

Hybrid HSFM-140 Series Surge Protection Transient Protection DC-DC converter front-end module



1 Features of transient protection DC-DC converter

- High reliability
- Maximum input transient voltage: 80V/50ms or 8V/50ms
- Output power P_O : 140W
- Operating temperature range : T_c : -55°C ~ +125°C
- Efficiency: 95% Size: 36.83×28.44×8.40mm (Without flange)
- Match with transient protection DC-DC converter with Input voltage range of 16-40V 50.80×28.44×8.40mm (With flange)
- Hermetically sealed metal cases Weight: 31g (Without flange)
34g (With flange)

2 Scope of application of transient protection DC-DC converter

High-reliability electronic system for aviation and aerospace, etc

Table 1 Models

3 Description of transient protection DC-DC converter

HSFM-140、HSFM-140F

HSFM-140 surge protection front-end module is matched with transient protection DC-DC converter.

It is used to treat the Instantaneous input voltage (80V/50ms, 8V/50ms), after processing, it provides a reliable input voltage for Transient protection DC-DC converter. The module is made of thick-film hybrid integrated process, bare chip assembly and full metal case sealed package.

Two operating modes for HSFM-140 surge protection front-end module:

Normal operating mode: When the bus voltage at 16V~40V, the module output voltage follows the input voltage and lower than the input voltage of about ΔV , while the internal transient protection DC-DC converter charge the external capacitor.

Surge maintenance mode: When the bus voltage reaches 80V/50ms or 8V/50ms, The output part of the modules will be switched back. The external capacitor discharged to supply power for the transient protection DC-DC converter till the surge ends.

4 Electrical performance of transient protection DC-DC converter

Table 2 Rated conditions and recommended operating conditions

Absolute Max. Rated value

Output Voltage: 46V Input voltage (Transient, 50ms) : 8V, 80V Output Power: 145W Storage temperature: -65°C ~ 150°C	Mechanical Shock: 1500g Lead resistance welding temperature : 300°C (15s) Weight (Non-flanged/flanged) : 31g/34g Static strength: 2000V
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Table 3 Electric characteristics

No.	Parameter	Conditions (Unless otherwise specified, $-55^{\circ}\text{C} \leq T_c \leq 125^{\circ}\text{C}$, $V_{IN}=28\text{V} \pm 5\%$)	HSFM-140	
			Min	Max
1	Input voltage /V	$V_0=V_1-\Delta V^a, P_0=140\text{W}$ (Pin 8)	20	40
		$V_0=V_1-\Delta V^a, I_0=7\text{A}$ (Pin 7)	18	20
		$V_0=V_1-\Delta V^a, I_0=6.5\text{A}$ (expect 18V) (Pin 8)	16	18
2	Efficiency /%	$T_A=25^{\circ}\text{C}, I_0=5\text{A}$ (Pin 8)	95	-
3	External storage capacitor ended output voltage/V	$V_1=16\text{V} \sim 40\text{V}, I_{\text{cext}}=50\text{mA}$ (Pin 7), $I_0=0\text{A}$ (Pin 8)	43	45
4	External storage capacitor ended output current/mA	$V_1=16\text{V} \sim 40\text{V}, I_0=0\text{A}$ (Pin 8)	-	50
5	External storage capacitor terminal line regulation/V	$T_A=25^{\circ}\text{C}, V_1=16\text{V} \sim 40\text{V}, I_{\text{cext}}=50\text{mA}$ (Pin 7), $I_0=0\text{A}$ (Pin 8)	-	250
6	External storage capacitor terminal current regulation /mV	$T_A=25^{\circ}\text{C}, V_1=16\text{V} \sim 40\text{V}, I_{\text{cext}}=50\text{mA}$ (Pin 7), $I_0=0\text{A}$ (Pin 8)	-	250
7	Input transient voltage	$T_A=25^{\circ}\text{C}$, Low input transient voltage duration time=50ms (Pin7 with 4700 μF \times Capacitor 3, Pin 8 with 140W constant power load)	8	-
		$T_A=25^{\circ}\text{C}$, High input transient voltage duration time=50ms (Pin7 with 4700 μF \times Capacitor 3, Pin 8 with 140W constant power load)	-	80
8	Isolation	$T_A=25^{\circ}\text{C}$, Any pin (except pin 6) connect 500V DC Voltage with package	100	-

