1-Channel 2.8A Mid-voltage H-Bridge DC Motor Driver

FEATURES

- Support the input voltage range:
- Motor power: 1.8V~11V
- Control power supply: 1.8V~7V
- LDMOS RDS(ON) (HS+LS): 285mΩ (typical)
- Ultra-low power sleep mode:
- 5nA (typical) VCC sleep mode current
- Maximum 2.8A current output capacity
- Built-in UVLO Protection
- Built-in Over Temperature Protection
- Built-in Short Circuit Protection
- Built-in Over Current Protection
- Built-in Charge Pump
- Package and Footprint
- TMI8230: DFN2x2-8 package
- TMI8230S: SOP8 package

GENERAL DESCRIPTION

TMI8230 and TMI8230S are low voltage DC motor driver IC. Internal integration 285mΩ (HS+LS typical) H-bridge NMOS switch, which can support the 1.8V~11V input voltage range. The maximum current capacity is up to 2.8A. The devices support for ultra-low power sleep mode; built-in UVLO, Thermal Shutdown, OCP protection circuit. TMI8230 and TMI8230S can be used in camera, smart lock and consumer products.

The package of TMI8230 is DFN2x2-8, and TMI8230S adopts SOP8 package.

APPLICATIONS

- Cameras
- Smart Lock
- Consumer Products
- Robotics
- DC Motor Driver

TYPICAL APPILCATION

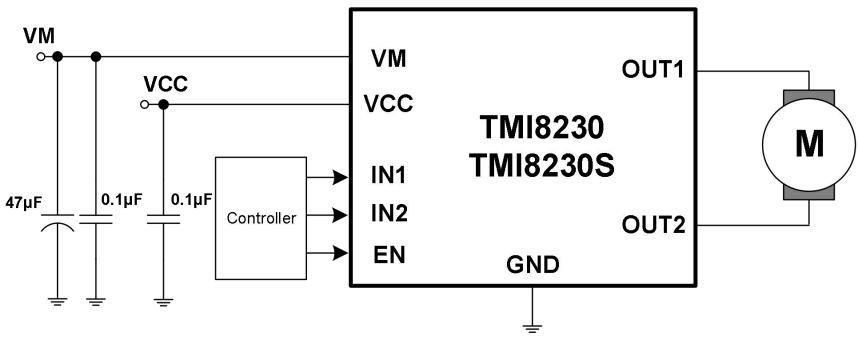
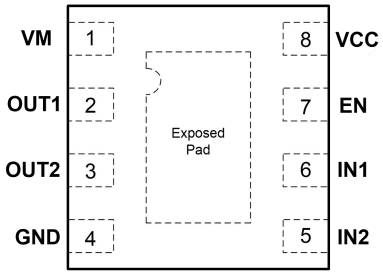


Figure 1. Basic Application Circuit

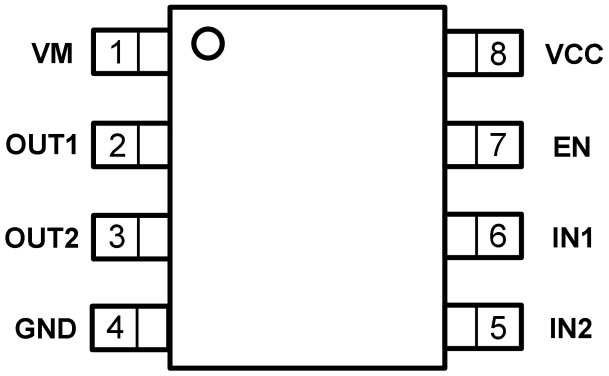
ABSOLUTE MAXIMUM RATINGS

Parameter	Min	Max	Unit
VM Voltage Range	-0.3	12	V
VCC, IN1, IN2, EN Voltages Range	-0.3	7	V
OUT1, OUT2 Voltage Range	-0.3	V_M+0.3	V
Storage Temperature Range	-50	150	°C
Junction Temperature	-40	150	°C
Allowable Power Dissipation (DFN2x2-8)	-	1.5	W
Allowable Power Dissipation (SOP8)	-	1.5	W
Lead Temperature (Soldering, 10s)	-	260	°C

