SPECIFICATION

Product Name	MEMS OSCILLATOR
Type	MO1532
Nominal Frequency	32.768kHz
Spec No.	1JAAL0032768AACX

If there is a change in this specifications, the specification number may be changed.

RECEIPT	
DATE	
RECEIVED	(signature) (name)

General Manufacturer of Quartz Devices

DAISHINKU CORP.

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C.ENG.   *T. Hanaki*

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KDS

ITEM: MEMS OSCILLATOR

PRODUCT TYPE: MO1532IL4-DCCM-YY-0032768D

NOMINAL FREQUENCY: 32.768kHz

Size: 1.5 x 0.8 mm

Spec No.:   1JAAL0032768AACX

Pb Free Products

Specification

Item	Ordering Code	Specification
Operation Temp.	I	-40 to +85℃
Size	L4	1.5 x 0.8 x 0.60Max. CSP 4Pads
Output 1	D	DC-Coupled
Output 2	C	Rail to Rail LVCMOS
Output 3	C	Rail to Rail LVCMOS
Freq. Deviation	M	100 ppm or ±100 ppm
Vdd	YY	Any Voltage 1.62 to 3.63V
Packing	D	8mm Tape & Reel, 3ku reel

MO1532
Smallest Footprint (1.2mm²) CSP,
10 ppm Ultra-Low Power 32.768 kHz XTAL Replacement

KDS
DAISHINKU CORP.

Features

- Smallest footprint in chip-scale (CSP): 1.5 x 0.8 mm
- Fixed 32.768 kHz
- <+10 ppm frequency tolerance
- Ultra-low power: <+1 µA
- Directly interfaces to XTAL inputs
- Supports coin-cell or super-cap battery backup voltages
- Vdd supply range: +1.5V to +3.63V over -40°C to +85°C
- Oscillator output eliminates external load caps
- Internal filtering eliminates external Vdd bypass cap
- NanoDrive™ programmable output swing for lowest power
- Pb-free, RoHS and REACH compliant

Applications

- Mobile Phones
- Tablets
- Health and Wellness Monitors
- Fitness Watches
- Sport Video Cams
- Wireless Keypads
- Ultra-Small Notebook PC
- Pulse-per-Second (pps) Timekeeping
- RTC Reference Clock
- Battery Management Timekeeping

Pb-Free

RoHS Compliant
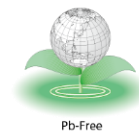
Electrical Specifications

Table 1. Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Frequency and Stability						
Fixed Output Frequency	Fout		32.768		kHz	
Frequency Stability						
Frequency Tolerance [1]	F_tol	–	–	10	ppm	T_A = +25°C, post reflow, Vdd: +1.5V – +3.63V.
		–	–	20	ppm	T_A = +25°C, post reflow with board-level underfill, Vdd: +1.5V – +3.63V.
Frequency Stability [2]	F_stab	–	–	75	ppm	T_A = -10°C to +70°C, Vdd: +1.5V – +3.63V.
		–	–	100		T_A = -40°C to +85°C, Vdd: +1.5V – +3.63V.
		–	–	250		T_A = -10°C to +70°C, Vdd: +1.2V – +1.5V.
25°C Aging		-1.0	–	+1.0	ppm	1st Year
Supply Voltage and Current Consumption						
Operating Supply Voltage	Vdd	+1.2	–	+3.63	V	T_A = -10°C to +70°C
		+1.5	–	+3.63		T_A = -40°C to +85°C
Core Operating Current [3]	Idd	–	+0.90	–	µA	T_A = +25°C, Vdd: +1.8V. No load
		–	–	+1.3		T_A = -10°C to +70°C, Vdd max: +3.63V. No load
		–	–	+1.4		T_A = -40°C to +85°C, Vdd max: +3.63V. No load
Output Stage Operating Current [3]	Idd_out	–	+0.065	+0.125	µA/Vpp	T_A = -40°C to +85°C, Vdd: +1.5V – +3.63V. No load
Power-Supply Ramp	t_Vdd_Ramp	–	–	100	ms	Vdd Ramp-up from 0 to 90%, T_A = -40°C to +85°C
Start-up Time at Power-up [4]	t_start	–	180	300	ms	T_A = -40°C ≤ T_A ≤ +50°C, valid output
		–	–	450		T_A = +50°C < T_A ≤ +85°C, valid output
Operating Temperature Range						
Commercial Temperature	T_use	-10	–	+70	°C	
Industrial Temperature		-40	–	+85	°C	

Notes:

1. Measured peak-to-peak. Tested with Agilent 53132A frequency counter. Due to the low operating frequency, the gate time must be ≥100 ms to ensure an accurate frequency measurement.
2. Measured peak-to-peak. Inclusive of Initial Tolerance at +25°C, and variations over operating temperature, rated power supply voltage and load. Stability is specified for two operating voltage ranges. Stability progressively degrades with supply voltage below +1.5V.
3. Core operating current does not include output driver operating current or load current. To derive total operating current (no load), add core operating current + (+0.065 µA/V) * (output voltage swing).
4. Measured from the time Vdd reaches +1.5V.

Table 1. Electrical Characteristics (continued)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
LVCMOS Output Option, T_A = -40°C to +85°C, typical values are at T_A = 25°C						
Output Rise/Fall Time	tr, tf	–	100	200	ns	10-90% (Vdd), 15 pF load, Vdd = +1.5V to +3.63V
		–	–	50		10-90% (Vdd), 5.0 pF load, Vdd ≥ +1.62V
Output Clock Duty Cycle	DC	48	–	52	%	
Output Voltage High	V_{OH}	90%	–	–	V	Vdd: +1.5V – +3.63V. I_{OH} = -10 µA, 15 pF
Output Voltage Low	V_{OL}	–	–	10%	V	Vdd: +1.5V – +3.63V. I_{OL} = +10 µA, 15 pF
NanoDrive™ Programmable, Reduced Swing Output						
Output Rise/Fall Time	tf, tf	–	–	200	ns	30-70% (V_{OL}/V_{OH}), 10 pF Load
Output Clock Duty Cycle	DC	48	–	52	%	
AC-coupled Programmable Output Swing	V_sw	–	+0.20 to +0.80	–	V	MO1532 does not internally AC-couple. This output description is intended for a receiver that is AC-coupled. See Table 2 for acceptable NanoDrive swing options. Vdd: +1.5V – +3.63V, 10 pF Load, I_{OH} / I_{OL} = ±0.2 µA.
DC-Biased Programmable Output Voltage High Range	V_{OH}	–	+0.60 to +1.225	–	V	Vdd: +1.5V – +3.63V. I_{OH} = -0.2 µA, 10 pF Load. See Table 1 for acceptable V_{OH}/V_{OL} setting levels.
DC-Biased Programmable Output Voltage Low Range	V_{OL}	–	+0.35 to +0.80	–	V	Vdd: +1.5V – +3.63V. I_{OL} = +0.2 µA, 10 pF Load. See Table 1 for acceptable V_{OH}/V_{OL} setting levels.
Programmable Output Voltage Swing Tolerance		-0.055	–	+0.055	V	T_A = -40°C to +85°C, Vdd = +1.5V to +3.63V.
Jitter						
Period Jitter	T_jitt	–	35	–	ns$_{RMS}$	Cycles = 10,000, T_A = +25°C, Vdd = +1.5V – +3.63V

Table 2. Pin Configuration

| Pin	Symbol	I/O	Functionality
1, 4	GND	Power Supply Ground	Connect to ground. Acceptable to connect pin 1 and 4 together. Both pins must be connected to GND.
2	CLK Out	OUT	Oscillator clock output. The CLK can drive into a Ref CLK input or into an ASIC or chip-set's 32kHz XTAL input. When driving into an ASIC or chip-set oscillator input (X IN and X Out), the CLK Out is typically connected directly to the XTAL IN pin. No need for load capacitors. The output driver is intended to be insensitive to capacitive loading.
3	Vdd	Power Supply	Connect to power supply +1.2V ≤ Vdd ≤ +3.63V. Under normal operating conditions, Vdd does not require external bypass/decoupling capacitor(s). For more information about the internal power-supply filtering, see the *Power Supply Noise Immunity* section in the detailed description. Contact factory for applications that require a wider operating supply voltage range.

