

	Specification	Symbol	Condition / Comment		HTS 440-2400 SCR	Unit
ABSOLUTE MAXIMUM RATINGS	Maximum Operating Voltage	$V_{O(max)}$	$I_{off} < 400 \mu ADC$, $T_{case} = 70^{\circ}C$		44	kVDC
	Maximum Isolation Voltage	V_i	Between HV switch and control / GND, continuously		± 50	kVDC
	Max. Housing Insulation Voltage	V_{INS}	Between switch and housing surface, 3 minutes		± 70	kVDC
	Maximum Turn-On Peak Current	$I_{P(max)}$	$T_{case} = 25^{\circ}C$	$t_p < 200 \mu s$, duty cycle $< 1\%$ $t_p < 1 ms$, duty cycle $< 1\%$ $t_p < 10 ms$, duty cycle $< 1\%$ $t_p < 100 ms$, duty cycle $< 1\%$	24000 12000 8080 4900	ADC
	Max. Non-Repetitive Peak Current	$I_{P(nr)}$	$T_{case} = 25^{\circ}C$	Half sine single pulse, $t_p < 200 \mu s$ Half sine single pulse, $t_p < 20 \mu s$	24000 48000	ADC
	Max. Continuous Load Current	I_L	$T_{case} = 25^{\circ}C$		5.24	ADC
	Max. Rate-of-Rise of OFF-State Voltage	dv/dt	@ $V_{O(max)}$, exponential waveform		150	kV/ μs
	Max. Continuous Power Dissipation	$P_{d(max)}$	$T_{case} = 25^{\circ}C$	Standard devices & FC, forced air 4 m/s	100	Watt
	Linear Derating		Above $25^{\circ}C$	Standard devices & FC, forced air 4 m/s	3.3	W/K
	Operating Temperature Range	T_o	Standard devices & options CF, GCF, ILC. (Option DLC)		-40...75	$^{\circ}C$
	Storage Temperature Range	T_s	Switches with option ILC may require frost protection!		-50...90	$^{\circ}C$
	Max. Permissible Magnetic Field	B	Homogeneous steady-field, surrounding the whole switch		25	mT
	Max. Auxiliary Voltage	V_{aux}	Built-in overvoltage limiter (replaceable)		5	VDC
ELECTRICAL CHARACTERISTICS	Permissible Operating Voltage Range	V_o			0... ± 44	kVDC
	Typical Breakdown Voltage	V_{br}	NOTE: V_{br} is a test parameter for quality control purposes only. Not applicable in	$I_{off} > 0.5 mA$	> 48	kVDC
	Typical Off-State Current	I_{off}	$0.8 \times V_o$, $T_{case} = 25...70^{\circ}C$, reduced I_{off} on request		< 400	μADC
	Typical Holding Current		$T_{case} = 70^{\circ}C$		35	mADC
	Typical On-State Voltage	V_{sat}	Each switching path $t_p < 1 \mu s$, duty cycle $< 1\%$	$0.01 \times I_{P(max)}$ $0.1 \times I_{P(max)}$ $1.0 \times I_{P(max)}$	46 86 230	VDC
	Typical Propagation Delay Time	$t_{d(on)}$	Resistive load, $0.1 \times I_{P(max)}$, $0.8 \times V_{O(max)}$, 50-50%		0.4	μs
	Typical Output Pulse Jitter	t_j	Impedance matched input, $V_{aux} / V_{ctrl} = 5.00 VDC$		1	ns
	Typical Turn-On Rise Time	$t_{r(on)}$	Resistive load, 10-90%	$0.1 \times V_{O(max)}$, $I_L = 0.1 \times I_{P(max)}$ $0.8 \times V_{O(max)}$, $I_L = 0.1 \times I_{P(max)}$ $0.8 \times V_{O(max)}$, $I_L = 1.0 \times I_{P(max)}$	320 97 290	ns
	Typical Turn-Off Time	t_{off}, t_q	Resistive load, 10-90%	$0.1 \times V_{O(max)}$, $I_L = 0.1 \times I_{P(max)}$ $0.8 \times V_{O(max)}$, $I_L = 1.0 \times I_{P(max)}$	35 90	μs
	On Time	t_{on}			35... ∞	ns
	Internal Driver Recovery Time	t_{rc}			1000	μs
	Max. Continuous Switching Frequency	$f_{(max)}$	@ $V_{aux} = 5.00 V$ Sw. shutdown if $f_{(max)}$ is exceeded	Standard devices without HFS option Standard devices with HFS supply Opt. HFS + sufficient cooling option	130 TBD TBD	Hz
	Maximum Burst Frequency	$f_{b(max)}$	Use option HFB for > 10 pulses within 20 μs or less		1	kHz
	Maximum Number of Pulses / Burst	$N_{(max)}$	@ $f_{b(max)}$ Note: Option HFB requires external buffer capacitors with a voltage rating of $> 630VDC$ and a capacitance of 100nF per additional pulse	Standard Option I-HFB Option HFB	10 Use option HFB for > 10 > 100 > 1000	Pulses
	Coupling Capacitance	C_C	HV side against control side		> 300	pF
	Control Voltage Range	V_{ctrl}	The V_{ctrl} has no impact on the output pulse shape.		4... 5	VDC
