

SCOP5161DN-D22

33-V Flat-clamp Surge Protector

Descriptions

The SCOP5161DN-D22 is a 33 V surge protector for power port using a unique design technique with flat clamping feature. The SCOP5161DA-D22 supports IEC 61000-4-5 8/20 μ s surge up to 35 A with clamping voltage below 40 V.

The device is available in a small 6-pin 2.0 mm x 2.0 mm DFN package. The operation temperature ranges from -40°C to +125°C.

Features

- Reverse stand-off voltage: 33 V
- Transient protection
IEC 61000-4-2: ± 11 kV (contact)
IEC 61000-4-5: 35 A (8/20 μ s)
- Flat-clamping feature

Applications

- Mobile phones
- Tablets
- PCs

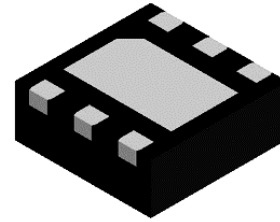
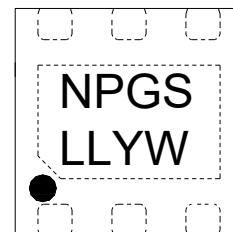


Figure 1 DFN2x2-6L (Bottom View)



NPGS = Part number
Y = Year code
W = Week code
LL = Special code

Figure 2 Marking (Top View)

Order Information

Table 1 Order Information

Device	Package	Shipping
SCOP5161DN-D22	DFN2x2-6L	3000 / Tape&Reel

Pin Information

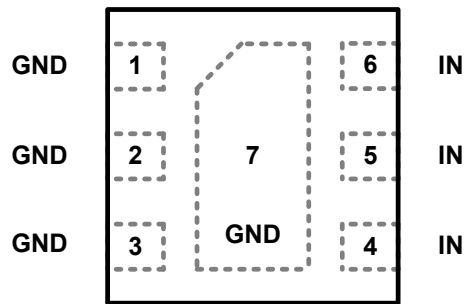


Figure 3 Pin Information (Top View)

Table 2 Pin Descriptions

Pin	Symbol	Description
1, 2, 3, 7	GND	Ground. Connect to the ground.
4, 5, 6	IN	Output/Input. Protected channel.

Functional Block Diagram

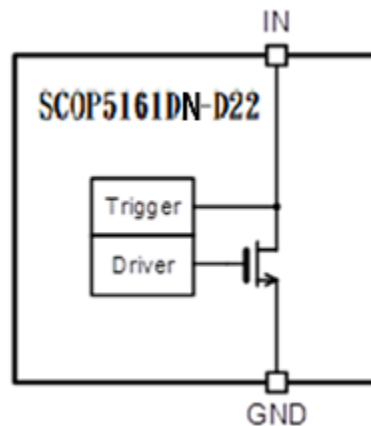


Figure 4 Functional Block Diagram

Typical Applications

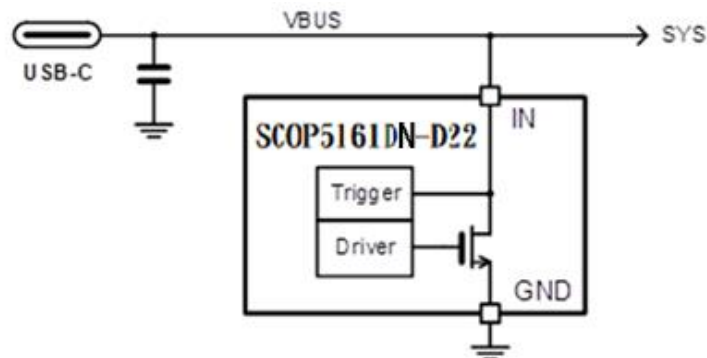


Figure 5 Application Information

Absolute Maximum Ratings

Maximum ratings are absolute ratings. Stresses exceeding any value in Table 3 might cause irreversible damage to the integrated circuit. Operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied.

