

**TECHNICAL DATA**  
**DATASHEET SCP-5282-180, Preliminary.2**

**High Voltage, 180V, High Pulse Power Transorb**

Application:

- +/- 180V DC systems
- Bi-Directional for AC systems.

Protection Level:

- Capable of handling 10/1000µs single pulse up to I<sub>PP</sub>. Tested at 486 A
- Capable of handling 5 pulses of I<sub>PP</sub>, 10/1000µs pulse, with 5 sec intervals.
- **SCP-5282-180-120** is designed to meet MIL-STD-1399 voltage spike requirements for 115V systems under the following conditions:
  - ✓ 1000V spike, 1 ohm source impedance, up to 50usec, per FIGURE 6 of MIL-STD-1399. At least one TVS unit of SCP-5282-180-120 is needed. The corresponding spike peak current is ~ 734A, and the clamping voltage is 266V.
  - ✓ The clamping voltage level will determine which unit to be used. When using SCP-5282-180-260, the corresponding spike peak current is ~ 754A, and the clamping voltage is 215V.
- **SCP-5282-180-120** is designed to meet MIL-STD-704 voltage requirements for 115Vac systems under the following conditions:
  - ✓ The typical breakdown voltage at 200V peak is 1mA, or ~ 141.4V rms.
  - ✓ Notice that for AC systems, source inductance will be the main current limiting element during voltage surges. In the next example, assume that the source inductance is 50 uH, and source resistance is 0.1 ohm.
  - ✓ 180Vrms voltage surge, 50uH source inductance. The corresponding peak current is ~ 150A, and the clamping peak voltage is 225V as shown in Fig. 2.
- **SCP-5282-180-120** is designed to meet DO-160 Induced Lightning, Section 22, Table 22-2 at above level 4 (Voc/Isc = 750V/750A, waveform 5B), Figure 22-5 and Figure 22-7.
- **SCP-5282-180-260** is designed to meet DO-160 Induced Lightning, Section 22, Table 22-2 at level 5 (Voc/Isc = 1600V/1600A, waveform 5B), Figure 22-5 and Figure 22-7.

Key Features:

- Increase system reliability through eliminating avalanche of sensitive components.
- Clamping below 290V at I<sub>PP</sub> for 10/1000µs pulse.
- High Pulse Power Capability
- MTBF (MIL STD 217F amended to reflect ANSI Vita S1.0-2008 (2013): 2.15 million hours for AUC environment and 50°C temperature

**Part Number Ordering:**

Part Number	Bi-Directional	Package 1	Package 2
<b>SCP-5282-180-120</b>	X	X	
<b>SCP-5282-180-260</b>	X		X

TECHNICAL DATA  
DATASHEET SCP-5282-180, Preliminary.2

TECHNICAL DATA @ 25°C

Rating	Condition	Symbol	Min	Max	Units
Peak Pulse Power Dissipation SCP-5282-180-120 SCP-5282-180-260	0.5ms, Square Wave, 5 pulses in 15 sec	$P_{pk}$	-	120 260	KW
Device Energy Capability SCP-5282-180-120 SCP-5282-180-260	in 15 sec	$E$		850 1900	Joules
Steady State Power Dissipation	@ 25°C	$P$	-	70	Watts
Reverse Stand-Off Voltage	-	$V_{WM}$	-	180	Volts
Reverse Leakage	@ $V_{WM}$	$I_D$	-	50	$\mu A$
Breakdown Voltage	@ 1 mA	$V_{(BR)}$	195	210	Volts
Clamping Voltage SCP-5282-180-120 SCP-5282-180-260	@ $I_{PP}$	$V_C$	-	250 225	Volts
Peak Pulse Current SCP-5282-180-120 SCP-5282-180-260	(10/1000 $\mu s$ ), 5 pulses in 10 sec	$I_{PP}$		400 1100	Amps
TVS Resistance SCP-5282-180-120 SCP-5282-180-260	at 200A at 400A  at 1100A	$R_S$ (Typical)		0.16 0.090  0.02	Ohms
Operating & Storage Temp.	-	<b>Top &amp; Tstg</b>	-55	+ 150	°C

- Peak Current  $I_P$  at any spike voltage  $V_S$  with a source resistance of  $R_{SP}$  is  $(V_S - 200V)/(R_S + R_{SP})$ , the corresponding TVS maximum clamping voltage is  $(200 + I_P \cdot R_S)$
- To calculate VBR vs. junction temperature, use the following formula:  
VBR at  $T_J = VBR$  at 25 °C  $\times (1 + \alpha T \times (T_J - 25))$ , where  $\alpha T$  is typically 0.001/°C.

