Fully Integrated Power Management with Power Path and Battery Charger

Check for Samples: TWL6032

FEATURES

- Five highly efficient buck converters
  - One 3 MHz, 0.6 to 2.1 V @ 5.0 A, DVS-capable
  - One 6 MHz, 0.6 to 2.1 V @ 2.5 A, DVS-capable
  - Three 6 MHz, 0.6 to 2.1 V @ 1.1 A, one being DVS-capable
  - Extended mode for higher output voltages
- 11 general-purpose low-droput voltage regulators (LDOs)
  - Six 1.0 to 3.3 V @ 0.2 A with battery or preregulated supply:

    One can be used as vibrator driver.
  - One 1.0 to 3.3 V @ 50 mA with battery or preregulated supply
  - One low-noise 1.0 to 3.3 V @ 50 mA with battery or preregulated supply
  - One 3.3 V @ 100 mA USB LDO
  - Two LDOs for TWL6032 internal use
- USB OTG module:
  - ID detection, accessory charger adapter (ACA) support
  - Accessory detection protocol (ADP) support
- Backup battery charger
- 12-bit sigma-delta analog-to-digital converter (ADC) with 19 input channels:
  - Seven external input channels
- 13-bit Coulomb counter with four programmable integration periods
- Low power consumption:
  - 8 µA in BACKUP state
  - 20 µA in WAIT-ON state
  - 110 µA in SLEEP state, with two DC-DCs active
- Real-time clock (RTC) with timer and alarm wake-up:
  - Three buffered 32-kHz outputs
- SIM and SD/MMC card detections
- Two digital PWM outputs
- Thermal monitoring:
  - High-temperature warning
  - Thermal shutdown
- Control:
  - Configurable power-up and power-down sequences (OTP memory)
  - Configurable sequences between SLEEP and ACTIVE states (OTP memory)
  - Three digital output signals that can be included in the startup sequence to control external devices
  - Two inter-integrated circuit (I^2C™) interfaces
  - All resources configurable by I^2C
- System voltage regulator/battery charger with power path from USB:
  - Input current limit to comply with USB standard
  - 3-MHz switched-mode regulator with integrated power FET for up to 2.0-A current
  - Dedicated control loop for battery current and voltage
  - External low-ohmic FET for power path and battery charging
  - Boost mode operation for USB OTG
  - Supplement mode to deliver current from battery during power path operation
  - Charger for single-cell Li-Ion and Li-polymer battery packs
  - Safety timer and reset control
  - Thermal protection
  - Input/output overvoltage protection
  - Charging indicator LED driver
  - Compliant with:
    - USB 2.0
    - OTG and EH 2.0
    - USB battery charging 1.2
    - YD/T 1591-2006
    - Japanese battery charging guidelines (JEITA)

PRODUCT PREVIEW

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- **Battery voltage range from 2.5 to 5.5 V**
- **Package 5.21 mm × 5.36 mm 155-pin WCSP**

APPLICATIONS

- **Mobile phones and smart phones**
- **Tablets**
- **Gaming handsets**
- **Portable media players**
- **Portable navigation systems**
- **Handheld devices**

DESCRIPTION

The TWL6032 device is an integrated power-management integrated circuit (PMIC) for applications powered by a rechargeable battery. The device provides five configurable step-down converters with up to 5.0-A current capability for memory, processor core, I/O, auxiliary, preregulation for LDOs, etc. It also contains nine LDO regulators for external use that can be supplied from a battery or a preregulated supply. The power-up/power-down controller is configurable and can support any power-up/power-down sequence (programmed in OTP memory). The RTC provides three 32-kHz clock outputs, seconds, minutes, hours, day, month, and year information, as well as alarm wakeup and timer. The TWL6032 device supports 32-kHz clock generation based on a crystal oscillator.

The device integrates a switched-mode system supply regulator from a USB connector. It includes power paths from the USB and battery with supplemental mode for immediate startup, even with an empty battery. The battery switch uses an external low-ohmic PMOS transistor allowing minimal serial resistance during fast charging and when operating from battery. The device can also be used without the external PMOS transistor; the battery is then always tied to the system supply and the switched-mode regulator is used for battery charging.