PACKAGE/ORDER INFORMATION



DFN2x2-8 (Top View)
TMI8230



SOP8 (Top View)
TMI8230S

Top Mark: TMI8/XXX (TMI8: Device Code, XXX: Inside Code) for TMI8230
Top Mark: TMI8230S/XXXXX (TMI8230S: Device Code, XXXXX: Inside Code) for TMI8230S

Part Number	Package	Top Mark	Quantity/ Reel
TMI8230	DFN2x2-8	TMI8 XXX	3000
TMI8230S	SOP8	TMI8230S XXXXX	3000

TMI8230 and TMI8230S devices are Pb-free and RoHS compliant.

PIN FUNCTIONS

Pin	Name	Function
1	VM	Power Supply for Driver. Connect a 0.1μF bypass ceramic capacitor and a 47μF bulk capacitor to GND.
2	OUT1	Motor Driver output 1
3	OUT2	Motor Driver output 2
4	GND	Ground pin
5	IN2	Control Logic input2. Internal pulldown.
6	IN1	Control Logic input1. Internal pulldown.
7	EN	Chip Enable Input Pin. When this pin is in logic low, the device enters low-power sleep mode. The device operates normally when this pin is logic high. The pin has an internal pull-down resistor to GND.
8	VCC	Power Supply for Logic Input. Connect a 0.1μF bypass ceramic capacitor to GND

ESD RATING

Items	Description	Value	Unit
V_{ESD}	Human Body Model for all pins	±2000	V

JEDEC specification JS-001

RECOMMENDED OPERATING CONDITIONS

Items	Description	Min	Max	Unit
VM Voltage Range	V_M	1.8	11	V
VCC Voltage Range	V_{CC}	1.8	7	V
T_J	Operating Junction Temperature Range	-40	125	°C

THERMAL RESISITANCE (Note 3)

Items	Description	Value	Unit
θ_{JA}	Junction-to-ambient thermal resistance of DFN2x2-8	70	°C/W
	Junction-to-ambient thermal resistance of SOP8	90	°C/W

ELECTRICAL CHARACTERISTICS

(T_A = 25°C, unless otherwise noted.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Power Suppliers (VM and VCC)						
VM Voltage Range	V_M		1.8		11	V
VM Supply Current	I_{VM}	V_M=5V, V_{CC}=3V No PWM		67		μA
		V_M=5V, V_{CC}=3V 50kHz PWM		0.43		mA
VM Sleep Current	I_{VMQ}	V_M=5V, V_{CC}=3V EN=0V		30	85	nA
VCC Voltage Range	V_{CC}		1.8		7	V
VCC Supply Current	I_{VCC}	V_M=5V, V_{CC}=3V No PWM		105		μA
		V_M=5V, V_{CC}=3V 50kHz PWM		0.28		mA
VCC sleep mode supply current	I_{VCCQ}	V_M=5V, V_{CC}=3V Sleep Mode (EN=0)		5		nA
Control Logic Input (IN1, IN2 and EN)						
Input Logic Low Voltage	V_{IL}		0.25x V_{CC}	0.4x V_{CC}		V
Input Logic High Voltage	V_{IL}			0.5x V_{CC}	0.6x V_{CC}	V
Input logic Hysteresis	V_{HYS}			0.1x V_{CC}		V
Input Logic Low Current	I_{IL}		-5		5	μA
Input Logic High Current	I_{IH}				50	μA
Input Pull Down Resistor	R_{IN}			100		kΩ
Motor Driver Ouputs (OUT1 and OUT2)						
Output Switch On-Resistance (HS+LS)	R_{ON}	V_M=5V, V_{CC}=3V I_{load}=800mA		0.285		Ω
Output Switch Leakage Current	I_{LEAK}		-200		200	nA
Protection Functions						
VCC UVLO Voltage	V_{UVLO}		1.75			V
UVLO Hysteresis	V_{UVLO_HY}			100		mV
Over Current Protection	I_{OCP}			4.5		A
Over Current Retry Time	T_{OCP_RT}			1.5		ms
Thermal Shutdown Threshold (Note 4)	T_{SDN}			180		°C