5 Circuit block diagram of transient protection DC-DC converter

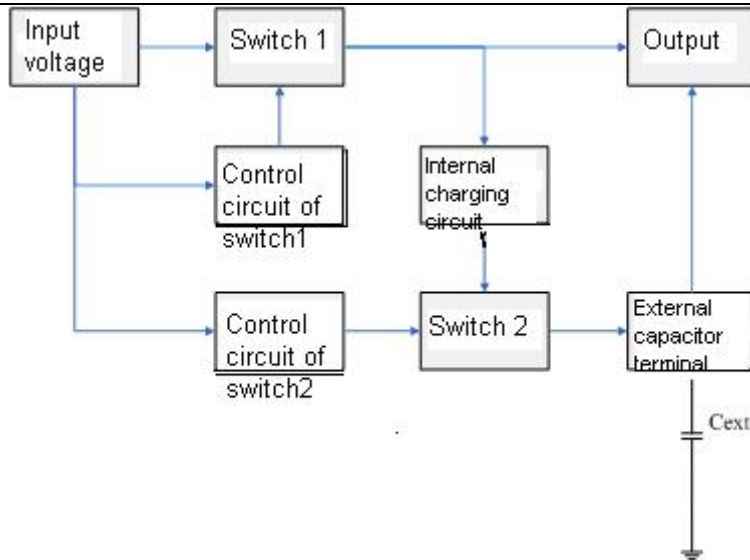


Figure 1 HSFM-140 circuit block diagram

The values of external capacitor C_{ext} can refer to the following formula:

$$C_{ext} = \frac{2 \cdot P \cdot t}{v^2(t1) - v^2(t2)}$$

其中: C_{ext} unit is F

P is output power, unit is W

T is the time of discharge, unit is s

v (t1) is the voltage when external capacitor is charged to full, unit is V

v (t2) is the voltage when external capacitor is discharged to empty, unit is V

6. Typical Performance Curves of transient protection DC-DC converter

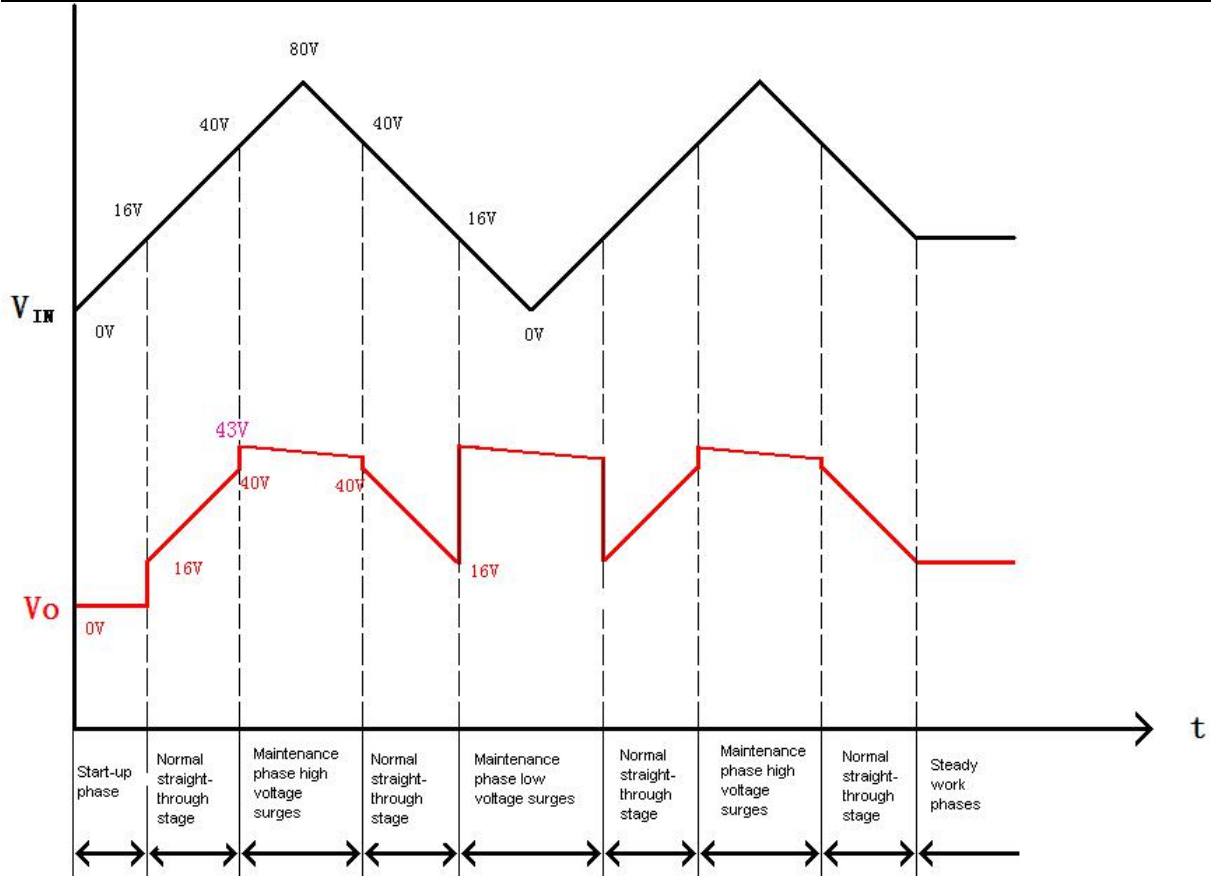


Figure 2 HSFM-140 input & output typical curves

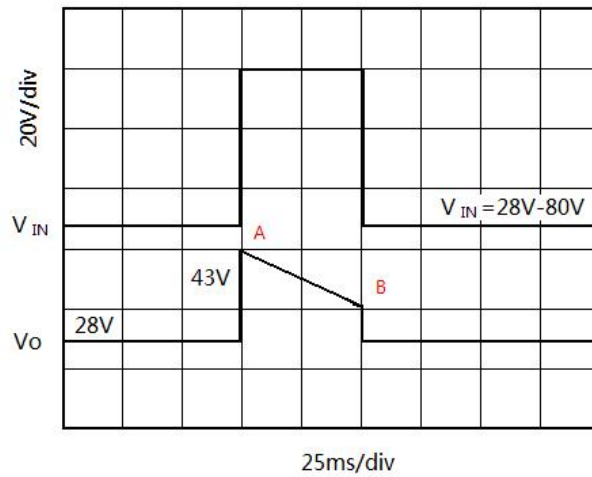


Figure 3 Input surge (80V, 50ms) output voltage curves

