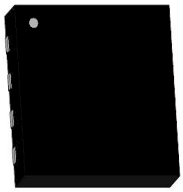
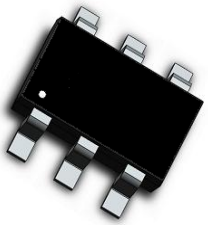
5V、4A Peak current low side Gan driver

Description

TK1001 it is a single-channel high-speed driver with 5V output and a dedicated driver for enhanced GaN FET. TK1001 can provide asymmetric peak current driving capability of 1.4A source current and 4A sink current, which can optimize the turn-on and turn off time of the device respectively. The TK1001 provides inverting and noninverting inputs to satisfy requirements for inverting and Noninverting gate drive in a single device type. When the input pin is suspended, the internal output pull-up and pull-down resistors keep the output low. The TK1001 has undervoltage locking function, which can keep the output at low level before the VDD power supply voltage is in the working range.

Features

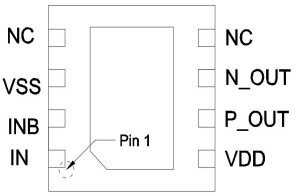




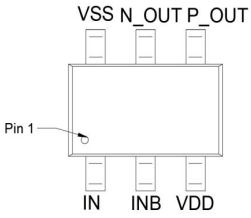
- Separate output configuration to control rise and fall time respectively
- 5V driving voltage
- 1.4A/4A Peak source and sink current
- Low transmission delay (Typ. 6.3ns)
- Fast rise and fall time (Typ. 5.3ns and 3.3ns)
- Support positive and negative phase configuration
- Undervoltage unlock voltage 4V
- Operating temperature range：-40℃ to 125℃

Applications

- Switching Power Supply
- AC/DC、DC/DC converter
- Synchronous rectification
- Envelope tracking



DFN3x3 BOTTOM VIEW

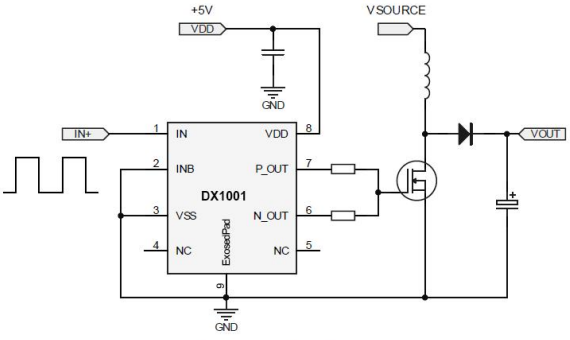


SOT23-6 TOP VIEW

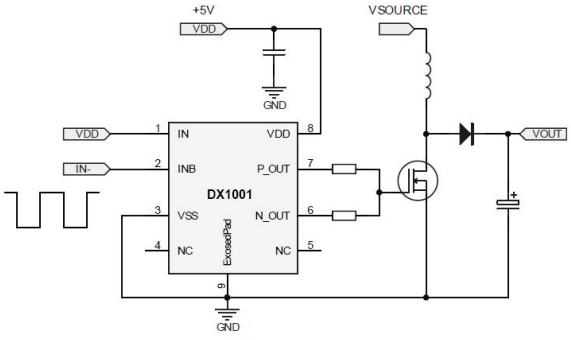
Device Information

Part Number	Package	Packing
TK1001A	DFN3x3	Tape，3K/reel
TK1001B	SOT23-6	Tape，3K/reel

Typical Application Diagram



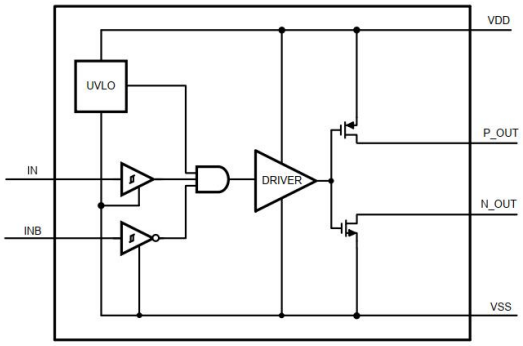
Non-Inverting Input



Inverting Input

Symbol	Describe	Application information
IN	Noninverting logic input	Connect VSS terminal when not in use.
INB	Inverting logic input	Connect VSS terminal when not in use.
VSS	Ground	All signals are referenced to this ground.
N_OUT	Sink current output	Connect to the Gate of GaN FET with a external driving resistor to control the turn-off speed.
P_OUT	Sourcing current output	Connect to the Gate of GaN FET with a external driving resistor to control the turn-on speed.
VDD	Driving voltage supply input	Bias power input.

