ET3175 - 5.7V, 6A, 18mΩ Load Switch

General Description

The ET3175 is a single-channel load switch with controlled turn on. The device contains N-channel MOSFETs that can operate over an input voltage range of 0.6V to 5.7V and can support a maximum continuous current of 6A. The switch is controlled by an on and off input ON, which can interface directly with low-voltage control signals.

The ET3175 is capable of thermal shutdown when the junction temperature is above the threshold, turning the switch off. The switch turns on again when the junction temperature stabilizes to a safe range. The ET3175 also offers an optional integrated 210Ω on-chip load resistor for quick output discharge when the switch is turned off.

The ET3175 is available in a small DFN8 package with thermal pad allowing for high power dissipation.

Features

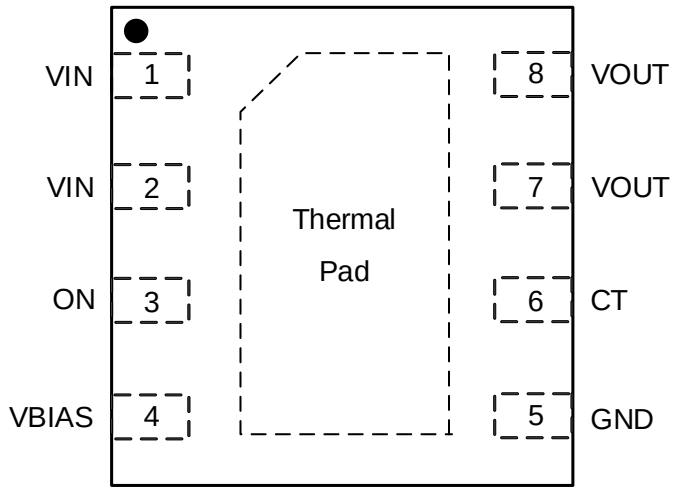
- Integrated Single Channel Load Switch
- V_{BIAS} Voltage Range:2.5V to 5.7V
- Input Voltage Range: 0.6V to V_{BIAS}
- Ultra-low R_{ON} Resistance:
  -- R_{ON} = 18mΩ (Typical) at V_{IN} = 0.6V to 5V, V_{BIAS} = 5V
- 6A Maximum Continuous Switch Current
- Low Quiescent Current:
  -- 30uA (Typical) at V_{IN} = V_{BIAS} = 5V
- Control Input Threshold Enable Use of 1.2V/1.8V/2.5V/3.3V Logic
- Configurable Rise Time
- Thermal Shutdown
- Quick Output Discharge (QOD)
- ESD Protection Complies with JESD22 Standard
  -- HBM: ±4000V Pass (JEDEC JS-001)
  -- CDM: ±1000V Pass (JEDEC JS-002)
  -- Latch-up Performance Exceeds ±100mA per JEDEC JESD78F
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ET3175	DFN8 (2.0mm × 2.0mm)	Tape and Reel, 3K/Reel	1

Application

- Ultra-book TM / Notebooks and Tablet PCs
- Set-top Boxes and Residential Gateways
- Telecom Systems and Solid-State Drives (SSD)

Pin Configuration



Top View

Figure 1. Pin Configuration

Pin Function

Pin No.	Pin Name	I/O	Description
1, 2	VIN	I	Switch Input. Input bypass capacitor recommended for minimizing VIN dip. Must be connected to Pin1 and Pin2.
3	ON	I	Active-High Switch Control Input. Do not leave floating.
4	VBIAS	I	Bias Voltage. Power supply to the device. Recommended voltage range for this pin is 2.5V to 5.7V
5	GND	/	Ground
6	CT	O	Switch Slew Rate Control. Can be left floating. Capacitor used on this pin must be rated for a minimum of 25V for desired rise time performance
7,8	VOUT	O	Switch Output
-	Thermal Pad	-	Thermal pad (exposed center pad) to alleviate thermal stress. Tie to GND.