Table 3

Parameter	Symbol	Condition	Min.	Max.	Unit
Maximum surge current	I _{PP}	IEC 61000-4-5 (8/20 μs)	35		A
Maximum surge power	P _{PK}	IEC 61000-4-5 (8/20 μs)	1330		W
Maximum forward surge current	I _{FPP}	IEC 61000-4-5 (8/20 μs)	50		A
Maximum forward surge power	P _{FPK}	IEC 61000-4-5 (8/20 μs)	80		W
DC breakdown current	I _{BR}	-	10		mA
DC forward current	I _F	-	500		mA
Storage temperature	T _{STG}	-	-55	150	°C
Operating free-air temperature	T _A	-	-40	125	°C
Lead temperature	T _{LEAD}	-	260	-	°C
ESD	V _{HBM}	ESDA/JEDEC JS-001-2017	±2		kV
	V _{CDM}	ESDA/JEDEC JS -002-2018	±1		kV
Moisture sensitivity	MSL	-	Level 1		

Thermal Information

Symbol	Parameter	Value	Unit
R _{θJA}	Junction-to-Ambient thermal resistance*1	67.5	°C/W
R _{θJC(top)}	Junction-to-Case (Top) Thermal Resistance	51.5	°C/W
R _{θJC(bottom)}	Junction-to-Case (Bottom) Thermal Resistance	11.5	°C/W
R _{θJB}	Junction-to-Board Thermal Resistance	34.2	°C/W

*1: Single component mounted on 2 oz, 1.5*1.5 inch^2 FR-4 PCB with 1.0*1.0 inch^2 Cu area

Recommended Operation Conditions

Recommended operation conditions define the conditions for actual device operation. Recommended operation conditions are specified to ensure optimal performance. WillSemi does not recommend exceeding the range or designing according to values in Absolute Maximum Ratings.

Table 4

Parameter	Symbol	Condition	Typ.	Unit
Reverse Stand-off Voltage	V _{RWM}	-	33	V

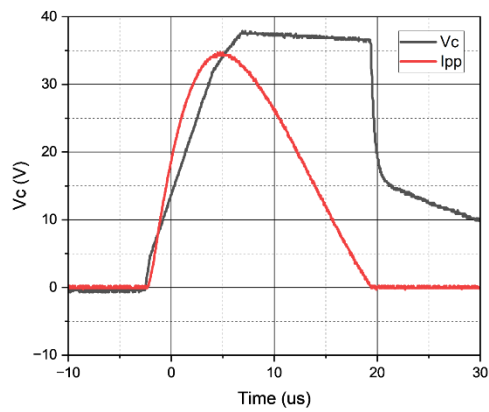
Electrical Characteristics

$T_A = 25^\circ\text{C}$ (unless otherwise noted)

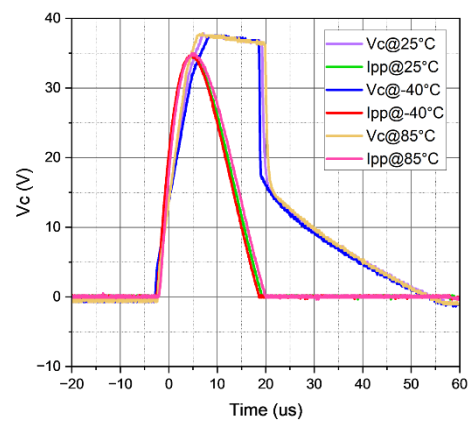
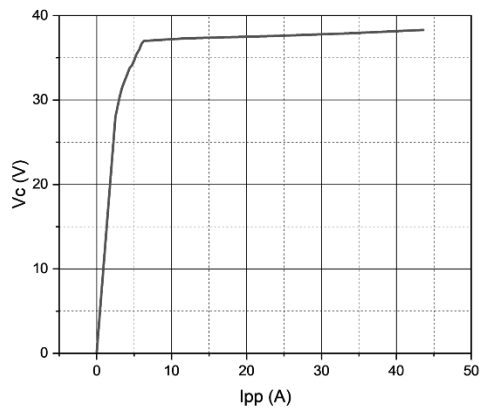
Table 5

