

SCOP5160DL-D22

22-V Flat-clamp Surge Protector

Descriptions

The SCOP5160DL-D22 is a 22 V surge protector for power port using a unique design technique with flat clamping feature. The SCOP5160DL-D22 supports IEC 61000-4-5 8/20 μ s surge up to 40 A with clamping voltage below 30 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: 22 V
- Transient protection
IEC 61000-4-2: ± 17 kV (contact)
IEC 61000-4-5: 40 A (8/20 μ s)
- Flat-clamping feature
- Capacitance: 85 pF

Applications

- Mobile phones
- Tablets
- PCs

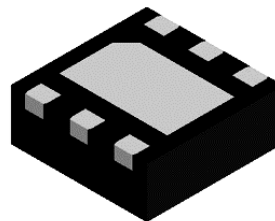
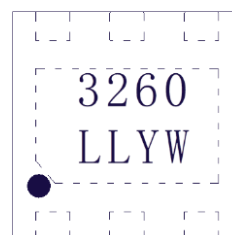


Figure 1 DFN2x2-6L (Bottom View)



3260 = Device code
Y = Year code
W = Week code
LL = Special code

Figure 2 Marking (Top View)

Order Information

Table 1 Order Information

Device	Package	Shipping
SCOP5160DL-D22	DFN2x2-6L	3000 / Tape&Reel

Pin Information

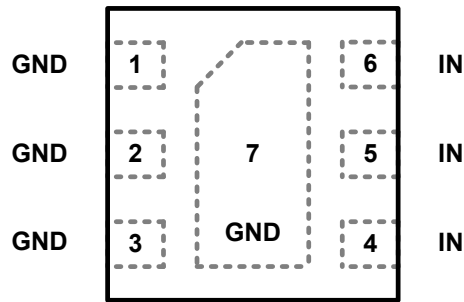


Figure 3 Pin Information (Top View)

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

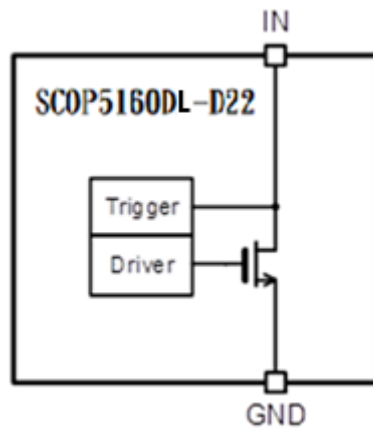


Figure 4 Functional Block Diagram

Typical Applications

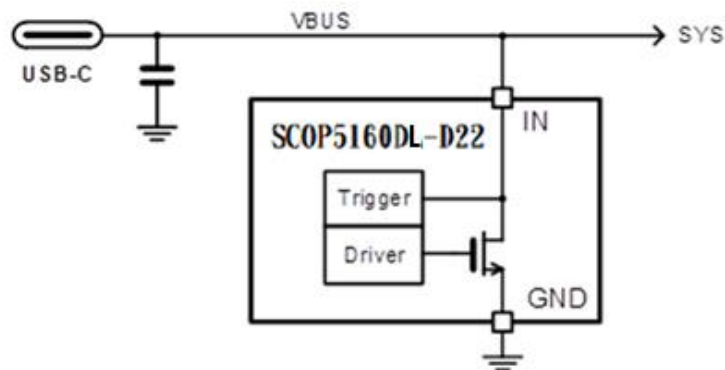


Figure 5 Application Information

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)	40		A
Maximum surge power	P _{PK}	IEC 61000-4-5 (8/20 μs)	1120		W
Maximum forward surge current	I _{FPP}	IEC 61000-4-5 (8/20 μs)	50		A
Maximum forward surge power	P _{FPP}	IEC 61000-4-5 (8/20 μs)	80		W
Number of repetitive strikes	N	IEC 61000-4-5 (8/20 μs) 35 A @ 125°C	5000		-
DC breakdown current	I _{BR}	-	18		mA
DC forward current	I _F	-	500		mA
Storage temperature	T _{STG}	-	-55	150	°C
Operating free-air temperature	T _A	-	-40	125	°C
Junction temperature	T _J	-	-55	150	°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	65.2	°C/W
R _{θJC(bottom)}	Junction-to-Case (Bottom) Thermal Resistance	12.5	°C/W
R _{θJB}	Junction-to-Board Thermal Resistance	35.4	°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}	-	22	V

