SGM05FB2E2
Femto-Farad Capacitance 2-Channel ESD Protection

GENERAL DESCRIPTION

The SGM05FB2E2 is a low capacitance ESD protection device designed to protect circuits from electrostatic discharge.

FEATURES

- **High ESD Withstand Voltage:**
  - **IEC 61000-4-2: ±18kV (Air)**
  - **IEC 61000-4-2: ±16kV (Contact)**
- **Rated Peak Pulse Current: 2.5A**
- **Channel Input Capacitance: 0.3pF (TYP)**
- **Low Profile Package: UTDFN-1×0.6-3L**
- **Working Voltage: 5V and Below**

APPLICATIONS

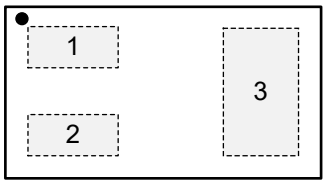
Thunderbolt
HDMI
USB3.0
Display Port Interface
IEEE 1394
10/100Mbit/s Ethernet
Desktop and Notebooks

PRODUCT SUMMARY

V_{RWM} (MAX)	I_{PP} (TYP)	C_{IN} (TYP)
5V	2.5A	0.3pF

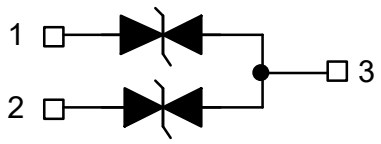
PIN CONFIGURATIONS

(TOP VIEW)



UTDFN-1×0.6-3L

EQUIVALENT CIRCUIT



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNITS
Peak Pulse Current (t_P = 8/20μs)	I_{PP}	2.5	A
ESD IEC 61000-4-2 (Air)	V_{ESD}	±18	kV
ESD IEC 61000-4-2 (Contact)		±16	
Operating Temperature Range	T_{OP}	-40 to 125	℃
Storage Temperature Range	T_{STG}	-55 to150	℃
Lead Temperature (Soldering, 10s)		+260	℃

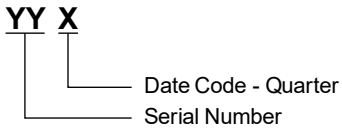
Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM05FB2E2	UTDFN-1×0.6-3L	-40℃ to +125℃	SGM05FB2E2XUEM3G/TR	01X	Tape and Reel, 10000
			SGM05FB2E2XUEM3DG/TR	01X	Tape and Reel, 10000

MARKING INFORMATION

NOTE: X = Date Code.



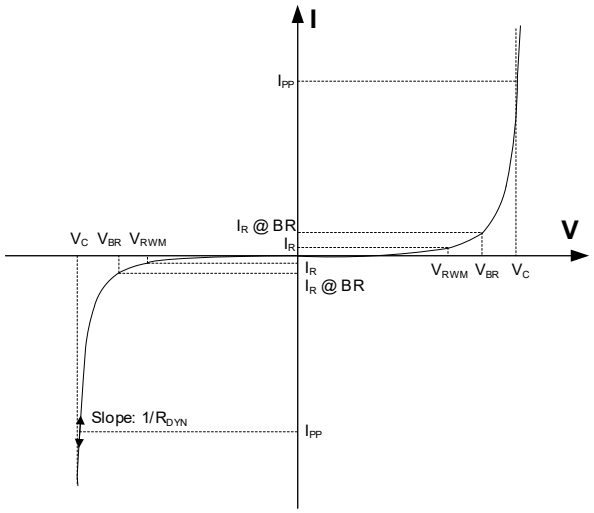
Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

ELECTRICAL PARAMETERS

SYMBOL	PARAMETER
V_{RWM}	Reverse Stand-Off Voltage
V_{BR}	Reverse Breakdown Voltage
I_R	Reverse Leakage Current
I_R @ BR	Reverse Leakage Current @ Breakdown
V_C	Clamping Voltage @ I_{PP}
I_{PP}	Peak Pulse Current
R_{DYN}	Dynamic Resistance



ELECTRICAL CHARACTERISTICS

(T_A = +25℃, unless otherwise noted.)