	Auxiliary Supply Voltage Range	V_{aux}	The +5 V supply is not required in the HFS mode.		5	VDC
	Typical Auxiliary Supply Current	I_{aux}	$V_{aux} = 5.00 VDC$, $T_{case} = 25^{\circ}C$. Active current limitation above 1A.	$0.01 \times f_{(max)}$ @ $f_{(max)}$	400 600	mADC
	Fault Signal Output		Switch will be turn off, if $f > f_{(max)}$, $V_{aux} < 4.75V$ or $T_{case} > 75^{\circ}C$ Fault condition is indicated by a logical "L"		H=4V, L=0.5V	VDC
	Trigger Voltage Range	V_{TR}	Switching behaviour is not influenced by trigger quality		< 10	VDC
	HOUSING	Dimensions	LxWxH	Standard housing Devices with option CF, non-isolated cooling fins Devices with option DLC		Please contact the manufacturer!
Weight			Standard housing Devices with option CF, non-isolated cooling fins Devices with option DLC		Please contact the manufacturer!	g
FUNCTIONS	Control Signal Input	Pin 1 / Yellow. TTL compatible with Schmitt-Trigger characteristics. Control voltage 2-10 V (3-5 V recommended for low jitter).				
	Logic GND / 5V Return	Pin 2 / Black. The ground pin is internally connected with the safety earthing terminal (threaded insert) on bottom side.				
ORDERING TI	5V Auxiliary Supply	Pin 3 / Red. The 5 V input is used for rep rates up to the specified max. frequency $f_{(max)}$. Higher rep rates require option HFS.				
	Fault Signal Output	Pin 4 / Orange. TTL output, short circuit proof. Indicating switch & driver over-heat, over-frequency, low auxiliary voltage. L = Fault.				
	Inhibit Signal Input	Pin 5 / Green. TTL compatible, Schmitt-Trigger characteristics for the connection of external safety circuits. L = Switch Inhibited.				
	LED Indicators	GREEN: "Auxiliary power good, switch OFF". YELLOW: "Control signal received, switch ON". RED: "Fault condition, switch OFF"				
	Temperature Protection	A) Standard switches and switches with option CF, GCF: Thermo trigger $75^{\circ}C$, response time $< 60 s$ @ $3 \times P_{d(max)}$, $\Delta T = 25K$ (50 to $75^{\circ}C$). Separate driver protection. B) Switches with option DLC: $65^{\circ}C$, response time $< 3 s$ @ $3 \times P_{d(max)}$, $\Delta T = 25K$ (40 to $65^{\circ}C$), coolant flow $> 3 l / min$. Separate driver protection.				
	HTS 440-2400 SCR	Thyristor Switch, 44 kVDC, 24000 ADC	Option LP	Low Pass. Input filter for increased noise immunity.	Option CCS	Ceramic Cooling Surface. $P_{d(max)}$ can be increased by the factor 2 to 3.
			Option S-TT	Soft Transition Time. Slower switching speed for simplified EMC.	Option CCF	Ceramic Flange Housing. $P_{d(max)}$ can be increased by the factor 3 to 15.
			Option HFB	High Frequency Burst. Improved burst capability by driver.	Option CF	Copper Cooling Fins. $P_{d(max)}$ can be increased by the factor 3 to 10.
		Option HFS	High Frequency Switching (two auxiliary supply inputs V1 & V2)	Option GCF	Grounded Cooling Flange (copper). $P_{d(max)}$ can be increased by the factor 3 to 15.	
		Option UFTR	Ultra Fast Thermotrieger. Response time for shut down $< 5s$.	Option ILC	Indirect Liquid Cooling (for water). $P_{d(max)}$ can be increased by the factor 3 to 15.	
		Option UFTS	Ultra Fast Thermosensor. Response time $< 5s$. NTC 10k / $\pm 1\%$	Option DLC	Direct Liquid Cooling (for FPE/PFC). $P_{d(max)}$ can be increased by the factor 10 to 100. 15.	
FOR FURTHER PRODUCT OPTIONS PLEASE REFER TO THE OPTIONS PAGE.						

Customized switching units are available on request. All data and specifications subject to change without notice. Please visit www.behlke.com for up-dates.

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