Block Diagram

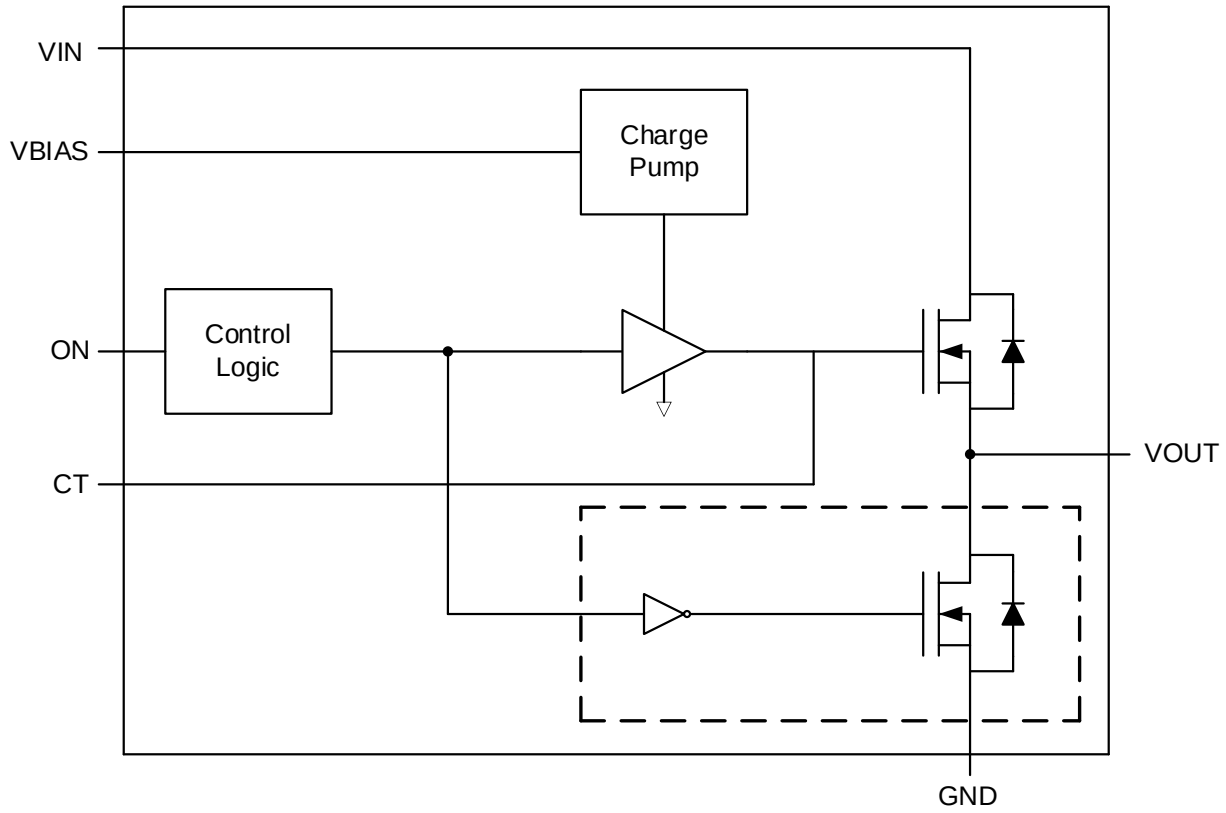


Figure 2. Functional Block Diagram

Functional Description

Input Capacitor

To limit the voltage drop on the input supply caused by transient inrush current when the switch turns on into a discharged load capacitor or short-circuit, a capacitor must be placed between the VIN and GND pins. A 1μF ceramic capacitor, C_{IN}, placed close to the pins is usually sufficient. Higher-value C_{IN} can be used to reduce the voltage drop in higher-current applications. When switching heavy loads, it is recommended to have an input capacitor 10 times higher than the output capacitor to avoid excessive voltage drop.