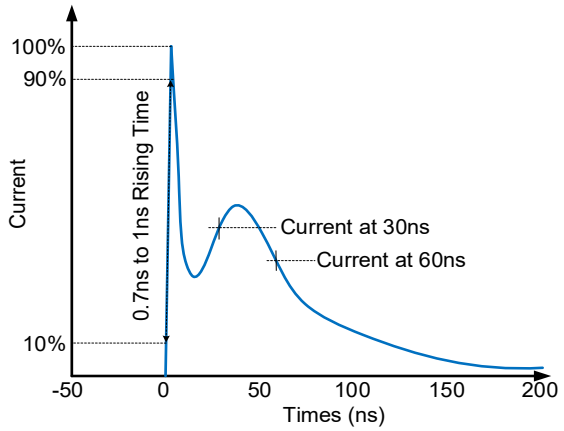
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Reverse Stand-Off Voltage	V_{RWM}	I/O to I/O			5	V
Reverse Breakdown Voltage	V_{BR}	I_R = 1mA, I/O to I/O	6	7.2	8.5	V
Reverse Leakage Current	I_R	V_R = 5V, I/O to I/O			500	nA
Channel Input Capacitance	C_{IN}	V_R = 0V, f = 1MHz, I/O to I/O		0.3	0.35	pF
Surge Clamping Voltage (1)	V_{C_SURGE}	I_{PP} = 2.5A		11.9		V
ESD Clamping Voltage (2)	V_C	I_{TLP} = 8A, t_P = 100ns		16.6		V
		I_{TLP} = 16A, t_P = 100ns		25.4		
Dynamic Resistance (2)	R_{DYN}	t_P = 100ns		1.1		Ω

NOTES:

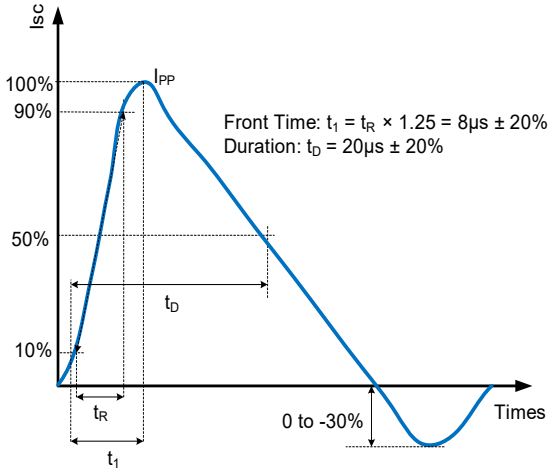
1. Non-repetitive current pulse 8/20μs exponential decay waveform according to IEC 61000-4-5, 2Ω source impedance.
2. Non-repetitive current pulse. Transmission line pulse (TLP) t_P = 100ns, square pulse.