CSP Package (Top View)

GND ① ④ GND

CLK Out ② ③ Vdd
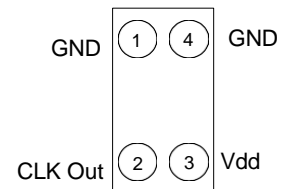
Figure 1. Pin Assignments
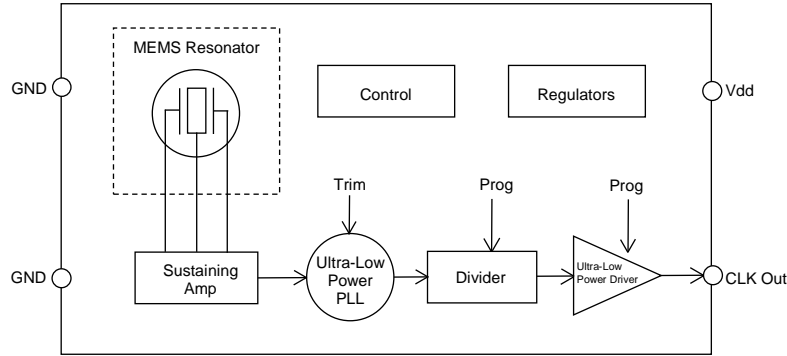
System Block Diagram

Figure 2. MO1532 Block Diagram

Table 3. Absolute Maximum

Attempted operation outside the absolute maximum ratings may cause permanent damage to the part.
Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

Parameter	Test Condition	Value	Unit
Continuous Power Supply Voltage Range (Vdd)		-0.5 to +3.63	V
Short Duration Maximum Power Supply Voltage (Vdd)	<30 minutes	+4.0	V
Continuous Maximum Operating Temperature Range	Vdd = +1.5V - +3.63V	+105	°C
Short Duration Maximum Operating Temperature Range	Vdd = +1.5V - +3.63V, ≤30 mins	+125	°C
Human Body Model ESD Protection	JESD22-A114	+3000	V
Charge-Device Model (CDM) ESD Protection	JESD22-C101	+750	V
Machine Model (MM) ESD Protection	JESD22-A115	+300	V
Latch-up Tolerance	JESD78 Compliant		
Mechanical Shock Resistance	Mil 883, Method 2002	10,000	g
Mechanical Vibration Resistance	Mil 883, Method 2007	70	g
1508 CSP Junction Temperature		+150	°C

Description

The MO1532 is the world's smallest, lowest power 32 kHz oscillator optimized for mobile and other battery-powered applications. KDS's silicon MEMS technology enables the smallest footprint and chip-scale packaging. This device reduces the 32 kHz footprint by as much as 85% compared to existing 2.0 x 1.2 mm SMD XTAL packages. Unlike XTALs, the MO1532 oscillator output enables greater component placement flexibility and eliminates external load capacitors, thus saving additional component count and board space. And unlike standard oscillators, the MO1532 features NanoDrive™, a factory programmable output that reduces the voltage swing to minimize power.

The +1.2V to +3.63V operating supply voltage range makes it an ideal solution for mobile applications that incorporate a low-voltage, battery-back-up source such as a coin-cell or super-cap.

KDS's MEMS oscillators consist of MEMS resonators and a programmable analog circuit. Our MEMS resonators are built with unique MEMS process. A key manufacturing step is Epi-Seal during which the MEMS resonator is annealed with temperatures over +1000°C. Epi-Seal creates an extremely strong, clean, vacuum chamber that encapsulates the MEMS resonator and ensures the best performance and reliability. During Epi-Seal, a poly silicon cap is grown on top of the resonator cavity, which eliminates the need for additional cap wafers or other exotic packaging. As a result, KDS's MEMS resonator die can be used like any other semiconductor die. One unique result of KDS's MEMS process and Epi-Seal manufacturing processes is the capability to integrate KDS's MEMS die with a SOC, ASIC, microprocessor or analog die within a package to eliminate external timing components and provide a highly integrated, smaller, cheaper solution to the customer.

Frequency Stability

The MO1532 is factory calibrated (trimmed) to guarantee frequency stability to be less than 10 ppm at room temperature and less than 100 ppm over the full -40°C to +85°C temperature range. Unlike quartz crystals that have a classic tuning fork parabola temperature curve with a +25°C turnover point, the MO1532 temperature coefficient is extremely flat across temperature. The device maintains less than 100 ppm frequency stability over the full operating temperature range when the operating voltage is between +1.5 and +3.63V as shown in Figure 2.

Functionality is guaranteed over the +1.2V - +3.63V operating supply voltage range. However, frequency stability degrades below +1.5V and steadily degrades as it approaches the +1.2V minimum supply due to the internal regulator limitations. Between +1.2V and +1.5V, the frequency stability is 250 ppm max over temperature.

When measuring the MO1532 output frequency with a frequency counter, it is important to make sure the counter's gate time is ≥100ms. The slow frequency of a 32kHz clock will give false readings with faster gate times.

Contact KDS for applications that require a wider supply voltage range >+3.63V or lower frequency options as low as 1Hz.
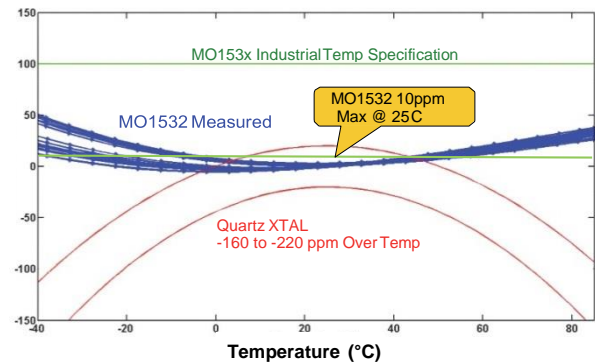

Figure 3. MEMS vs. Quartz

Power Supply Noise Immunity

In addition to eliminating external output load capacitors common with standard XTALs, The MO1532 includes special internal power supply filtering and thus, eliminates the need for an external Vdd bypass-decoupling capacitor. This feature further simplifies the design and keeps the footprint as small as possible. Internal power supply filtering is designed to reject greater than ±150 mVpp magnitude and frequency components through 10 MHz.

Output Voltage

The MO1532 has two output voltage options. One option is a standard LVCMOS output swing. The second option is the NanoDrive reduced swing output. Output swing is customer specific and programmed between +200mV and +800mV. For DC-coupled applications, output V_{OH} and V_{OL} are individually factory programmed to the customers' requirement. V_{OH} programming range is between +600 mV and +1.225V in +100 mV increments. Similarly, V_{OL} programming range is between +350mV and +800mV. For example; a PMIC or MCU is internally +1.8V logic compatible, and requires a +1.2V V_{IH} and a +0.6V V_{IL}. Simply select MO1532 NanoDrive factory programming code to be "D14" and the correct output thresholds will match the downstream PMIC or MCU input requirements. Interface logic will vary by manufacturer and we recommend that you review the input voltage requirements for the input interface.

For DC-biased NanoDrive output configuration, the minimum V_{OL} is limited to +350mV and the maximum allowable swing (V_{OH} - V_{OL}) is +750 mV. For example, +1.1V V_{OH} and +400 mV V_{OL} is acceptable, but +1.2V V_{OH} and +400 mV V_{OL} is not acceptable.

