SILICON POWER

SDM170HK2
500A, 4500V
53mm MTO™ Thyristor

Features

500A, 4500V
Voltage Control Turn-Off Capability
Low Power Gate Driver
Symmetrical Blocking Capability

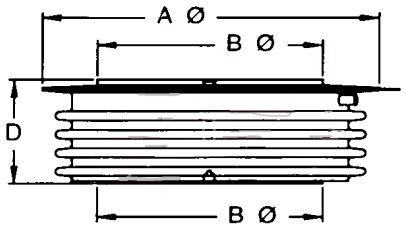
Description

MTO™ Thyristor is a new hybrid high power bipolar MOS turn-off thyristor. It is designed for switching current on by positive pulsed control current on G1and off by pulsed control voltage on MOS gate, G2. It is designed for use in motor controls, inverters, line switches and other power switching applications. The MTO™ thyristor is suited for applications in hard switched and resonant circuits.

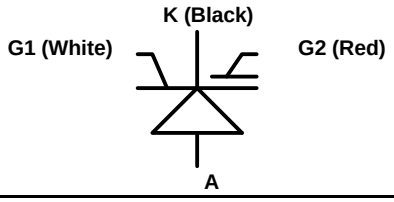
MTO thyristor is supplied in an industry standard disc-type package, ready to mount to forced or naturally cooled heat dissipators using commercially available mechanical clamping hardware.

Package

A = 75.2mm, B = 48.3mm, D = 27.2mm



Symbol



PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	WEIGHT
SDM170HK2	DISC	1.15 lbs

Absolute Maximum Ratings

At T_J = 115°C, Unless Otherwise Specified

	SYMBOL		UNITS
Peak Off State Voltage	V_{DRM}	4500	V
Peak Reverse Voltage	V_{RRM}	4500	V
Continuous Cathode Current (T_C=65°C)	I_{K65}	250	A
Peak Controllable Cathode Current	I_{KC}	500	A
Non-Repetitive Peak Cathode Current (Note 1)	I_{KSM}	4200	A
Gate to Cathode Voltage @ G2 (Peak - Turning Off)	V_{G2M}	+20	V
Gate to Cathode Voltage @ G2 (Continuous - Turning Off)	V_{G2}	+15	V
Gate Trigger Current @ G1 (Pulse - Turning On) (Note 2)	I_{G1T}	50 - 100	A
Minimum Gate Current @ G1 (Sustain On)	I_{G1}	15	A
Minimum Cathode Current (Holding Current)	I_H	40	A
Rate of Change of Voltage (V_D=70% V_{DRM})	dv/dt	1000	V/µs
Rate of Change of Current (V_D=50% V_{DRM})	di/dt	300	A/µs
Maximum Power Dissipation (T_C = 65°C)	P_T	1780	W
Operating and Storage Temperature	T_J, T_{STG}	0 to +115	°C
Minimum Off Time (Time b/w turning off to turn on again)	t_{OFF}	100	µs
Mounting Force	F	4500-5000	lbs

NOTE:
1. Maximum Pulse Width of 8.3ms
2. Minimum Pulse Width of 10µs and Maximum of 30µs
3. Recommended Gate Current Trigger Slew Rate (I_{G1T}) from 0 to 50A is less than 500ns. (See Figures # 13 & 14)

Electrical Specifications

At T_J = 115°C, Unless Otherwise Specified

PARAMETERS	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Peak Off State Blocking	I_{DRM}	V_{AK} = +/-4500V	T_J = +115°C			75	mA
Forward & Reverse Current	I_{RRM}	V_{G2} = +15V	R_{GK} = 4.7Ω			75	mA
On State Voltage	V_{TM}	I_K = 500A	T_J = +25°C		5.1		V
		I_{G1} = 15A	T_J = +115°C		5.2	6	V
Input Capacitance	C_{ISS}	Off FET				125	nF
Current Turn-On Delay Time	$t_{D(ON)I}$	I_K = 350A	T_J = 115°C		1.4		µs
Current Rise Time	t_{RI}	V_{AK} = 2000V			3		µs
Turn On Energy	E_{ON}	dI_{G1T}/dt = 100A/µs			0.6		J
Current Turn-Off Delay Time	$t_{D(OFF)I}$	I_K = 350A	T_J = 115°C		1.2		µs
Current Fall Time	t_{FI}	V_{AK} = 2000V				1.5	µs
Turn Off Energy	E_{OFF}	V_{G2} = +15V			1.4		J
Thermal Resistance	$R_{\theta JC}$	Double Side Cooling			0.028		°C/W