TYPICAL PERFORMANCE CHARACTERISTICS

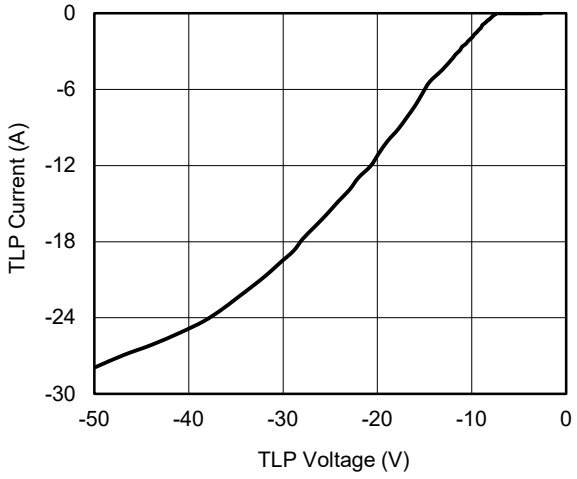
ESD Pulse Waveform per IEC 61000-4-2



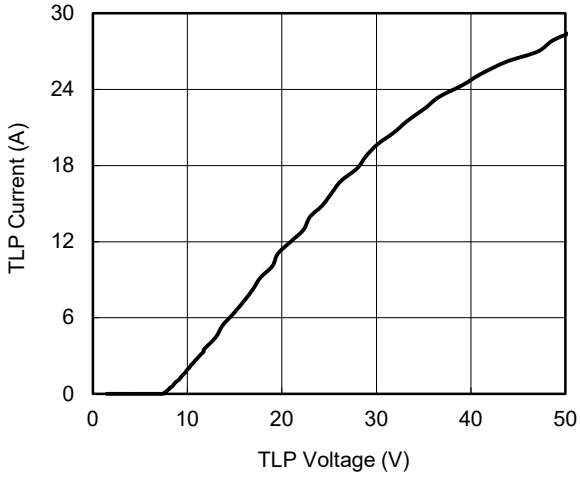
8/20μs Waveform per IEC 61000-4-5



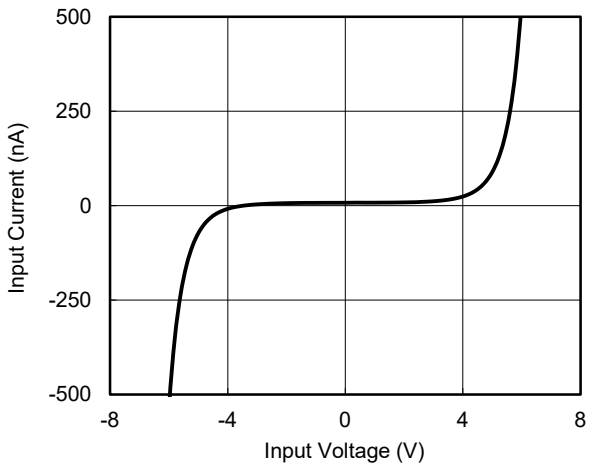
TLP_Pin1 (-) to Pin2 (+)



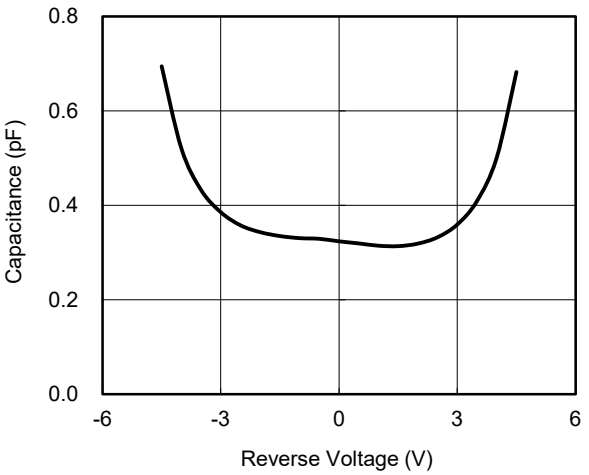
TLP_Pin1 (+) to Pin2 (-)



IV Curve

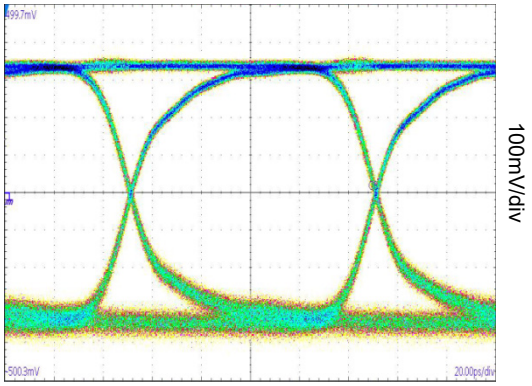


Capacitance vs. Reverse voltage



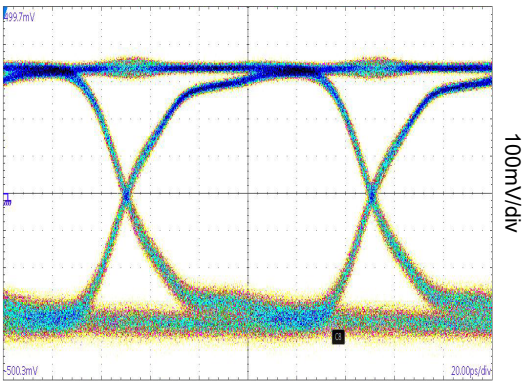
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