Thermal Shutdown Hysteresis (Note 4)	T_{SDN_HY}			30		°C

ELECTRICAL CHARACTERISTICS (continued)

(T_A = 25°C, unless otherwise noted.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Timing Requirements						
Output Enable time	T_1			180		ns
Output Disable time	T_2			70		ns
Delay Time IN1 low to OUT2 high IN2 low to OUT1 high	T_3			140		ns
Delay Time IN2 high to OUT1 low IN1 high to OUT2 low	T_4			160		ns
Output rise time	T_5			60		ns
Output fall time	T_6			40		ns

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

Note 2: T_J is calculated from the ambient temperature T_A and power dissipation PD according to the following formula: $T_J = T_A + (PD) \times \theta_{JA}$.

Note 3: Measured on JESD51-7, 4-layer PCB.

Note 4: Guaranteed by design.

FUNCTIONAL BLOCK DIAGRAM

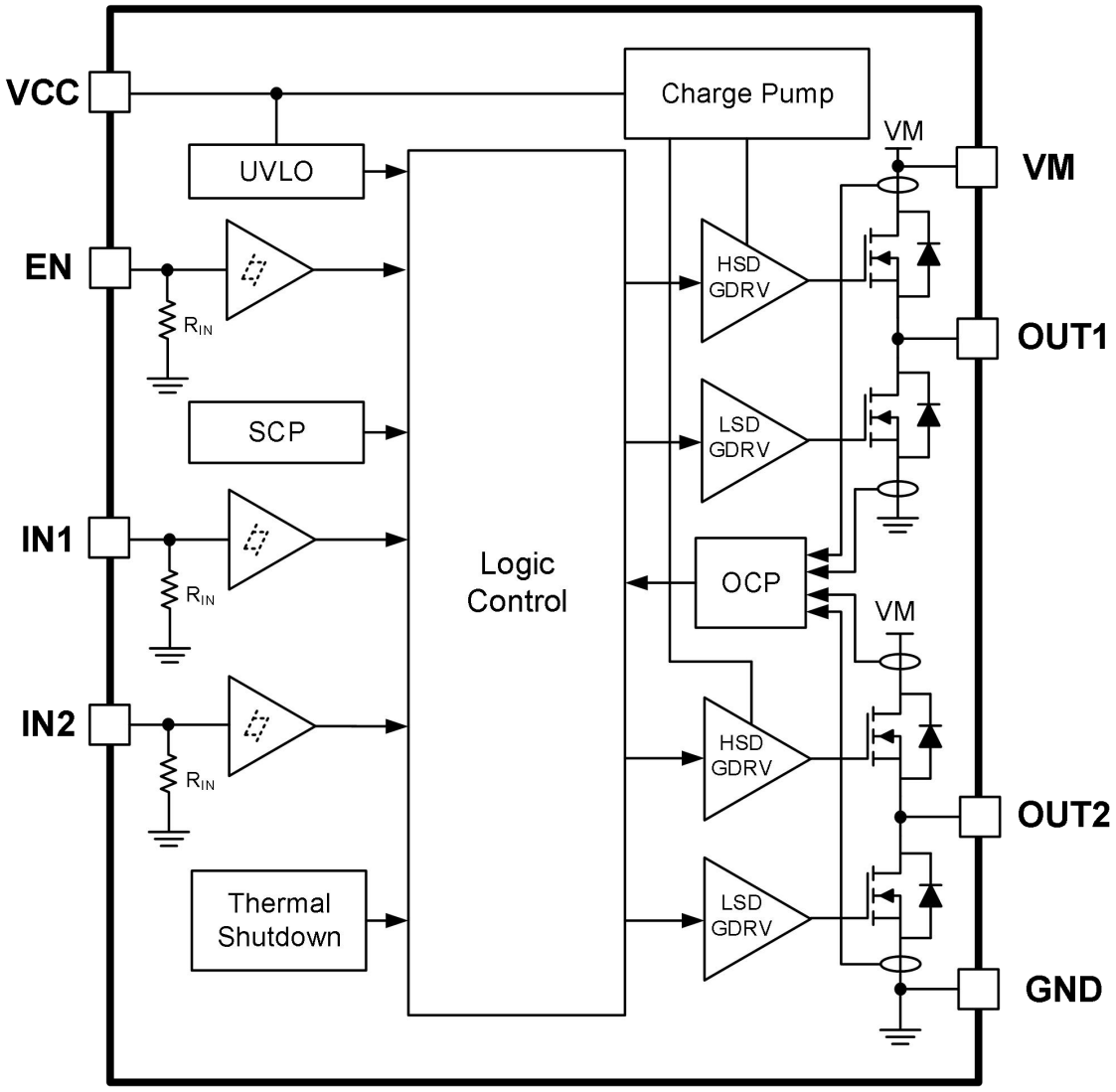
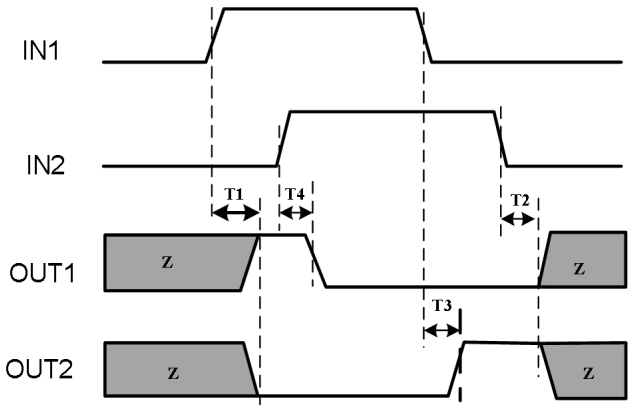
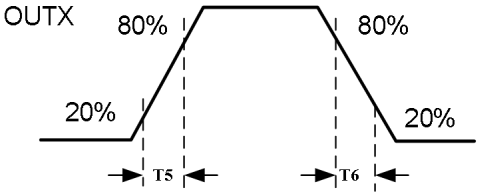