Functional Block Diagram



Truth Table

IN	INB	P_OUT	N_OUT
L	L	OPEN	L
L	H	OPEN	L
H	L	H	OPEN
H	H	OPEN	L

Key Technical Indicators

Absolute Maximum Ratings

Over operating free-air temperature range(Unless otherwise noted) (1)

Description	Min	Max	Unit
VDD to VSS	-0.3	5.5	V
IN, INB to VSS	-0.3	20	V
N_OUT to VSS	-0.3	VDD+0.3	V
P_OUT to VSS	-0.3	VDD+0.3	V
Junction temperature		+150	℃
Storage temperature	-55	+150	℃

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions.* Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Recommended Operating conditions

Over operating free-air temperature range(Unless otherwise noted)

Description	Min	Max	Unit
VDD	4.2	5.2	V
IN, INB	4.0	18	V
Operating temperature	-20	+125	℃

Thermal Characteristics

Symbol	Description	Package	Value	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance	DFN3x3	70	℃/W
		SOT23-6	170	℃/W
$R_{\theta JC(bottom)}$	Junction-to-board thermal resistance	DFN3x3	9.0	℃/W
		SOT23-6	120	℃/W

Electrical Characteristics

The maximum and minimum limits are determined by design, test, or data correlation. The typical values represent the most likely parametric norm at TJ = 25 ℃ for reference purposes only. (unless otherwise specified, VDD = 5V).

Symbol	Description	Test conditions	Min.	Typ.	Max.	Unit
V_{DD}	VDD operating voltage	Tj range of -20℃ to 125℃	4.7	5.0	5.2	V
UVLO	VDD undervoltage lockout	VDD rising	3.8	4.0	4.2	V
	VDD undervoltage lockout hysteresis			0.1		V
	VDD undervoltage lockout to output delay time			1300		ns
I_{LK-N}	Output leakage current	N_OUT=VDD		0.5	15	μA
I_{LK-P}	Output leakage current	P_OUT=VDD		0.5	15	μA
N Channel output						
R_{ON-N}	Drive output resistance - pulling down	VDD=5V			0.36	Ω
P Channel output						
R_{ON-P}	Drive output resistance – pulling up	VDD=5V		1.62	1.64	Ω
Logic input						
V_{IH}	Input voltage - logic 1		2.05			V
V_{IL}	Input voltage - logic 0				1.78	V

High frequency characteristics

Over operating free-air temperature range (unless otherwise noted)

Symbol	Description	Test conditions	Min.	Typ.	Max.	Unit
t_R	Rise time[1)]	C_L = 1000 pF		5.2		ns
t_F	Fall time	C_L = 1000 pF		3.3		ns
t_{D-ON}	Turn-on propagation delay	C_L = 1000 pF		6.3		ns
t_{D-OFF}	Turn-off propagation delay	C_L = 1000 pF		6.3		ns

The rise time is the time required for the output signal to rise from 10% to 90%。
The fall time is the time required for the output signal to drop from 90% to 10%。
The on propagation delay is the time required for the input signal to rise to 50% and the output signal to rise to 10%。

The turn off propagation delay is the time required for the input signal to drop to 50% and the output signal to drop to 10%。

Characteristic curves

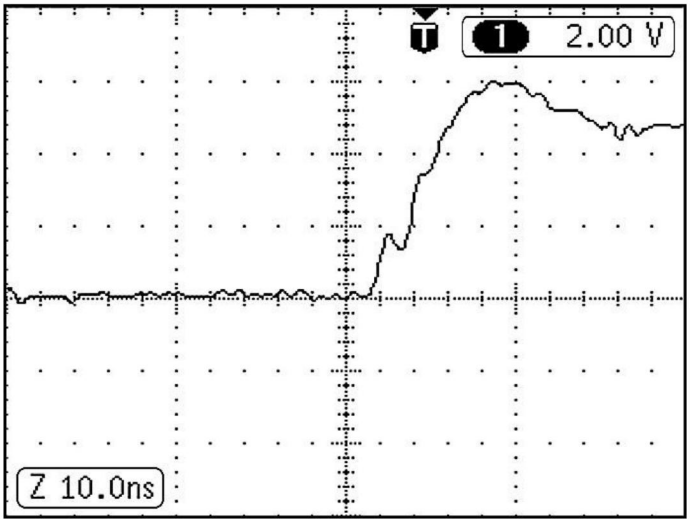


Figure 1. Rise time (VDD=5V, CL=1000pF)

