FAST HIGH VOLTAGE TRANSISTOR SWITCHES

These MOSFET switches are designed for general high voltage switching applications such as deflection and acceleration grid drivers and electrical test equipment. The switching modules incorporate all features of the well known HTS switch family: Easy handling, high reliability, low jitter and reproducible switching behaviour. The HTS-LC2 series represents the second generation of Behlke low capacitance switches. The HV transient immunity of the HTS-LC2 series has been improved significantly and is now comparable with that of the standard HTS series.

The switch is turned-on by a positive going control signal of 3 to 6 Volts at the control input (pin1). The shielded control cable is terminated by an internal 100 Ohm resistor. The on-time may simply be controlled by the input control pulse width and can range from 200 ns to infinity. The control electronics of the switching module requires an auxiliary supply of +4.75 to +9.0 VDC (pin 3). To ensure a safe off-state of the switch, the auxiliary supply should be permanently present, especially in the case of possible voltage fluctuations or fast transients at the high voltage input.

An interference-proof driver and control circuit provides signal conditioning, auxiliary voltage monitoring, frequency limitation and temperature protection. Any false operating condition (under voltage, over frequency or over temperature) will result in immediate switch deactivation and a TTL compatible fault signal ("L") will be generated at pin 4 of the control plug. All operating conditions (pulse, on, off, fault) are indicated by LED's.

The high frequency burst operation (>10 pulses/100µs) requires the option "HFB" (High Frequency Burst) respectively "I-HFB" (Integrated High Frequency Burst), depending on the number of pulses to be generated. In case of option HFB, external buffer capacitors must be connected to the internal driver circuitry. A continuous high frequency operation above the specified maximum switching frequency requires the option "HFS" (High Frequency Switching). With the help of this option, two external supply voltages can be connected to increase the power capability of the internal switch driver for higher switching frequencies. Those external voltages are +15 V and +380-480 V, depending on switch model. The +5 V auxiliary supply is not required then.

Due to high galvanic isolation, the switches may also simply be operated in floating circuits or in high-side switching applications without any additional isolation transformer or optical coupler. Several housing and cooling options are available to meet individual design requirements. Please refer to product survey "C3 Variable On-Time, Low Coupling Capacitance, MOSFET" or consult BEHLKE for more details.

HTS 501-10-LC2 50 kV / 100 A

HTS 701-10-LC2 70 kV / 100 A

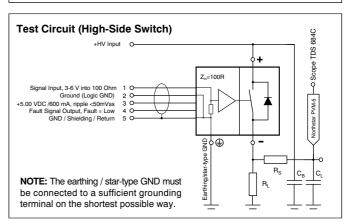
90 kV / 100 A

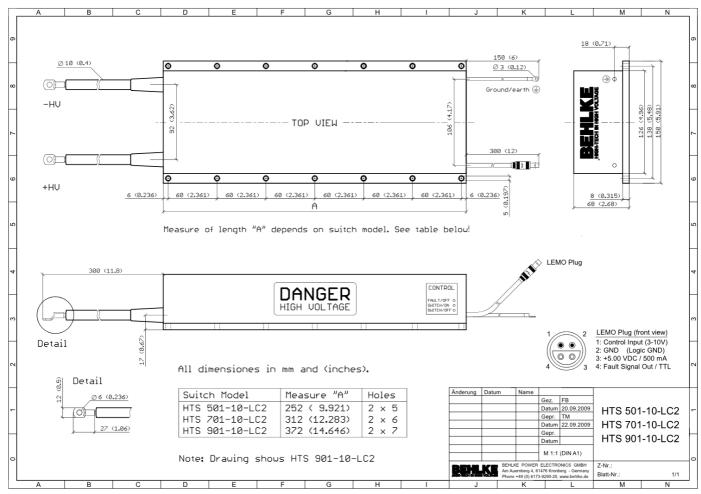
HTS 901-10-LC2 (standard model)

