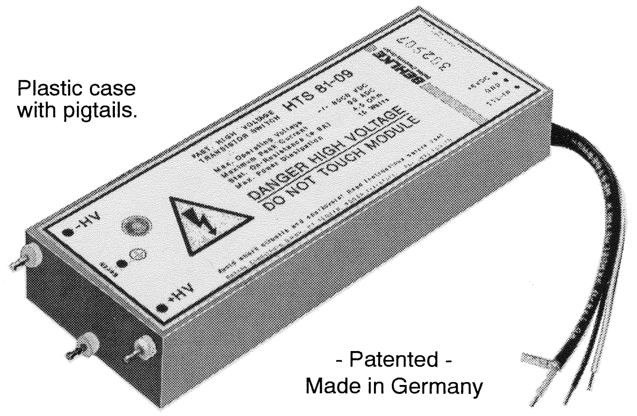
FAST HIGH VOLTAGE TRANSISTOR SWITCHES

These MOSFET switches are designed for general high power switching applications such as material and component testers, crowbar circuits, DC/DC converters, surge generators, flash lamp drivers, pulse transformer drivers, piezo crystal drivers etc. The devices described here are distinguished above all by a very good switching efficiency especially at higher frequencies. Since the transition times do not remain under 10 to 20 nanoseconds the switches are relatively insensitive against poor circuit layouts and may also be used in industrial environments, in which EMI and EMC are often critical design aspects. All switch models can drive resistive, capacitive and even inductive loads in conjunction with the optionally free-wheeling diode.

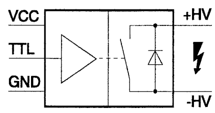
The switching modules incorporate all features of the well known HTS switch family: Easy handling, high reliability, low jitter and precise switching. In contrast to conventional high voltage switches like spark gaps, electron tubes, gas discharge tubes and mechanical switches, HTS transistor switches show very stable switching characteristics independent of temperature and age. The mean time between failures (MTBF) is by several orders of magnitude higher than that of the classical HV switches. The switching modules are controlled by an interference-proof driver circuit which provides signal conditioning, auxiliary voltage monitoring, frequency limitation and temperature protection. In case of false operating conditions the switches are immediately turned-off and a fault signal is generated (no signal output with "pigtail" devices). The switches are controlled by a positive going signal of 2 to 10 volts amplitude. The on-time may be varied between 200 ns and infinity. A short recovery time (min. pulse spacing) of 400 ns allows burst frequencies up to 2.5 MHz. In case long lasting high frequency bursts shall be generated (>10 pulses within <20 μs) the burst option 01 is required which allows an external connection of buffer capacitors to the driver circuit. Due to the galvanic isolation of more than 10 kV the switches may simply be operated also in high-side circuits.

Three housing options are available to meet individual electrical and constructive requirements. The plastic case is the cost-effective package in low frequency, pulsed power applications with a low power dissipation. The plastic housing has soldering terminals and "pigtails" for connection. It is also available as a printed circuit board version with soldering pins at bottom (option 06). To increase the Maximum Power Dissipation Pd(max) the plastic modules can additionally be fitted with non-isolated cooling fins (option 04), which improve the Pd(max) value by approximately the factor 5 to 10. A power dissipation in the kilowatt range requires the High Power Metal Case (option 05). Please refer to the corresponding data sheet and the general instructions for further details.

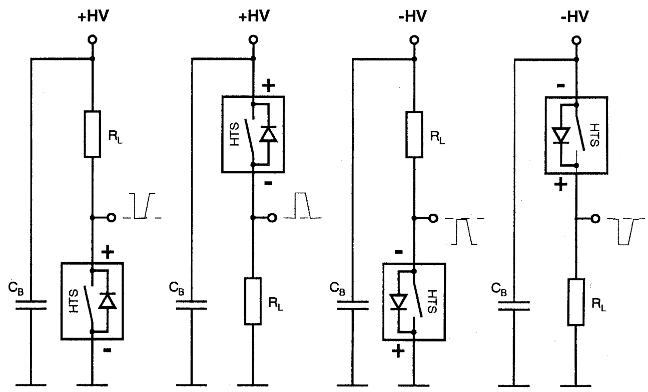
HTS 21-50 2000 VDC / 500 Amps
HTS 51-20 5000 VDC / 200 Amps
HTS 81-09 8000 VDC / 90 Amps



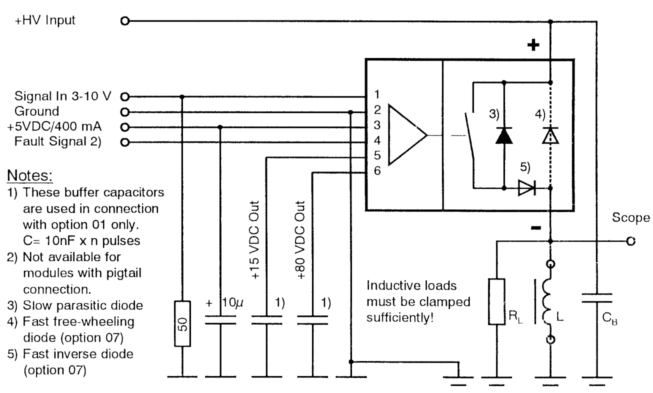
High Efficiency
High Frequency
Variable On-Time



