SGM260421
High-Integration PMIC with 4 Bucks, 2 LDOs and Load Bypass Switches

GENERAL DESCRIPTION

The SGM260421 is a highly-integrated multi-channel power management circuit. It supports a variety of microcontrollers and solid-state drive applications. It incorporates four Bucks and two LDOs that deliver several output voltage levels. Buck1 and two LDOs can be set as a load switch while Buck4 can be set as an LDO. The device has several default configurations which are programmed in the factory. Startup sequencing, turn-on delay, extra delay, turn-off delay, wake-up delay, voltage of each channel, soft-start time, SLEEP or DPSLP state, operating modes, and other settings can all be configured.

SGM260421 supplies 8 configurable GPIOs for system hardware control requirements. These GPIOs can be programmed for a variety of functions, including nIRQ, SYSMON, SYSWARN, EXT_EN, I^2C controlled output, PG of internal rail, SLEEP/PWREN, PWRDIS, EN of internal rail. Otherwise, GPIO2 - GPIO4 can support three-state status for configuring the default output voltage, regulators operation mode, and extra turn-on delay times.

The SGM260421 is available in Green WLCSP-2.69×2.69-36B, FOCSP-3.35×3.1-34B and TBGA-3.35×3.1-34B packages.

APPLICATIONS

Solid-State Drives
FPGA
Microcontroller Applications
Personal Navigation Devices

FEATURES

- **Input Voltage Range: 2.7V to 5.5V**
- **Advanced PMIC:**
  - **Buck1: 1.7V to 2.9V, 20mV/Step, 4A, Configurable Bypass Function**
  - **Buck2: 0.5V to 1.33V, 10mV/Step, 3A**
  - **Buck3: 0.5V to 1.3V, 10mV/Step, 4A**
  - **Buck4: 0.8V to 2.0V, 10mV/Step, 2A, Configurable 400mA LDO**
  - **LDO1: 1V to 2.7V, 50mV/Step, 400mA, Configurable 400mA LSW**
  - **LDO2: 1V to 2.7V, 50mV/Step, 400mA, Configurable 400mA LSW**
  - **ACOT Control for Bucks**
- **Ultra-Low Quiescent Current**
- **Buck1 and LDO1, LDO2 Bypass Mode**
- **Flex Configurable**
  - **Output Voltage**
  - **Soft-Start Time**
  - **Startup Sequence**
  - **Switching Frequency**
  - **Current Limit**
  - **Status Reporting and Controllability via I^2C**
  - **8 Programmable GPIOs**
  - **Seamless Sequencing of External Supplies**
  - **Multiple SLEEP Modes**
- **I^2C Interface up to 3.4MHz**
- **Input OV/UV Protection**
- **Output OV/UV Protection**
- **Thermal Shutdown Protection**

PACKAGE/ORDERING INFORMATION

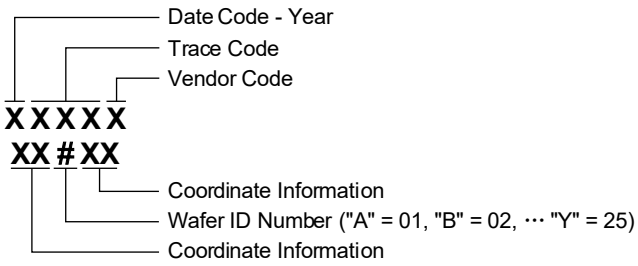
MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM260421-001	TBGA-3.35×3.1-34B	-40℃ to +125℃	SGM260421-001XTBAE34G/TR	SGM21R TBAE34 XXXXX	Tape and Reel, 5000
SGM260421-002	WLCSP-2.69×2.69-36B	-40℃ to +125℃	SGM260421-002XG/TR	SGM 24E XXXXX XX#XX	Tape and Reel, 3000
SGM260421-003	FOCSP-3.35×3.1-34B	-40℃ to +125℃	SGM260421-003XG34/TR	24K XXXXX XX#XX	Tape and Reel, 5000
	TBGA-3.35×3.1-34B	-40℃ to +125℃	SGM260421-003XTBAE34G/TR	SGM27Z TBAE34 XXXXX	Tape and Reel, 5000
SGM260421-004	TBGA-3.35×3.1-34B	-40℃ to +125℃	SGM260421-004XTBAE34G/TR	SGM2C4 TBAE34 XXXXX	Tape and Reel, 5000
SGM260421-006	TBGA-3.35×3.1-34B	-40℃ to +125℃	SGM260421-006XTBAE34G/TR	SGM27U TBAE34 XXXXX	Tape and Reel, 5000

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.

