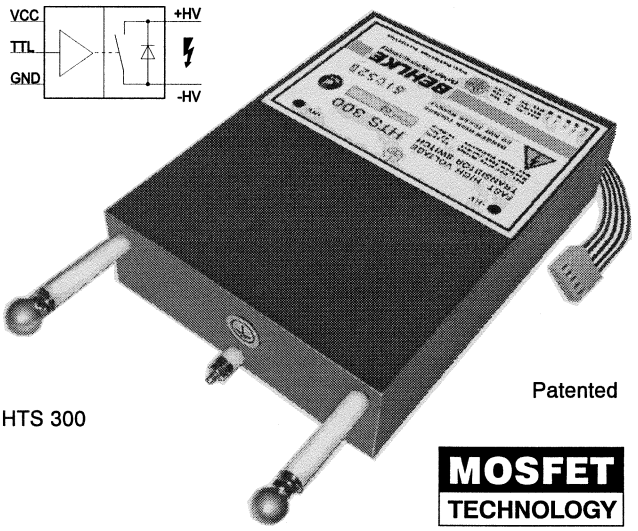
FAST HIGH VOLTAGE TRANSISTOR SWITCHES

These solid-state switches generate precise high-voltage pulses with amplitudes of up to 65 kV as needed for example in pulsed electrostatic deflection and acceleration systems. The models HTS 300 and HTS 650 will preferably be used to generate high voltage pulses with a very fast leading edge and a highly stable and ripple-free pulse top, but without special requirements regarding the trailing edge.

In contrast to conventional high-voltage switches like gas discharge tubes or electron tubes, HTS switches do not need heating power or complex drive circuitries. They show a very short recovery time, a low jitter and a lifetime typical for semiconductor devices. The power part of the switching modules is made up of a large number of MOSFET connected in parallel and in series which are absolutely synchronously controlled by a special driver. Due to the galvanic isolation the devices can be used as high-side switches for positive as well as for negative voltages. The modules are protected from thermal overload by means of an internal temperature sensor. Further protection is afforded against too high a signal frequency and unsufficient auxiliary supply. All fault conditions will be indicated at the fault signal output (pin 4) as a logical "Low" signal. At the same time the switch will be turned off until correct operating conditions are ensured.

The on-time of the standard models is fixed at 200 nanoseconds. On-time extensions of 1, 10 and 100 mircoseconds as well as customized on-time extensions are available as built-in options. In connection with these options the switches can also be retriggered within their burst capability which allows an on-time variation in certain limits. The turn-off rise time of switches with on-time extension option roughly corresponds to the preceding on-time. As a result of that considerable switching losses may arise, especially at low load resistances. Therefore the working resistors should not be chosen smaller than some 10 kOhm if on-time options are used. For detailed design recommendations please refer to the instructions.

HTS 300 30 kVDC / 30 A (pk)
HTS 650 65 kVDC / 30 A (pk)