Output Capacitor

Due to the integrated body diode in the NMOS switch, a C_{IN} greater than C_L is highly recommended. A C_L greater than C_{IN} can cause V_{OUT} to exceed V_{IN} when the system supply is removed. This could result in current flow through the body diode from V_{OUT} to V_{IN}. A C_{IN} to C_{OUT} ratio of 10 to 1 is recommended for minimizing V_{IN} dip caused by inrush currents during startup, however a 10 to 1 ratio for capacitance is not required for proper functionality of the device. A ratio smaller than 10 to 1 (such as 1 to 1) could cause a V_{IN} dip upon turn-on due to inrush currents.

ON/OFF Control

The ON terminal controls the state of the load switch, and asserting the terminal high (active high) enables the switch. The ON terminal is compatible with standard GPIO logic threshold and can be used with any micro-controller or discrete logic with 1.2V or higher GPIO voltage. This terminal cannot be left floating and must be tied either high or low for proper functionality.

Quick Output Discharge (QOD)

The ET3175 includes a QOD feature. When the switch is disabled, an internal discharge resistance is connected between VOUT and GND to remove the remaining charge from the output. This resistance prevents the output from floating while the switch is disabled. For best result, it is recommended that the device gets disabled before VBIAS falls below the minimum recommended voltage.

Thermal Shutdown

Thermal shutdown protects the part from internally or externally generated excessive temperatures. When the device temperature exceeds TSD (Typical 160°C), the switch is turned off. The switch automatically turns on again if the temperature of the die drops 20 degrees below the TSD threshold.

Functions Table

ON State	V_{IN} to V_{OUT}	V_{OUT} State
L	OFF	GND
H	ON	VIN

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameters		Min	Max	Unit
V_{IN}	V_{IN} to GND		-0.3	6.0	V
V_{BIAS}	V_{BIAS} to GND		-0.3	6.0	V
V_{OUT}	V_{OUT} to GND		-0.3	6.0	V
V_{ON}	ON to GND		-0.3	6.0	V
I_{MAX}	Maximum Continuous Switch Current per Channel			6.0	A
I_{PLS}	Maximum Pulsed Switch Current, Pulse < 300us,3% Duty Cycle			8.0	A
T_J	Maximum Junction Temperature			125	°C
T_{STG}	Storage Junction Temperature		-65	150	°C
θ_{JA}	Junction-to-ambient Thermal Resistance		51		°C/W
V_{ESD}	Electrostatic Discharge Capability	Human Body Model, JEDEC JS-001	-4.0	4.0	kV
		Charged Device Model, JEDEC JS-002	-2.0	2.0	

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the data sheet specifications. ETEK does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameters	Min	Max	Unit
V_{IN}	Input Voltage	0.6	V_{BIAS}	V
V_{BIAS}	Bias Voltage Range	2.5	5.7	V
V_{ON}	ON Voltage Range	0	5.7	V
V_{OUT}	Output Voltage Range		V_{IN}	V
$C_{IN1,2}$	Input Capacitor (1)	1		μF
T_A	Ambient Operating Temperature(2)	-40	+105	°C

Note(1) See the Input Capacitor section

Note(2) In applications where high power dissipation and/or poor package thermal resistance is present, the maximum ambient temperature may have to be derated. Maximum ambient temperature (T_{A_MAX}) is dependent on the maximum operating junction temperature (T_{J_MAX}), the maximum power dissipation of the device in the application (P_{D_MAX}), and the junction-to-ambient thermal resistance of the part/package in the application (θ_{JA}), as given by the following equation: $T_{A\_MAX} = T_{J\_MAX} - (\theta_{JA} \times P_{D\_MAX})$.

Electrical Characteristics, V_{BIAS} = 5V

The specification in below table applies V_{BIAS} = 5V, typical values are for T_A = 25°C (unless otherwise noted).