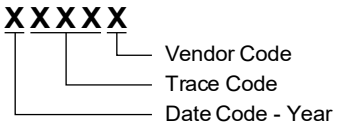
MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor Code. XX#XX = Coordinate Information and Wafer ID Number.

FOCSP-3.35×3.1-34B/WLCSP-2.69×2.69-36B



TBGA-3.35×3.1-34B



ABSOLUTE MAXIMUM RATINGS

All I/O and Power pins except PGND12, PGND34, AGND ..... -0.3V to 6V
Grounds: Any PGND referenced to AGND ..... -0.3V to 0.3V
SW_Bx to PGNDx..... -0.3V to 6V
SW_Bx to PGNDx (1ns Transient).....-2V
FB_Bx to AGND..... -0.3V to 6V
LDOx to AGND ..... -0.3V to 6V
Package Thermal Resistance
TBGA-3.35×3.1-34B, θ_{JA}..... 32.4℃/W
TBGA-3.35×3.1-34B, θ_{JB}..... 5.5℃/W
TBGA-3.35×3.1-34B, θ_{JC} ..... 21.5℃/W
WLCSP-2.69×2.69-36B, θ_{JA}..... 28.1℃/W
WLCSP-2.69×2.69-36B, θ_{JB}..... 4.5℃/W
WLCSP-2.69×2.69-36B, θ_{JC}..... 9.6℃/W
FOCSP-3.35×3.1-34B, θ_{JA} ..... 29.1℃/W
FOCSP-3.35×3.1-34B, θ_{JB} ..... 5.2℃/W
FOCSP-3.35×3.1-34B, θ_{JC} ..... 9.2℃/W
Junction Temperature.....+150℃
Storage Temperature Range .....-65℃ to +150℃
Lead Temperature (Soldering, 10s).....+260℃
ESD Susceptibility (1) (2)
HBM.....±2000V
CDM .....±500V

NOTES:

1. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.
2. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.

RECOMMENDED OPERATING CONDITIONS

AVIN, VIN_B1, VIN_B2, VIN_B3, VIN_B4 (1) .....2.7V to 5.5V
VIN_LDO1
LDO Mode.....1.62V to 5.5V
LSW Mode .....1.62V to AVIN
Operating Junction Temperature Range ..... -40℃ to +125℃

NOTE: 1. The maximum input voltage of the device must be AVIN at all times.

OVERSTRESS CAUTION

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. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

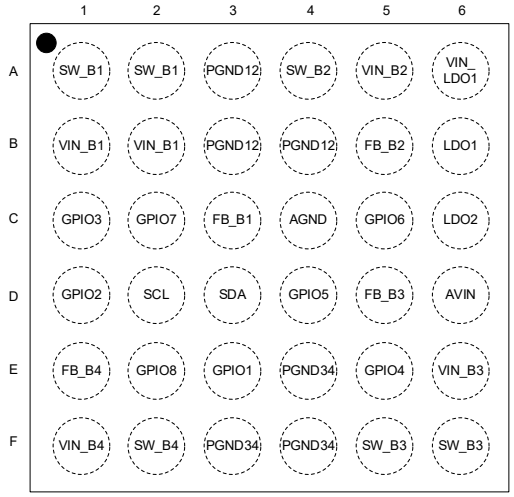
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