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Leakage current	I_{LEAK}	$V_{\text{IN}} = V_{\text{RWM}}, T_A = 25^\circ\text{C}$	-	14	150	nA
		$V_{\text{IN}} = V_{\text{RWM}}, T_A = 85^\circ\text{C}^{[1]}$	-	35	<u>600-</u>	nA
Forward voltage	V_F	$I = 1\text{ mA}$ from GND to IN	<u>0.25-</u>	0.5	<u>0.65-</u>	V
Break-down voltage	V_{BR}	$I = 1\text{ mA}$ from IN to GND	<u>34.5-</u>	37.4	<u>39-</u>	V
Forward clamp voltage	$V_{\text{FCLAMP}}^{[1]}$	35 A IEC 61000-4-5 Surge (8/20 μs) from GND to IN	<u>1-</u>	2	<u>5-</u>	V
Clamp voltage	$V_{\text{CLAMP}}^{[1]}$	15 A IEC 61000-4-5 Surge (8/20 μs) from IN to GND with 0V bias	<u>34-</u>	37.5	<u>40-</u>	V
		35 A IEC 61000-4-5 Surge (8/20 μs) from IN to GND with 0V bias	<u>34-</u>	37.9	<u>40-</u>	V
Dynamic resistance	$R_{\text{DYN}}^{[1]}$	Calculated from V_{CLAMP} at 15 A and 30 A surge (8/20 μs) current levels	-	20	<u>60-</u>	m Ω
Input pin capacitance	$C_{\text{IN}}^{[1]}$	$V_{\text{IN}} = 12\text{ V}$, $f = 1\text{ MHz}$, 30 mV _{PP} , IN to GND	-	120	-	pF
Maximum slew rate	$\text{SR}^{[1]}$	0 V_{RWM} rising edge, sweep rise time and measure slew rate when $I_{\text{PK}} = 1\text{ mA}$	-	2.5	-	V/ μs
		0 V_{RWM} rising edge, sweep rise time and measure slew rate when $I_{\text{PK}} = 1\text{ mA}$, 105°C	-	0.7	-	V/ μs

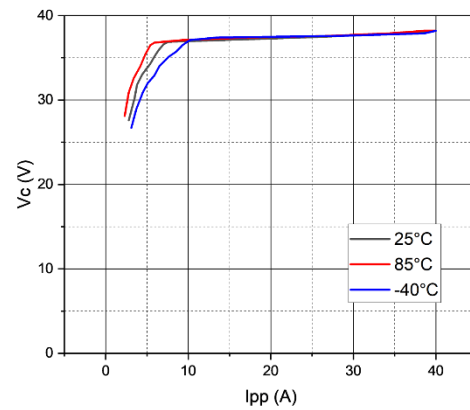
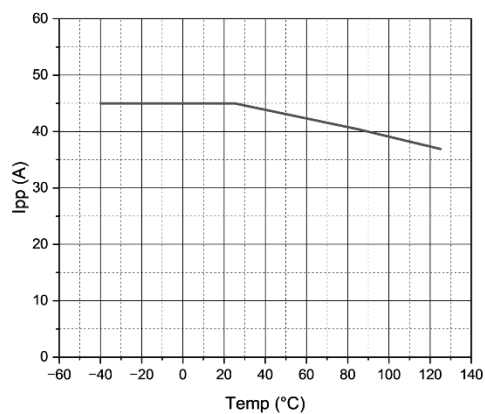
Note 1: Guaranteed by design



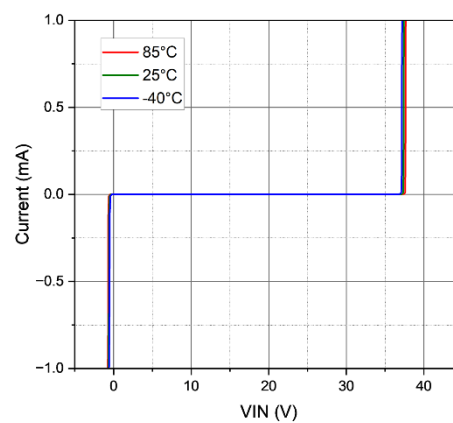
Clamping Voltage vs. Peak Pulse Current at 35 A