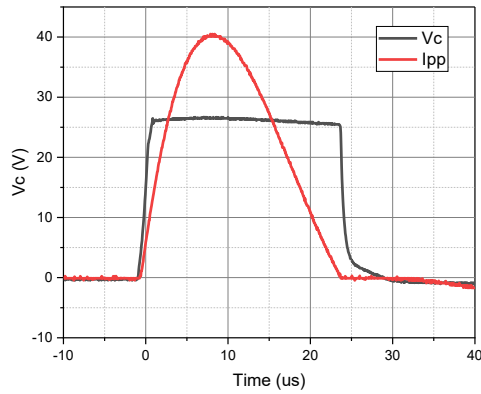
Electrical Characteristics

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

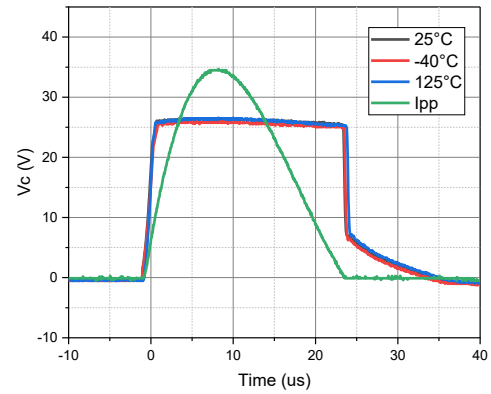
Table 5

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse stand-off voltage	$V_{RWM}^{[1]}$	-	-0.5	-	22	V
Leakage current	I_{LEAK}	$V_{IN} = V_{RWM}, T_A = 25^\circ\text{C}$	-	3	-	nA
		$V_{IN} = V_{RWM}, T_A = 85^\circ\text{C}^{[1]}$	-	15	-	nA
		$V_{IN} = V_{RWM}, T_A = 105^\circ\text{C}^{[1]}$	-	50	-	nA
Forward voltage	V_F	$I = 1\text{ mA}$ from GND to IN	-	0.5	-	V
Break-down voltage	V_{BR}	$I = 1\text{ mA}$ from IN to GND	-	25.9	-	V
Forward clamp voltage	$V_{FCLAMP}^{[1]}$	40 A IEC 61000-4-5 Surge (8/20 μs) from GND to IN	-	2	-	V
Clamp voltage	$V_{CLAMP}^{[1]}$	24 A IEC 61000-4-5 Surge (8/20 μs) from IN to GND with 0V bias	-	26.5	-	V
		40 A IEC 61000-4-5 Surge (8/20 μs) from IN to GND with 0V bias	-	27.1	-	V
		35 A IEC 61000-4-5 Surge (8/20 μs) from IN to GND with V_{RWM} bias, $T_A = 125^\circ\text{C}$	-	27	-	V
Dynamic resistance	$R_{DYN}^{[1]}$	Calculated from V_{CLAMP} at $0.5 \cdot I_{PP}$ and I_{PP} surge (8/20 μs) current levels	-	30	-	m Ω
Input pin capacitance	$C_{IN}^{[1]}$	$V_{IN} = V_{RWM}$, $f = 1\text{ MHz}$, 30 mV _{PP} , IN to GND	-	85	-	pF
Maximum slew rate	$SR^{[1]}$	0 V_{RWM} rising edge, sweep rise time and measure slew rate when $I_{PK} = 1\text{ mA}$	-	2.5	-	V/ μs
		0 V_{RWM} rising edge, sweep rise time and measure slew rate when $I_{PK} = 1\text{ mA}$, 105°C	-	0.7	-	V/ μs

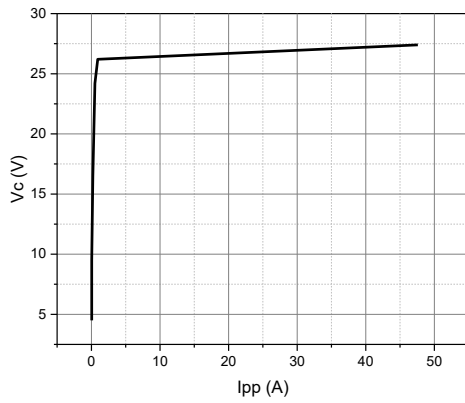
Note 1: Guaranteed by design



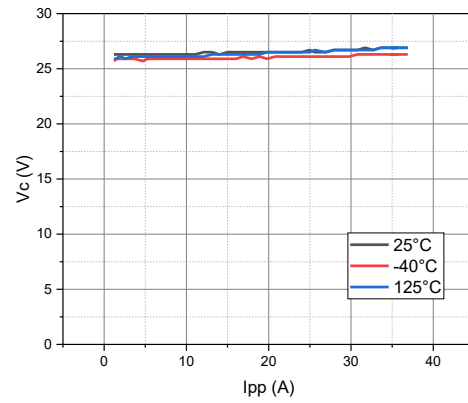
Clamping Voltage vs. Peak Pulse Current at 40 A