Typical Performance Curves

FIGURE 1. CATHODE CURRENT vs ON STATE VOLTAGE (TYPICAL)

FIGURE 2. THERMAL RESISTANCE vs POWER ON TIME (TYPICAL)

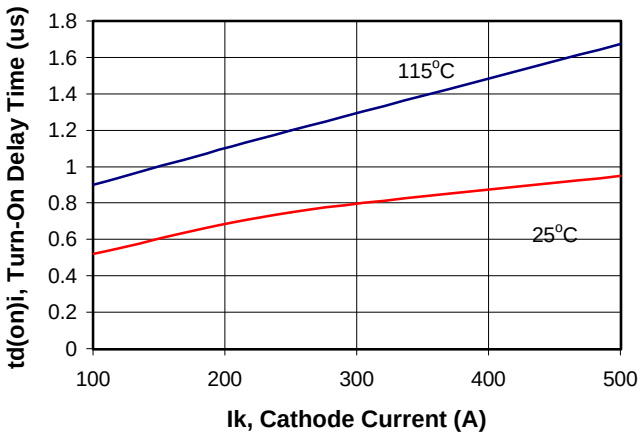


FIGURE 3. TURN-ON DELAY TIME vs. CATHODE CURRENT @ V_{AK}= 2000V (TYPICAL)

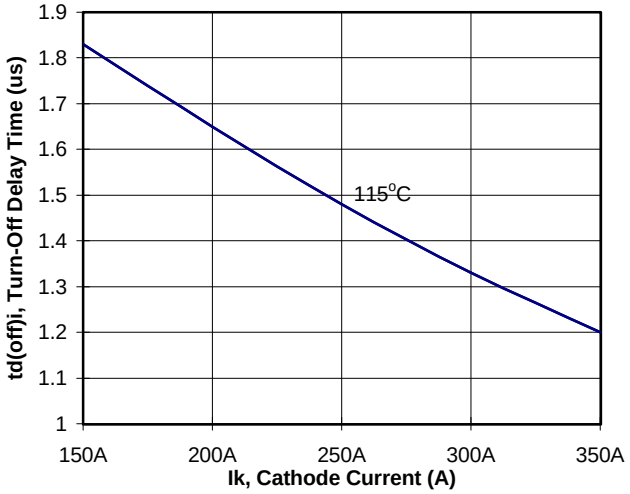


FIGURE 4. TURN-OFF DELAY TIME vs. CATHODE CURRENT @ V_{AK} = 2000V SNUBBERLESS (TYPICAL)

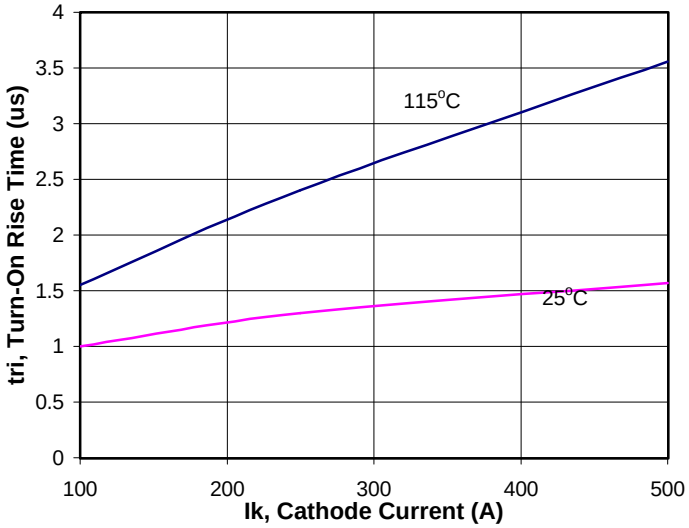


FIGURE 5. TURN-ON RISE TIME vs. CATHODE CURRENT @ V_{AK} = 2000V (TYPICAL)