Figure 2. TMI8230/S Block Diagram

INPUT OUTPUT LOGIC

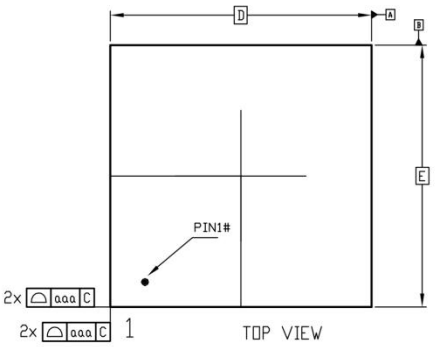


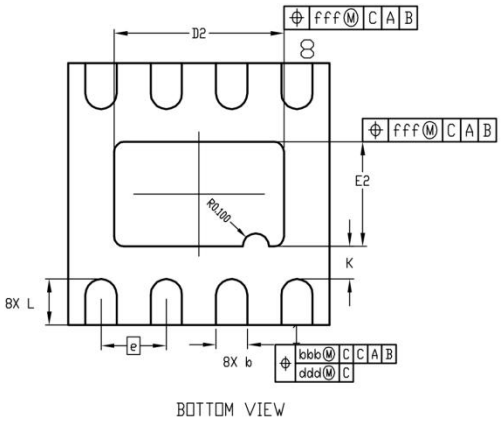


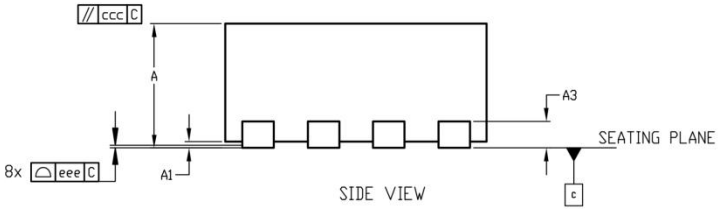
EN	IN1	IN2	OUT1	OUT2	Function
0	X	X	Z	Z	Coast
1	0	0	Z	Z	Coast
1	1	0	H	L	Forward
1	0	1	L	H	Reverse
1	1	1	L	L	Brake