TECHNICAL DATA  
DATASHEET SCP-5282-180, Preliminary.2

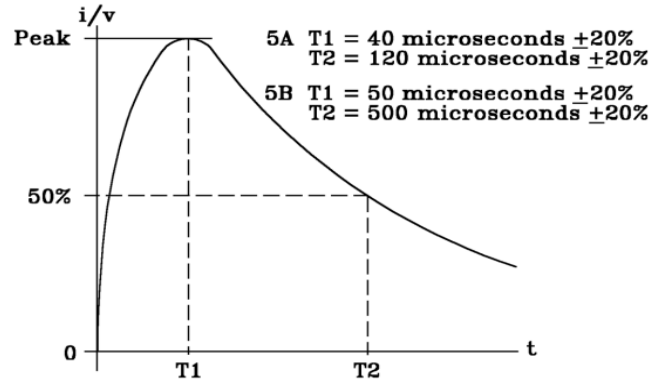


Figure 22-5 Current/Voltage Waveform 5

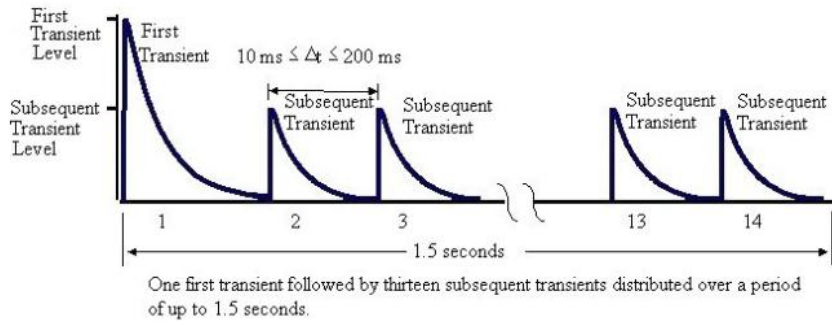


Figure 22-7 Multiple Stroke Application

Table 22-2 Generator Setting Levels for Pin Injection

Level	Waveforms		
	3/3 Voc/Isc	4/1 Voc/Isc	5A/5A Voc/Isc
1	100/4	50/10	50/50
2	250/10	125/25	125/125
3	600/24	300/60	300/300
4	1500/60	750/150	750/750
5	3200/128	1600/320	1600/1600

NOTES:

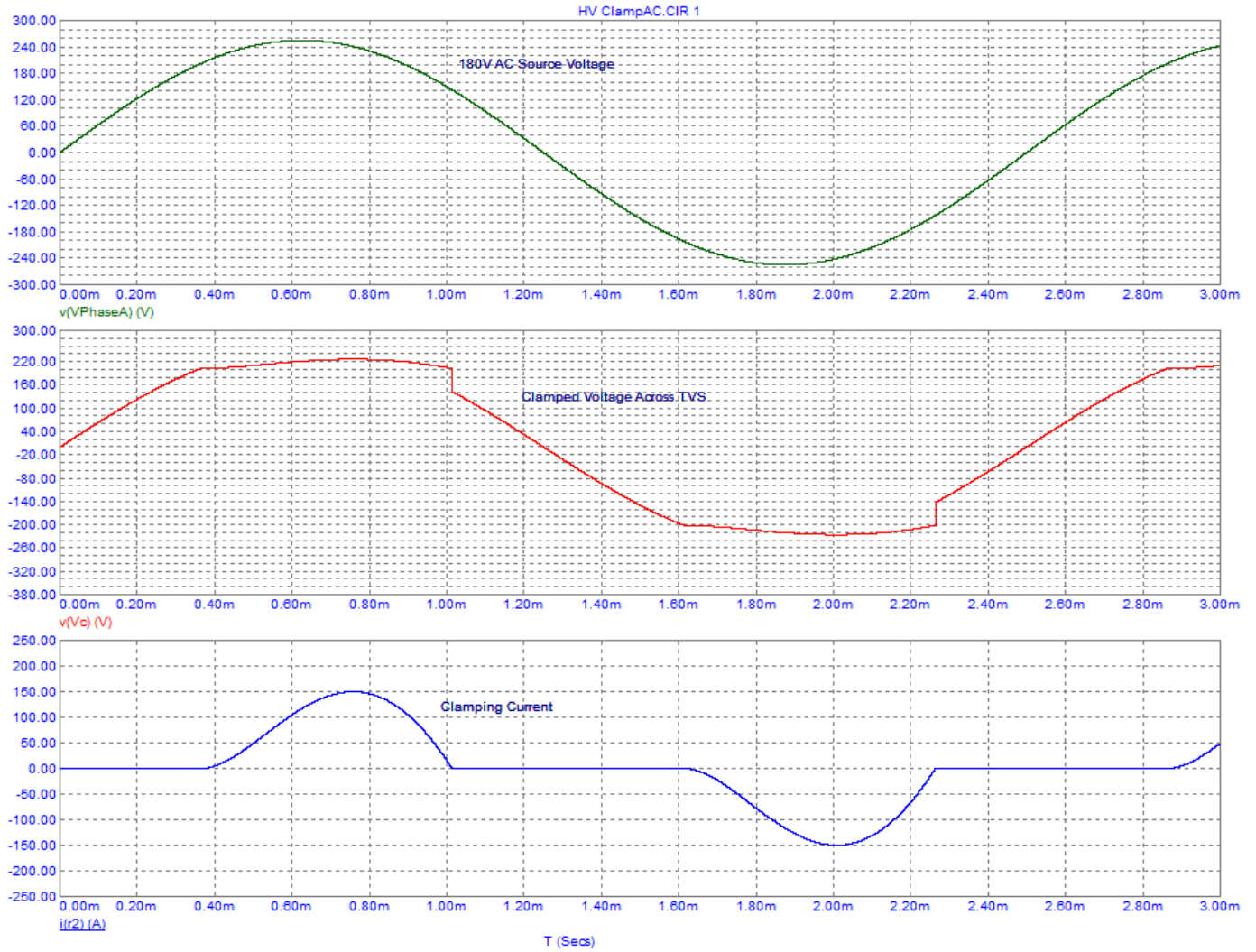
1. Voc = Peak Open Circuit Voltage (Volts) available at the calibration point shown in Figure 22-10, Figure 22-11, or Figure 22-12.
2. Isc = Peak Short Circuit Current (Amps) available at the calibration point shown in Figure 22-10, Figure 22-11, or Figure 22-12.
3. Amplitude Tolerances +10%, -0%.
4. The ratio of Voc to Isc is the generator source impedance to be used during the calibration procedure.
5. Waveforms 3, 4 and 5A are identified in Figure 22-3, Figure 22-4 and Figure 22-5.

DO-160 Section 22 Test Waveforms  
Fig. 1

## Application Examples

- SCP-5282-180-120 is designed to meet DO-160 Induced Lightning, Section 22, Table 22-2 at above level 4 ( $V_{oc}/I_{sc} = 750V/750A$ , waveform 5B), Figure 22-5 and Figure 22-7.
  - At 750V spike with waveform per Figure 22-5, level 5B, and 1 ohm source impedance, the peak surge current will be 505A. The corresponding peak clamped voltage will be  $200V + 0.09 \text{ ohms} \cdot 505A = 245V$ . The total energy absorbed by the TVS will be ~ 89.3 Joules in the first pulse of Figure 22-7. The following pulses peak current will be 250A, peak clamping voltage 240.0V, TVS energy will be 43.3 Joules. The total TVS energy will be  $89.3 + 13 \cdot 43.3 = 652.2$  Joules, this is within the device capability of 850 Joules.
- SCP-5282-180-260 is designed to meet DO-160 Induced Lightning, Section 22, Table 22-2 at level 5 ( $V_{oc}/I_{sc} = 1600V/1600A$ , waveform 5B), Figure 22-5 and Figure 22-7.
  - At 1600V spike with waveform per Figure 22-5, level 5B, and 1 ohm source impedance, the peak surge current will be 1372A. The corresponding peak clamped voltage will be 227V. The total energy absorbed by the TVS will be ~ 450 Joules in the first pulse of Figure 22-7. The following pulses peak current will be 588A, peak clamping voltage 212V, TVS energy will be 180 Joules. The total TVS energy will be  $450 + 13 \cdot 180 = 2788$  Joules, this is within the device capability of 3000 Joules.