Symbol	Parameter	Test Conditions		T_A = 25°C			T_A = -40~85°C		T_A = -40~105°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
I_{Q_BIAS}	V_{BIAS} Quiescent Current	I_{OUT} = 0mA, V_{IN} = V_{ON} = 5V			30			45		45	μA
I_{SD_VBIAS}	V_{BIAS} Shutdown Current	V_{ON} = 0V, V_{OUT} = 0V			1			2.3		2.3	μA
I_{S_VIN}	V_{IN} Shutdown Current	V_{ON} = 0V V_{OUT} = 0V	V_{IN} = 5.0V		0.1			10		20	μA
			V_{IN} = 3.3V		0.03			5		10	
			V_{IN} = 1.8V		0.01			3		6	
			V_{IN} = 0.6V		0.005			2		3	
I_{ON}	ON-pin Input Leakage Current	V_{ON} = 5.5V			0.01			0.1		0.1	μA
V_{IH}	High-level Voltage ON	V_{IN} = 5.0V			0.74		0.9		0.9		V
V_{IL}	Low-level Voltage ON	V_{IN} = 5.0V			0.67			0.4		0.4	V
R_{ON}	On Resistance	I_{OUT} = -0.2A	V_{IN} = 5.0V		18			28		30	mΩ
			V_{IN} = 3.3V		18			28		30	
			V_{IN} = 1.8V		18			28		30	
			V_{IN} = 1.5V		18			28		30	
			V_{IN} = 1.05V		18			28		30	
			V_{IN} = 0.6V		18			28		30	
V_{ON_HYS}	ON-pin Hysteresis	V_{IN} = 5V			60						mV
R_{PD}	Output Pull-down Resistance	V_{IN} = 5.0V, V_{ON} = 0V, V_{OUT} = 5.0V			210			300		300	Ω
T_{SD}	Thermal Shutdown	Junction Temperature Rising			160						°C
T_{SD_HYS}	Thermal Shutdown Hysteresis	Junction Temperature Falling Threshold			20						°C

Electrical Characteristics, V_{BIAS} = 2.5V

The specification in below table applies V_{BIAS} = 2.5V, typical values are for T_A = 25°C (unless otherwise noted).

Symbol	Parameter	Test Conditions		T_A = 25°C			T_A = -40~85°C		T_A = -40~105°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
I_{Q_BIAS}	V_{BIAS} Quiescent Current	I_{OUT} = 0mA, V_{IN} = V_{ON} = 2.5V			9			20		20	μA
I_{SD_VBIAS}	V_{BIAS} Shutdown Current	V_{ON} = 0V, V_{OUT} = 0V			0.4			1.0		1.0	μA
I_{S_VIN}	V_{IN} Shutdown Current	V_{ON} = 0V V_{OUT} = 0V	V_{IN} = 2.5V		0.03			4		8	μA
			V_{IN} = 1.8V		0.01			3		6	
			V_{IN} = 1.05V		0.005			3		4	
			V_{IN} = 0.6V		0.005			2		3	
I_{ON}	ON-pin Input Leakage Current	V_{ON} = 5.5V			0.01			0.1		0.1	μA
V_{IH}	High-level Voltage ON	V_{IN} = 2.5V			0.68		0.9		0.9		V
V_{IL}	Low-level Voltage ON	V_{IN} = 2.5V			0.63			0.4		0.4	V
R_{ON}	On Resistance	I_{OUT} = -0.2A	V_{IN} = 2.5V		19			32		34	mΩ
			V_{IN} = 1.8V		18			29		31	
			V_{IN} = 1.5V		18			28		30	
			V_{IN} = 1.2V		18			28		30	
			V_{IN} = 1.05V		18			28		30	
			V_{IN} = 0.6V		18			28		30	
V_{ON_HYS}	ON-pin Hysteresis	V_{IN} = 2.5V			50						mV
R_{PD}	Output Pull-down Resistance	V_{IN} = 2.5V, V_{ON} = 0V, V_{OUT} = 2.5V			210			320		320	Ω
T_{SD}	Thermal Shutdown	Junction Temperature Rising			160						°C
T_{SD_HYS}	Thermal Shutdown Hysteresis	Junction Temperature Falling Threshold			20						°C

Switching Characteristics

Refer to the timing test circuit in the Figure 3 and t_{ON} / t_{OFF} waveform in the Figure 4 for references to external components used for the test condition in the switching characteristics table.