PACKAGE INFORMATION

DFN2x2-8







Unit: mm

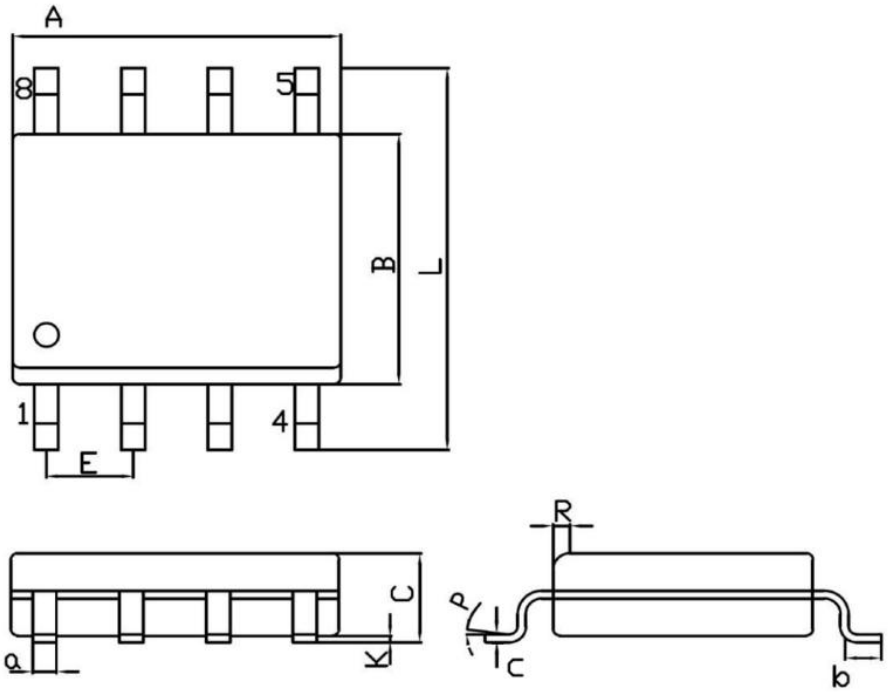
Symbol	Dimensions In Millimeters			Symbol	Dimensions In Millimeters		
	Min	Typ	Max		Min	Typ	Max
A	0.70	0.75	0.80	L	0.30	0.35	0.40
A1	0	0.02	0.05	K	0.20	-	-
A3	-	0.20 REF	-	aaa	-	0.15	-
b	0.19	0.24	0.29	bbb	-	0.10	-
D	2.00 BSC			ccc	-	0.10	-
E	2.00 BSC			ddd	-	0.05	-
D2	1.25	1.30	1.35	eee	-	0.08	-
E2	0.75	0.80	0.85	fff	-	0.10	-
e	0.50 BSC						

Note:

1) All dimensions are in millimeters.

PACKAGE INFORMATION

SOP8



Unit: mm

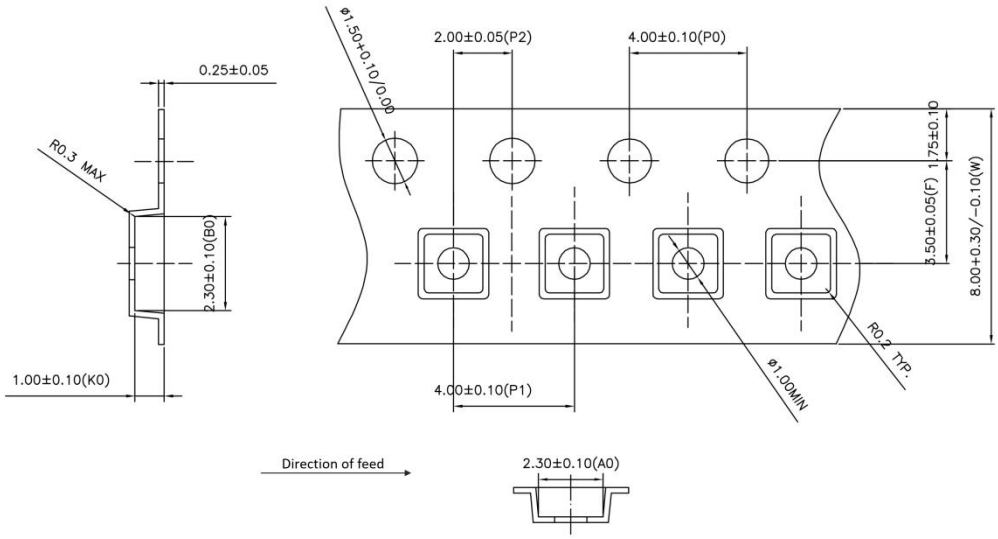
Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
A	4.70	5.10	C	1.35	1.75
B	3.70	4.10	a	0.35	0.49
L	6.00	6.40	R	0.30	0.60
E	1.27 BSC		P	0°	7°
K	0.12	0.22	b	0.40	1.25
			c	0.203	0.243