When the output is interfacing to an XTAL input that is internally AC-coupled, the MO1532 output can be factory programmed to match the input swing requirements. For example, if a PMIC or MCU input is internally AC-coupled and requires an +800 mV swing, then simply choose the MO1532 NanoDrive programming code "AA8" in the part number. It is important to note that the MO1532 does not include internal AC-coupling capacitors. Please see the *Part Number Ordering* section at the end of the datasheet for more information about the part number ordering scheme.

Power-up

The MO1532 starts-up to a valid output frequency within 300 ms (180 ms typ). To ensure the device starts-up within the specified limit, make sure the power-supply ramps-up in approximately 10 - 20 ms (to within 90% of Vdd). Start-up time is measured from the time Vdd reaches +1.5V. For applications that operate between +1.2V and +1.5V, the start-up time will be typically 50 ms longer over temperature.

MO1532 NanoDrive™

Figure 3 shows a typical output waveform of the MO1532 (into a 10 pF load) when factory programmed for a +0.70V swing and DC bias (V_{OH}/V_{OL}) for +1.8V logic:

Example:

- NanoDrive™ part number coding: D14. Example part number: MO1532IL4-**D14**M-YY-0032768S
- V_{OH} = 1.1V, V_{OL} = +0.4V ($V_{\_sw}$ = +0.70V)
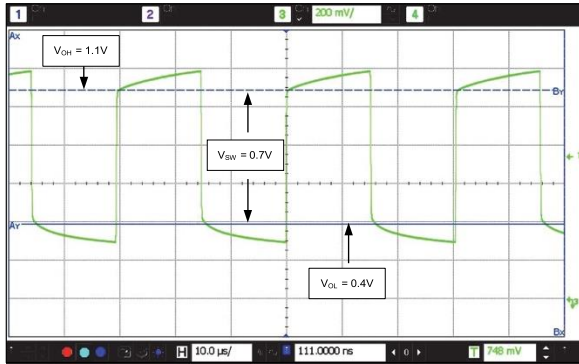
Figure 4. MO1532IL4-D14M-YY-0032768
Output Waveform (10 pF load)

Table 1 shows the supported NanoDrive™ V_{OH}, V_{OL} factory programming options.

Table 4. Acceptable V_{OH}/V_{OL} NanoDrive™ Levels

NanoDrive	V_{OH} (V)	V_{OL} (V)	Swing (mV)	Comments
D26	+1.2	+0.6	+600 ±55	+1.8V logic compatible
D14	+1.1	+0.4	+700 ±55	+1.8V logic compatible
D74	+0.7	+0.4	+300 ±55	XTAL compatible
AA3	n/a	n/a	+300 ±55	XTAL compatible

The values listed in Table 1 are nominal values at +25°C and will exhibit a tolerance of ±55 mV across Vdd and -40°C to +85°C operating temperature range.

MO1532 Full Swing LVCMOS Output

The MO1532 can be factory programmed to generate full swing LVCMOS levels. Figure 4 shows the typical waveform (Vdd = +1.8V) at room temperature into a 15 pF load.

Example:

- LVCMOS output part number coding is always **DCC**
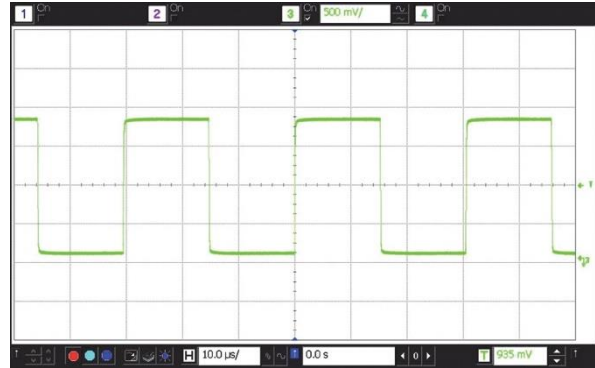- Example part number: MO1532IL4-**DCC**M-YY-0032768

Figure 5. LVCMOS Waveform
(Vdd = +1.8V) into 15 pF Load

Calculating Load Current

No Load Supply Current

When calculating no-load power for the MO1532, the core and output driver components need to be added. Since the output voltage swing can be programmed for reduced swing between +250 mV and +800 mV for ultra-low power applications, the output driver current is variable. Therefore, no-load operating supply current is broken into two sections; core and output driver. The equation is as follows:

Total Supply Current (no load) = I_{dd} Core + (65nA/V)(Vout$_{pp}$)

Example 1: Full-swing LVCMOS

- Vdd = +1.8V
- Idd Core = +900nA (typ)
- Vout$_{pp}$ = +1.8V

Supply Current = 900nA + (65nA/V)(1.8V) = +1017nA

Example 2: NanoDrive™ Reduced Swing

- Vdd = +1.8V
- Idd Core = +900nA (typ)
- Vout$_{pp}$ (D14) = $V_{OH} - V_{OL}$ = 1.1V - 0.4V = +700mV Supply

Supply Current = 900nA + (65nA/V)(0.7V) = +946nA

Total Supply Current with Load

To calculate the total supply current, including the load, follow the equation listed below. Note the 30% reduction in power with NanoDrive™.

Total Current = Idd Core + Idd Output Driver (65nA/V*Vout$_{pp}$) + Load Current (C*V*F)

Example 1: Full-swing LVCMOS

- Vdd = +1.8V
- Idd Core = +900nA
- Load Capacitance = 10pF
- Idd Output Driver: (65nA/V)(1.8V) = +117nA
- Load Current: (10pF)(1.8V)(32.768kHz) = +590nA
- Total Current = 900nA + 117nA + 590nA = +1.6µA

Example 2: NanoDrive™ Reduced Swing

- Vdd = +1.8V
- Idd Core = +900nA
- Load Capacitance = 10pF
- Vout$_{pp}$ (Programmable): $V_{OH} - V_{OL}$ = 1.1V - 0.4V = +700mV
- Idd Output Driver: (65nA/V)(0.7V) = +46nA
- Load Current: (10pF)(0.7V)(32.768kHz) = +229nA
- Total Current = 900nA + 46nA + 229nA = +1.175µA

Typical Operating Curves

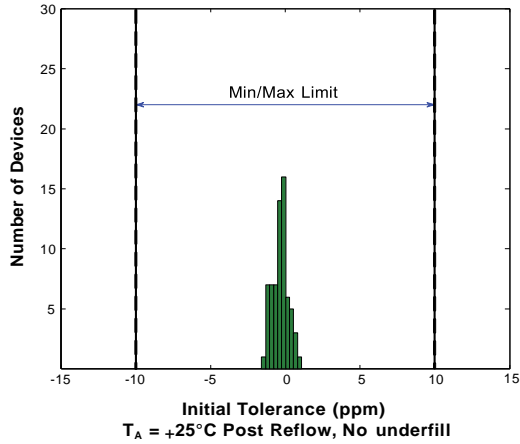(T_A = +25°C, Vdd = +1.8V, unless otherwise stated)
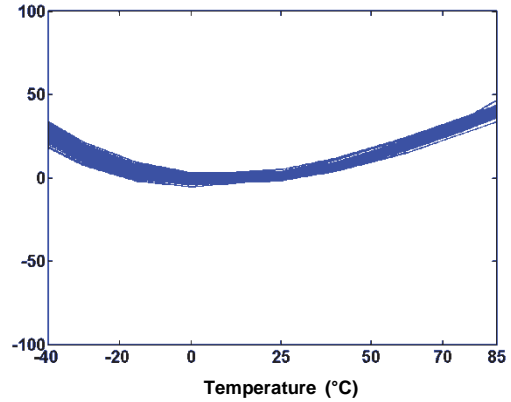