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

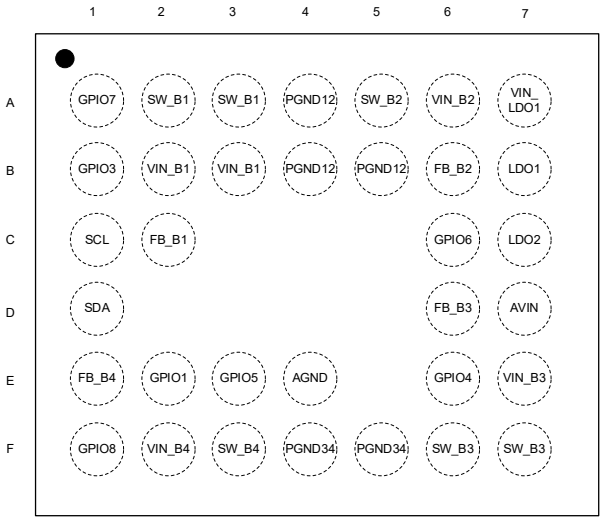
PIN CONFIGURATIONS

(TOP VIEW)



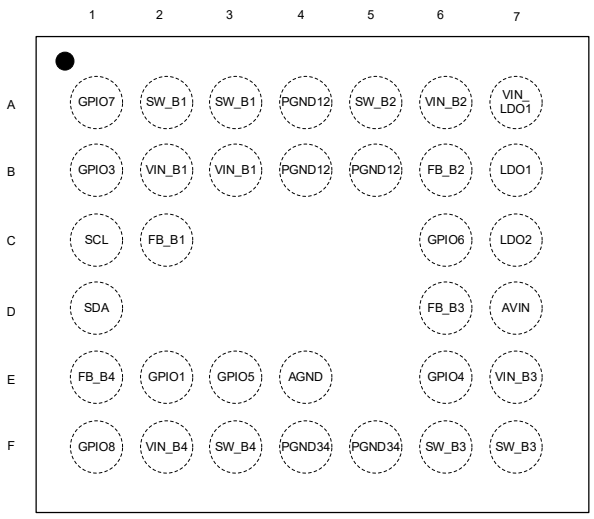
WLCSP-2.69×2.69-36B

(TOP VIEW)



FOCSP-3.35×3.1-34B

(TOP VIEW)



TBGA-3.35×3.1-34B

PIN DESCRIPTION

PIN		NAME	FUNCTION	
WLCSP	FOCSP/TBGA			
A3, B3, B4	A4, B4, B5	PGND12	Power Ground of Buck1 and Buck2.	The PGNDx pins are the dedicated power ground pins for the Buck converters, directly connecting to the low-side FETs of the Buck converters.
E4, F3, F4	F4, F5	PGND34	Power Ground of Buck3 and Buck4.	
C4	E4	AGND	Analog Ground. AGND is the analog ground pin for the analog circuitry and LDOs. It must be tied to the PGNDx pins, and this connection should not carry high currents.	
A1, A2	A2, A3	SW_B1	Switch Pin of Buck1.	SW_Bx are the switch nodes of the Buck converters, directly connected to the corresponding Buck inductor on the top PCB layer.
A4	A5	SW_B2	Switch Pin of Buck2.	
F5, F6	F6, F7	SW_B3	Switch Pin of Buck3.	
F2	F3	SW_B4	Switch Pin of Buck4.	
B1, B2	B2, B3	VIN_B1	VIN Power Input of Buck1.	Each Buck converter requires its VIN_Bx pin to be bypassed directly to the corresponding PGNDx pin on the top PCB layer using a high-quality ceramic capacitor.
A5	A6	VIN_B2	VIN Power Input of Buck2.	
E6	E7	VIN_B3	VIN Power Input of Buck3.	
F1	F2	VIN_B4	VIN Power Input of Buck4.	
C3	C2	FB_B1	Feedback of Buck1.	These are the feedback pins of the Buck regulators, which should be Kelvin-connected to the corresponding Buck output capacitors.
B5	B6	FB_B2	Feedback of Buck2.	
D5	D6	FB_B3	Feedback of Buck3.	
E1	E1	FB_B4	Feedback of Buck4.	
A6	A7	VIN_LDO1	VIN Power Input of LDO1. The dedicated input power pin for LDO1 is designated as VIN_LDO1. This pin must be bypassed directly to AGND on the top PCB layer using a 1μF ceramic capacitor.	
B6	B7	LDO1	Output of LDO1.	These are the LDO output pins. Each LDO output pin must be bypassed directly to AGND using a 1μF ceramic capacitor.
C6	C7	LDO2	Output of LDO2.	
D6	D7	AVIN	Analog Input Supply and Power Input of LDO2. This pin also monitors the VIN for over-voltage or under-voltage. AVIN is the input power pin for LDO2 and supplies power to the analog circuitry. It must be bypassed directly to AGND on the top PCB layer using a 1μF ceramic capacitor.	
D2	C1	SCL	I^2C Clock Input.	Standard I^2C interface pins for digital communication.
D3	D1	SDA	I^2C Data Input and Output.	
E3	E2	GPIO1	Configurable General Purpose I/O (Open-Drain or Push-Pull).	
D1	-	GPIO2		
C1	B1	GPIO3		
E5	E6	GPIO4		
D4	E3	GPIO5		
C5	C6	GPIO6		
C2	A1	GPIO7		
E2	F1	GPIO8		