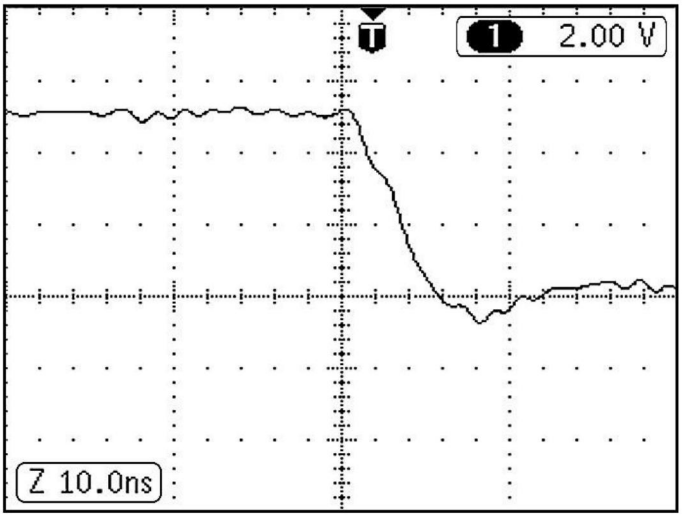


Figure 2. Fall time (VDD=5V, CL=1000pF)

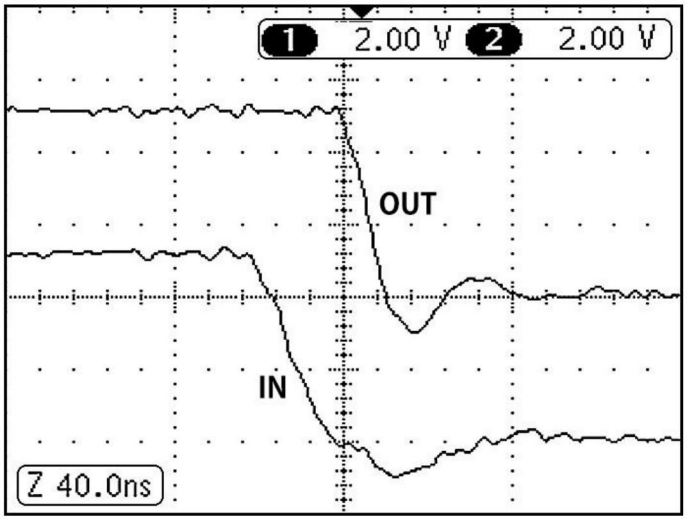
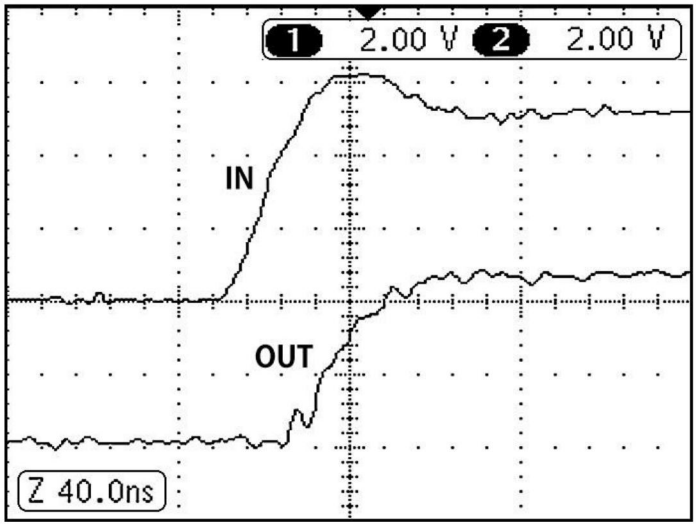


Figure3.Rise propagation delay (VDD=5V, CL=4700pF)