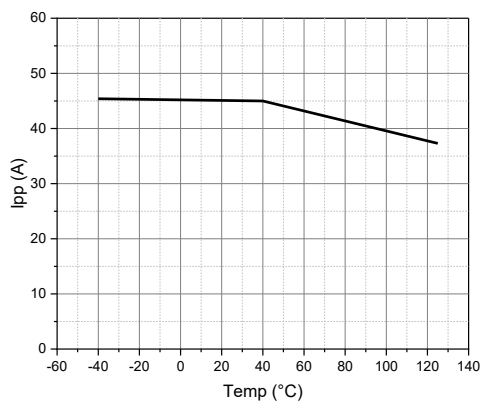
Clamping Voltage vs. 35 A I_{pp} across Temperature



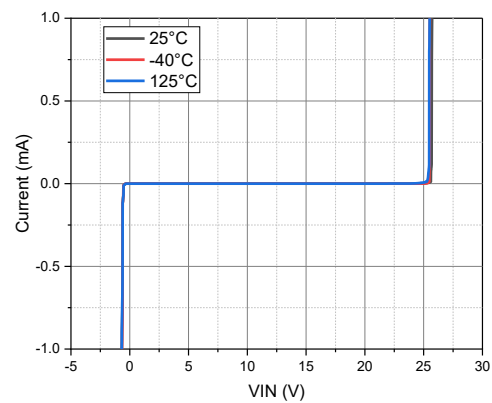
Clamping Voltage vs. Peak Pulse Current



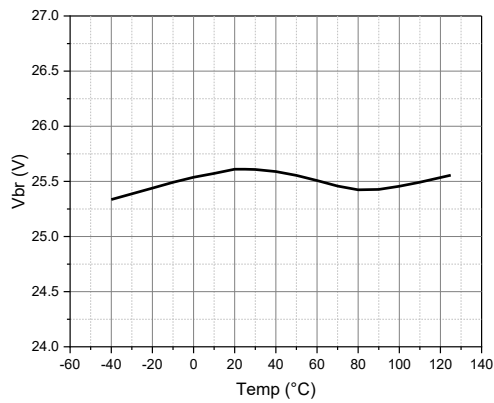
Clamping Voltage vs. I_{pp} across Temperature