Symbol	Parameter	Test Conditions	T_A = 25°C			Unit
			Min	Typ	Max	
V_{IN} = V_{ON} = V_{BIAS} = 5V						
t_{ON}	Turn-on Time	R_L= 10Ω, C_L = 0.1uF, C_T = 1000pF		1200		µs
t_{OFF}	Turn-off Time			5		
t_R	V_{OUT} Rise Time			1500		
t_F	V_{OUT} Fall Time			2.5		
t_D	Delay Time			480		
V_{IN} = 0.6V, V_{ON} = V_{BIAS} = 5V						
t_{ON}	Turn-on Time	R_L = 10Ω, C_L = 0.1uF, C_T = 1000pF		530		µs
t_{OFF}	Turn-off Time			5.5		
t_R	V_{OUT} Rise Time			250		
t_F	V_{OUT} Fall Time			2		
t_D	Delay Time			440		
V_{IN} = 2.5V, V_{ON} = 5V, V_{BIAS} = 2.5V						
t_{ON}	Turn-on Time	R_L = 10Ω, C_L = 0.1uF, C_T = 1000pF		1880		µs
t_{OFF}	Turn-off Time			8.8		
t_R	V_{OUT} Rise Time			2050		
t_F	V_{OUT} Fall Time			2.5		
t_D	Delay Time			1020		
V_{IN} = 0.6V, V_{ON} = 5V, V_{BIAS} = 2.5V						
t_{ON}	Turn-on Time	R_L = 10Ω, C_L = 0.1uF, C_T = 1000pF		1150		µs
t_{OFF}	Turn-off Time			11		
t_R	V_{OUT} Rise Time			650		
t_F	V_{OUT} Fall Time			2.3		
t_D	Delay Time			940		

