

	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 pigtailed Devices with option CF Devices with option ILC & DLC		225x150x58 225x150x58 275x200x68	250x150x58 250x150x58 300x200x68	275x150x58 275x150x58 325x200x68	mm ³
	Weight		Standard housing Devices with option CF Devices with option ILC & DLC		< 2650 < 3800 < 3200			g
FUNCTIONS	Control Signal Input Logic GND / 5V Return 5V Auxiliary Supply Fault Signal Output Inhibit Signal Input LED Indicators Temperature Protection	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). Pin 2 / Black (LS-C: Shielding). The ground pin is internally connected with the safety earthing terminals (threaded inserts) on bottom side. 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. Pin 4 / Orange (LS-C: Pin 3). TTL output, short circuit proof. Indicating switch & driver over-heat, over-frequency, low auxiliary voltage. L = Fault. Pin 5 / Green (LS-C: Pin 2). TTL compatible, Schmitt-Trigger characteristics for the connection of external safety circuits. L = Switch Inhibited. GREEN: "Switching path B ON". YELLOW: "Switching path A ON". RED: "Fault condition or inhibit input "L", switch OFF" 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.				