Basic Circuits



Test Circuit



TECHNICAL DATA

Specification	Symbol	Condition / Comment		21-50	51-20	81-09	Unit
Maximum Operating Voltage	$V_{O(max)}$	I_{off} < 100 µADC		2000	5000	8000	VDC
Minimum Operating Voltage	$V_{O(min)}$	Increased $t_{r(on)}$ and $t_{r(off)}$ below 0.1x $V_{O(max)}$			0		VDC
Typical Breakdown Voltage	V_{br}	I_{off} > 1mADC, T_{case} = 70 °C		2200	5500	10000	VDC
Galvanic Isolation	V_I	HV side against control side			10000		VDC
Maximum Peak Current	$I_{P(max)}$	T_{case} = 25°C	t_p<10 µs, duty cycle <1%	500	200	90	
			t_p<100µs, duty cycle <1%	400	160	73	
			t_p<1 ms, duty cycle <1%	285	114	52	ADC
Maximum Continuous Load Current	I_L	T_{case} = 25°C	Plastic case	7	2.5	1.1	
		respectively	Ditto +cooling fins (opt. 04)	16	8	3.6	
		T_{fin} = 25°C	Metal case B2 (opt. 05)	43	21	9.4	ADC
Static On-Resistance	R_{stat}	T_{case} = 25°C	0.1 x $I_{P(max)}$	0.3	1.2	5	
			@ $I_{P(max)}$	0.6	2.5	12.5	Ω
Maximum Off-State Current	I_{off}	0.8 x V_O		50	50	30	µADC
Turn-On Delay Time	$t_{d(on)}$	@ $I_{P(max)}$		140	125	115	ns
Typical Turn-On Rise Time	$t_{r(on)}$	0.8 x V_O,	0.1 x $I_{P(max)}$	15	10	17	
		10-90 %	1.0 x $I_{P(max)}$	50	35	25	ns
Typical Turn-Off Rise Time	$t_{r(off)}$	0.8xV_O, 0.1x $I_{P(max)}$, resistive load, 10-90%			30		ns
Minimum On-Time	$t_{on(min)}$	Limited by driver circuit			200		ns
Maximum On-Time	$t_{on(max)}$	Please note possible $P_{d(max)}$ limitations			∞		
Switch Recovery Time	t_{rc}	t_{rc} = minimum pulse spacing			400		ns
Typical Turn-On Jitter	$t_{j(on)}$	V_{aux} / V_{tr} = 5.0 VDC			100		ps
Max. Switching Frequency	$f_{(max)}$	Please note possible $P_{d(max)}$ limitations			20		kHz
Maximum Burst Frequency	$f_{b(max)}$	Use option 01 for >10 pulses within<20µs			2.5		MHz
Maximum Continuous Power Dissipation	$P_{d(max)}$	T_{case} = 25°C	Plastic case		15		
		respectively	Ditto +cooling fins (opt. 04)		160		
		T_{fin} = 25°C	Metal case B2 (opt. 05)		1100		
			Ditto plus diode option 07		1400		Watts
Linear Derating		Above 25 °C	Plastic case		0.33		
			Ditto +cooling fins (opt. 04)		0.56		
			Metal case B2 (opt. 05)		0.055		
			Ditto plus diode option 07		0.043		W/K
Temperature Range	T_O	Plastic case, plastic case +cooling fins			-40...70		
		Metal case B2 (option 05)			-30...85		°C
Natural Capacitance	C_N	Capacitance between switch poles at $V_{O(max)}$		350	140	100	pF
Coupling Capacitance	C_C	HV side against control side			24		pF
Typical Diode Reverse Recovery Times	t_{rrc}	I_F=0.1x$I_{P(max)}$	MOSFET parasitic diode	300	500	500	
		1kA/µs,25°C	Free-wheeling diode (opt. 07)	25	23	50	ns
Typical Diode Forward Voltage Drop	V_F	I_F=0.1x$I_{P(max)}$	MOSFET parasitic diode	12	12	10	
		T_{case} = 25°C	Free-wheeling diode (opt.07)	8.5	14	9	
			Inverse diode (opt. 07)	1.1	0.9	0.8	VDC
Auxiliary Supply Voltage	V_{aux}	Stabilized to ± 5%			5.0		VDC
Auxiliary Supply Current	I_{aux}	@ f_{max}			400		mADC
Trigger Signal	V_{tr}	> 3VDC recommended			2-10		VDC
Fault Signal		H=Fault			H= 4 V, L= 0.5 V		VDC
Dimensions		Plastic case (+option 04, cooling fins)		178x64x27	(178x64x57)		
		Metal case B2, (+opt. water cooling plate)		264x100x53.5	(314x100x62)		mm^3
Weight		Plastic housing, (+option 04, cooling fins)		530	(780)		
		Metal case B2, (+opt. water cooling plate)		3800	(6100)		g

Ordering Informations

HTS 21-50	Transistor switch, 2000 VDC, 500 Amps.	**Option 03**	Increased thermal conductivity (plastic case only)
HTS 51-20	Transistor switch, 3000 VDC, 200 Amps.	**Option 04**	Cooling fins, non-isolated
HTS 81-09	Transistor switch, 8000 VDC, 90 Amps.	**Option 05**	Metal case B2, potential-free (c.f. separate data sheet)
Option 01	High frequency burst	**Option 06**	Soldering pins for printed circuit boards
Option 02	Flame retardend casting resin UL94-VO	**Option 07**	Fast free-wheeling diode network

All data and specifications subject to change without notice. Custom designed devices on request.