

	Specification	Symbol	Condition / Comment	HTS 31-13 AC-B-C	Unit	
ABSOLUTE MAXIMUM RATINGS	Maximum Operating Voltage	$V_{O(max)}$	$I_{off} < 50 \mu ADC$, $T_{case} = 70^{\circ}C$	3.6	kVDC	
	Maximum Isolation Voltage	V_I	Between HV switch and control / GND, continuously	10	kVDC	
	Max. Housing Insulation Voltage	V_{INS}	Between switch and housing surface, 3 minutes	15	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 $< 1\%$	130 68 54 25	ADC	
	Maximum Continuous Load Current	$I_{L(max)}$	$T_{case} = 25^{\circ}C$ Standard devices Devices with option DLC	2.8 28	ADC	
	Max. Continuous Power Dissipation	$P_{d(max)}$	$T_{case} = 25^{\circ}C$ Standard devices & FC, forced air 4 m/s Devices with option DLC	9 1000	Watt	
	Linear Derating		Above $25^{\circ}C$ Standard devices & FC, forced air 4 m/s Devices with option DLC	0.11 4	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		$0... \pm 3.6$	kVDC	
	Typical Breakdown Voltage	V_{br}	NOTE: V_{br} is a test parameter for quality control purposes only. Not applicable in $I_{off} > 0.5 mA$	3.9	kVDC	
	Typical Off-State Current	I_{off}	$0.8 \times V_O$, $T_{case} = 25...70^{\circ}C$, reduced I_{off} on request	< 10	μADC	
	Typical Turn-On Resistance	R_{stat}	Each switching path $t_p < 1 \mu s$, duty cycle $< 1\%$ $0.1 \times I_{P(max)}$, $T_{case} = 25^{\circ}C$ $1.0 \times I_{P(max)}$, $T_{case} = 25^{\circ}C$ $1.0 \times I_{P(max)}$, $T_{case} = 70^{\circ}C$	1 2.1 6.3	Ohm	
	Typical Propagation Delay Time	$t_{d(on)}$	Resistive load, $0.1 \times I_{P(max)}$, $0.8 \times V_{O(max)}$, 50-50%	100	ns	
	Typical Output Pulse Jitter	t_j	Impedance matched input, $V_{aux} / V_{ctrl} = 5.00 VDC$	< 500	ns	
	Typical Turn-On Rise Time	$t_{r(on)}$	Resistive load, 10-90% $0.1 \times V_{O(max)}$, $I_L = 0.1 \times I_{P(max)}$ $0.8 \times V_{O(max)}$, $I_L = 0.1 \times I_{P(max)}$ $0.8 \times V_{O(max)}$, $I_L = 1.0 \times I_{P(max)}$	6 9 22	ns	
	Typical Turn-Off Rise Time	t_{off}, t_q	Resistive load, 10-90% $0.1 \times V_{O(max)}$, $I_L = 0.1 \times I_{P(max)}$ $0.8 \times V_{O(max)}$, $I_L = 1.0 \times I_{P(max)}$	10 20	ns	
	Maximum Turn-On Time	$t_{on(max)}$	No limitation	∞		
	Minimum Turn-On Time	$t_{on(min)}$	$t_{on(min)}$ can be customized. Please consult factory	100	ns	
	Maximum Turn-Off Time	$t_{off(max)}$	No limitation	∞		
	Minimum Turn-Off Time	$t_{off(min)}$	$t_{off(min)}$ can be customized. Please consult factory	120	ns	
	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	18 50 100	kHz	
	Maximum Burst Frequency	$f_b(max)$	Use option HFB for > 10 pulses within 20 μs or less	500	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	10 Use option HFB for > 10 > 100 > 1000	Pulses	
	Coupling Capacitance	C_C	HV side against control side	12	pF	
	Natural Capacitance	C_N	Between switch poles, @ $0.5 \times V_{O(max)}$	< 5	pF	
	Control Voltage Range	V_{ctrl}	The V_{ctrl} has no impact on the output pulse shape.	2... 6	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. $0.01 \times f_{(max)}$ @ $f_{(max)}$	105 400	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	
	Opt. HFS, Ext. Supply Voltage V1	$V_{HFS(V1)}$	Stability $\pm 3\%$, current consumption $< 0.4 mA/kHz$ @ $25^{\circ}C$	15	VDC	
	Opt. HFS, Ext. Supply Voltage V2	$V_{HFS(V2)}$	Stability $\pm 3\%$, current consumption $< 0.9 mA/kHz$ @ $25^{\circ}C$	120	VDC	
	Intrinsic Diode Forward Voltage	V_F	$T_{case} = 25^{\circ}C$, $I_F = 0.3 \times I_{P(max)}$	< 10	VDC	
	Diode Reverse Recovery Time	t_{rrc}	$T_{case} = 25^{\circ}C$, $I_F = 0.3 \times I_{P(max)}$, $di/dt = 100 A/\mu s$	< 500	ns	
	HOUSING	Dimensions	$L \times W \times H$	Standard housing Devices with option CF, non-isolated cooling fins Devices with option DLC	Please contact the manufacturer!	mm ³
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.				
FUNCTIONS	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.				
FUNCTIONS	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"				
FUNCTIONS	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.				
ORDERING TI	HTS 31-13 AC-B-C	Transistor Switch, 3 kVDC, 130 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 Thermotrigger. 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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