Figure 6. Initial Tolerance Histogram
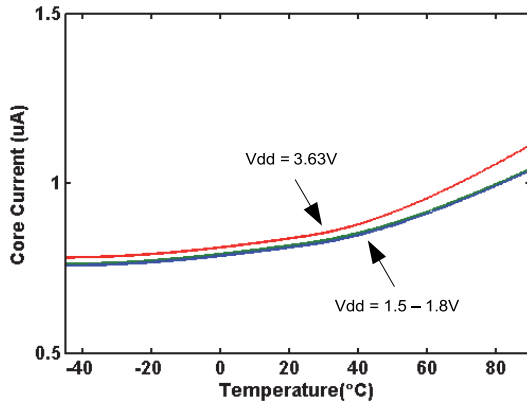

Figure 7. Frequency Stability Over Temperature

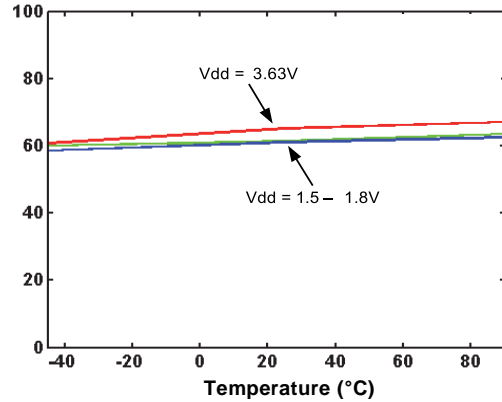

Figure 8. Core Current Over Temperature
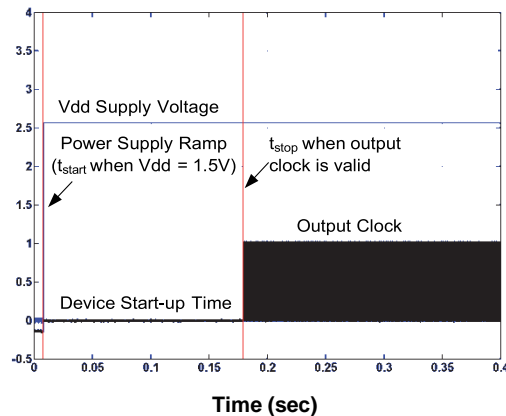

Figure 9. Output Stage Current Over Temperature
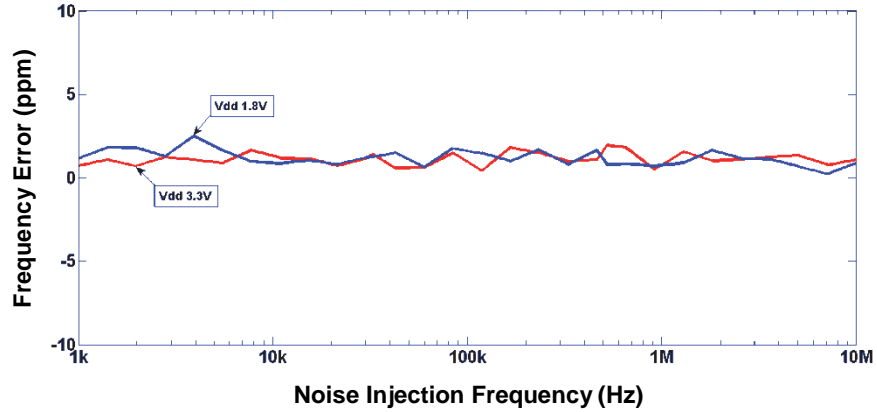

Figure 10. Start-up Time

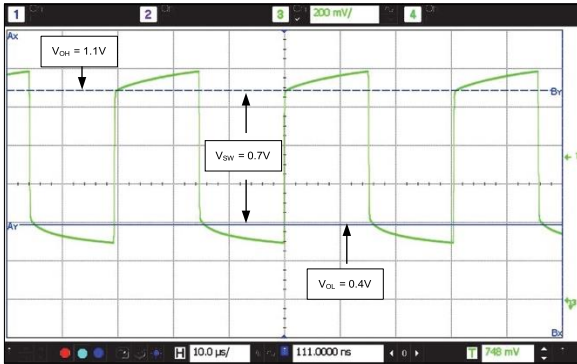**Figure 11. Power Supply Noise Rejection**
(±150mV Noise)

Figure 12. NanoDrive™ Output Waveform
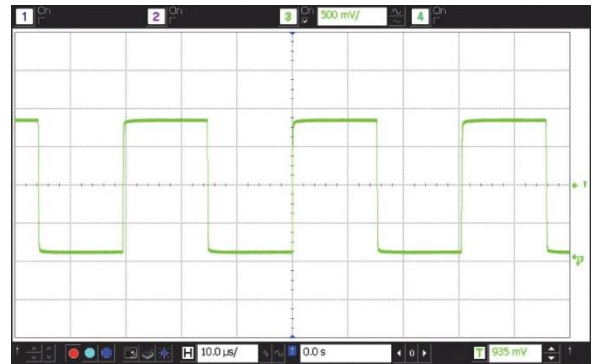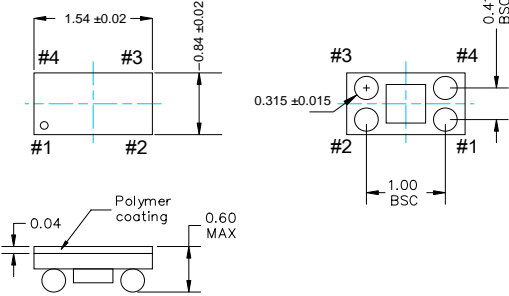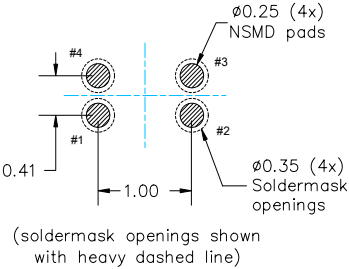(V$_{OH}$ = +1.1V, V$_{OL}$ = +0.4V, MO1532IL4-D14M-YY-0032768S)

Figure 13. LVCMOS Output Waveform
(V$_{swing}$ = +1.8V, MO1532IL4-DCCM-YY-0032768S)

Dimensions and Patterns

Package Size – Dimensions (Unit: mm)	Recommended Land Pattern (Unit: mm)
1.55 x 0.85 mm CSP	

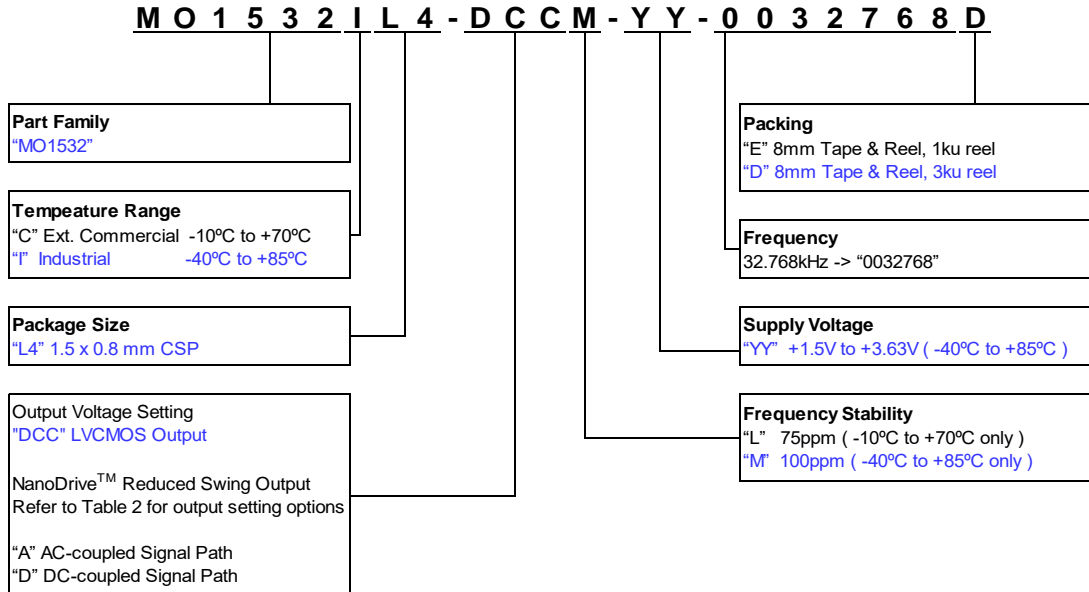Recommend 4-mil (0.1mm) stencil thickness

Manufacturing Guidelines

1) No Ultrasonic Cleaning: Do not subject the MO1532 to an ultrasonic cleaning environment. Permanent damage or long term reliability issues to the MEMS structure may occur.