 Clamping Voltage vs. 35 A I_{pp} across Temperature


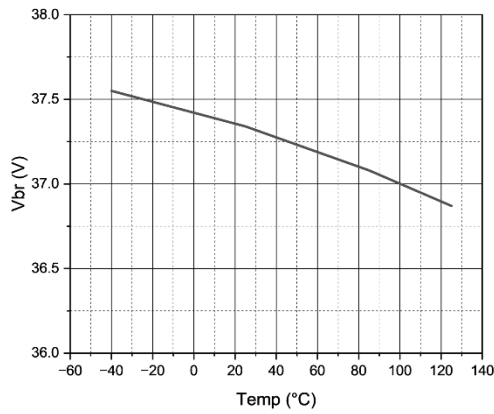
Clamping Voltage vs. Peak Pulse Current


 Clamping Voltage vs. I_{pp} across Temperature


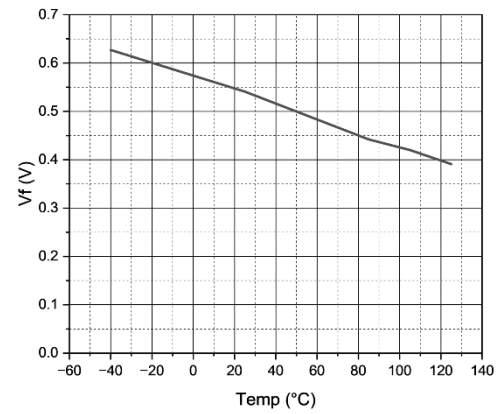
Peak Pulse Current vs. Temperature



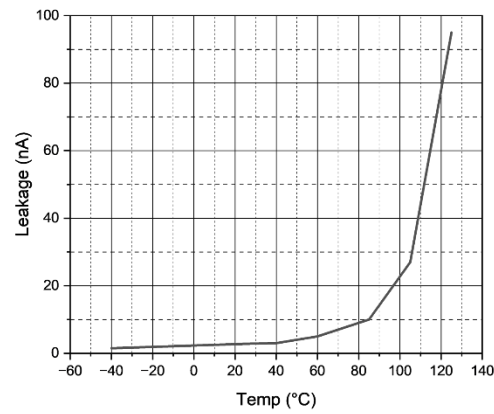
IV across Temperature



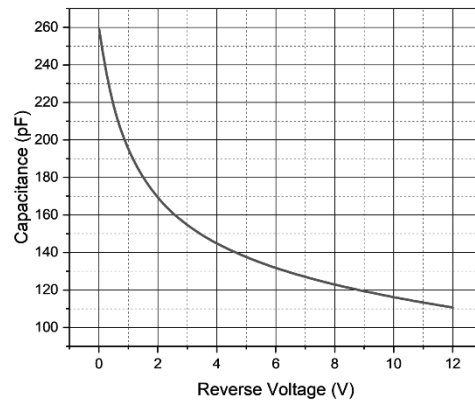
Breakdown Voltage vs. Temperature



Forward Voltage vs. Temperature



Leakage Current vs. Temperature at 33 V



Capacitance vs. Reverse Voltage

PCB Layout Guide

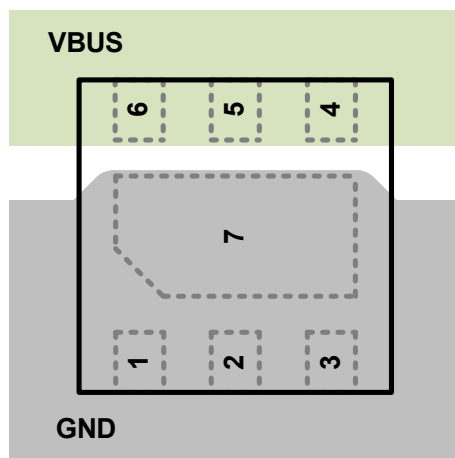
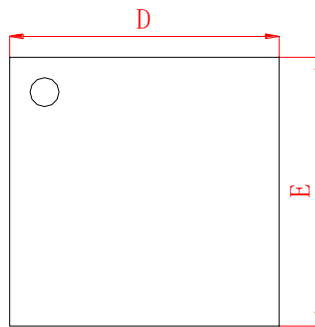
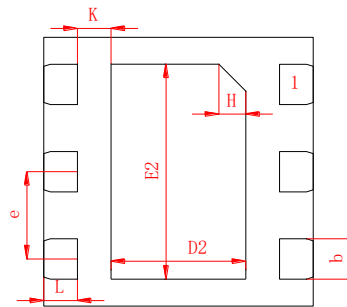


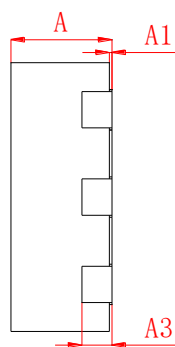
Figure 6 Layout Example (Top of the PCB)