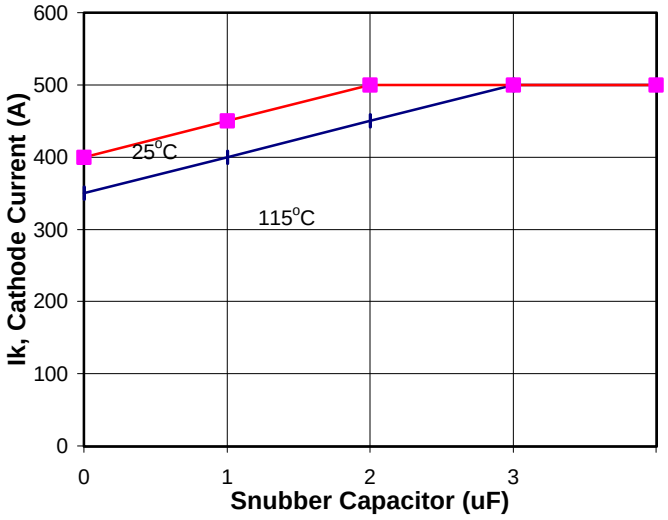


FIGURE 6. SAFE OPERATING AREA vs. SNUBBER CAPACITOR @ V_{AK} = 2000V

Typical Performance Curves

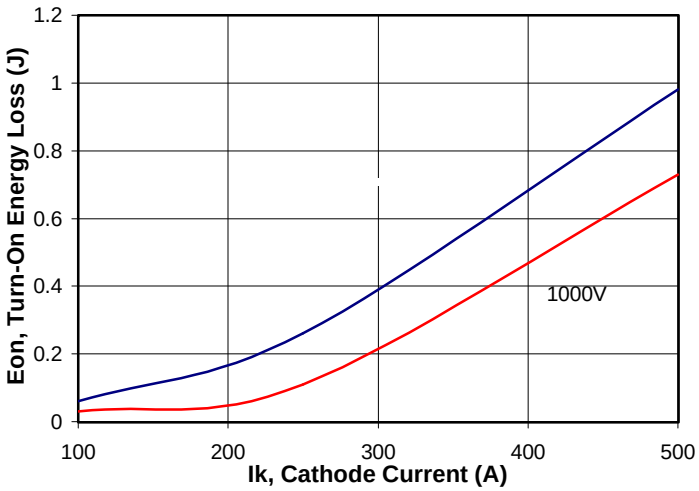


FIGURE 7. TURN-ON ENERGY vs. CATHODE CURRENT
@ T_J = 115°C (TYPICAL)

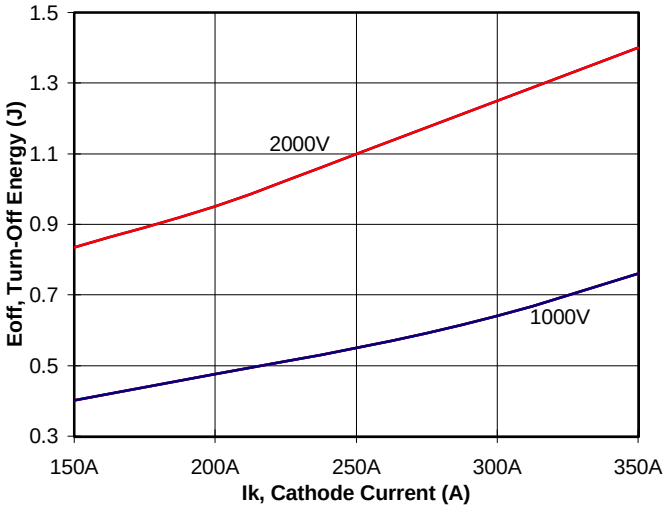


FIGURE 8. TURN-OFF ENERGY vs. CATHODE CURRENT
@ T_J = 115°C, SNUBBERLESS (TYPICAL)

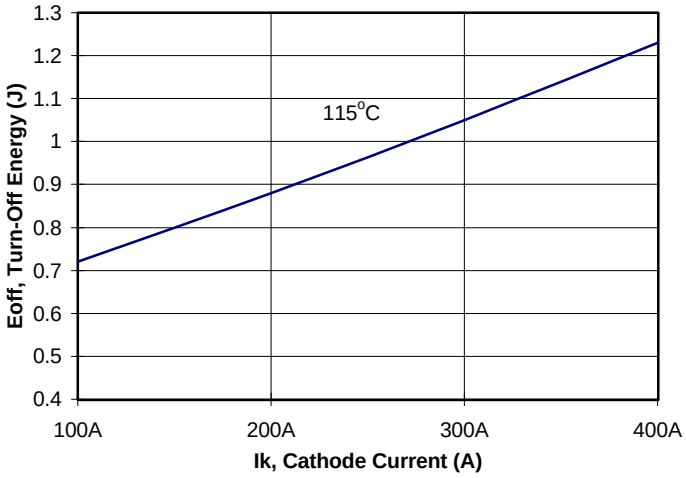


FIGURE 9. TURN-OFF ENERGY vs. CATHODE CURRENT
@ 2000V, SNUBBER Cs = 1µF (TYPICAL)