**TECHNICAL DATA**  
**DATASHEET SCP-5282-180, Preliminary.2**



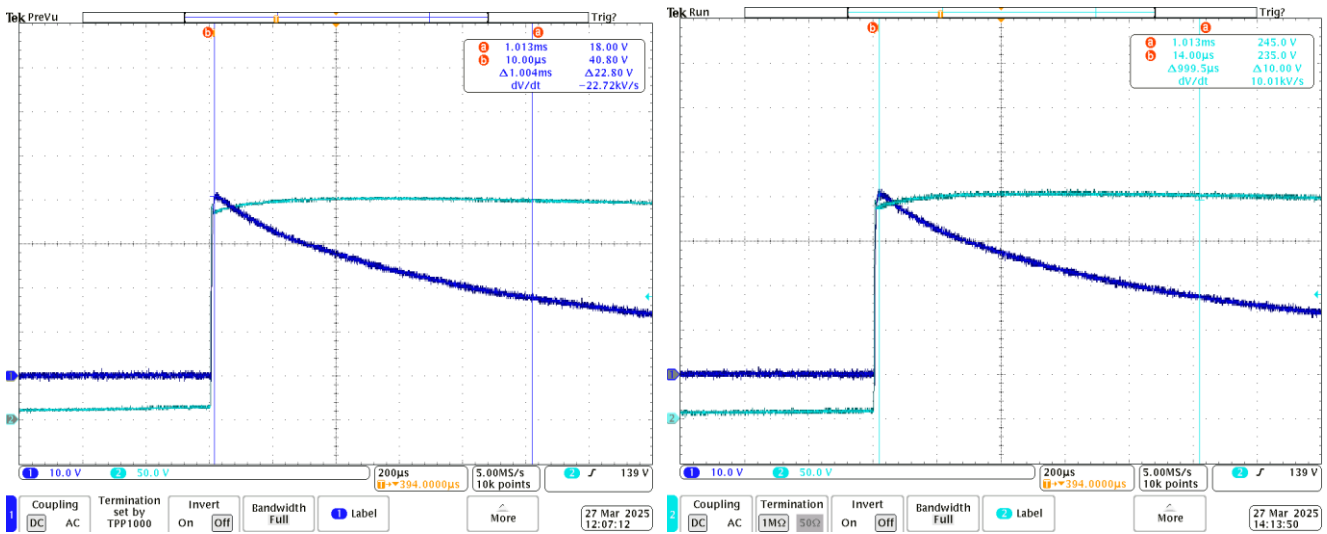
**180V AC Source Surge Voltage and Clamped Voltage & Current Waveforms**  
**(Assuming Source Inductance is 50uH)**  
**Fig. 2**

TECHNICAL DATA  
DATASHEET SCP-5282-180, Preliminary.2

**Test Data for SCP5282-180-120**

- The below waveform is 10/1000 us waveforms.
- The measured peak current is 408A (current scale is 10A/V).
- The measured clamping voltage is 235V at 408A.
- The corresponding Power Loss is 95.9 KW
- The corresponding TVS Energy is  $1.443 \times 95.9 = 138$  Joules

Due to the effect of junction heating, the maximum clamped voltage at 200A , after ~ 500 us, is 245V. Notice that this clamping voltage is higher than the initial voltage of 235V at 408A.