Note:

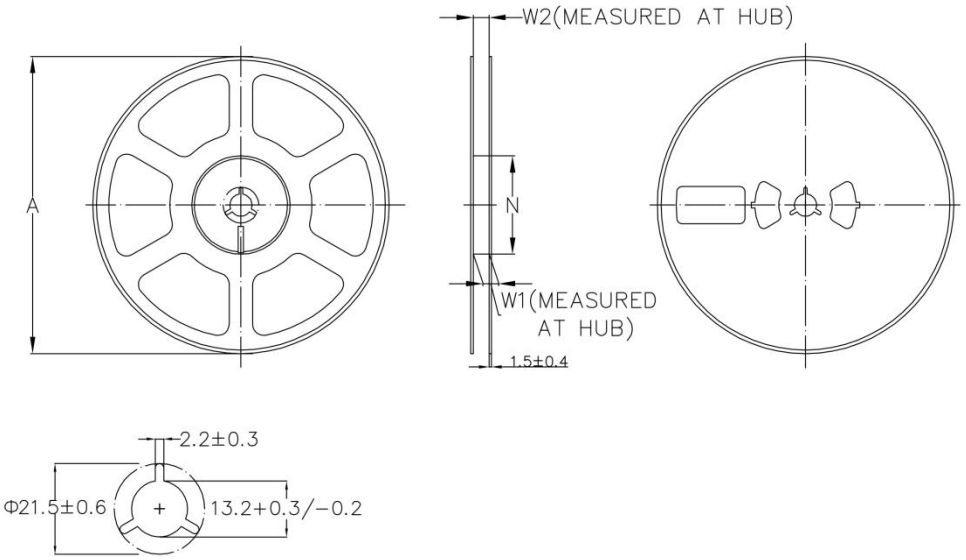
1) All dimensions are in millimeters.
2) Package length does not include mold flash, protrusion or gate burr.
3) Package width does not include inter lead flash or protrusion.
4) Lead popularity (bottom of leads after forming) shall be 0.10 millimeters max.
5) Pin 1 is lower left pin when reading top mark from left to right.