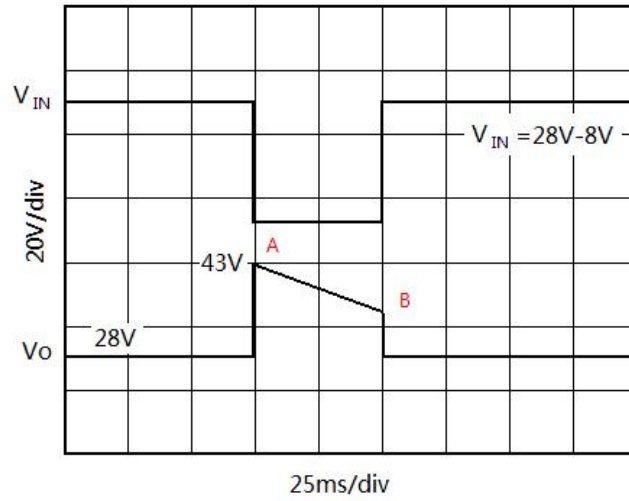


Figure 4 Input surge (8V, 50ms) output voltage curves

7. MTBF Curves of transient protection DC-DC converter

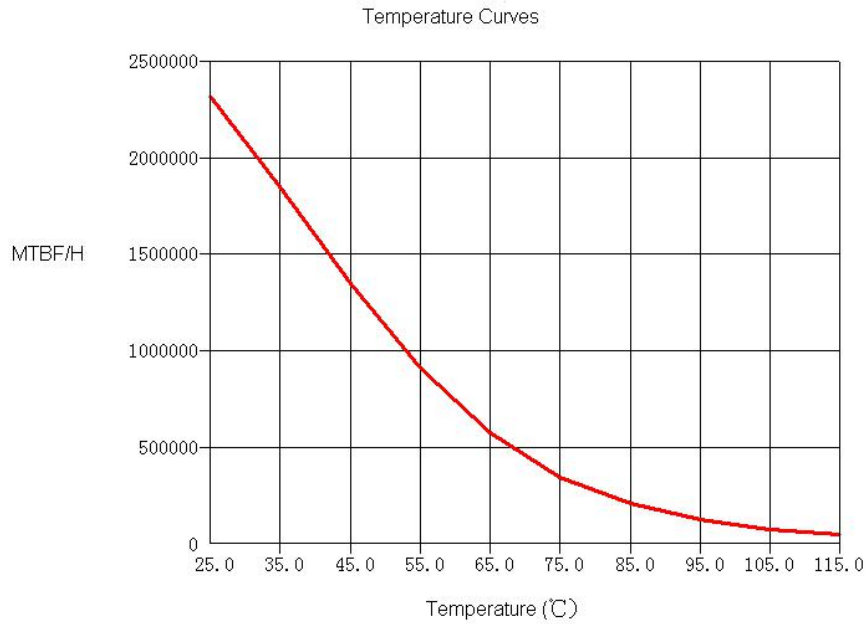


Figure 5 MTBF temperature curves (HSFM-140)

8 Pin Designation of transient protection DC-DC converter

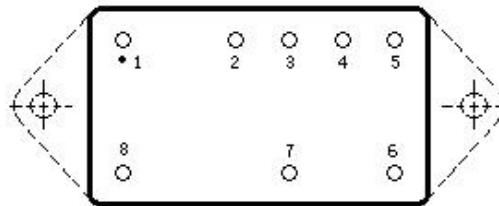


Figure 6 Pin Out Bottom View

Table 4 Pin Designation

Pin	Symbol	Designation
1	V_{IN}	Positive input
2	V_d	Schottky positive terminal
3	NC	null
4	GND	Input output common
5	NC	null
6	GND_c	Case common
7	C_{ext}	external capacitor terminal
8	V_o	Positive output