TYPICAL APPLICATION CIRCUIT

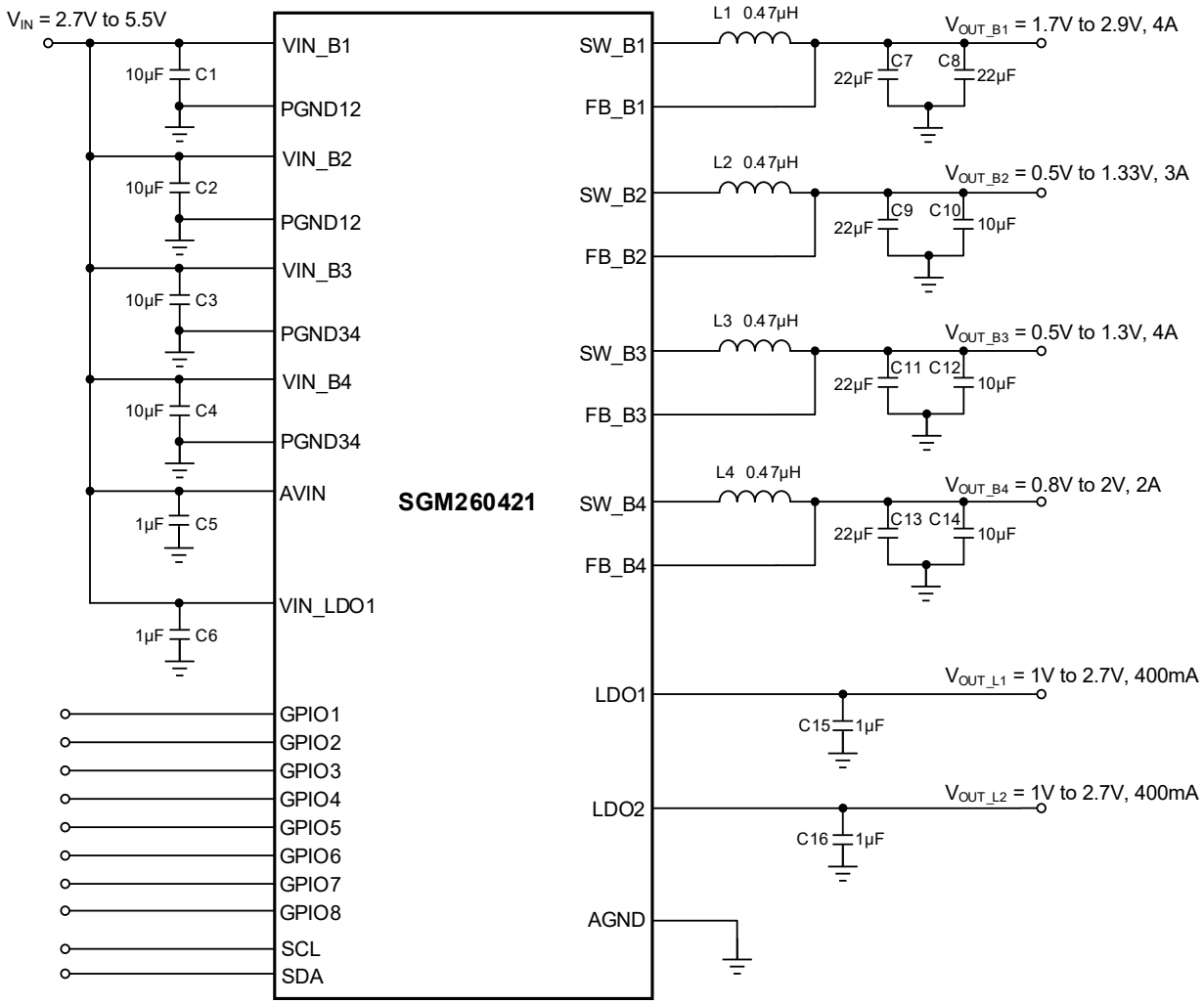


Figure 2. Typical Application Circuit