The TWL6032 device is available in a 155-pin WCSP package, 5.21 mm × 5.36 mm with a 0.4-mm ball pitch.

Figure 1 shows the TWL6032 device block diagram.

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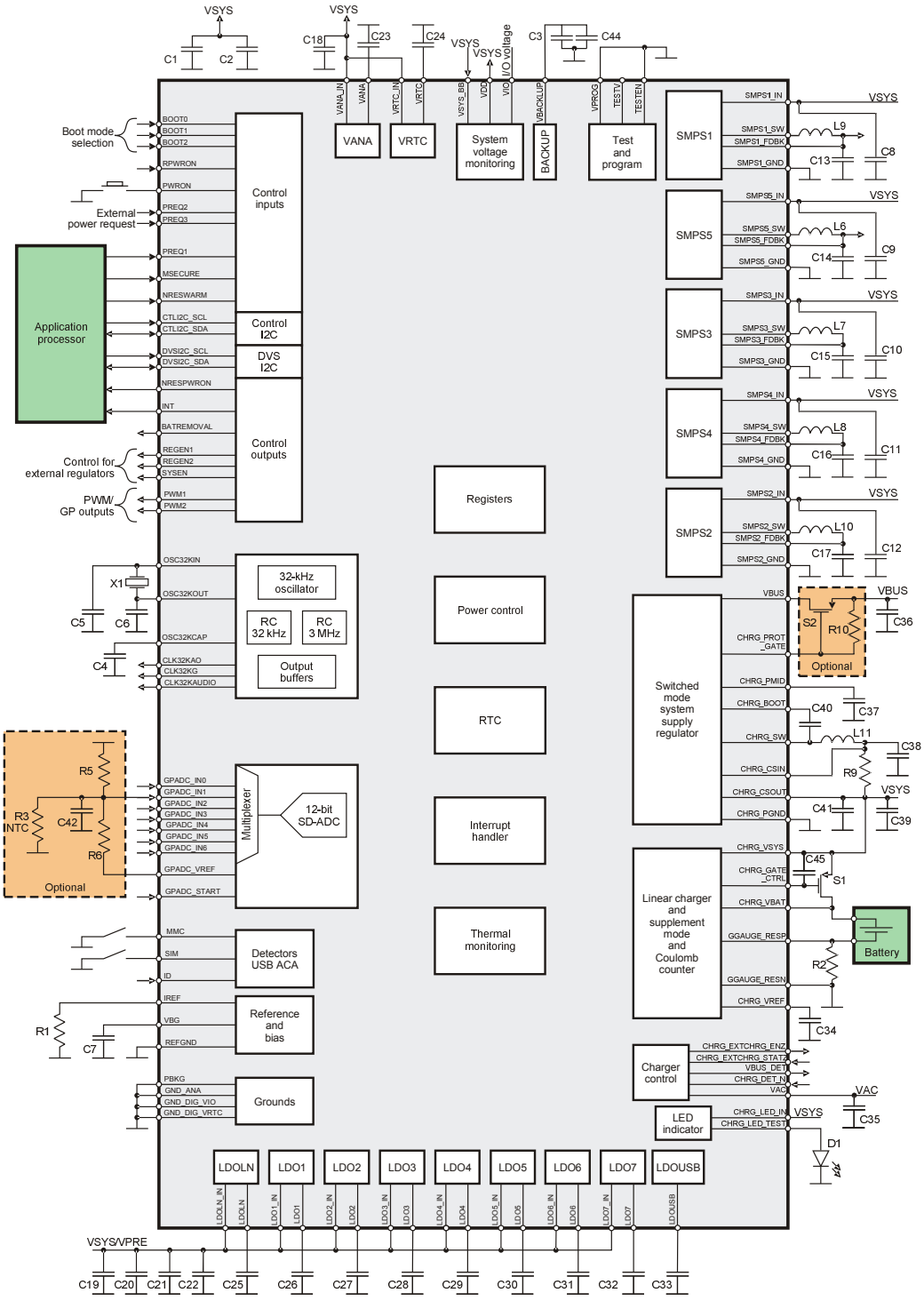

Figure 1. TWL6032 Device Block Diagram

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For the complete TWL6032 data sheet, contact your TI sales representative or omap4_companion@list.ti.com. The document is internally available for download on ESP under the corresponding TWL6032 product folders and can be shared with customers.