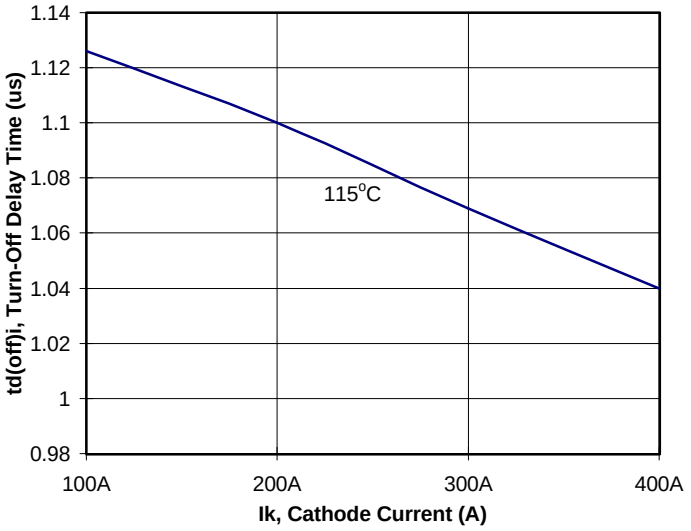


FIGURE 10. TURN-OFF DELAY TIME vs. CATHODE CURRENT
@ 2000V, SNUBBER Cs = 1µF (TYPICAL)

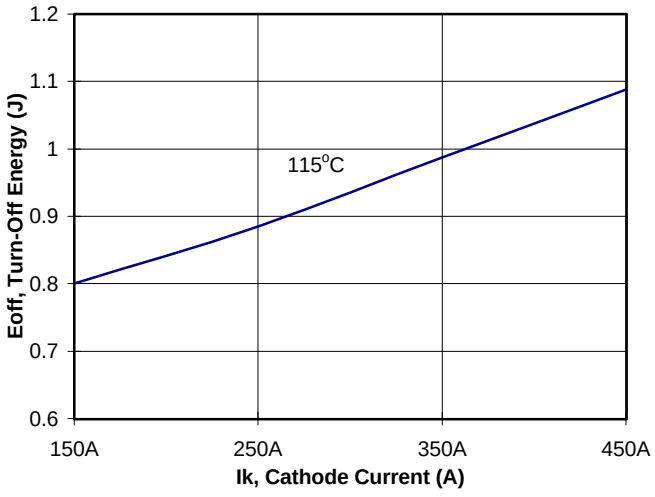


FIGURE 11. TURN-OFF ENERGY vs. CATHODE CURRENT
@ 2000V, SNUBBER Cs = 2µF (TYPICAL)

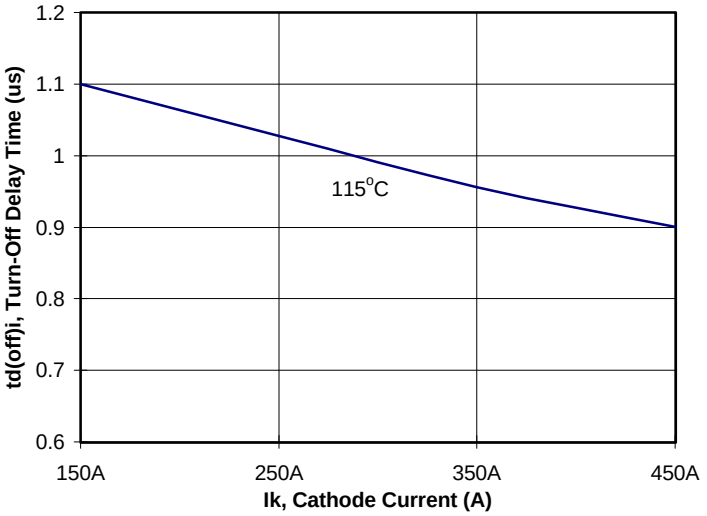


FIGURE 12. TURN-OFF DELAY TIME vs. CATHODE CURRENT
@ 2000V, SNUBBER Cs = 2µF (TYPICAL)

Typical Performance Curves

FIGURE 13. TYPICAL LOAD LINES FOR GATE DRIVER DESIGN TO ACHIEVE 50A @ 100A/us FOR G1.