USB3.x Eye Diagram without SGM05FB2E2
10Gbps, 800mVpp, Test Board Only



Time (20ps/div)

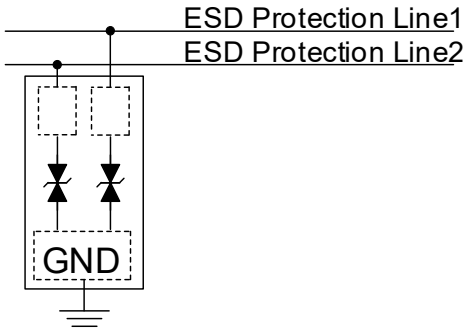
USB3.x Eye Diagram with SGM05FB2E2 10Gbps,
800mVpp, Test Board + SGM05FB2E2



Time (20ps/div)

APPLICATION INFORMATION

The SGM05FB2E2 is applied to offer a bidirectional line in order to eliminate ESD events on high-speed signals. The device is a good choice for lines with positive and negative signal polarity relative to the ground.



The recommended guidelines are as follows:

1. **TVS Placement**
   Place the TVS as close as possible to the input connector.
2. **TVS's Trace Layout**
   Avoid running protected traces in parallel with unprotected traces.
   Minimize the path length between the TVS and the protected line.
   Minimize parallel signal path length.
   Route the protected traces as straight as possible.
3. **GND Layout**
   Avoid using a common ground point shared with the TVS transient return path.
   Minimize the length of the TVS transient return path to ground.
   Use ground vias as close as possible to the TVS transient return to ground.

REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

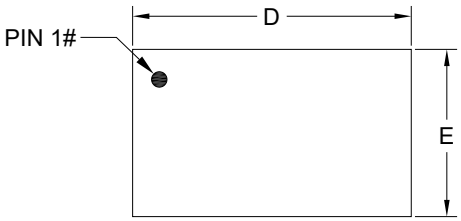
JANUARY 2026 – REV.A.1 to REV.A.2	Page
Updated product summary	1
Updated package/ordering information	2
Updated electrical characteristics	3
Updated package outline dimensions	7
Updated tape and reel information	8

APRIL 2024 – REV.A to REV.A.1	Page
Added typical performance characteristics figures	All

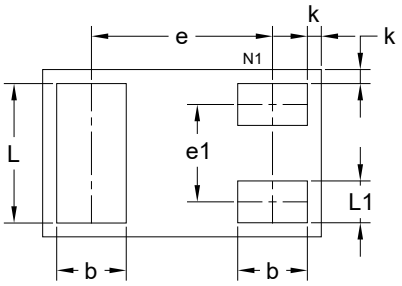
Changes from Original to REV.A (DECEMBER 2023)	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