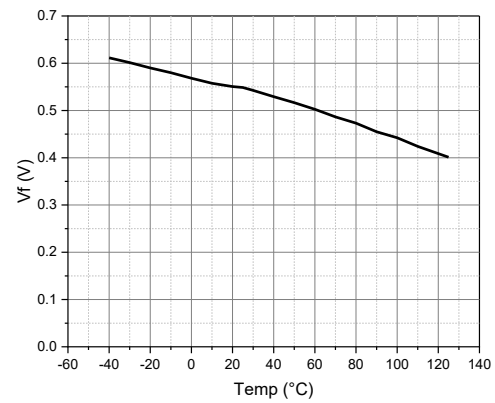
Peak Pulse Current vs. Temperature



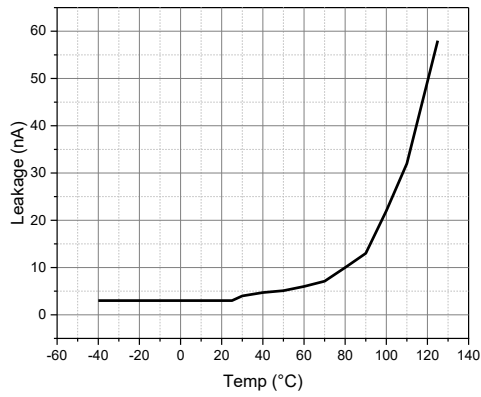
IV across Temperature



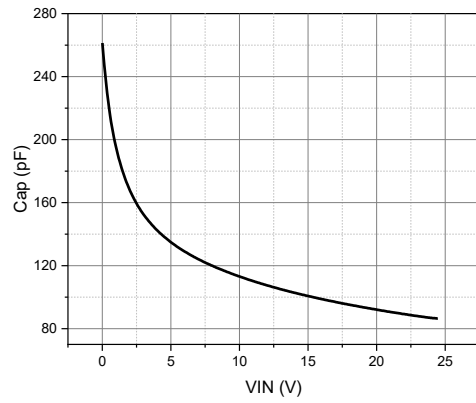
Breakdown Voltage vs. Temperature



Forward Voltage vs. Temperature



Leakage Current vs. Temperature at 22 V



Capacitance vs. Temperature at 22 V

PCB Layout Guide

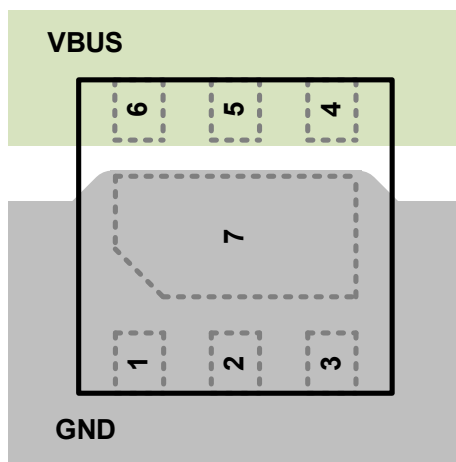
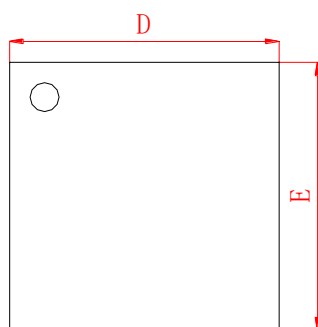
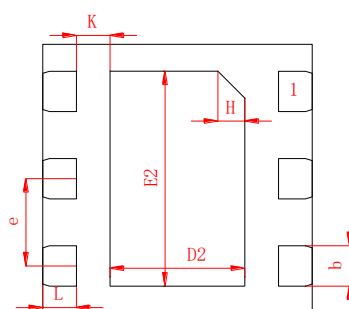


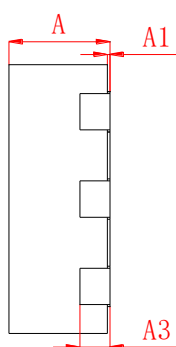
Figure 6 Layout Example (Top of the PCB)

Package Outline Dimensions
DFN2x2-6L


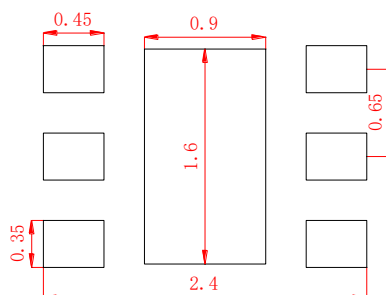
TOP VIEW



BOTTOM VIEW

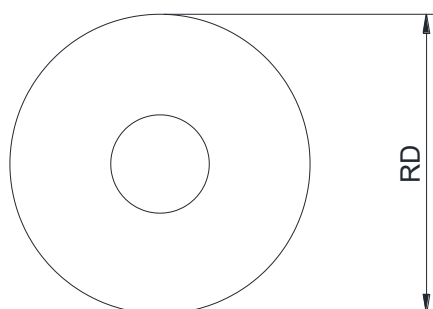
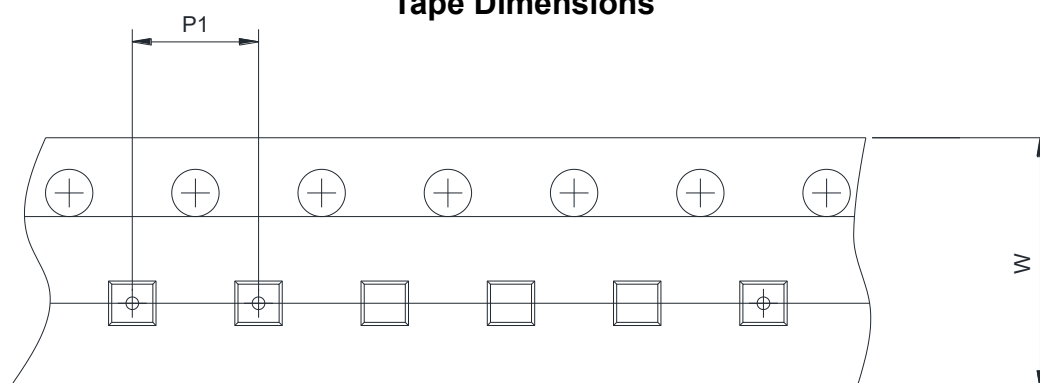
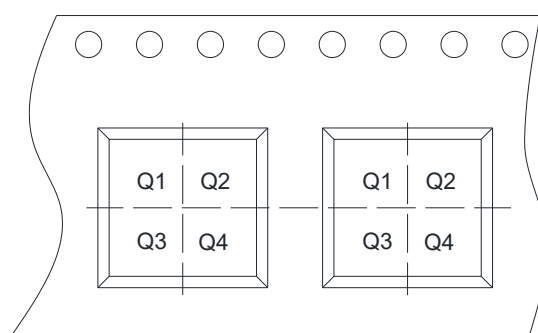


SIDE VIEW



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


➔
User Direction of Feed

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