FUNCTIONAL BLOCK DIAGRAM

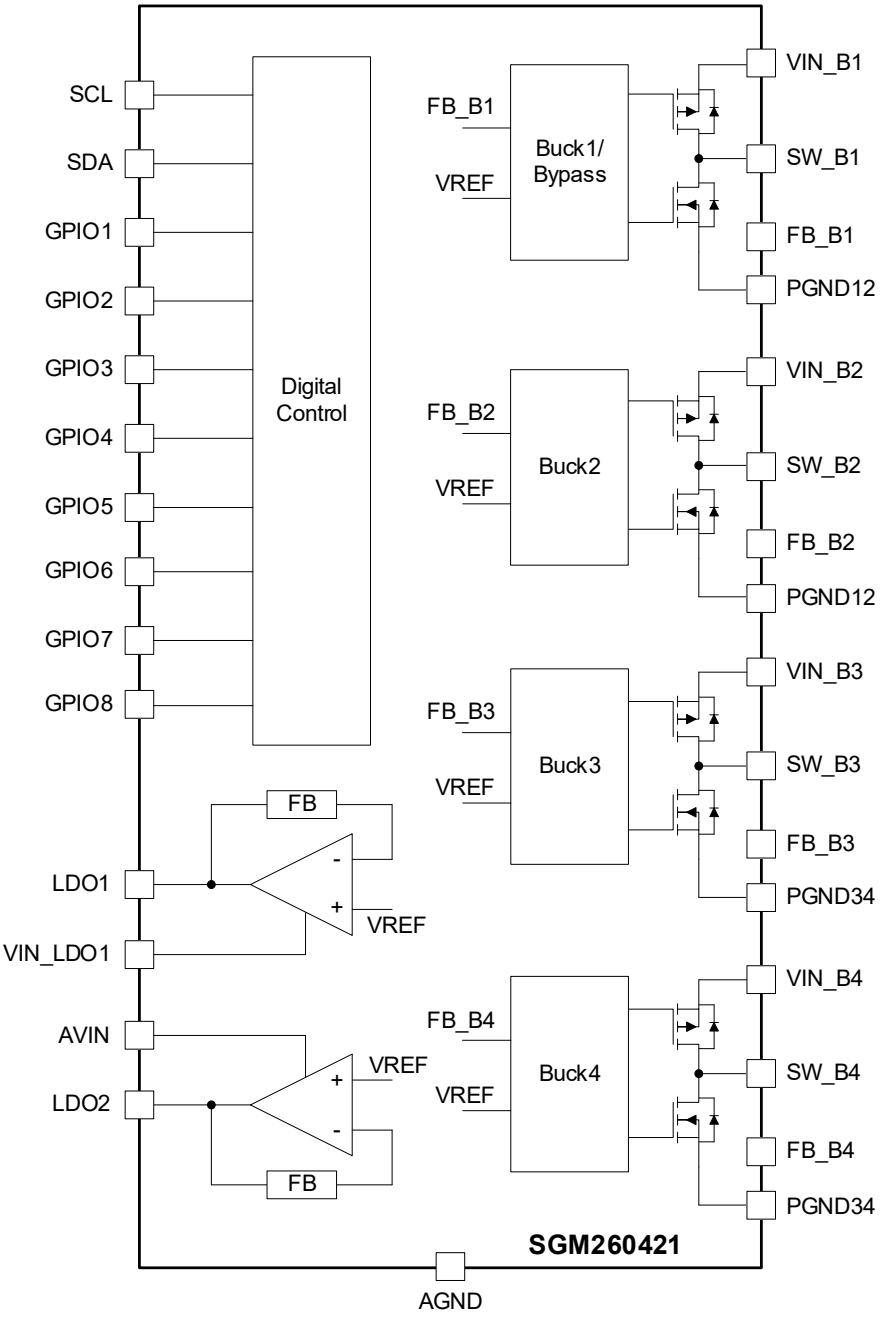
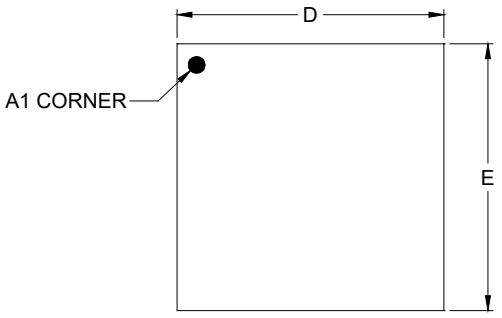