2) Applying board-level underfill (BLUF) to the device is acceptable, but will cause a shift in the frequency tolerance, as specified in the datasheet electrical table. Tested with UF3810, UF3808, and FP4530 underfill.

3) Reflow profile, per JESD22-A113D.

4) For additional manufacturing guidelines and marking/tape-reel instructions, contact KDS.

MO1532
Smallest Footprint (1.2mm²) CSP,
10 ppm Ultra-Low Power 32.768 kHz XTAL Replacement

KDS DAISHINKU CORP.

Ordering Information

M O 1 5 3 2 I L 4 - D C C M - Y Y - 0 0 3 2 7 6 8 D

Part Family
"MO1532"

Tempeature Range
"C" Ext. Commercial -10ºC to +70ºC
"I" Industrial   -40ºC to +85ºC

Package Size
"L4" 1.5 x 0.8 mm CSP

Output Voltage Setting
"DCC" LVCMOS Output

NanoDrive™ Reduced Swing Output
Refer to Table 2 for output setting options

"A" AC-coupled Signal Path
"D" DC-coupled Signal Path

Packing
"E" 8mm Tape & Reel, 1ku reel
"D" 8mm Tape & Reel, 3ku reel

Frequency
32.768kHz -> "0032768"

Supply Voltage
"YY" +1.5V to +3.63V (-40ºC to +85ºC)

Frequency Stability
"L" 75ppm (-10ºC to +70ºC only)
"M" 100ppm (-40ºC to +85ºC only)

The following examples illustrate how to select the appropriate temp range and output voltage requirements:

Example 1: MO1532IL4-D14M-YY-0032768

- Industrial temp & corresponding 100 ppm frequency stability. Note, 100 ppm is only available for the industrial temp range, and 75 ppm is only available for the commercial temp range.
- Output swing requirements:
  a) "D" = DC-coupled receiver
  b) "1" = V_{OH} = +1.1V
  c) "4" = V_{OL} = +400mV

Example 2: MO1532CL4-AA3L-YY-0032768

- Commercial temp & corresponding 75 ppm frequency stability. Note, 100 ppm is only available for the industrial temp range, and 75 ppm is only available for the commercial temp range.
- Output swing requirements:
  a) "A" = AC-coupled receiver
  b) "A" = AC-coupled receiver
  c) "3" = +300mV swing

Table 2. Acceptable V_{OH}/V_{OL} NanoDrive™ Levels[5]

NanoDrive	V_{OH} (V)	V_{OL} (V)	Swing (mV)	Comments
D26	+1.2	+0.6	+600 ±55	+1.8V logic compatible
D14	+1.1	+0.4	+700 ±55	+1.8V logic compatible
D74	+0.7	+0.4	+300 ±55	XTAL compatible
AA3	n/a	n/a	+300 ±55	XTAL compatible

Notes:

5. If these available options do not accommodate your application, contact KDS for other NanoDrive options.

Revision History

Version	Release Date	Change Summary
1.0	09/02/14	Rev 0.9 Preliminary to Rev 1.0 Production Release • Updated start-up time specification • Added typical operating plots • Separated initial tolerance spec for condition with and without underfill • Added Manufacturing Guidelines section
1.1	10/14/14	• Improved Start-up Time at Power-up spec • Added 5pF LVCMOS rise/fall time spec
1.2	11/07/14	• Updated 5pF LVCMOS rise/fall time spec
1.25	06/03/16	• Updated NanoDrive section • Updated test conditions in the absolute maximum table
1.26	01/16/2018	• Updated SPL, page layout changes

1. Marking diagram

Assembly Identifier

Y X

● X X X

#1 Index

Manufacturing Lot Code
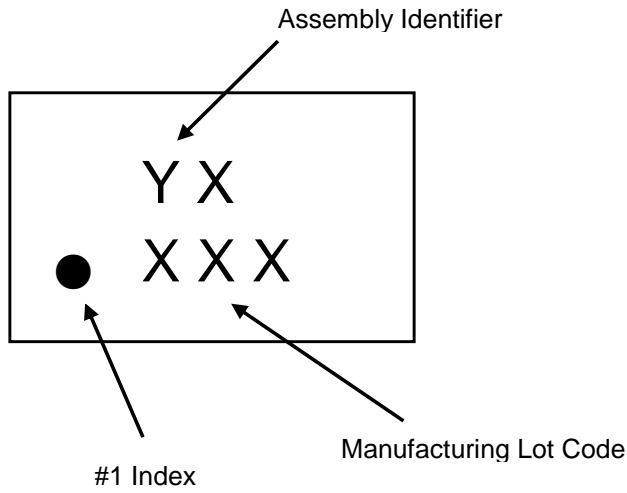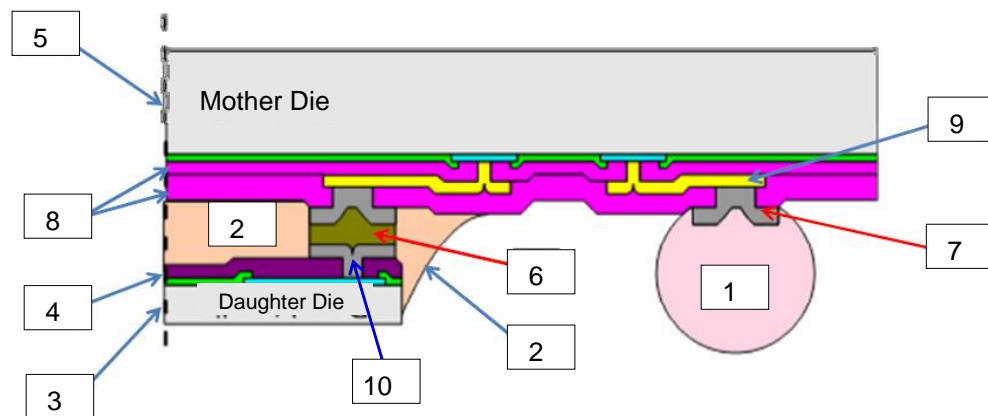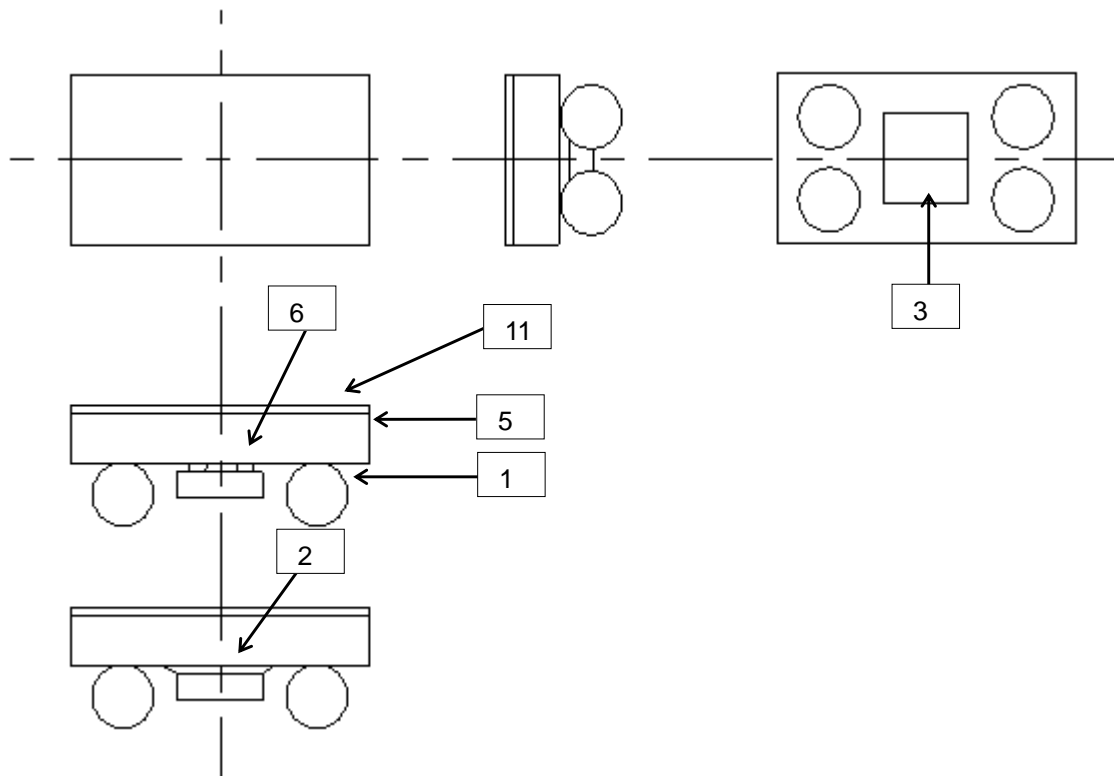
"Y" denotes assembly identifier:
"A": Carsem / Malaysia
"B": UTAC / Thailand
"C": ASE / Taiwan

