FAST HIGH VOLTAGE TRANSISTOR SWITCHES

TECHNOLOGY

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.

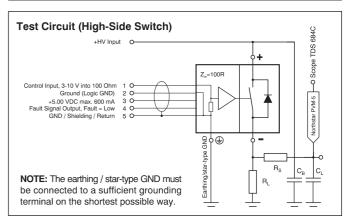
An interference-proof driver and control circuit provides signal conditioning, auxiliary voltage monitoring, frequency limitation and temperature protection. Any false operating condition (under voltage, over frequency or over temperature) will result in immediate switch deactivation and a TTL compatible 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 (>100 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.

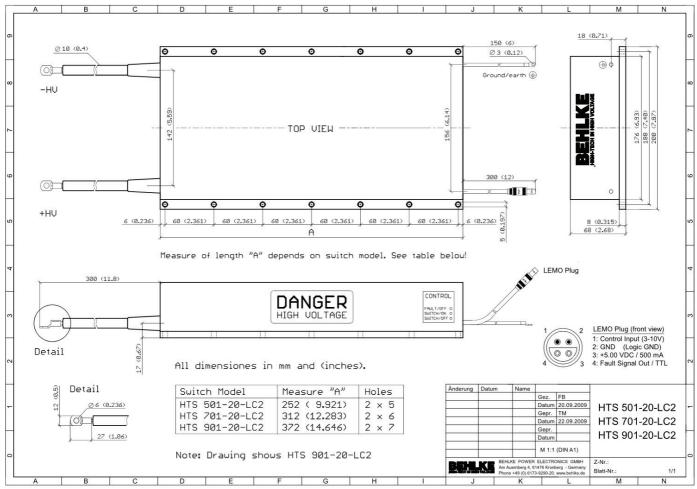
HTS 501-20-LC2 50 kV / 200 A
HTS 701-20-LC2 70 kV / 200 A
HTS 901-20-LC2 90 kV / 200 A

HTS 901-20-LC2 (standard model)