Timing Diagram

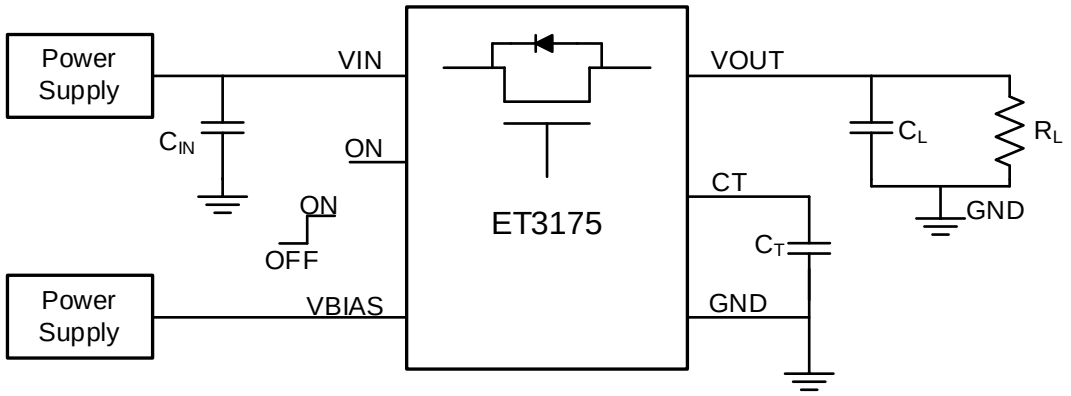


Figure 3. Timing Test Circuit

Waveform

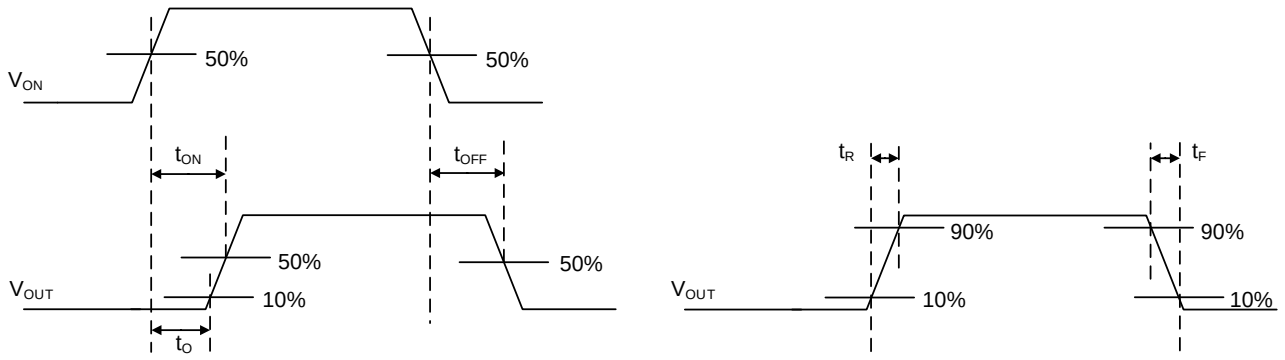


Figure 4. t_{ON} and t_{OFF} Waveform

Application Circuit

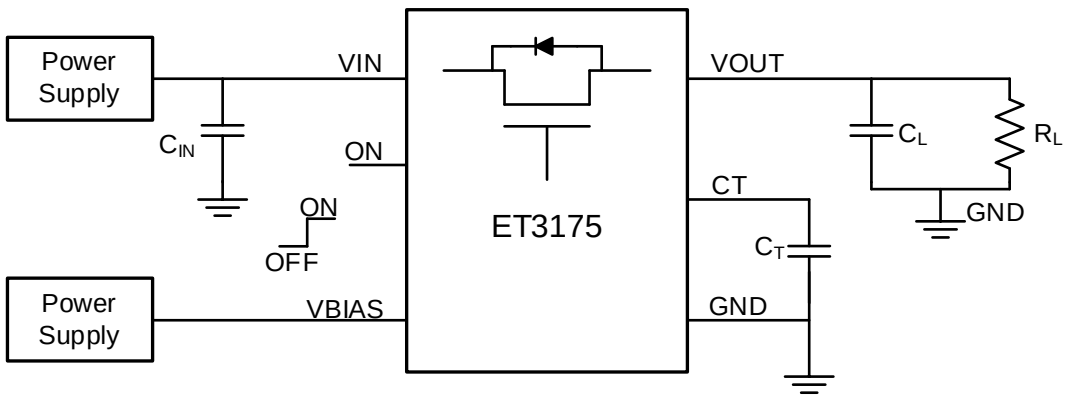
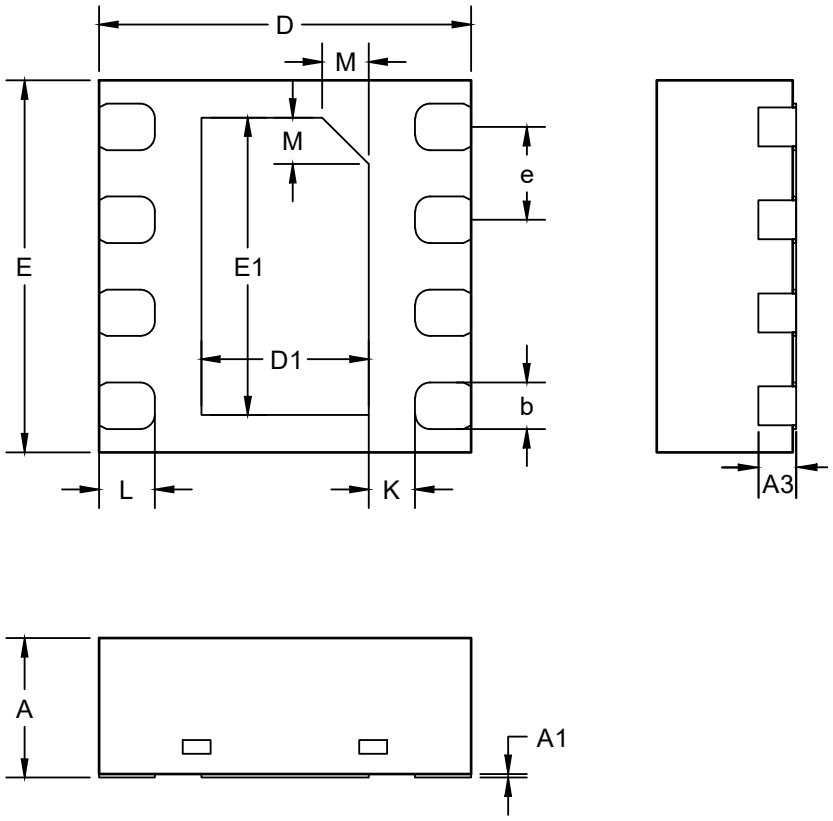