MOSFET
TECHNOLOGY

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Specification	Symbol	Condition / Comment			HTS 501-10-LC2	HTS 701-10-LC2	HTS 901-10-LC2	Ur
Maximum Operating Voltage	V _{O(max)}	l _{off} < 50 μADC, T _{case} = 70°C			50	70	90	kV[
Maximum Isolation Voltage	Vı	Between HV switch and control input / GND			80	100	120	kVI
Max. Housing Insulation Voltage	VINS	Between switch and housing surface, 3 minutes				150		kV
Maximum Turn-On Peak Current Maximum Continuous Load Current Max. Continuous Power Dissipation	$I_{P(max)}$	T _{case} = 25°C			100			
			t _p < 1 ms, duty	cycle <1%		59		
			t _p < 10 ms, duty	cycle <1%		36		
			t _p <100 ms, duty	cycle <1%		27		Α
Maximum Continuous Load Current	IL	T _{case} = 25°C	Standard mode	el .	0.85	0.85	0.85	
		T _{fluid} = 25°C	Option DLC - 1	.0 / 1.4 / 1.8 1)	4.75	4.75	4.75	
			Option DLC - 3	.0 / 4.2 / 5.4 1)	8.25	8.25	8.25	Α
Max. Continuous Power Dissipation	$P_{d(max)} \\$	T _{case} = 25°C	Standard mode	el .	32	45	58	
		T _{fluid} = 25°C	Option DLC - 1	.0 / 1.4 / 1.8 1)	1000	1400	1800	
			Option DLC - 3	.0 / 4.2 / 5.4 1)	3000	4200	5400	W
Linear Derating		Above 25°C	Standard mode	el .	0.711	1	1.288	
			Option DLC - 1	.0 / 1.4 / 1.8 1)	22.22	31.11	40	
			Option DLC - 3	.0 / 4.2 / 5.4 1)	66.66	93.33	120	٧
Operating Temperature Range	To				-4070			
Storage Temperature Range	Ts				-4090			
Maximum Auxiliary Supply Voltage	$V_{\text{aux}(\text{max})}$				9		٧	
Permissible Operating Voltage Range	Vo				050	070	090	k١
Typical Breakdown Voltage	V _{br}	CAUTION: V _{br} is a test parameter of purposes and is not applicable in nor	only for quality control	off >500 μADC	53	74	95	k١
Typical Off-State Current	l _{off}	0.8xV _O , T _{case} =25°C, lov				20		μ
Typical Static On-Resistance	R _{stat}	t _p < 1 µs, duty cycle <1°), T _{case} = 25°C	18	25	32	Ė
	. 15101	φ . μο, ααι, ο, ο. ο	,	t), T _{case} = 25°C	21	30	38	
			,	t), T _{case} = 70°C	44	62	80	
Typical Turn-On Delay Time	t _{d(on)}	Resistive load, 0.1 x I _{P(max)} , 0.8 x V _{O(max)} , 50-50%			250			
Typical Turn-On Rise Time	t _{r(on)}	Resistive load, 10-90%		ax), 0.1 x I _{P(max)}	12	14	15	
	u (OII)	1.00.00.70		ax), 0.1 x I _{P(max)}	32	45	56	
			· ·	ax), 1.0 x I _{P(max)}	35	50	62	
Typical Turn-Off Rise Time	t _{off} , t _q	Resistive load, 10-90%		ax), 0.1 x I _{P(max)}		30		
	2011, 14	0.8 x V _{O(max)} , 1.0 x I _{P(max)}			80			
Maximum On-Time	ton(max)	V.O.A. V.QiilaA), 1.O.A. IP(IIIaX)			Infinitely			
Minimum On-Time	t _{on(min)}	t _{on(min)} can be customized. Please consult factory.			250			
Maximum Off-Time	t _{off(max)}	Confirming Court 20 Control of the Confirming Court Co			Infinitely			
Minimum Off-Time	toff(min)	toff(min) can be customized. Please consult factory.			250			
Typical Turn-On Jitter	t _{j(on)}	V _{aux} / V _{tr} = 5.00 VDC			3			
Max. Continuous Switching	f _(max)	V _{aux} = 5.00 VDC, T _{case} = 25°C, switch Standard		1.7	1.2	1	1	
Frequency	·(max)	will be turned off, if f _(max) is exceeded Option HFS		1	100	•	ļ ,	
Maximum Burst Frequency	f _{b(max)}	CAUTION: Applications with long lasting high frequency bursts may require special cooling measures to prevent overheating of the MOSFET junctions. Please consult factory.			2		, N	
Maximum Number of Pulses / Burst		cooling measures to prevent overheating of the MOSFET junctions. Please consult factory. @ f _{b(max)} , Note: Option HFB requires Standard			10		<u> </u>	
maximum varibor of raisos / Barot	''	external buffer capacitors	•	Option I-HFB		>100		
		C _{ext} ≈ 100nF per gen	,	Option HFB		>1000		Ρι
Coupling Capacitance	Cc	HV side against control side		33	46	60	<u> </u>	
Natural Capacitance	CN	Between switch poles			27	20	15	
Auxiliary Supply Voltage Range	Vaux	5.00 VDC recommended for best driver efficiency			Li	4.75 – 9.00	10	V
Intrinsic Diode Forward Voltage	Vaux	T _{case} = 25°C, I _F =10 A			40	4.75 – 9.00 57	74	V
		CAUTION: Intrinsic diodes must not be used in normal operation. Inductive load requires fast free-wheeling diodes (FDA) in parallel to the switch!			40		14	
Diode Reverse Recovery Time	trrc			250	<250	AFO	-	
Auxiliary Supply Current	l _{aux}	Vaux - 5.00 VDC, I case).1 x f _(max)	250	350 900	450 900	
Control Voltore Deser	W	>E VDC		@ f _(max)	800	800	800	m
Control Voltage Range	V _{tr}	>5 VDC recommended for best EMC		050 - 450 - 00	3 - 10	270 - 450 - 00	٧	
Dimensions	5. 10				252 x 150 x 68	312 x 150 x 68	372 x 150 x 68	r
Weight		Standard housing			3200	4000	4700	1