HTS 300

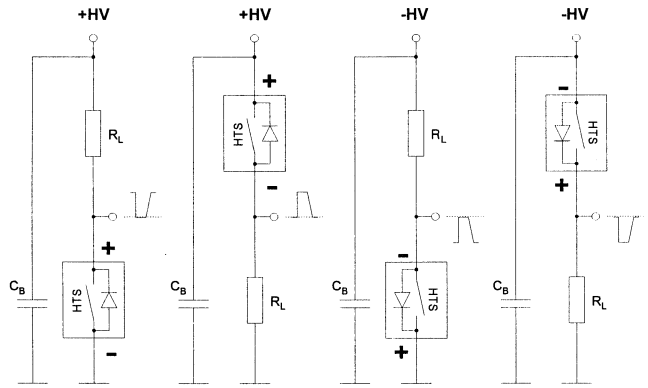
Patented

MOSFET TECHNOLOGY

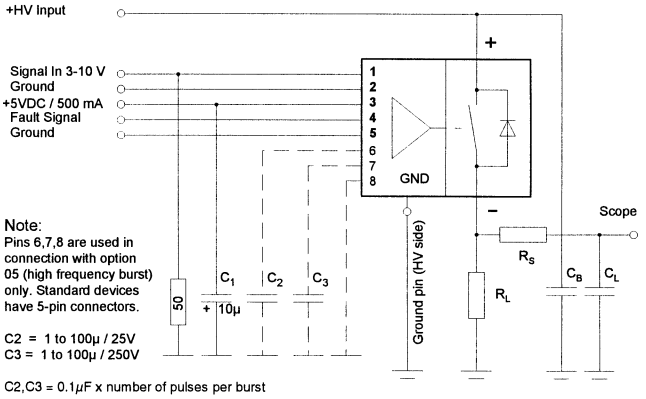
Fixed On-Time

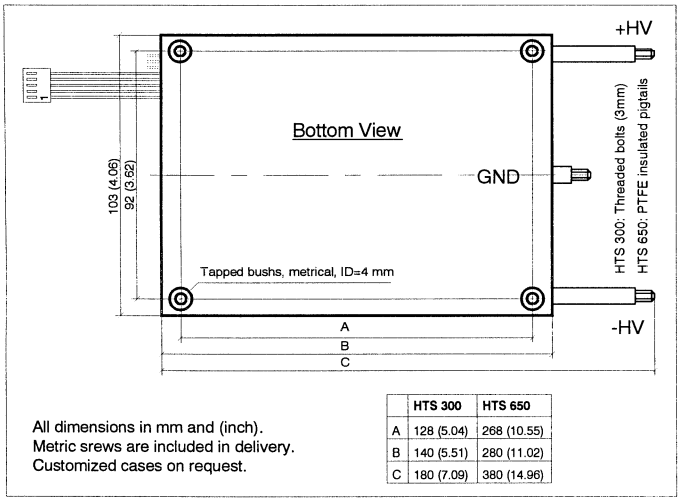
for extremely low noise & uncritical EMC

Basic Circuits



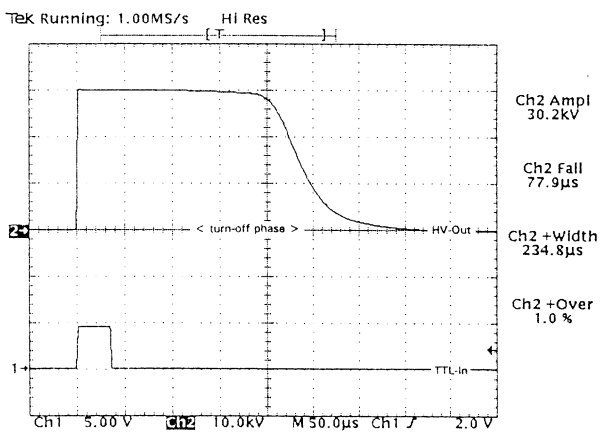
Test Circuit (High-Side Switch)





All dimensions in mm and (inch).
Metric srews are included in delivery.
Customized cases on request.

	HTS 300	HTS 650
A	128 (5.04)	268 (10.55)
B	140 (5.51)	280 (11.02)
C	180 (7.09)	380 (14.96)



HTS 300 with 100µs on-time extension. R_L = 1MΩ, C_L = 20pF, vert. 10kV/div.

HVP
High Voltage Products. High Voltage Experts.

