

|                            | Specification                       | Symbol   | Condition / Comment   |  | 701-15-SiC  | 901-15-SiC   | 1201-15-SiC       | 1601-15-SiC           | Unit   |
|----------------------------|-------------------------------------|--|---|--|---|--|-------------------|-----------------------|--------|
| ABSOLUTE MAXIMUM RATINGS   | Maximum Operating Voltage           | V <sub>O(max)</sub>  | I <sub>off</sub> < 80 μADC, T <sub>case</sub> = 70°C  |  | ± 70  | ± 90   | ± 120             | ± 160                 | kVDC   |
|                            | Maximum Isolation Voltage           | V <sub>I</sub>   | Between HV switch and control / GND, continuously   |  | ± 170   |  |                   |                       | kVDC   |
|                            | Max. Housing Insulation Voltage     | V <sub>INS</sub>   | Between switch and housing surface, 3 minutes   |  | ± 200   |  |                   |                       | kVDC   |
|                            | Maximum Turn-On Peak Current        | I <sub>p(max)</sub>  | T <sub>case</sub> = 25°C  | t <sub>p</sub> < 200 μs, duty cycle <1%<br>t <sub>p</sub> < 1 ms, duty cycle <1%<br>t <sub>p</sub> < 10 ms, duty cycle <1%<br>t <sub>p</sub> < 100 ms, duty cycle <1%  | 150<br>100<br>65<br>45  |  |                   |                       | ADC    |
|                            | Maximum Continuous Load Current     | I <sub>L(max)</sub>  | T <sub>case</sub> = 25°C  | Standard devices<br>Devices with option DLC  | 1.26<br>16.5  |  |                   |                       | ADC    |
|                            | Max. Continuous Power Dissipation   | P <sub>d(max)</sub>  | T <sub>case</sub> = 25°C  | Standard devices & FC, forced air 4 m/s<br>Devices with option DLC   | 40<br>2500  | 46<br>2750   | 60<br>3000        | 80<br>3300            | Watt   |
|                            | Linear Derating                     |  | Above 25°C  | Standard devices & FC, forced air 4 m/s<br>Devices with option DLC   | 0.168<br>36.92  | 0.272<br>58.92   | 0.377<br>79.01    | 0.55<br>115           | W/K    |
|                            | Operating Temperature Range         | T <sub>O</sub>   | Standard devices & options CF, GCF, ILC. (Option DLC)   |  | -40...70 (60)   |  |                   |                       | °C     |
|                            | Storage Temperature Range           | T <sub>S</sub>   | Switches with option ILC may require frost protection!  |  | -40...90  |  |                   |                       | °C     |
|                            | Max. Permissible Magnetic Field     | B  | Homogeneous steady-field, surrounding the whole switch  |  | 25  |  |                   |                       | mT     |
| Max. Auxiliary Voltage     | V <sub>aux</sub>                    | Built-in overvoltage limiter (replaceable)   |   | 5.5  |   |  |                   | VDC                   |        |
| ELECTRICAL CHARACTERISTICS | Permissible Operating Voltage Range | V <sub>O</sub>   |   |  | 0... ± 70   | 0... ± 90  | 0... ± 120        | 0... ± 160            | kVDC   |
|                            | Typical Breakdown Voltage           | V <sub>br</sub>  | NOTE: V <sub>br</sub> is a test parameter for quality control purposes only. Not applicable in normal operation!<br>I <sub>off</sub> > 0.5 mA             |  | 78  | 100  | 132               | 175                   | kVDC   |
|                            | Typical Off-State Current           | I <sub>off</sub>   | 0.8xV <sub>O</sub> , T <sub>case</sub> =25...70°C, reduced I <sub>off</sub> on request  |  | < 80  |  |                   |                       | μADC   |
|                            | Typical Turn-On Resistance          | R <sub>stat</sub>  | Each switching path<br>t <sub>p</sub> < 1μs, duty cycle < 1%  | 0.1 x I <sub>p(max)</sub> , T <sub>case</sub> =25°C<br>1.0 x I <sub>p(max)</sub> , T <sub>case</sub> =25°C<br>1.0 x I <sub>p(max)</sub> , T <sub>case</sub> =70°C  | 2.4<br>5.2<br>12.8  | 3.04<br>6<br>15.1  | 4<br>8.5<br>21.25 | 5.44<br>11.5<br>27.26 | Ohm    |
|                            | Typical Propagation Delay Time      | t <sub>d(on)</sub>   | Resistive load, 0.1 x I <sub>p(max)</sub> , 0.8 x V <sub>O(max)</sub> , 50-50%  |  | 200   |  |                   |                       | ns     |