Figure 5. Typical Application

Package Dimension

DFN8 (2mm × 2mm)



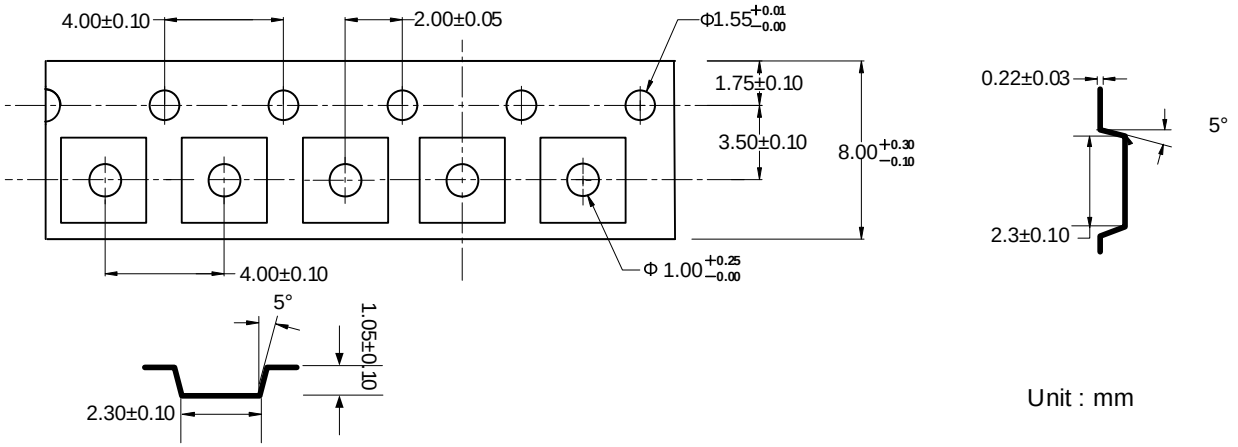
COMMON DIMENSIONS

(Unit: mm)

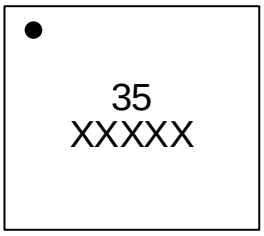
SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3		0.203REF	
b	0.20	0.25	0.30
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D1	0.80	0.90	1.00
E1	1.50	1.60	1.70
e	0.40	0.50	0.60
K	0.15	0.25	0.35
L	0.25	0.30	0.35
M		0.25REF	

Tape Information

DFN8 (2mm × 2mm)



Marking Information



ET3175

35 = Part Number

XXXXX = Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2025-12-11	Preliminary Version	Wang qifan	Yang xiaoxu	Liu jiaying
1.0	2026-04-27	Official Version	Wang anran	Yang xiaoxu	Liu jiaying
1.1	2026-05-28	Update EC Table	Wang anran	Yang xiaoxu	Liu jiaying
1.2	2026-06-08	Update Tape Information and Marking Information	Lu shaojie	Yang xiaoxu	Liu jiaying