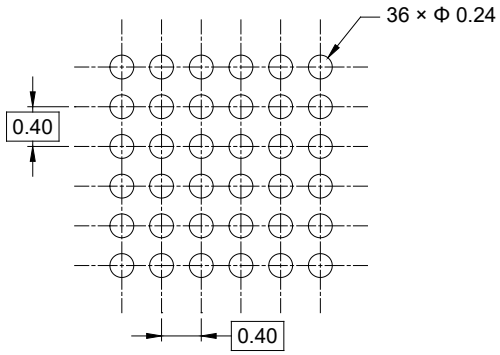
Figure 3. Block Diagram

PACKAGE OUTLINE DIMENSIONS

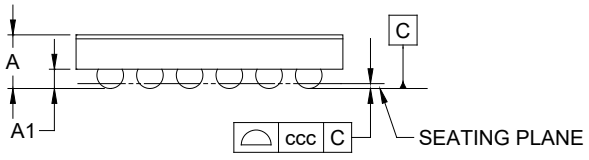
WLCSP-2.69×2.69-36B



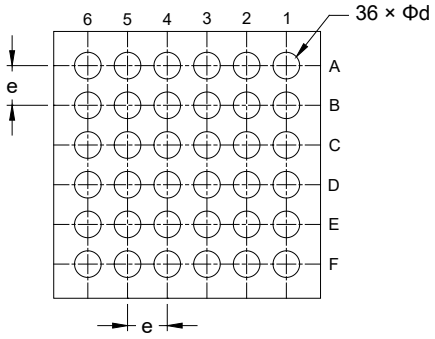
TOP VIEW



RECOMMENDED LAND PATTERN (Unit: mm)



SIDE VIEW



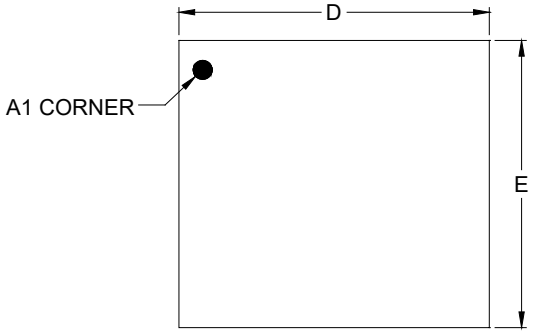
BOTTOM VIEW

Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	-	-	0.585
A1	0.174	-	0.214
D	2.658	-	2.718
E	2.658	-	2.718
d	0.238	-	0.298
e	0.400 BSC		
ccc	0.050		

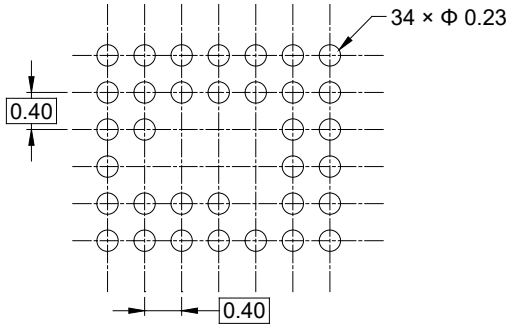
NOTE: This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