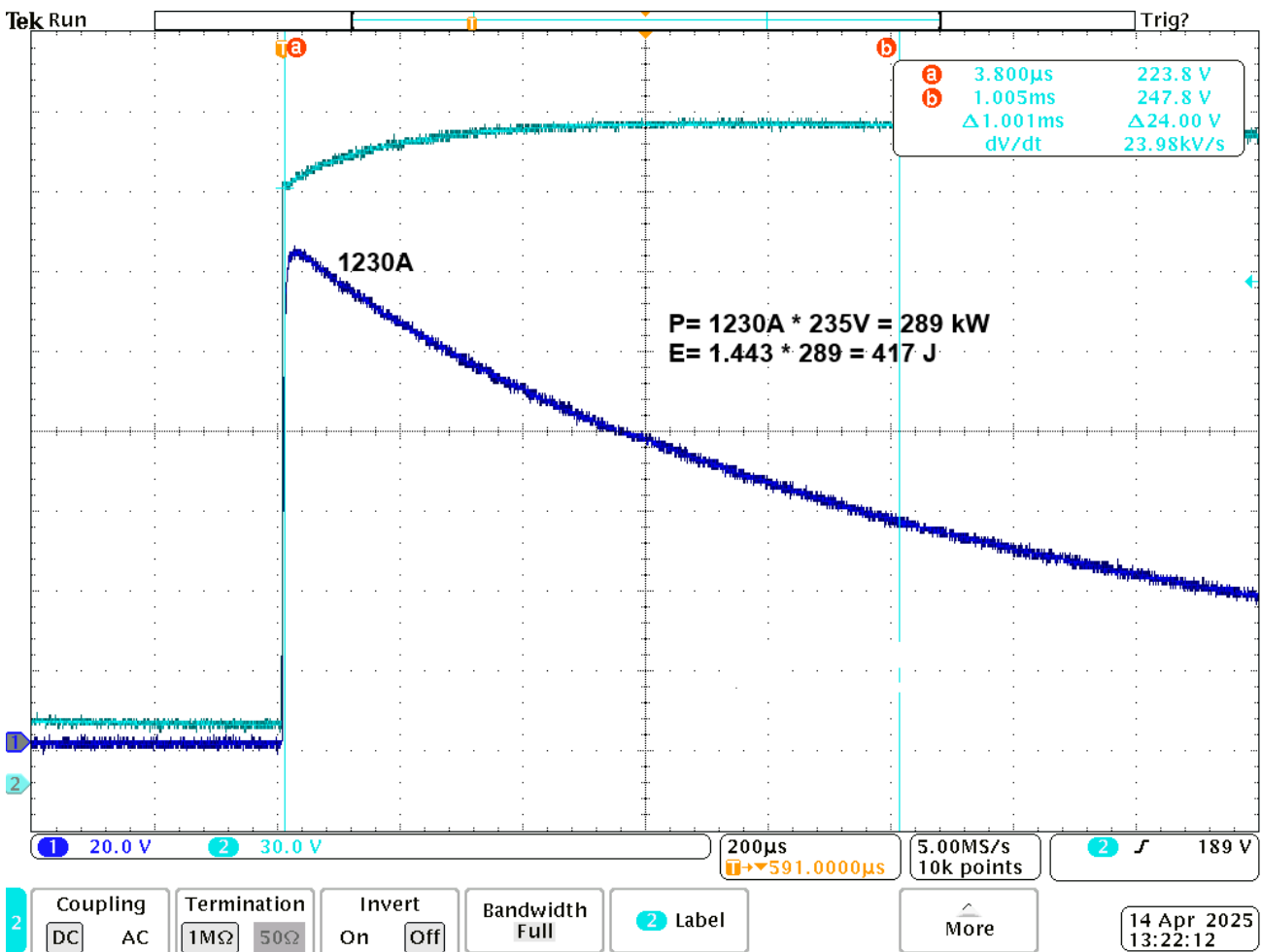


**Voltage & Current Waveforms During Voltage Clamp at 408A  
(10/1000 usec Waveform)  
Fig. 3**

### Test Data for SCP5282-180-260

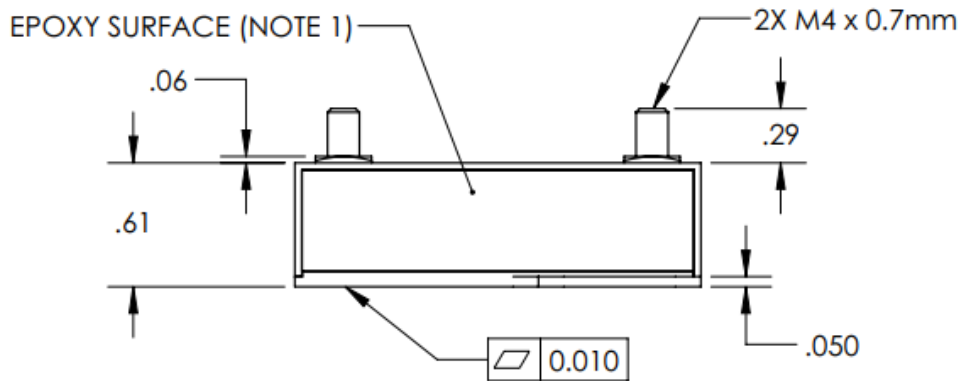
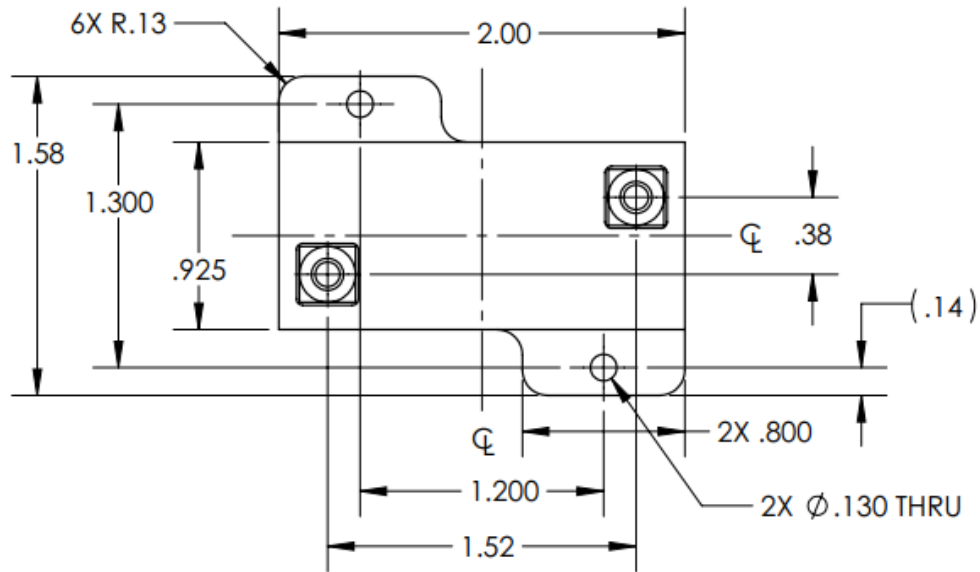
- The below waveform is 10/1000 us waveforms.
- The measured peak current is 1230A (current scale is 10A/V).
- The measured clamping voltage is 223V at 1230A.
- The corresponding Power Loss is 274 KW
- The corresponding TVS Energy is  $1.443 \times 274 = 395$  Joules

Due to the effect of junction heating, the Maximum clamped voltage at 800A , after ~ 500 us, is 247V. Notice that this clamping voltage is higher than the initial voltage of 223V at 1230A.



**Voltage & Current Waveforms During Voltage Clamp at 408A  
(10/1000 usec Waveform)  
Fig. 4**

TECHNICAL DATA  
DATASHEET SCP-5282-180, Preliminary.2



NOTES:

1. POTTING SURFACE UNCONTROLLED.
2. DIMENSIONS UNLESS OTHERWISE NOTED ARE IN INCHES.
3. TOLERANCES:
  1. TWO PLACE DECIMAL:  $\pm .02$
  2. THREE PLACE DECIMAL:  $\pm .01$

**Package 1:**  
**SCP-5282-180-120**

---

TECHNICAL DATA  
DATASHEET SCP-5282-180, Preliminary.2

**Package 2:  
SCP-5282-180-260**

**TBD**

---

**TECHNICAL DATA**  
**DATASHEET SCP-5282-180, Preliminary.2**

**DISCLAIMER:**

- 1- *The information given herein, including the specifications and dimensions, is subject to change without prior notice to improve product characteristics. Before ordering, purchasers are advised to contact the Sensitron Semiconductor sales department for the latest version of the datasheet(s).*
- 2- *In cases where extremely high reliability is required (such as use in nuclear power control, aerospace and aviation, traffic equipment, medical equipment, and safety equipment) , safety should be ensured by using semiconductor devices that feature assured safety or by means of users' fail-safe precautions or other arrangement.*
- 3- *In no event shall Sensitron Semiconductor be liable for any damage that may result from an accident or any other cause during operation of the user's units according to the datasheet(s). Sensitron Semiconductor assumes no responsibility for any intellectual property claims or any other problems that may result from applications of information, products or circuits described in the datasheets.*
- 4- *In no event shall Sensitron Semiconductor be liable for any failure in a semiconductor device or any secondary damage resulting from use at a value exceeding the absolute maximum rating.*
- 5- *No license is granted by the datasheet(s) under any patents or other rights of any third party or Sensitron Semiconductor.*
- 6- *The datasheet(s) may not be reproduced or duplicated, in any form, in whole or part, without the expressed written permission of Sensitron Semiconductor.*
- 7- *The products (technologies) described in the datasheet(s) are not to be provided to any party whose purpose in their application will hinder maintenance of international peace and safety nor are they to be applied to that purpose by their direct purchasers or any third party. When exporting these products (technologies), the necessary procedures are to be taken in accordance with related laws and regulations.*