|                            | Typical Output Pulse Jitter         | t <sub>j</sub>   | Impedance matched input, V <sub>aux</sub> / V <sub>ctrl</sub> = 5.00 VDC  |  | 3   |  |                   |                       | ns     |
|                            | Typical Turn-On Rise Time           | t <sub>r(on)</sub>   | Resistive load, 10-90%  | 0.1 x V <sub>O(max)</sub> , I <sub>L</sub> = 0.1 x I <sub>p(max)</sub><br>0.8 x V <sub>O(max)</sub> , I <sub>L</sub> = 0.1 x I <sub>p(max)</sub><br>0.8 x V <sub>O(max)</sub> , I <sub>L</sub> = 1.0 x I <sub>p(max)</sub> | 80<br>100<br>120  |  |                   |                       | ns     |
|                            | Typical Turn-Off Rise Time          | t <sub>off</sub> , t <sub>q</sub>  | Resistive load, 10-90%  | 0.1 x V <sub>O(max)</sub> , I <sub>L</sub> = 0.1 x I <sub>p(max)</sub><br>0.8 x V <sub>O(max)</sub> , I <sub>L</sub> = 1.0 x I <sub>p(max)</sub>   | 50<br>100   |  |                   |                       | ns     |
|                            | Maximum Turn-On Time                | t <sub>on(max)</sub>   | No limitation   |  | ∞   |  |                   |                       | ns     |
|                            | Minimum Turn-On Time                | t <sub>on(min)</sub>   | t <sub>on(min)</sub> can be customized. Please consult factory  |  | 250   |  |                   |                       | ns     |
|                            | Maximum Turn-Off Time               | t <sub>off(max)</sub>  | No limitation   |  | ∞   |  |                   |                       | ns     |
|                            | Minimum Turn-Off Time               | t <sub>off(min)</sub>  | t <sub>off(min)</sub> can be customized. Please consult factory   |  | 250   |  |                   |                       | ns     |
|                            | Max. Continuous Switching Frequency | f <sub>(max)</sub>   | @ V <sub>aux</sub> = 5.00 V<br>Sw. shutdown if f <sub>(max)</sub> is exceeded   | Standard devices without HFS option<br>Standard devices with HFS supply<br>Opt. HFS + sufficient cooling option  | TBD<br>30<br>60   |  |                   |                       | kHz    |
|                            | Maximum Burst Frequency             | f <sub>b(max)</sub>  | Use option HFB for >10 pulses within 20μs or less   |  | 500   |  |                   |                       | kHz    |
|                            | Maximum Number of Pulses / Burst    | N <sub>(max)</sub>   | @ f <sub>b(max)</sub><br>Note: Option HFB requires external buffer capacitors with a voltage rating of > 630VDC and a capacitance of 100nF per additional | Standard<br>Option I-HFB<br>Option HFB   | >10<br>>100<br>>1000  |  |                   |                       | Pulses |
|                            | Coupling Capacitance                | C <sub>C</sub>   | HV side against control side  |  | <100  |  |                   |                       | pF     |
|                            | Natural Capacitance                 | C <sub>N</sub>   | Between switch poles, @ 0.5 x V <sub>O(max)</sub>   |  | 22  | 18   | 15                | 12                    | pF     |
|                            | Control Voltage Range               | V <sub>ctrl</sub>  | The V <sub>ctrl</sub> has no impact on the output pulse shape.  |  | 3 ... 10  |  |                   |                       | VDC    |
|                            | Auxiliary Supply Voltage Range      | V <sub>aux</sub>   | The +5 V supply is not required in the HFS mode.  |  | 4.5 ... 5.5   |  |                   |                       | VDC    |
|                            | Typical Auxiliary Supply Current    | I <sub>aux</sub>   | V <sub>aux</sub> = 5.00 VDC, T <sub>case</sub> = 25°C.<br>Active current limitation above 1A.   | 0.01 x f <sub>(max)</sub><br>@ f <sub>(max)</sub>  | 130<br>800  | 150<br>800   | 160<br>800        | 180<br>800            | mADC   |
|                            | Fault Signal Output                 |  | Switch will be turn off, if f>f <sub>(max)</sub> , V <sub>aux</sub> <4.75V or T <sub>case</sub> >75°C<br>Fault condition is indicated by a logical "L"    |  | >4.0<br><0.8  |  |                   |                       | VDC    |
|                            | Opt. HFS, Ext. Supply Voltage V1    | V <sub>HFS(V1)</sub>   | Stability ±3%, current consumption <0.4 mA/kHz @ 25°C   |  | 15  |  |                   |                       | VDC    |