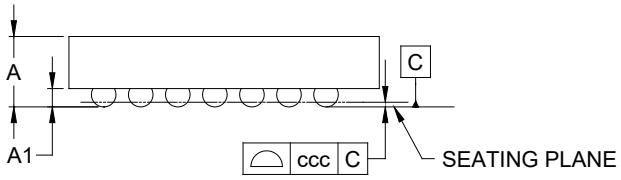
FOCSP-3.35×3.1-34B



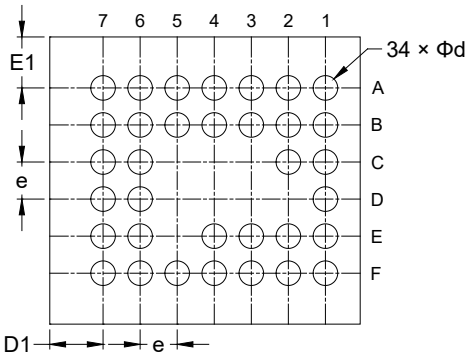
TOP VIEW



RECOMMENDED LAND PATTERN (Unit: mm)



SIDE VIEW



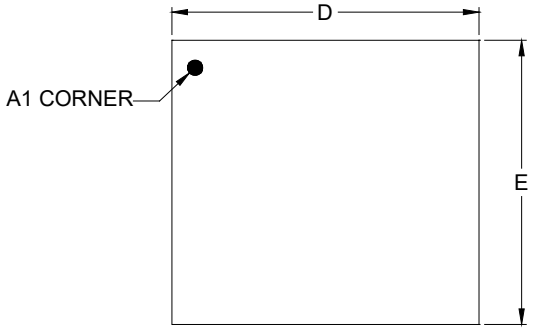
BOTTOM VIEW

Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	-	-	0.810
A1	0.178	-	0.218
D	3.300	-	3.400
D1	0.575 REF		
E	3.050	-	3.150
E1	0.550 REF		
d	0.235	-	0.295
e	0.400 BSC		
ccc	0.050		

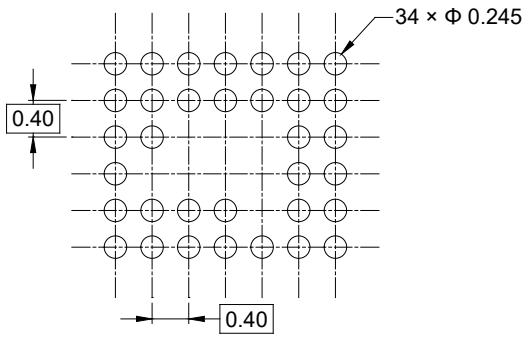
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PACKAGE OUTLINE DIMENSIONS

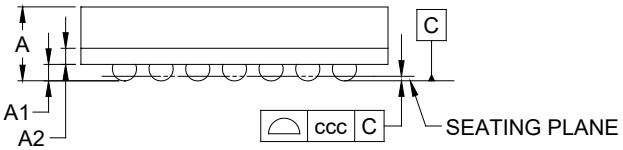
TBGA-3.35×3.1-34B



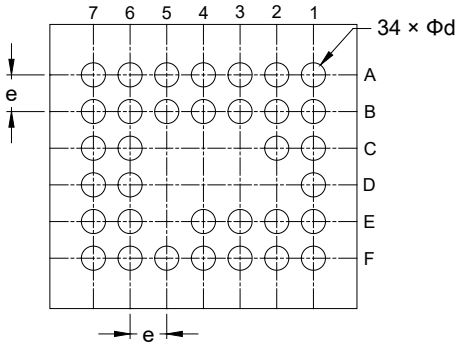
TOP VIEW



RECOMMENDED LAND PATTERN (Unit: mm)