9 Typical Connection Diagram of transient protection DC-DC converter

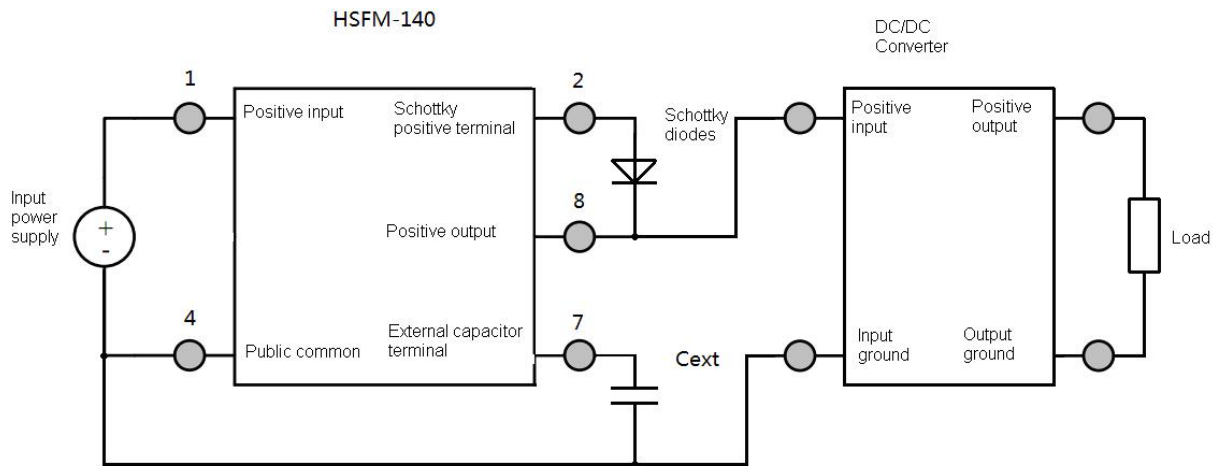


Figure 7 Typical connection diagram

10. Package Specifications of transient protection DC-DC converter (Unit:mm)

① Non-flanged

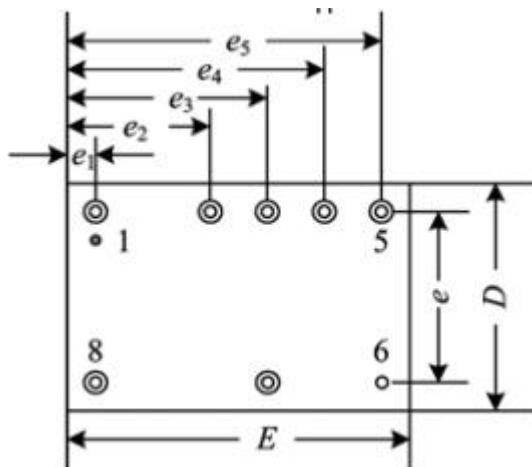


Figure 8 Bottom View

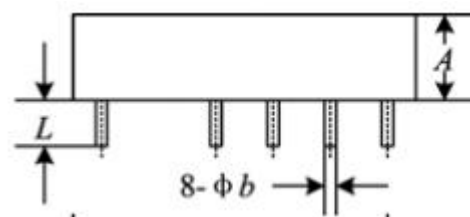


Figure 9 Side View

② With flanged

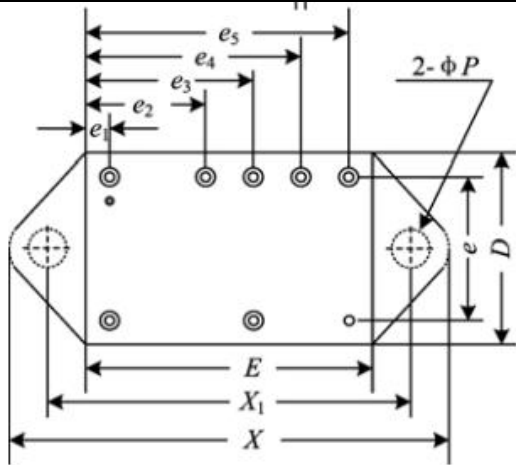


Figure 10 Bottom View

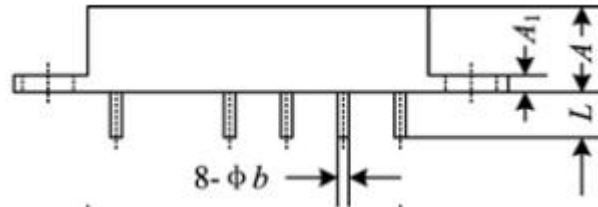


Figure 11 Side View

Table 5 Package Outline

Dimension Symbols	Unit/mm		
	Minimum	Nominal	Maximum
<i>A</i>	-	8.4	8.90
<i>A1</i>	1.20	1.50	1.80
<i>φb</i>	0.87	1.00	1.13
<i>D</i>	-	28.44	28.94
<i>E</i>	-	36.83	37.33
<i>e</i>	-	20.32	-
<i>e1</i>	-	5.21	-
<i>e2</i>	-	12.83	-
<i>e3</i>	-	17.91	-
<i>e4</i>	-	22.99	-
<i>e5</i>	-	28.07	-
<i>X</i>	-	50.8	51.30
<i>X1</i>	43.45	43.95	44.45
<i>P</i>	3.00	3.30	3.60
<i>L</i>	5.35	6.35	-

Table 6 Case Materials

Case Model	Header	Header Plating	Cover	Cover Plating	Pin	Pin Plating	Sealing Style	Notes
UPP3728-08c (Non-flanged)	Cold Rolled Steel (10#)	Ni	Kovar (4J42)	Ni	Copper -core Compound	Ni/Au	Compression Seal	Nickel Plating is for case ground pin
UPP3728-08d (Flanged)	Cold Rolled Steel (10#)	Ni	Kovar (4J42)	Ni	Copper -core Compound	Ni/Au	Compression Seal	Nickel Plating is for case ground