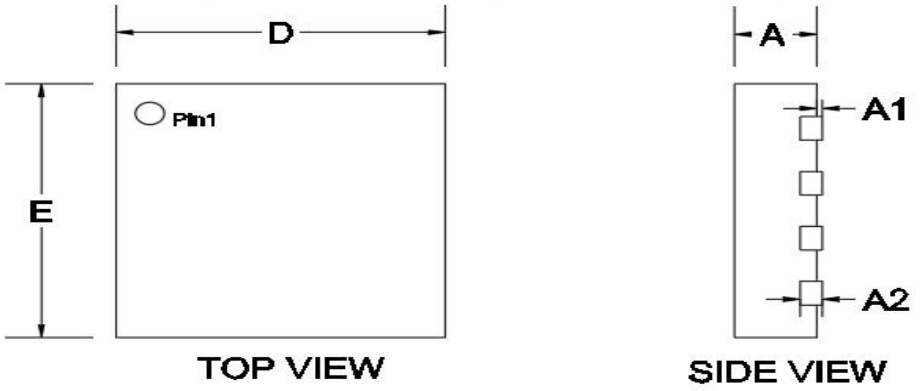


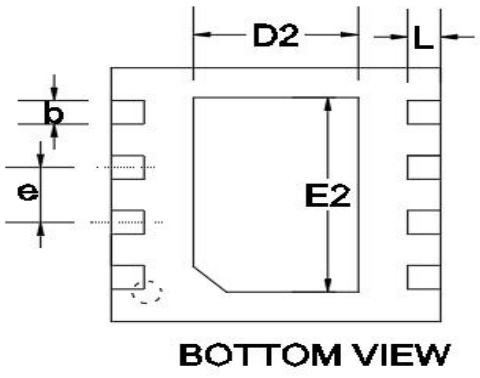
Picture 4. Fall propagation delay (VDD=5V, CL=4700pF)

Device dimensions

DFN3x3 Dimensions

尺寸对照表(单位：mm)			
	Min.	Nom.	Max.
A	0.70	0.75	0.80
A1	-	-	0.05
A2	0.203(REF)		
b	0.23	0.28	0.33
D	2.90	3.00	3.10
D2	1.40	1.50	1
E	2.90	3.00	3.10
E2	2.20	2.30	2.40
e	0.65(TYP)		
L	0.25	0.30	0.35

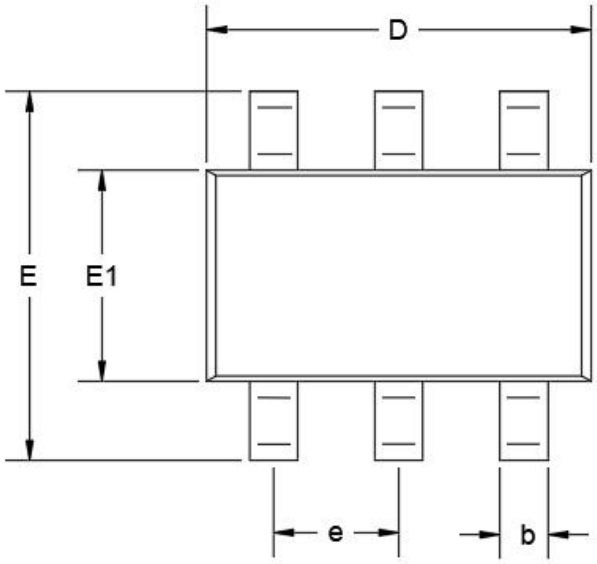




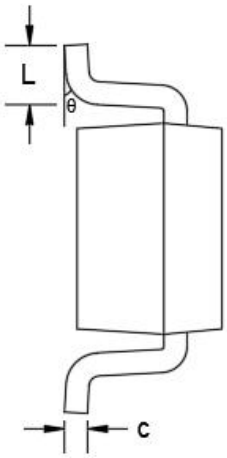
DFN3x3

SOT23-6 Dimensions

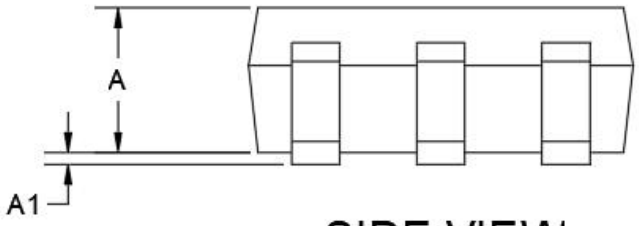
尺寸对照表(单位：mm)			
	Min.	Nom.	Max.
A	1.05	1.10	1.15
A1	0.03	0.09	0.15
b	0.28	0.37	0.45
C	0.12	0.18	0.23
D	2.82	2.92	3.02
E	2.60	2.80	3
E1	1.50	1.60	1.70
e		0.95(BSC)	
L	0.35	0.45	0.55
θ	0°	4°	8°



TOP VIEW



SIDE VIEW



SIDE VIEW

SOT23-6