SIDE VIEW



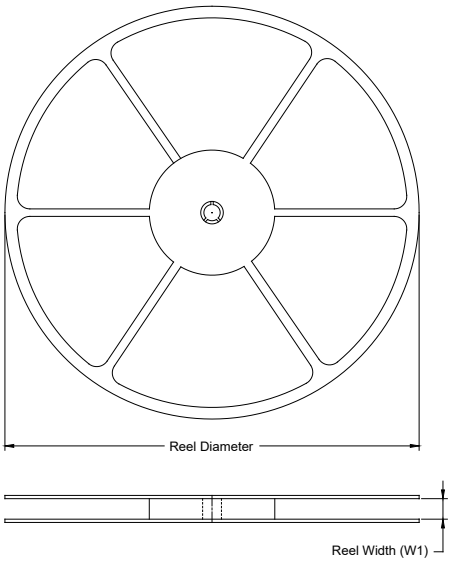
BOTTOM VIEW

Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	-	-	0.900
A1	0.130	-	0.230
A2	0.176 REF		
D	3.250	-	3.450
E	3.000	-	3.200
d	0.213	-	0.313
e	0.400 BSC		
ccc	0.080		

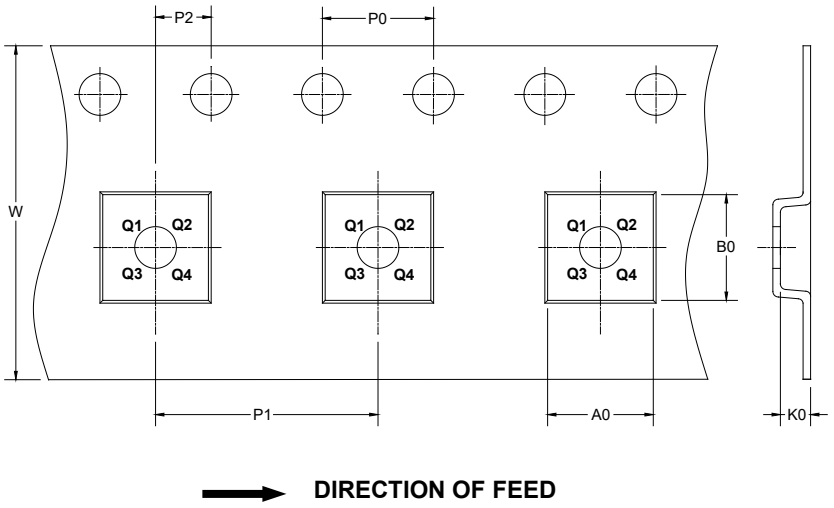
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



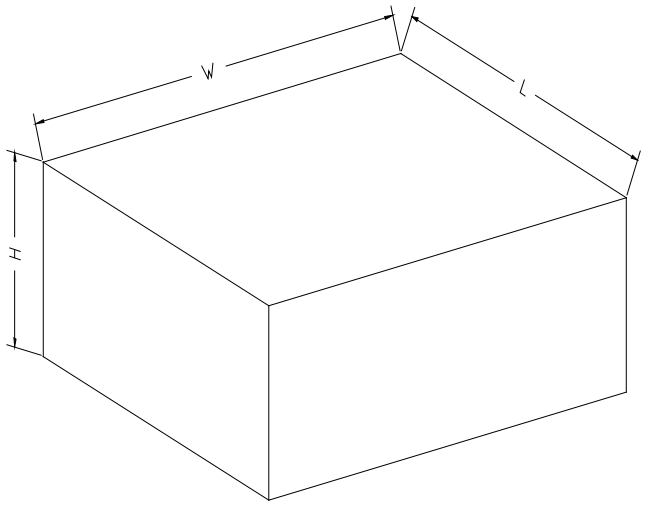
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
WLCSP-2.69×2.69-36B	7"	9.5	2.90	2.90	0.75	4.0	4.0	2.0	8.0	Q1
FOCSP-3.35×3.1-34B	13"	12.4	3.28	3.54	0.96	4.0	8.0	2.0	12.0	Q2
TBGA-3.35×3.1-34B	13"	12.4	3.40	3.65	1.15	4.0	8.0	2.0	12.0	Q2

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
13″	386	280	370	5

DD0002