Made in Germany

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	Specification	Symb.	Condition / Comment		HTS 501-20-LC2	HTS 701-20-LC2	HTS 901-20-LC2	Unit	
	Maximum Operating Voltage	V _{O(max)}	l _{off} < 50 μADC, T _{case} = 70°C		50	70	90	kVDC	
	Maximum Isolation Voltage	VI	Between HV switch and control input / GND		80	100	120	kVDC	
	Max. Housing Insulation Voltage	VINS	Between switch and housing surface, 3 minutes				150		kVD0
55	Maximum Turn-On Peak Current	I _{P(max)}	T _{case} = 25°C	t _p < 200 μs, dut	y cycle <1%		200		
Ž				t _p < 1 ms, duty	cycle <1%		118		
ABSOLUTE MAXIMUM RATINGS				t _p < 10 ms, duty	cycle <1%		72		
				t _p <100 ms, duty	cycle <1%		54		ADC
	Maximum Continuous Load Current	IL.	T _{case} = 25°C	Standard mode	I	1.26	1.26	1.26	
			T _{fluid} = 25°C	Option DLC - 2	.0 / 2.8 / 3.6 1)	9.5	9.5	9.5	
				Option DLC - 6	.0 / 8.4 / 10 1)	16.5	16.5	16.5	AD(
	Max. Continuous Power Dissipation	$P_{d(max)} \\$	T _{case} = 25°C	Standard mode	l	35	49	63	
			T _{fluid} = 25°C	Option DLC - 2	.0 / 2.8 / 3.6 1)	2000	2800	3600	
				Option DLC - 6	.0 / 8.4 / 10 1)	6000	8400	10800	Watt
Ö	Linear Derating		Above 25°C	Standard mode	l	0.777	1.088	1.4	
183				Option DLC - 2	.0 / 2.8 / 3.6 1)	44.44	62.22	80	
V				Option DLC - 6	.0 / 8.4 / 10 1)	133.3	186.6	240	W/k
	Operating Temperature Range	To				-4070		°C	
	Storage Temperature Range	Ts				-4090		°C	
	Maximum Auxiliary Supply Voltage	V _{aux(max)}				9		VDC	
	Permissible Operating Voltage Range	Vo				050	070	090	kVD
	Typical Breakdown Voltage	V_{br}	CAUTION: $V_{\rm br}$ is a test parameter only for quality control purposes and is not applicable in normal operation!		53	74	95	kVD	
	Typical Off-State Current	l _{off}	purposes and is not applicable in normal operation! 0.8xVo, T _{case} = 25°C, lower leakage current on request			40		μAD	
	Typical Static On-Resistance	R _{stat}), T _{case} = 25°C	9	12.5	16	-
	Typiodi otatio on resistance			,), T _{case} = 25°C	10.5	15	19	
			1.0 x I _P (max), T _{case} = 70°C		22	31	40	Ohn	
	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		ns	
	Typical Turn-On Rise Time	tr(on)			ax), 0.1 x I _{P(max)}	12	14	15	110
	Typical Fall Cirtico Fillio	u(on)	1100001101010101	,	ax), 0.1 x I _{P(max)}	32	45	56	
				,	ax), 1.0 x I _{P(max)}	35	50	62	ns
	Typical Turn-Off Rise Time	t _{off} , t _q	Resistive load, 10-90%		ax), 0.1 x I _{P(max)}		30	*-	1
SS	7,	-011, -4	0.8 x V _{O(max)} , 1.0 x I _{P(max)}			80		ns	
Ţ	Maximum On-Time	ton(max)	o.o x vo(max), no x re(max)				Infinitely		
ERISTICS	Minimum On-Time	ton(max)	t _{on(min)} can be customized. Please consult factory.				300		ns
CTE	Maximum Off-Time	toff(max)	uni(min) can be customized. I lease consult factory.				Infinitely		
•	Minimum Off-Time	t _{off(min)}	t _{off(min)} can be customized. Please consult factory.				300		ns
42	Typical Turn-On Jitter	t _{j(on)}	Valux / Vtr = 5.00 VDC				3		ns
CHARA	Max. Continuous Switching	f _(max)	Vaux = 5.00 VDC, T _{case} = 25°C, switch will Standard		0.8	0.6	0.5	110	
_	Frequency	I(IIIax)	be turned off, if f _(max) is exceeded		Option HFS	0.0	100	0.0	kHz
7	Maximum Burst Frequency	f _{b(max)}	CAUTION: Applications with long lasting high frequency bursts may require special cooling measures to prevent MOSFET overheating. Please consult			2		MH	
ELECTRICAL	Maximum Number of Pulses / Burst	N	factory. @ fb(max) Standard			>100		-	
EC	Mayimam Maimper of Larges / Dalet	14	NOTE: Option HFB requires external buffer capacitors with a		Option I-HFB		>100		
EL	voltage rating of > 630 VDC and a capacitance additional pulse. The buffer capacitors are inte		citance of ≈ 100nF per	Option HFB		>1000		Pulse	
	Coupling Capacitance	Сс	HV side against control side		33	46	60	pF	
	Natural Capacitance	C _N	Between switch poles			54	40	30	<u> </u>
	· · · · · · · · · · · · · · · · · · ·		5.00 VDC recommended for best driver efficiency			U4		30	pF
	Auxiliary Supply Voltage Range	V _{aux}	T _{case} = 25°C, I _F =10 A			40	4.75 – 5.25	74	VD(
	Intrinsic Diode Forward Voltage	V _F	CAUTION: Intrinsic diodes must not be used in normal operation. Inductive load			40	57	14	VDO
	Diode Reverse Recovery Time	trrc	requires fast free-wheeling diodes (series FDA) in parallel to the switch!		050	<250	450	ns	
	Auxiliary Supply Current	l _{aux}	$V_{aux} = 5.00 \text{ VDC}, T_{case} = 25^{\circ}\text{C}$ 0.1 x f _(max)		250	350	450	m= A F	
	0 - 1 - 1 \(\sigma \)		@ f _(max)		800	800	800	mAD	
	Control Voltage Range	V _{tr}	4 - 6 VDC recommended for best EMC			050 000 00	3 - 10	270 . 222 . 22	VD
lons	Dimensions		Standard housing, without pigtails			252 x 200 x 68	312 x 200 x 68	372 x 200 x 68	mm
₹	Weight		Standard housing Recommended Ontions:			3700	5200	6700	g

Recommended Options:

Option HFB
Option I-HFB
Option HFS
Option LP
Option MIN-ON
Option MIN-OFF
Option DLC – X.X
Option TH
Option SEP-C

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 M12 bolts at the tube ends. Dimension Ø90x350, Ø90x450 or Ø90x550 mm (depending on switch model).

Separate 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).