

	Specification	Symbol	Condition / Comment	HTS	201-20-GSM	241-20-GSM	301-20-GSM	Unit
ABSOLUTE MAXIMUM RATINGS	Maximum Operating Voltage	$V_{O(max)}$	$I_{off} < 50 \mu ADC$, $T_{case} = 70^\circ C$		± 20000	± 24000	± 30000	VDC
	Maximum Isolation Voltage	V_I	Between HV switch and control / GND, continuously			± 40000		VDC
	Max. Housing Insulation Voltage	V_{INS}	Between switch and housing surface, 3 minutes			± 50000		VDC
	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 $< 1\%$			200 118 72 54		ADC
	Maximum Continuous Load Current	$I_{L(max)}$	$T_{case} = 25^\circ C$	Standard devices & FC, forced air 4 m/s Devices with option CF, forced air 4 m/s Devices with option DLC		1.7 2.7 28.1		ADC
	Max. Continuous Power Dissipation	$P_{d(max)}$	$T_{case} = 25^\circ C$	Standard devices & FC, forced air 4 m/s Devices with option CF, forced air 4 m/s Devices with option DLC	15 240 2500	17 260 3000	20 300 3800	Watt
	Linear Derating		Above $25^\circ C$	Standard devices & FC, forced air 4 m/s Devices with option CF, forced air 4 m/s Devices with option DLC	0.285 4.56 47.5	0.343 5.488 60.53	0.429 6.864 81.51	W/K
	Operating Temperature Range	T_o	Standard devices & options CF, GCF, ILC. (Option DLC)			-40...70 (60)		$^\circ C$
	Storage Temperature Range	T_s	Switches with option ILC may require frost protection!			-50...100		$^\circ C$
	Max. Permissible Magnetic Field	B	Homogeneous steady-field, surrounding the whole switch			25		mT
Max. Auxiliary Voltage	V_{aux}	Protection by built-in overvoltage limiter (replaceable)			5.5		VDC	
ELECTRICAL CHARACTERISTICS	Permissible Operating Voltage Range	V_o	Unipolar operation (one switch pole grounded or floated) Bipolar operation (positive & negative voltage applied)		$0... \pm 20000$ $0... \pm 10000$	$0... \pm 24000$ $0... \pm 12000$	$0... \pm 30000$ $0... \pm 15000$	VDC
	Typical Breakdown Voltage	V_{br}	NOTE: V_{br} is a test parameter for quality control purposes only. Not applicable in normal operation! $I_{off} > 0.5 mA$		22000	26000	32000	VDC
	Typical Off-State Current	I_{off}	$0.8xV_o$, $T_{case} = 25...70^\circ C$, reduced I_{off} on request			< 20		μADC
	Typical Turn-On Resistance	R_{stat}	Each switching path $t_p < 1 \mu s$, duty cycle $< 1\%$	$0.1 x I_{P(max)}$, $T_{case} = 25^\circ C$ $1.0 x I_{P(max)}$, $T_{case} = 25^\circ C$	3.8 8.5	4.5 10.2	6.3 14.3	Ohm
	Typical Capacitive Power Dissipation of Switch (Natural Power Dissipation)	P_{dc}	Switch capacitance only - without external load and parasitic capacitances	$0.8 x V_{O(max)}$, $f = 10 Hz$ $0.8 x V_{O(max)}$, $f = 100 Hz$ $0.8 x V_{O(max)}$, $f = 1000 Hz$ $0.8 x V_{O(max)}$, $f = 10000 Hz$	0.243 2.43 24.3 243	0.313 3.13 31.1 313	0.432 4.32 43.2 432	Watts
	Typical Propagation Delay Time	$t_{d(on)}$	Resistive load, $0.1 x I_{P(max)}$, $0.8 x V_{O(max)}$, 50-50%			200		ns
	Typical Output Pulse Jitter	t_j	Impedance matched input, $V_{aux} / V_{ctrl} = 5.00 VDC$			3		ns
	Typical Output Transition Time (Rise Time & Fall Time)	t_r, t_f	Resistive load, 10-90%	$0.1 x V_{O(max)}$, $I_L = 0.1 x I_{P(max)}$ $0.8 x V_{O(max)}$, $I_L = 0.1 x I_{P(max)}$ $0.8 x V_{O(max)}$, $I_L = 1.0 x I_{P(max)}$	10 26 30	11 27 32	11 30 33	ns
	Maximum Turn-On Time	$t_{on(max)}$	No limitation			∞		ns
	Minimum Turn-On Time	$t_{on(min)}$	can be customized. Please consult factory			200		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		1.7 100 200		kHz
	Maximum Burst Frequency	$f_{b(max)}$	Use option HFB for > 10 pulses within 20 μs or less			2		MHz
	Maximum Number of Pulses / Burst	$N_{(max)}$	$f_b = 1MHz$ (1 μs spacing). Switch shutdown if $N_{(max)}$ is exceeded.			200 Use burst option HFB for > 200 pulses		Pulses
	Coupling Capacitance	C_c	Switch against control side	Standard devices & options CF, DLC Devices with options GCF, ILC	14 105	17 130	21 160	pF