TAPE AND REEL INFORMATION

TAPE DIMENSIONS: DFN2x2-8



REEL DIMENSIONS: DFN2x2-8



Unit: mm

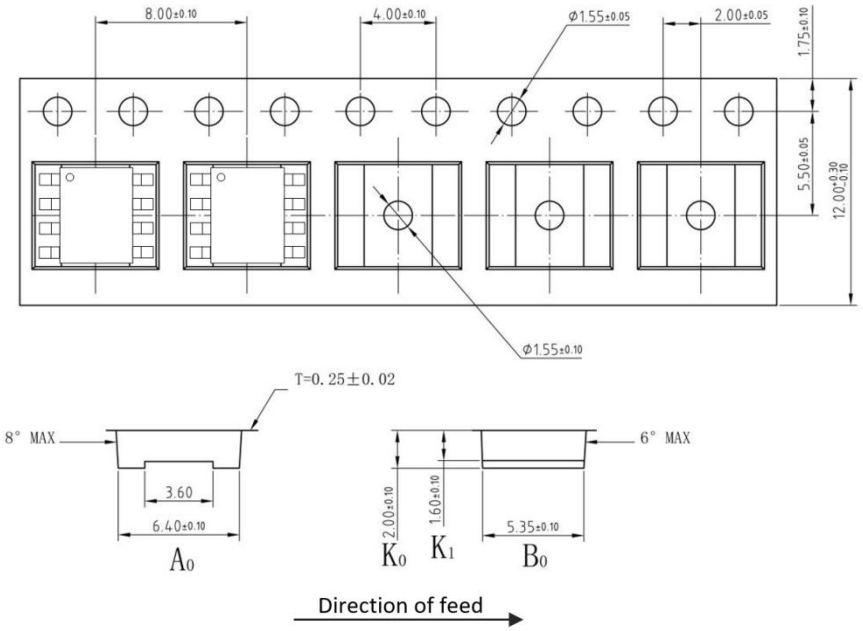
TAPE WIDTH	Ø A (±1.0)	Ø N (±2.0)	W1 (+1.5/-0)	W2 (Max)
8MM	178	54	8.4	14.4

Note:

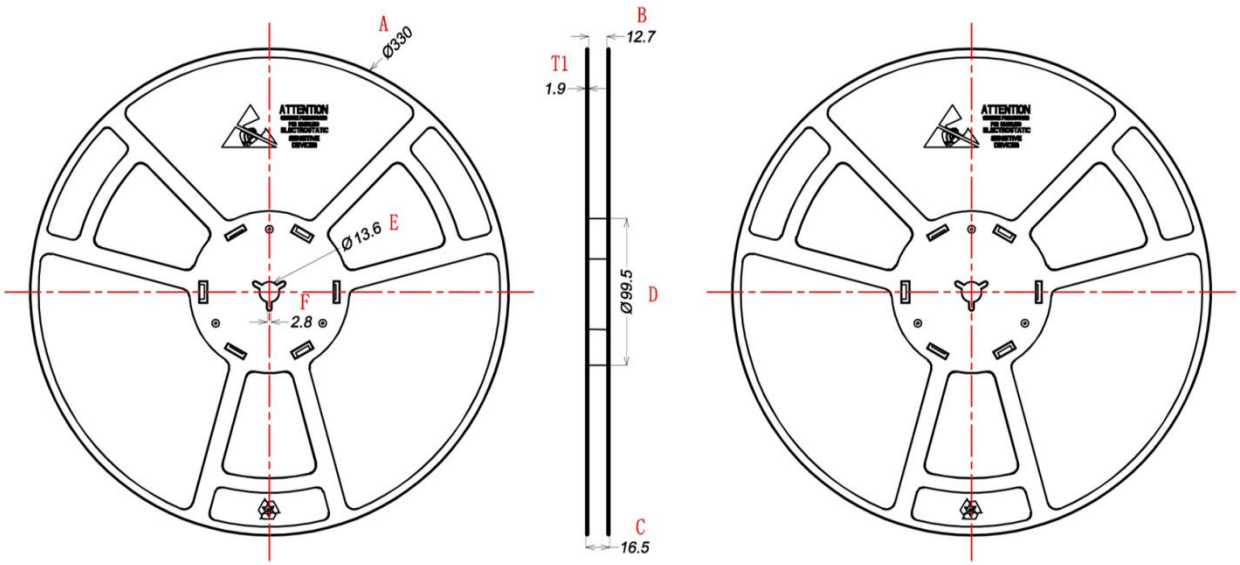
1) All Dimensions are in Millimeter
2) Quantity of Units per Reel is 3000
3) MSL level is level 3.

TAPE AND REEL INFORMATION

TAPE DIMENSIONS:



REEL DIMENSIONS:



Unit: mm

A	B	C	D	E	F	T1
Ø 330±1	12.7±0.5	16.5±0.3	Ø 99.5±0.5	Ø 13.6±0.2	2.8±0.2	1.9±0.2

Note:

1) All Dimensions are in Millimeter
2) Quantity of Units per Reel is 3000
3) MSL level is level 3.