Table 1. Ordering Information

PART NUMBER	ORDERING(1)	Processor	Power Path	AUTOCHARGE OTP bit	
TWL6032	(P)TWL6032A1B0YFFR	OMAP4460	Yes	0	Reel, 2500 units
TWL6032	(P)TWL6032A1B0YFFT	OMAP4460	Yes	0	Reel, 250 units
TWL6032	(P)TWL6032A1B4YFFR	OMAP4470	Yes	1	Reel, 2500 units
TWL6032	(P)TWL6032A1B4YFFT	OMAP4470	Yes	1	Reel, 250 units
TWL6032	(P)TWL6032A1B6YFFR	OMAP4470	Yes	0	Reel, 2500 units
TWL6032	(P)TWL6032A1B6YFFT	OMAP4470	Yes	0	Reel, 250 units
TWL6032	(P)TWL6032A1B7YFFR	OMAP4470	No	0	Reel, 2500 units
TWL6032	(P)TWL6032A1B7YFFT	OMAP4470	No	0	Reel, 250 units

(1) The Ordering numbers starting with "PTWL6032..." are for Prototype devices. The Ordering numbers will be changed to start with "TWL6032..." when the device is released to market.

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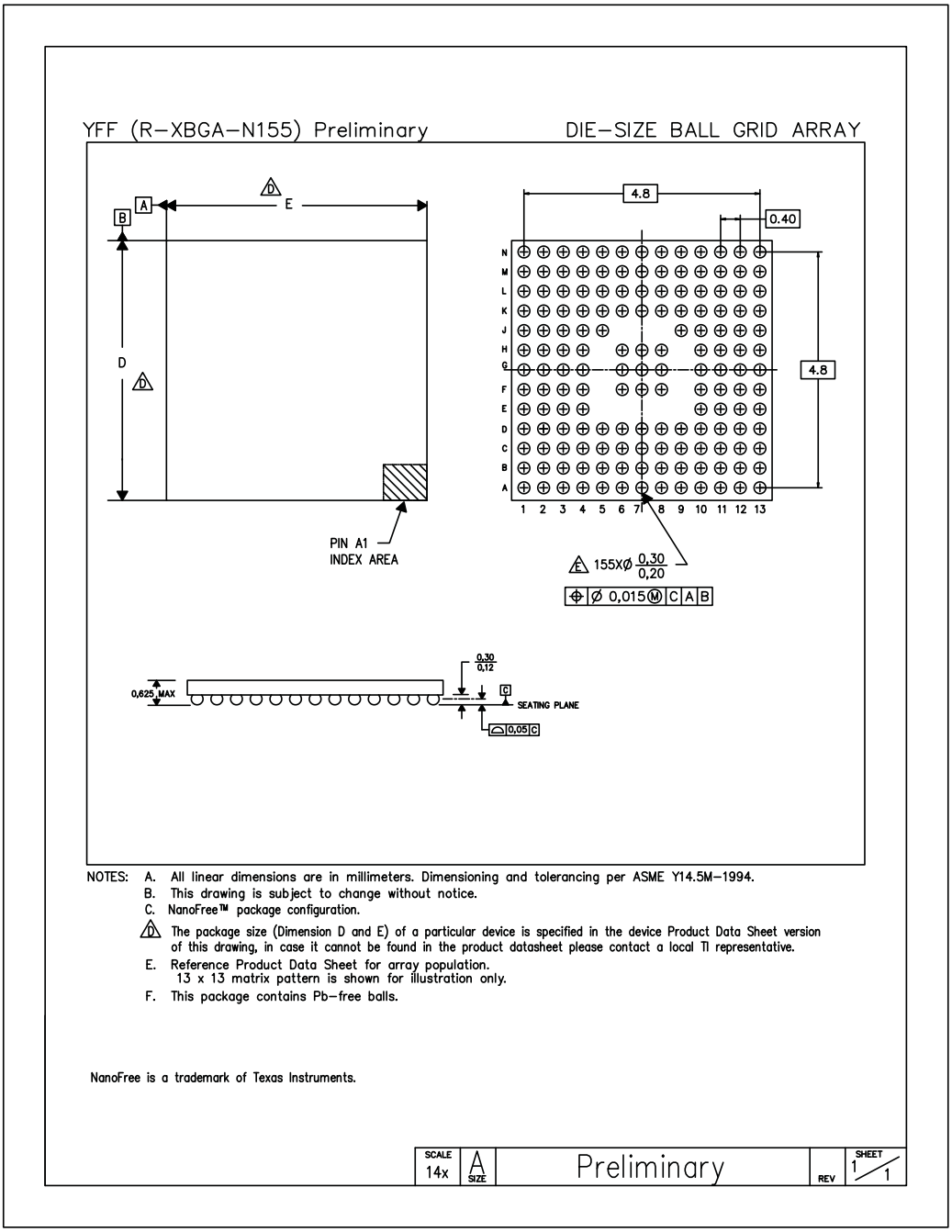
Package Information

