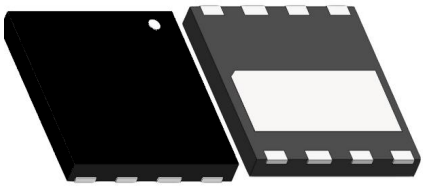
Description

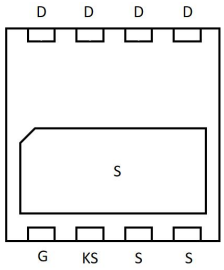
TKC1565S2F is a sealed device that includes a single channel high-speed driver and an enhanced GaN-on-silicon transistor. GaN is a wide band gap semiconductor with high power density. The gallium nitride transistor is characterized by no body diode, so the reverse recovery charge is zero.

Features

- Integrated 650 V e-mode GaN HEMT and gate driver
- High repetitive input voltage tolerance of ±18V
- $R_{DS(on),\ max}$ = 130mΩ
- $I_{DS(max)}$ = 15A
- Very high switching frequency (> 10 MHz)
- Fast and controllable rise time
- Zero reverse recovery loss



DFN8x8



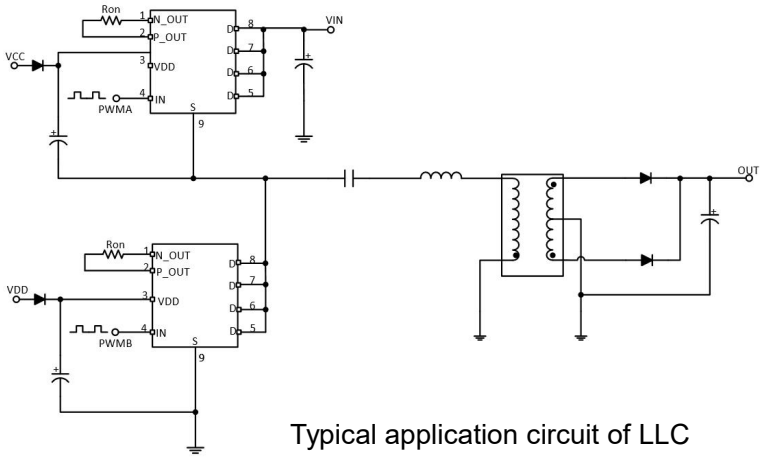
Bottom View

Applications

- Fast Battery Charging
- LED lighting drivers
- Power Factor Correction
- LLC Converters
- Wireless Power Transfer

Device Information

Part Number	Marking Code	Package	Packing
TKC1565S2F	C1565S2F	DFN8x8	260pcs/tray



Typical application circuit of LLC

Absolute Maximum Ratings (Tc=25℃ unless otherwise specified)

Parameter	Symbol	Value	Unit	Condition
Drain-Source voltage	V_{DS}	650	V	
Continuous drain current*	I_D	18	A	Tc=25℃
		14	A	Tc=125℃
Operation and storage temperature	T_j	-55 to 150	℃	
	T_{stg}	-55 to 150	℃	

*** An Estimated Value**

Electrical Characteristics (Tc=25℃ unless otherwise specified)

Typical Performance – Static

Parameter	Symbol	Values			Unit	Test condition
		Min.	Type.	Max.		
Drain source breakdown voltage	BV_{DS}	650	/	/	V	VGS=0V, ID=20μA
Total drain leakage current	I_{DSS}	/	0.7	25	μA	VDS=650V, VGS=0V, Tj=25℃
		/	6	200	μA	VDS=650V, VGS=0V, Tj=150℃
Static drain-source on-resistance	$R_{DS(ON)}$	/	104	130	mΩ	VGS=6V, ID=3A, Tj=25℃
		/	215	/	mΩ	VGS=6V, ID=3A, Tj=150℃

Single Channel High Speed Drive 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

Parameter	Symbol	Values	Unit	Note/Test Condition
Thermal resistance, junction-ambient	RthJA	60.3	°C/W	
Thermal resistance, junction-case	RthJC	1.1	°C/W	
Maximum reflow soldering temperature	Tsold	260	°C	MSL3

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

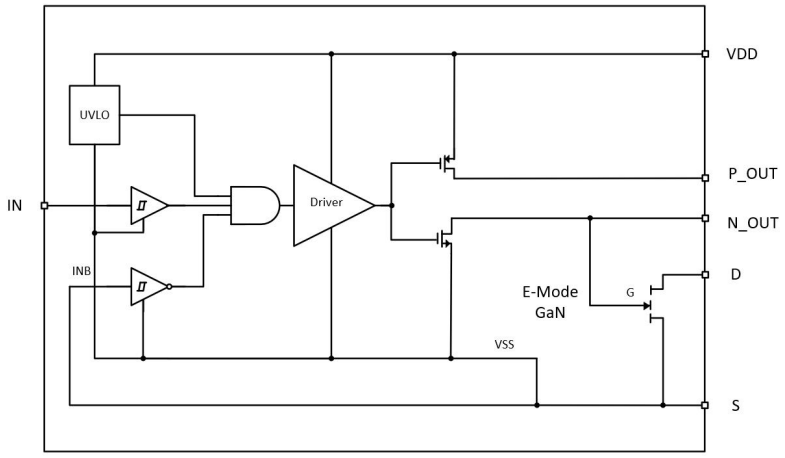
The rise time is the time required for the output signal to rise from 10% to 90%。

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%。

Functional Block Diagram



Package

Dimensions(mm)			
Symbol	**Min.**	**Nom.**	**Max.**
A	0.75	0.85	0.95
A1	0.00	0.03	0.05
A2		REF 0.203	
b	0.95	1.00	1.05
D	7.90	8.00	8.10
D1	6.84	6.94	7.04
E	7.90	8.00	8.10
E1	3.10	3.20	3.30
e		REF 2.00	
K1	0.40	0.50	0.60
K2	0.90	1.00	1.10
K3	2.70	2.80	2.90
L	0.40	0.50	0.60
R	0.15	0.25	0.35

