
C140B (2N3651) C141B (2N3656)		—	5.0	6.0*	mAdc	$V_{RO} = V_{FO} = 200V$ DC
C140C (2N3652) C141C (2N3657)		—	5.0	5.5*	mAdc	$V_{RO} = V_{FO} = 300V$ DC
C140D (2N3653) C141D (2N3658)		—	3.5	4.0*	mAdc	$V_{RO} = V_{FO} = 400V$ DC
GATE TRIGGER CURRENT	I_{GT}	—	80	180	mAdc	$T_C = +25°C$, $V_{FX} = 6$Vdc, $R_L = 4$ ohms
		—	150	500*	mAdc	$T_C = -65°C$, $V_{FX} = 6$Vdc, $R_L = 2$ ohms
GATE TRIGGER VOLTAGE	V_{GT}	—	1.5	3.0	Vdc	$T_C = +25°C$, $V_{FX} = 6$ Vdc, $R_L = 4$ ohms
		0.25*	—	—	Vdc	$T_C = +120°C$, V_{FX} = Rated, $R_L = 200$ ohms
		—	2.0	4.5*	Vdc	$T_C = -65°C$, $V_{FX} = 6$Vdc, $R_L = 2$ ohms
PEAK ON-VOLTAGE	V_F	—	1.8	2.05*	V	$T_C = +25°C$, $I_{FM} = 25A$ 1msec. pulse. Duty cycle = 1%
HOLDING CURRENT	I_{HO}					Anode supply = 24Vdc. Initial forward current pulse, 0.1ms to 10ms wide, = 3.0A
		—	75	150	mAdc	$T_C = +25°C$. Gate supply: 10V open circuit, 20 ohms, 45 μsec min. pulse width.
		—	150	350*	mAdc	$T_C = -65°C$. Gate supply: 20V open circuit, 20 ohms, 45 μsec min. pulse width.
EFFECTIVE THERMAL RESISTANCE (DC)	θ_{J-C}	—	0.85	1.7*	°C/watt	
RATE OF RISE OF FORWARD BLOCKING VOLTAGE THAT WILL NOT TURN ON SCR	dv/dt	200*	—	—	volts/ μsec	$T_C = +120°C$. Gate open circuited. V_{FO} = Rated