

	Specification	Symbol	Condition / Comment	401-15-GSM-SiC	Unit	
ABSOLUTE MAXIMUM RATINGS	Maximum Operating Voltage	$V_{O(max)}$	$I_{off} < 50 \mu ADC$, $T_{case} = 70^{\circ}C$	± 40	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 $< 1\%$	150 90 29 15	ADC	
	Maximum Continuous Load Current	$I_{L(max)}$	$T_{case} = 25^{\circ}C$ Standard devices Option CF, cooling fins Devices with option DLC	1.26 3 16	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	50 3200	Watt	
	Linear Derating		Above $25^{\circ}C$ Standard devices & FC, forced air 4 m/s Devices with option DLC	0.89 100	W/K	
	Operating Temperature Range	T_O	Standard devices & options ILC, DLC	-40...70 (60)	$^{\circ}C$	
	Storage Temperature Range	T_S	Switches with option ILC may require frost protection!	-40...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)	5.5	VDC		
ELECTRICAL CHARACTERISTICS	Permissible Operating Voltage Range	V_O	Unipolar operation (one switch pole grounded or floated) Bipolar operation (positive & negative voltage applied)	0... ± 40 0... ± 20	kVDC	
	Typical Breakdown Voltage	V_{br}	NOTE: V_{br} is a test parameter for quality control purposes only. Not applicable in normal operation! $I_{off} > 0.5 mA$	± 44	kVDC	
	Typical Off-State Current	I_{off}	$0.8 \times V_O$, $T_{case} = 25...70^{\circ}C$, reduced I_{off} on request	150	μADC	
	Typical Turn-On Resistance	R_{stat}	Each switching path $t_p < 1 \mu s$, duty cycle $< 1\%$ $0.1 \times I_{P(max)}$, $T_{case} = 25^{\circ}C$ $1.0 \times I_{P(max)}$, $T_{case} = 25^{\circ}C$ $1.0 \times I_{P(max)}$, $T_{case} = 70^{\circ}C$	1.6 3.6 6.2	Ohm	
	Typical Capacitive Power Dissipation of Switch (Natural Power Dissipation)	P_{dc}	Switch capacitances only- without external load and parasitic capacitances! $0.8 \times V_{O(max)}$, $f = 10Hz$ $0.8 \times V_{O(max)}$, $f = 100Hz$ $0.8 \times V_{O(max)}$, $f = 10000Hz$	0.002 0.038 0.32	Watt	
	Typical Propagation Delay Time	$t_{d(on)}$	Resistive load, $0.1 \times I_{P(max)}$, $0.8 \times V_{O(max)}$, 50-50%	TBD	ns	
	Typical Output Pulse Jitter	t_j	Impedance matched input, $V_{aux} / V_{ctrl} = 5.00 VDC$	2	ns	
	Typical Output Transition Time (Rise Time & Fall Time)	t_r, t_f	Resistive load, 10-90% $0.1 \times V_{O(max)}$, $I_L = 0.1 \times I_{P(max)}$ $0.8 \times V_{O(max)}$, $I_L = 0.1 \times I_{P(max)}$ $0.8 \times V_{O(max)}$, $I_L = 1.0 \times I_{P(max)}$	200 252 300	ns	
	Maximum Turn-On Time	$t_{on(max)}$	No limitation	∞	ns	
	Minimum Turn-On Time	$t_{on(min)}$	can be customized. Please consult factory	180	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	4.5 30 80	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	$N_{(max)}$	$f_b = 1MHz$ (1 μs spacing). Switch shutdown if $N_{(max)}$ is exceeded.	10	Pulses	
	Coupling Capacitance	C_C	Switch against control side Standard devices & options CF, DLC	< 150	pF	
	Natural Capacitance	C_N	Between switch poles, @ $0.5 \times V_{O(max)}$	< 20	pF	
	Control Voltage Range	V_{ctrl}	The V_{ctrl} has no impact on the output pulse shape.	3 ... 10	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 1A. $0.01 \times f_{(max)}$ @ specified $f_{(max)}$	180 400	mADC	
	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 $< 0.5 mA/kHz$ @ $25^{\circ}C$	150	VDC	
	Intrinsic Diode Forward Voltage	V_F	$T_{case} = 25^{\circ}C$, $I_F = 0.3 \times I_{P(max)}$	< 80	VDC	
	Diode Reverse Recovery Time	t_{rr}	$T_{case} = 25^{\circ}C$, $I_F = 0.3 \times I_{P(max)}$, $di/dt = 100 A/\mu s$	< 40	ns	
HOUSING	Dimensions	$L \times W \times H$	Standard housing, without pigtails Devices with option ILC & DLC	Please contact the manufacturer!	mm ³	
	Weight		Standard housing Devices with option ILC & DLC	Please contact the manufacturer!	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). 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: "Auxiliary power good, switch OFF". YELLOW: "Control signal received, switch ON". RED: "Fault condition, switch OFF" A) Standard switches and switches with opt. FC, 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 $> 3l / min$. Separate driver protection.				
	Logic GND / 5V Return					
	5V Auxiliary Supply					
	Fault Signal Output					
	Inhibit Signal Input					
	LED Indicators					
	Temperature Protection					
ORDERING	HTS 401-15-GSM-SiC	Fast HV Push-Pull Switch, 40kV, 150	Option LP	Low Pass. Input filter for increased noise immunity.	Option I-PC	Integrated part components according to customer specification.
			Option HFB	High Frequency Burst (improved capability by external capacitors)	Option UL-94	Flame retardant casting resin, UL94-V0
			Option HFS	High Frequency Switching (two auxiliary supply inputs V1 & V2)	Option I-FWD	Integrated Free-Wheeling Diode. In connection with inductive load only.
			Option I-HFS	Integrated High Frequency Burst	Option I-FWDN	Integrated Freewheeling Diode Network. In connection with inductive load.
			Option S-TT	Soft Transition Time decrease the rise and fall time by 20%	Option PT-C	Pigtail for control connection: Flexible leads (l=75mm) with lermo connector.
			Option Min-On	Individually increased "Min. On-Time" to avoid unwanted triggering	Option SEP-C	Separated control unit. Control unit with LED indicators in a separate
			Option Min-Off	Individually increased "Min. Off-Time" to avoid unwanted triggering	Option TH	Tubular Housing
			Option PCC	Pulser Configuration. Switch combined with custom specific parts.	Option CF	Copper Cooling Fins. $P_{d(max)}$ can be increased by the factor 3 to 10.
			Option ISO-80	80kV Isolation. Isolation Voltage increased to 80kV.	Option GCF	Grounded Cooling Flange. $P_{d(max)}$ can be increased by the factor 3 to 15.
			Option ISO-120	120kV Isolation. Isolation Voltage increased to 120kV.	Option ILC	Indirect Liquid Cooling (for water). $P_{d(max)}$ can be increased by the factor 3 to 15.
			Option ISO-160	160kV Isolation. Isolation Voltage increased to 160kV.	Option DLC	Direct Liquid Cooling. $P_{d(max)}$ can be increased by the factor 10 to 100.
			Option ISO-200	200kV Isolation. Isolation Voltage increased to 200kV.	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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