|                            | Opt. HFS, Ext. Supply Voltage V2    | V <sub>HFS(V2)</sub>   | Stability ±3%, current consumption <0.5 mA/kHz @ 25°C   |  | TBD   |  |                   |                       | VDC    |
|                            | Intrinsic Diode Forward Voltage     | V <sub>F</sub>   | T <sub>case</sub> = 25°C, I <sub>F</sub> = 0.3 x I <sub>p(max)</sub>  |  | TBD   |  |                   |                       | VDC    |
|                            | Diode Reverse Recovery Time         | t <sub>rr</sub>  | T <sub>case</sub> = 25°C, I <sub>F</sub> = 0.3 x I <sub>p(max)</sub> , di/dt = 100 A/μs   |  | <50ns   |  |                   |                       | ns     |
| HOUSING                    | Dimensions                          | LxWxH  | Standard housing<br>Devices with option DLC   | Please contact the manufacturer!   |   |  |                   | mm <sup>3</sup>       |        |
|                            | Weight                              |  | Standard housing<br>Devices with option DLC   | Please contact the manufacturer!   |   |  |                   | g                     |        |
| FUNCTIONS                  | Control Signal Input                | <b>Pin 1 / Yellow (LS-C: Pin 1).</b> TTL compatible (LS-C: With 100Ω termination). Schmitt-Trigger characteristics. Control voltage 2-10 V (3-5 V for low jitter).<br><b>Pin 2 / Black (LS-C: Shielding).</b> The ground pin is internally connected with the safety earthings terminals (threaded inserts) on bottom side.<br><b>Pin 3 / Red (LS-C: Pin 4).</b> The 5 V input is used for rep rates up to the specified max. frequency f <sub>(max)</sub> . Higher rep rates require option HFS.<br><b>Pin 4 / Orange (LS-C: Pin 3).</b> TTL output, short circuit proof. Indicating switch & driver over-heat, over-frequency, low auxiliary voltage. L = Fault.<br><b>Pin 5 / Green (LS-C: Pin 2).</b> TTL compatible, Schmitt-Trigger characteristics for the connection of external safety circuits. L = Switch Inhibited.<br><b>GREEN:</b> "Auxiliary power good, switch OFF". <b>YELLOW:</b> "Control signal received, switch ON". <b>RED:</b> "Fault condition, switch OFF"<br>Switches with option DLC: 65°C, response time < 3 s @ 3xP <sub>d(max)</sub> , ΔT=25K (40 to 65°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 701-15-SiC                      | Fast HV SiC Mosfet Switch, 70kV, 150 A   | Option LP   | Low Pass. Input filter for increased noise immunity.   | Option I-PC   | Integrated part components according to customer specification.                      |                   |                       |        |
|                            | HTS 901-15-SiC                      | Fast HV SiC Mosfet Switch, 90kV, 150 A   | Option HFB  | High Frequency Burst (improved capability by external capacitors)  | Option UL-94  | Flame retardant casting resin, UL94-V0   |                   |                       |        |
|                            | HTS 1201-15-SiC                     | Fast HV SiC Mosfet Switch, 120kV, 150 A  | Option HFS  | High Frequency Switching (two auxiliary supply inputs V1 & V2)   | Option I-FWD  | Integrated Free-Wheeling Diode. In connection with inductive load only.              |                   |                       |        |
|                            | HTS 1601-15-SiC                     | Fast HV SiC Mosfet Switch, 160kV, 150  | 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 lemo                    |                   |                       |        |
|                            |                                     |  | 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 <sub>d(max)</sub> can be increased by the factor 3 to 10.     |                   |                       |        |
|                            |                                     |  | Option ISO-40   | 40kV Isolation. Isolation Voltage increased to 120kV.  | Option DLC  | Direct Liquid Cooling. P <sub>d(max)</sub> can be increased by the factor 10 to 100. |                   |                       |        |
|                            |                                     |  | Option ISO-60   | 60kV Isolation. Isolation Voltage increased to 200kV.  | FOR FURTHER PRODUCT OPTIONS PLEASE REFER TO THE OPTIONS PAGE. |  |                   |                       |        |