Figure 2 shows the TWL6032 package.



Dimensions:

- D: 5364 µm (nominal), 5334 µm (minimum), 5394 µm (maximum)
- E: 5214 µm (nominal), 5184 µm (minimum), 5244 µm (maximum)

Figure 2. TWL6032 Package

PRODUCT PREVIEW

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/ Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
TWL6032A1B0YFFR	PREVIEW	DSBGA	YFF	155	3000	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	
TWL6032A1B0YFFT	PREVIEW	DSBGA	YFF	155	250	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	
TWL6032A1B4YFFR	ACTIVE	DSBGA	YFF	155	3000	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	
TWL6032A1B4YFFT	ACTIVE	DSBGA	YFF	155	250	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	
TWL6032A1B6YFFR	ACTIVE	DSBGA	YFF	155	3000	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	
TWL6032A1B6YFFT	ACTIVE	DSBGA	YFF	155	250	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	
TWL6032A1B7YFFR	PREVIEW	DSBGA	YFF	155	3000	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	
TWL6032A1B7YFFT	PREVIEW	DSBGA	YFF	155	250	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	
TWL6032A1BEYFFR	ACTIVE	DSBGA	YFF	155	3000	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	
TWL6032A1BEYFFT	ACTIVE	DSBGA	YFF	155	250	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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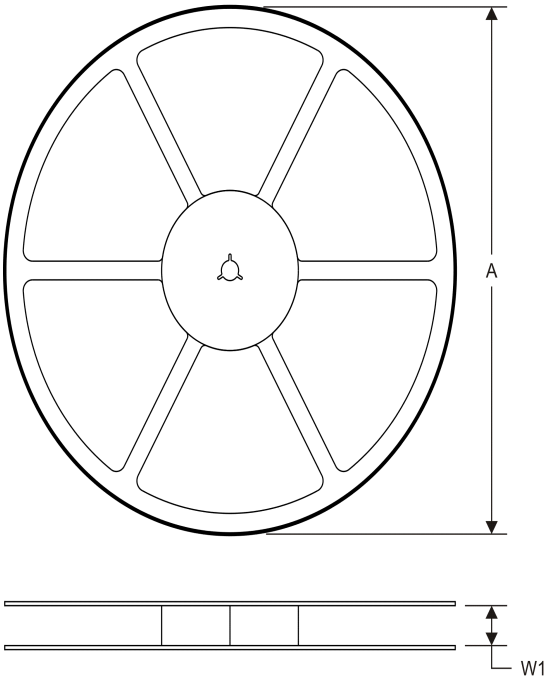
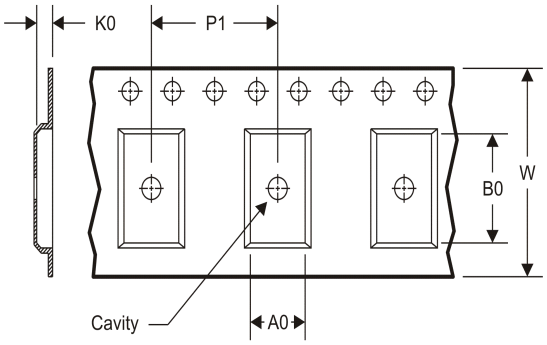
REEL DIMENSIONS