"XXXX" denotes 4 alpha-numeric characters of the manufacturing lot code without any dashes, Periods, or symbols.

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2. Internal Structure

No.	Item	Material / Spec.
1	Solderball	Sn, Ag, Cu
2	Underfill	Silica, Epoxy Resin
3	MEMS Die	Si
4	Polymer(MEMS)	Polyimide
5	CMOS Die	Si
6	Solderbump	Sn, Ag, Cu
7	UBM(CMOS)	Cu, NiV, Al
8	Polymer(CMOS)	PBO
9	RDL(CMOS)	Al, Ti
10	UBM(MEMS)	Cu, NiV, Ti
11	Back Side Coating	Polyethylene Terephthalate

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3. Solder Reflow Profile

3.1 Solder Reflow Profile
The solder reflow profile shown in the following is IPC/JEDEC J-STD-020 compliant.

■**Reflow Temperature Profile**
(Available for lead free soldering)
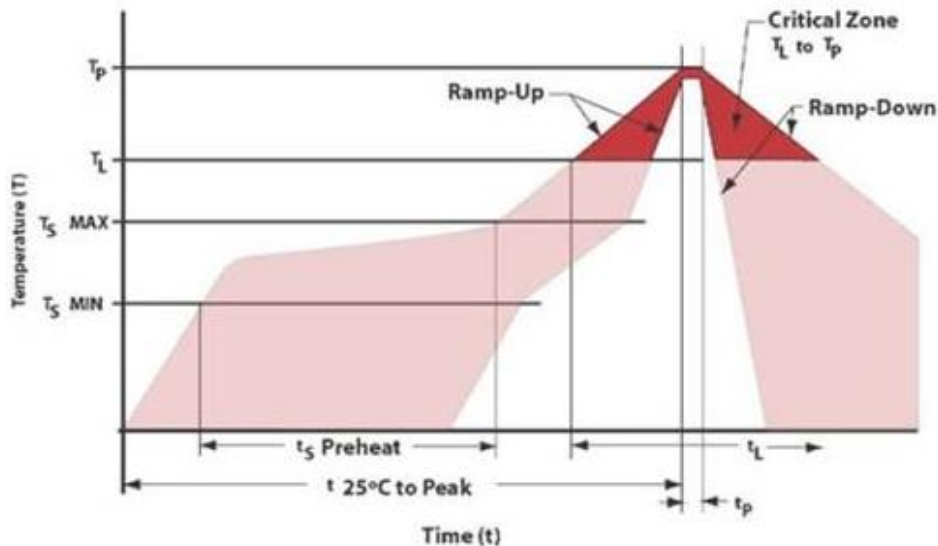
■**High Temperature Infrared/Convection Reflow Conditions IPC/JEDEC J-STD-020**

IPC/JEDEC Standard	IPC/JEDEC J-STD-020
Moisture Sensitivity Level	Level 1
TS MAX to TL (Ramp-up Rate)	3°C/second Maximum
Preheat	
- Temperature Minimum (TS MIN)	+150°C
- Temperature Typical (TS TYP)	+175°C
- Temperature Maximum (TS MAX)	+200°C
- Time (tS)	60 - 180 Seconds
Ramp-up Rate (TL to TP)	3°C/second Maximum
Time Maintained Above:	
- Temperature(TL)	+217°C
- Time (TL)	60 - 150 Seconds
Peak Temperature(TP)	+260°C Maximum
Target Peak Temperature (TP Target)	+255°C
Time within 5°C of actual peak (tP)	20 - 40 seconds
Max. Number of Reflow Cycles	3
Ramp-down Rate	6°C/second Maximum
Time 25°C to Peak Temperature (t)	8 minutes Maximum

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4. Packing Condition

4.1 Taping package

(1) Emboss tape format, dimensions and direction

See Fig.1, Fig.2, Fig.3

(2) Quantity on reel

See suffix of part code and Table.1

(3) Taping specification

See Fig.4

(4) Reel specification

See suffix of part code and Fig.5

It is possible that color of the reels may be different in two different shipments depending on manufacturing

location. However, the specifications of the reel are identical.

(5) Taping material list

See right table.

Taping material List
Cover Tape : PS(Antistatic)
Emboss : PS (Conductivity)
Reel : PS (Antistatic)

(6) Packing specification list

See Table.1

Taping Part code	Emboss Taping	Package Size (mm)	Reel Size (mm Max.)	Quantity (pcs)
D	8mm width	1.5 x 0.8	180	3000

Table.1 Packing specification of part code

*The detail of part code was mentioned in data sheet.

4.2 Packing

The products packed in the antistatic bag.

*Moisture sensitivity level : IPC/JEDEC Standard J-STD-033 / Level 1

No dry pack required and baking after re-storage is unnecessary.

4.3 Packing box

Max 10 reels/packing box. However, in the case of less than 10 reels, It is contained by any boxes.
The space in a box is fill up with a cushion.

4.4 Label detail

A Lot label is put on a reel and a shipping label is put on a packing box.