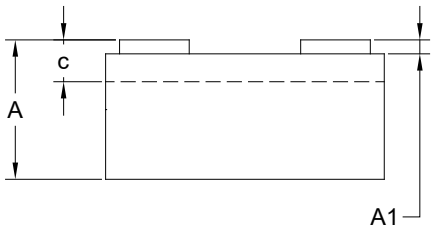
UTDFN-1×0.6-3L



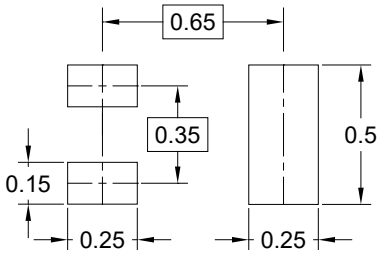
TOP VIEW



BOTTOM VIEW



SIDE VIEW



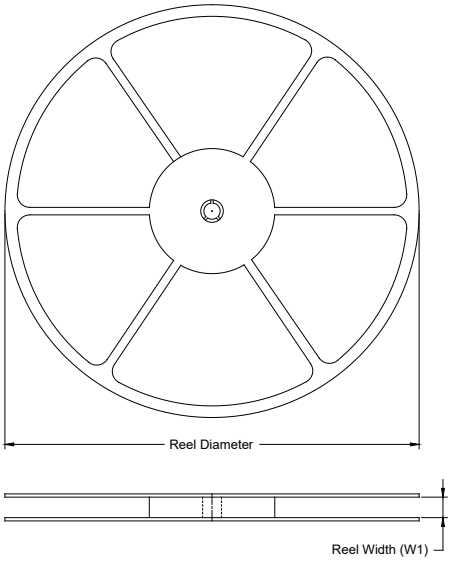
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.400	0.500	0.550
A1	0.000	-	0.050
b	0.200	0.250	0.300
c	0.120	0.150	0.180
D	0.950	1.000	1.050
E	0.550	0.600	0.650
e	0.650 BSC		
e1	0.350 BSC		
k	0.050 REF		
L	0.450	0.500	0.550
L1	0.100	0.150	0.200

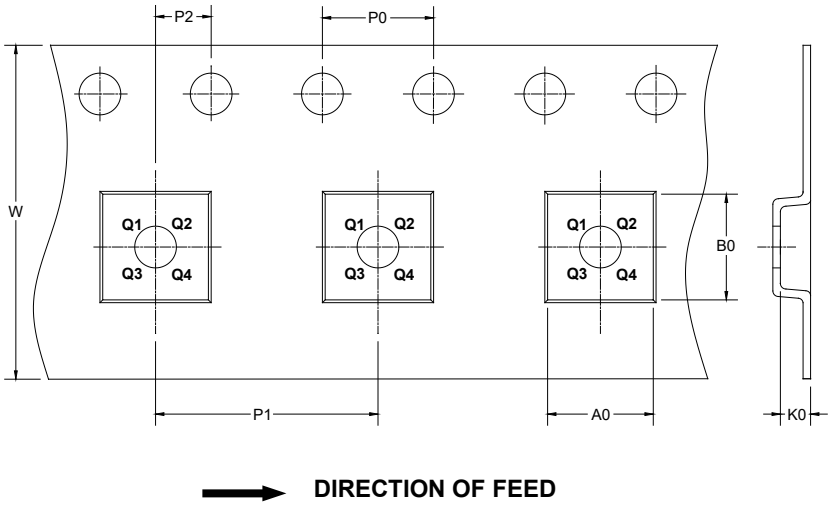
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



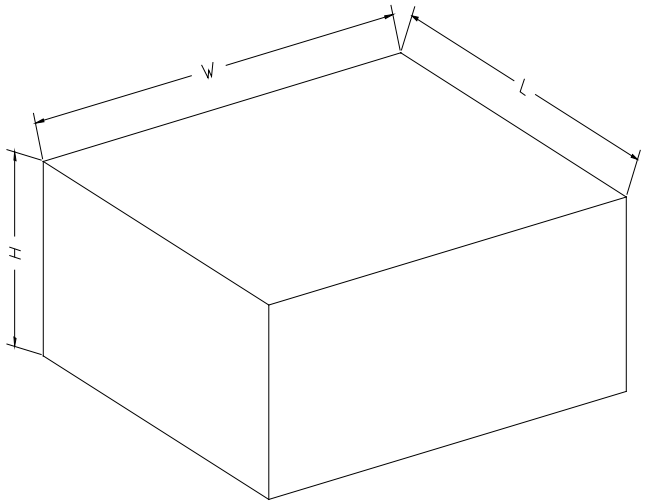
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Ordering Number	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SGM05FB2E2XUEM3G/TR	7"	8.6	0.70	1.15	0.57	4.0	2.0	2.0	8.0	Q2
SGM05FB2E2XUEM3DG/TR	7"	8.6	0.70	1.15	0.57	4.0	2.0	2.0	8.0	Q3

DD0001

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7″ (Option)	368	227	224	8
7″	442	410	224	18

DD0002