BEHLKE

TECHNICAL DATA

Specification	Symbol	Condition / Comment		HTS 300	HTS 650	Unit
Maximum Operating Voltage	$V_{O(max)}$			± 30	± 65	kVDC
Minimum Operating Voltage	$V_{O(min)}$	$t_{r(on)}$ is increased significantly below 10%of $V_{O(max)}$		0		VDC
Switch Breakdown Voltage	V_{br}	I_{off} = 1 mADC, T_{case}=70°C		>33	>72	kVDC
Isolation Voltage	V_I	Switch against ground / control		>40	>85	kVDC
Maximum Peak Current	$I_{P(max)}$	t_p < 10μs, duty cycle < 1%		30		ADC
Static On-Resistance	R_{stat}	Single pulse/	I_L = 0.1 x $I_{P(max)}$	68	144	
		T_{case}=25°C	I_L = 1.0 x $I_{P(max)}$	170	360	Ω
Maximum Off-State Current	I_{off}	0.8 x V_0		<10		μADC
Turn-On Delay Time	$t_{d(on)}$	0.8 x V_0, C_L=20pF, R_S=51Ω		110	125	ns
Turn-On Rise Time	$t_{r(on)}$	R_L= 1MΩ	0.8 x V_0, C_L= 20pF	15	70	
		R_S= 51Ω	0.8 x V_0, C_L= 100pF	60	120	
			0.8 x V_0, C_L= 250pF	110	135	ns
Turn-Off Rise Time	$t_{r(off)}$	Standard devices without on-time extension		0.03		
		With option 01		~1		
		With option 02		~10		
		With option 03		~100		μs
On-Time (=Pulse Duration)	t_{on}	Standard devices without on-time extension, on-time tolerance ± 10%		150	200	ns
		With option 01, on-time tolerance -10,+30%		1		
		With option 02, on-time tolerance -10,+30%		10		
		With option 03, on-time tolerance -10,+30%		100		
		With option 04, customized on-time		Any value from 0.1 to 200		μs
Typical Turn-On Jitter	$t_{j(on)}$	V_{aux}=5.0 VDC, V_{tr}=5VDC		100		ps
Maximum Burst Frequency	$f_{b(max)}$	Burst option required for > 20 pulses / 20 μs		2		MHz
Maximum Continuous Frequency	$f_{c(max)}$	@ V_{aux}=5.00VDC, note $P_{d(max)}$ limitations		10	3	kHz
Max. Continuous Power Dissipation	$P_{d(max)}$)	T_{case}=25°C, standard plastic case		20	25	Watts
Linear Derating above 25°C				0. 44	0.55	W/°C
Temperature Range	T_O	Extended temperature range on request		-30 to +70		°C
Natural Switch Capacitance	C_N	Capacitance between switch poles at $V_{0(max)}$		18	25	pF
Coupling Capacitance	C_C	Capacitance between switch and ground		30	50	pF
Diode Reverse Recovery Time	t_{rrc}	@ I_F= 6A, di/dt=100A/μs		500		ns
Diode Forward Voltage	V_{SD}	@ I_F= 6A, single pulse 10μs		51	108	VDC
Auxiliary Supply Voltage	V_{aux}	Stabilized to ± 5%		5		VDC
Auxiliary Supply Current	I_{aux}	@ f_{Cmax}		400		mADC
Trigger Signal Voltage	V_{tr}			3-10		VDC
Fault Signal Output Voltage		„Low“ in case of overfrequency, overtemperature		„High“ ≥ 4.0		
		or bad auxiliary supply. @ 1mA output current.		„Low“ ≤ 0.8		VDC
Fault Signal Output Current		Source current (High), short circuit proof		5		
		Sink current (Low), short circuit proof		10		mADC
Dimensions		Case only, see drawing		140x102x35	280x102x35	mm^3
Weight				830	1570	g

Ordering Information

HTS 300	Transistor switch, 30 kV
HTS 650	Transistor switch, 65 kV
Option 01	On-time extension, ~1 μs, fixed
Option 02	On-time extension, ~10 μs, fixed
Option 03	On-time extension, ~100 μs, fixed
Option 04	Customized on-time, up to 200 μs
Option 05	High frequency burst
Option 06	UL-94-VO casting resin
Option 07	Increased thermal conductivity
Option 08	High power metal case (integrated oil cooling)

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

300-650-04/99