TAPE DIMENSIONS



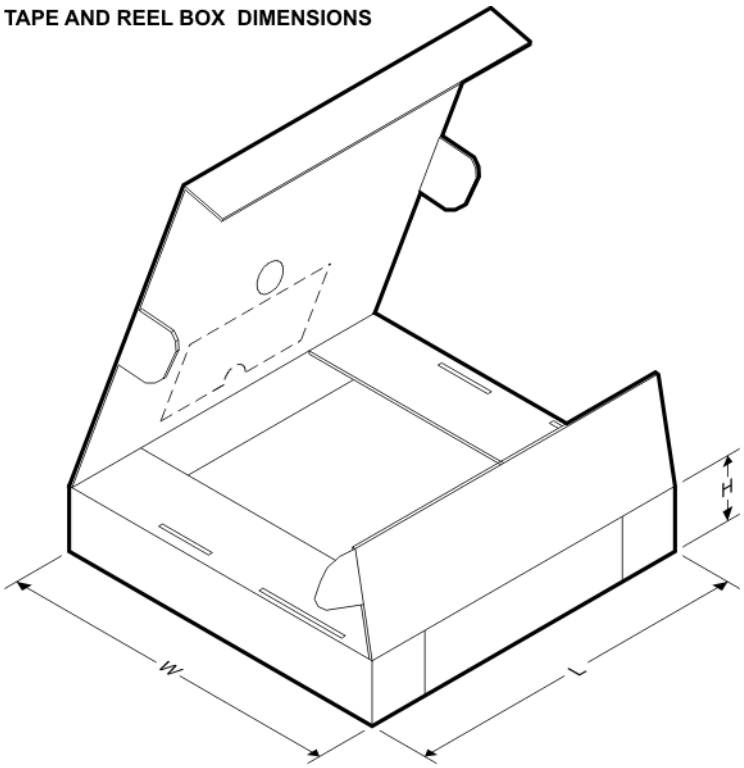
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

TAPE AND REEL INFORMATION

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TWL6032A1B4YFFR	DSBGA	YFF	155	3000	330.0	12.4	5.35	5.49	0.86	8.0	12.0	Q1
TWL6032A1B4YFFT	DSBGA	YFF	155	250	180.0	12.4	5.35	5.49	0.86	8.0	12.0	Q1
TWL6032A1B6YFFR	DSBGA	YFF	155	3000	330.0	12.4	5.35	5.49	0.86	8.0	12.0	Q1
TWL6032A1B6YFFT	DSBGA	YFF	155	250	180.0	12.4	5.35	5.49	0.86	8.0	12.0	Q1
TWL6032A1BEYFFR	DSBGA	YFF	155	3000	330.0	12.4	5.35	5.49	0.86	8.0	12.0	Q1
TWL6032A1BEYFFT	DSBGA	YFF	155	250	180.0	12.4	5.35	5.49	0.86	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TWL6032A1B4YFFR	DSBGA	YFF	155	3000	346.0	346.0	29.0
TWL6032A1B4YFFT	DSBGA	YFF	155	250	210.0	185.0	35.0
TWL6032A1B6YFFR	DSBGA	YFF	155	3000	346.0	346.0	29.0
TWL6032A1B6YFFT	DSBGA	YFF	155	250	210.0	185.0	35.0
TWL6032A1BEYFFR	DSBGA	YFF	155	3000	346.0	346.0	29.0
TWL6032A1BEYFFT	DSBGA	YFF	155	250	210.0	185.0	35.0

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