Option I-HFB
Option HFS
Option HFS
Option LP
Option MIN-ON
Option MIN-OFF

Option DLC - X.X

Option TH

Option EXC

High Frequency Burst: Improved burst capability of driver by means of external buffer capacitors. Recommended for burst operation with >100 pulses within a burst of <100 µs duration.

Integrated High Frequency Burst: Improved burst capability by integrated buffer capacitors. For moderate burst requirements (10-100 pulses within a burst of <100 µs duration).

High Frequency Switching: Connector for additional auxiliary voltages (+12 VDC and +350 VDC to +450 VDC, model depending). Necessary for operation above standard f_(max).

Low Pass: Low pass filter at the control input. Propagation delay time will be increased by ~200 ns. Improved noise immunity and less critical wiring in high speed applications.

Minimum On-Time: Individually increased "Minimum On-Time" to avoid unwanted triggering by input noise during this time. Please indicate the demanded tof(min) with order.

Minimum Off-Time: Individually increased "Minimum Off-Time" to avoid unwanted triggering by input noise during this time. Please indicate the demanded tof(min) with order.

Direct Liquid Cooling: Internal liquid channel in direct contact with the power semiconductors. Excellent cooling method for very high voltages. GALDEN® & non-conductive liquids only.

Tubular Housing: Self-supporting axial housing. Attachment & HV connection by M10 bolts at the tube ends. Dimension Ø90x350, Ø90x450 or Ø90x550 mm (depending on switch model).

External Control Unit: Control unit (dimension 79x38x25 mm³) separated from high-voltage switching unit. 1m connecting cable between switch and control (standard if option TH is ordered).