	Natural Capacitance	C_N	Between switch poles, @ $0.5 x V_{O(max)}$		65	55	45	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.			4.5 ... 5.5		VDC
	Typical Auxiliary Supply Current	I_{aux}	$V_{aux} = 5.00 VDC$, $T_{case} = 25^\circ C$. Active current limitation above 700 mA.	$0.01 x f_{(max)}$ @ specified $f_{(max)}$		250 500		mADC
	Opt. HFS, Ext. Supply Voltage V1	$V_{HFS(V1)}$	Stability $\pm 3\%$, current consumption $< 2 mA/kHz$ @ $25^\circ C$			15		VDC
	Opt. HFS, Ext. Supply Voltage V2	$V_{HFS(V2)}$	Stability $\pm 3\%$, current consumption $< 12 mA/kHz$ @ $25^\circ C$		210	220	230	VDC
	Intrinsic Diode Forward Voltage	V_f	$T_{case} = 25^\circ C$, $I_f = 0.3 x I_{P(max)}$		17	20	25	VDC
	Diode Reverse Recovery Time	t_{rrc}	$T_{case} = 25^\circ C$, $I_f = 0.3 x I_{P(max)}$, $di/dt = 100 A/\mu s$			< 250		ns
	HOUSING	Dimensions	LxWxH	Standard housing, without pigtails Devices with option CF Devices with option ILC & DLC		225x150x58 225x150x58 275x200x68	250x150x58 250x150x58 300x200x68	275x150x58 275x150x58 325x200x68
Weight			Standard housing Devices with option CF Devices with option ILC & DLC			< 2650 < 3800 < 3200		g
FUNCTIONS	Control Signal Input	Pin 1 / Yellow (LS-C: Pin 1). TTL compatible (LS-C: With 100 Ω termination). Schmitt-Trigger characteristics. Control voltage 2-10 V (3-5 V for low jitter).						
	Logic GND / 5V Return	Pin 2 / Black (LS-C: Shielding). The ground pin is internally connected with the safety earthing terminals (threaded inserts) on bottom side.						
	5V Auxiliary Supply	Pin 3 / Red (LS-C: Pin 4). 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 (LS-C: Pin 3). TTL output, short circuit proof. Indicating switch & driver over-heat, over-frequency, low auxiliary voltage. L = Fault.						
	Inhibit Signal Input	Pin 5 / Green (LS-C: Pin 2). TTL compatible, Schmitt-Trigger characteristics for the connection of external safety circuits. L = Switch Inhibited.						
	LED Indicators	GREEN: "Switching path B ON". YELLOW: "Switching path A ON". RED: "Fault condition or inhibit input "L", switch OFF"						
	Temperature Protection	A) Standard switches and switches with opt. FC, CF, GCF: Thermo trigger $75^\circ C$, response time $< 60 s$ @ $3xP_d(max)$, $\Delta T = 25K$ (50 to $75^\circ C$). Separate driver protection. B) Switches with option DLC: $65^\circ C$, response time $< 3 s$ @ $3xP_d(max)$, $\Delta T = 25K$ (40 to $65^\circ C$), coolant flow $> 3l / min$. Separate driver protection.						
ORDER	HTS 201-20-GSM	Fast HV Transistor Switch, 20kV, 200 A	Option LP	Low Pass. Input filter for increased noise immunity.	Option Min-On	Individually increased "Minimum On-Time" to avoid unwanted triggering		
	HTS 241-20-GSM	Fast HV Transistor Switch, 24kV, 200 A	Option HFB	High Frequency Burst (improved capability by external capacitors)	Option Min-Off	Individually increased "Minimum Off-Time" to avoid unwanted triggering		
	HTS 301-20-GSM	Fast HV Transistor Switch, 30kV, 200 A	Option HFS	High Frequency Switching (two auxiliary supply inputs V1 & V2)	Option S-TT	Soft Transition Time decrease the rise and fall time by 20%		
			Option I-HFB	Integrated High Frequency Burst	Option I-FWDN	Integrated Freewheeling Diode Network		
			Option CF	Copper Cooling Fins. $P_{d(max)}$ can be increased by the factor 3 to 10.	Option SEP-C	External control unit		
			Option ILC	Indirect Liquid Cooling (for water). $P_{d(max)}$ can be increased by the factor 3 to 10.	Option TH	Tubular Housing		
Option DLC	Direct Liquid Cooling (for FPE/PFC). $P_{d(max)}$ can be increased by the factor 10	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. 201-20-GSM-RS / REV 11-10-2013 ©2013 All rights reserved