Lot lable

KDS (LOGO)	ROHS, ESD, Pb-free(LOGO)
TYPE	(Model Name/Part code)
SPEC NO.	(KDS Spec. Number)
PARTS NO.	(User's Parts Number)
MFG. LOT NO.	(Manufacturing Lot Number, Marking Lot Number)
FREQ.	(Nominal Frequency)
Q'TY	(Quantity) MADE IN XXXXXX(Country Origin)

Shipping label

KDS (LOGO)	ROHS, ESD, Pb-free(LOGO)
TYPE	(Model Name/Part code)
SPEC	(KDS Spec. Number)
PARTS NO.	(User's Parts Number)
SHIP LOT NO.	(Shipping Lot Number)
SHIP DATE	(Shipping Date)
Q'TY	(Quantity) MADE IN XXXXXX(Country Origin)

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Lot label example

KDS	
TYPE	MOxxxx-xxx-xxx-xxxxxxxx
SPEC NO.	XXXXXXXXXXXXXXX
PARTS NO.	XXXXXXXXXX
MFG. LOT NO.	XXXXXXXXXX XXXXX
FREQ.	XXX.XXXXXX MHz
Q'TY	XXXX pcs
	MADE IN XXXXXX

Shipping label example

KDS	
TYPE	MOxxxx-xxx-xxx-xxxxxxxx
SPEC NO.	XXXXXXXXXXXXXXX
PARTS NO.	XXXXXXXXXX
SHIP. LOT NO.	XXXXXXXXXX
SHP DATE.	XXXX/XX/XX
Q'TY	XXXX pcs
	MADE IN XXXXXX

Formation of a lot number

M	M	9101	00101
Product code	Country origin	year/month/day	Serial No.

The notation method of country origin

A : Taiwan   M:Malaysia   U: Thailand

The notation method of a manufacture year, month, and day.(4digit alphanumeric character)

YMDD	(4digits)	e.g.) 2019/01/01 → 9101
Y	Year	1digit (Last digit of year)
M	Month	1digit alphanumeric symbol
DD	Day	2digits numerical characters of day

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Symbol	1	2	3	4	5	6	7	8	9	O	N	D

The marks on the label are as follows.

<ROHS>   <ESD Caution>   <Pb-free>

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Lot Label

Antistatic Bag

Air Cushion

Shipping Label
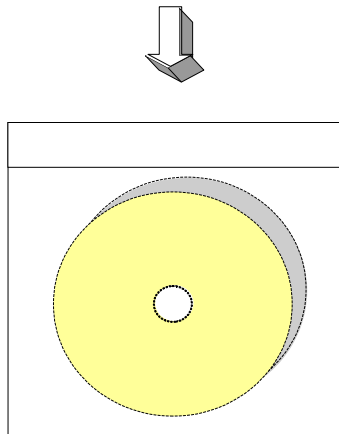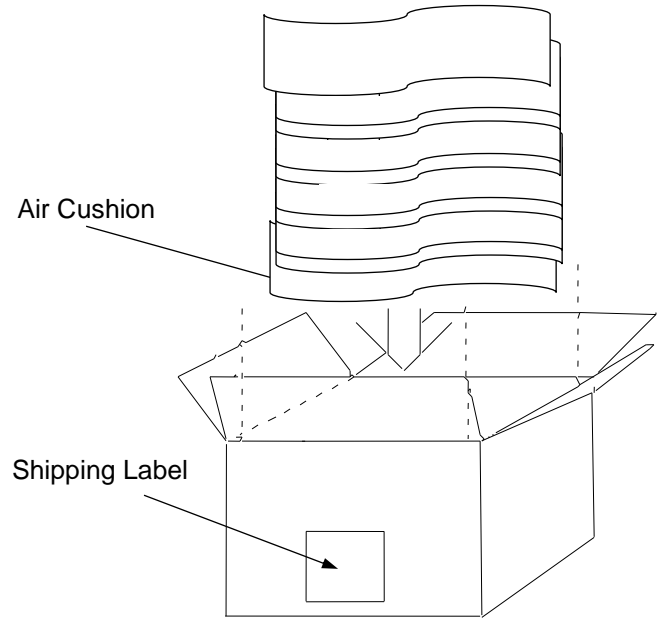
The product is picked up with the method which does not break in the handling by the shipping agent.

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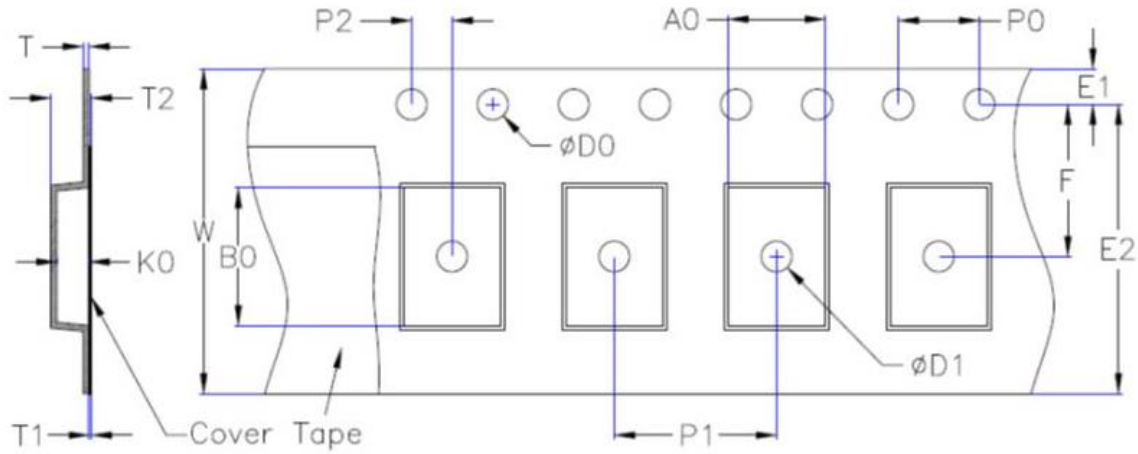
Unit: mm

Package Outline Drawing	Package Size	Tape Size	D0	D1 Min.	E1	E2 Min.	F	P0	P1	P2	T	T1 Max.	T2 Max.	W Max.	A0	B0	K0
POD-32	1.5 x 0.8 x 0.60	8	1.55 ±0.05	0.18	1.75 ±0.1	6.05	3.5 ±0.05	4.0 ±0.1	4.0 ±0.1	2.0 ±0.05	0.2 ±0.02	0.1	1.55	8.3	0.96 ±0.03	1.66 ±0.03	0.63 ±0.03

Fig.1 Emboss tape format and dimensions table
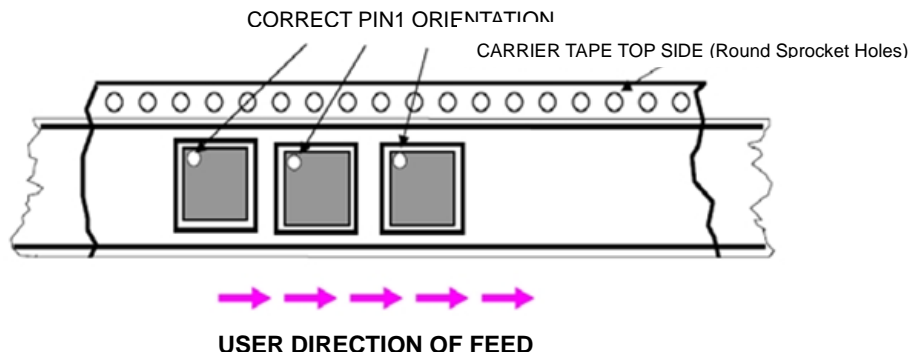
Fig.2 Standard Tape and Reel Pin 1 orientation (all except for SOT-23)
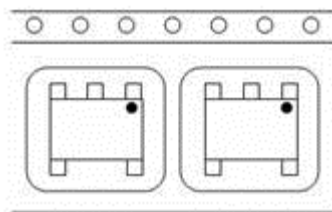
Fig.3 SOT-23 Tape and Reel Pin 1 orientation

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Trailer
(160mm Min)

Components

Leader
(400mm Min)

User Direction of Feed

Top Cover tape

No Components
(150mm Min)