Package Outline Dimensions
DFN2x2-6L


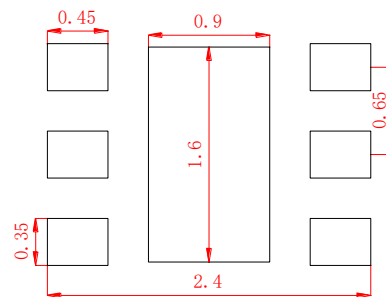
TOP VIEW



BOTTOM VIEW



SIDE VIEW

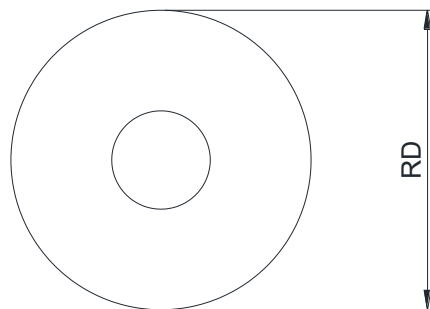


RECOMMENDED LAND PATTERN(unit:mm)

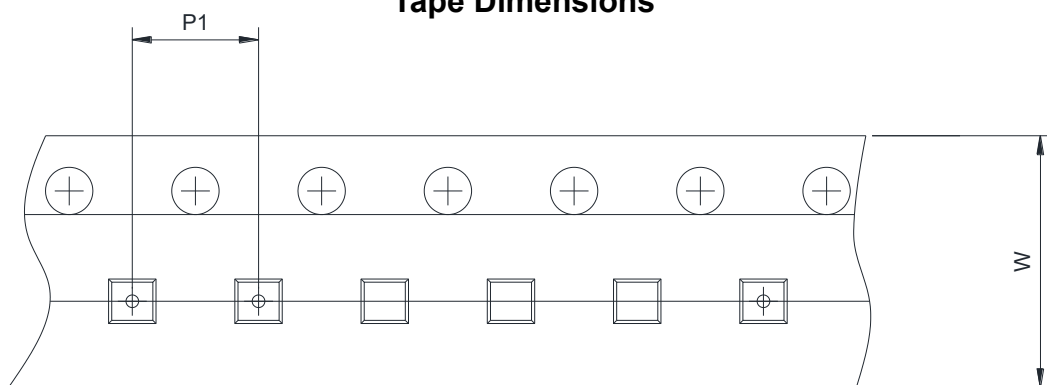
Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3	0.20 Ref		
b	0.25	0.30	0.35
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D2	0.90	1.00	1.10
E2	1.50	1.60	1.70
e	0.55	0.65	0.75
K	0.15	0.25	0.35
L	0.20	0.25	0.30
H	0.20 REF		

Tape and Reel Information

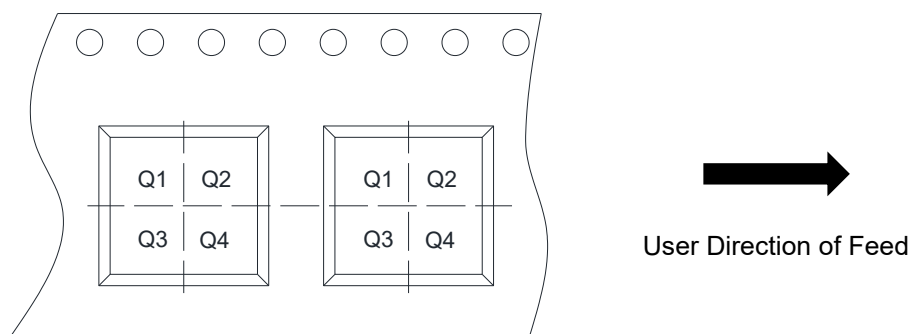
Reel Dimensions



Tape Dimensions



Quadrant Assignments for PIN1 Orientation in Tape



RD	Reel Dimension	☒ 7inch	☐ 13inch
W	Overall width of the carrier tape	☒ 8mm	☐ 12mm ☐ 16mm
P1	Pitch between successive cavity centers	☐ 2mm	☒ 4mm ☐ 8mm
Pin1	Pin1 Quadrant	☐ Q1	☒ Q2 ☐ Q3 ☐ Q4