FIGURE 14. TYPICAL GATE DRIVER LOAD LINE SUPPLYING BACK PORCH CURRENT TO G1.

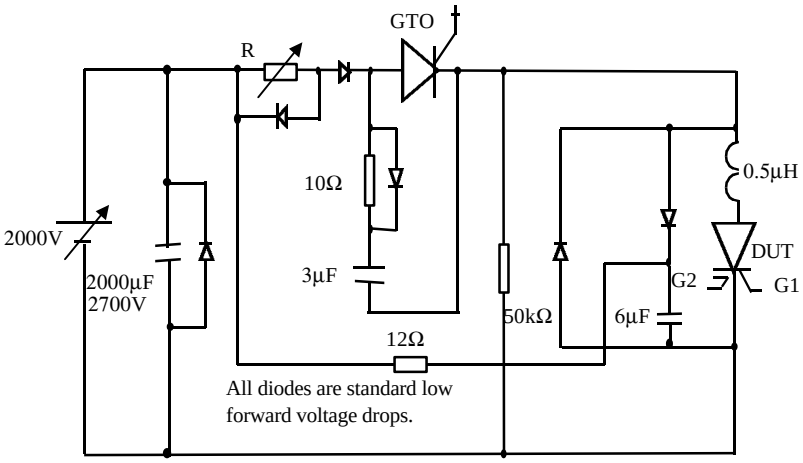


FIGURE 15. TURN-OFF TEST CIRCUIT

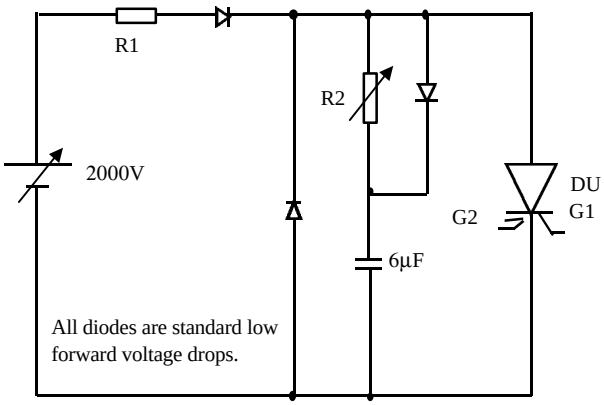


FIGURE 16. TURN-ON TEST CIRCUIT

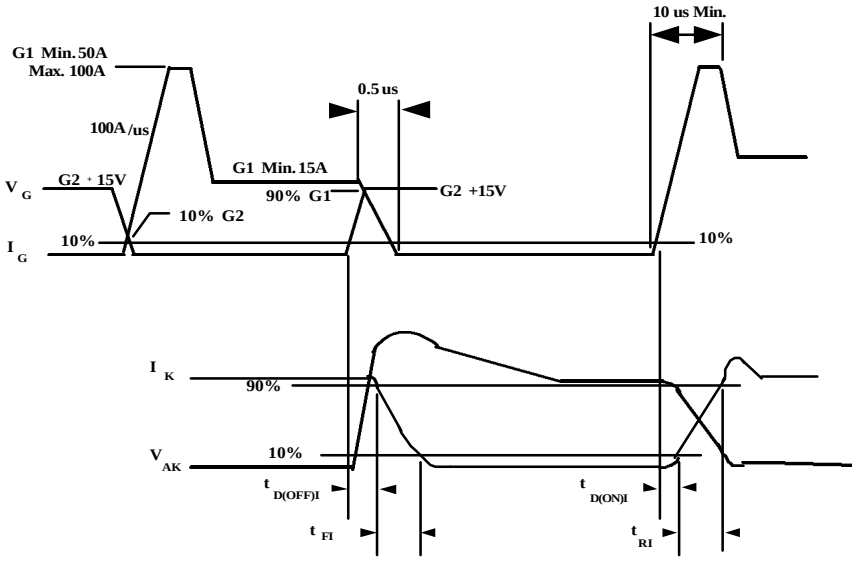


FIGURE 17. SWITCHING TEST WAVEFORMS

(NOTE: NOT ACTUAL TEST WAVEFORMS AND NOT TO SCALE, FOR TIME EXPLANATION ONLY)