Top Cover Tape

Enbossed Carrier

Directionmark

User Direction of Feed
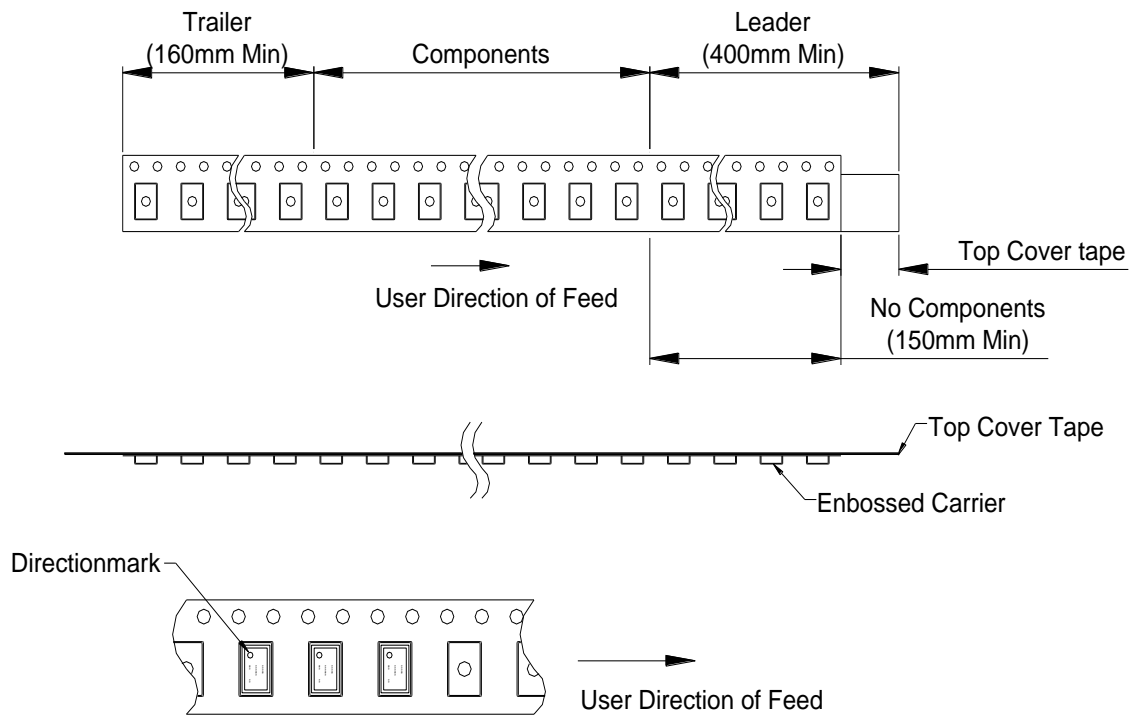
When a tape end is taken out to the front, sprocket holes becomes right hand side.

Peel strength
Pulling speed at 300mm/min, strength should be 0.1~1.3N(10g~130g).

Carrier tape basic dimensions are based on EIA481.

Fig.4. Taping specification

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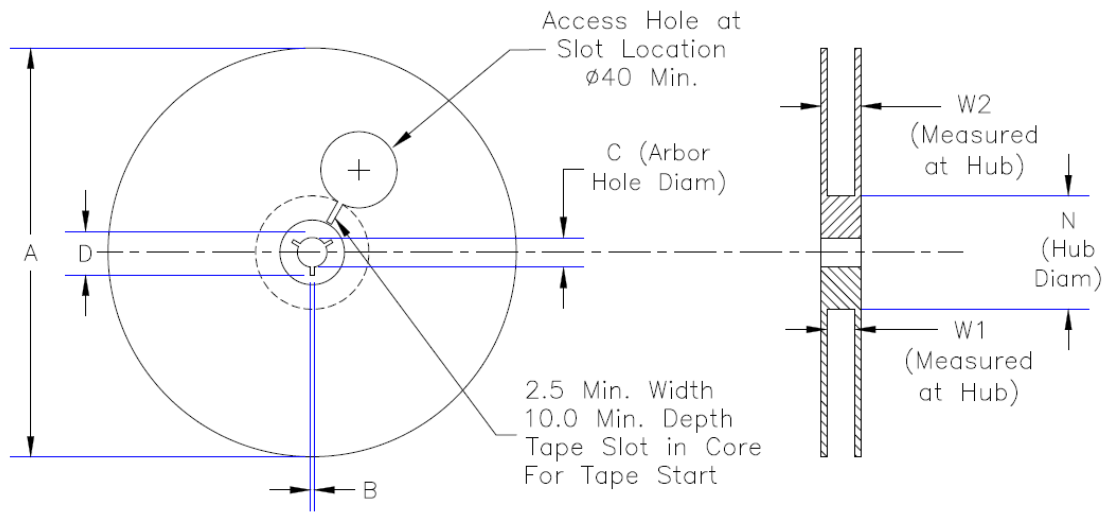
Unit: mm

Tape Size	A Max.	B Min.	C	D Min.	N	W1	W2 Max.
8	180	1.5	13.0 +0.6/-0.2	20	60 +0.5/-0.5	8.4 +1.5/-0	14.4

Fig.5　Reel format and dimensions

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5. Notes on mounting and handling

5.1 Storage environment

(1) The temperature and humidity of a storage place, Please give +5~+40°C and 40~85% as a standard.

(2) Please use this product within one year from the packing label date of issue.

(3) Please avoid the place which generates corrosive gas, and the place with much dirt.

(4) Please keep it in a place with little temperature change.
Dew condensation arises owing to a rapid temperature change and solderability becomes bad.

5.2 Be cautions to static electricity and high voltage.

5.3 This product has sufficient durability to fall and vibration. However, conditions may change to the fall after mounting to a PWB, and vibration. When you should drop on a floor the PWB which mounted the product or too much shock is added. Please use after a performance check.

5.4 Please check that the curvature of the substrate at the time of substrate cutting does not affect product. Moreover, especially when a product is near the position of a PWB guide pin, and the position of PWB break, be careful.

5.5 The part recommends not using cleaning baths operating at ultrasonic frequencies. Instead, KDS recommends that the customer use IPA (Isopropyl Alcohol) baths.

5.6 Please repair at +260°C in 5s with hot air.

6. Mandatory control

6.1 Ozone-depleting substance

It regulates by the U.S. air purifying method (November, 1990 establishment). ODS of CLASS1 and CLASS2 is not contained or used.

6.2 PBDE, PBBs

PBDE, PBBs are not contained into all the material currently used for this product.

6.3 RoHS

Following material restricted by RoHS (2011/65/EU) is not included or used. Lead, mercury, cadmium, hexavalent , chromium ,PBB and PBDE.

6.4 Law Concerning Examination and Regulation of Manufacture, etc. of Chemical Substances

All the material currently used for this product is based on "Law Concerning Examination and Regulation of Manufacture, etc. of Chemical Substances". It is a registered material.

6.5 Lead

Leads, such as solder, are not used for this product. (Lead Free)

6.6 About the existence of silver and mercury use

The silver and mercury are not used for this product.

7. The country origin (Manufacturing site and assembly, test location)

The country origin / Manufacture company

Taiwan / Advanced Semiconductor Engineering Inc.

Malaysia / Carsem Sdn. Bhd.

Thailand / UTAC Thai Ltd.

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2019-0156 REVERSION RECORD

Rev. No.	Date	Reason	Contents	Approved	Checked	Drawn
-	2019/03/13	-	Initial Release	T.Hanaki	T.Moriwaki	T.Moriwaki
Rev. No.	Date	Reason	Contents	Approved	Checked	Drawn
-	2019/03/13		Initial Release	T.Hanaki	T.Moriwaki	T.Moriwaki

DM-Z0002: Style-008 Ver.1