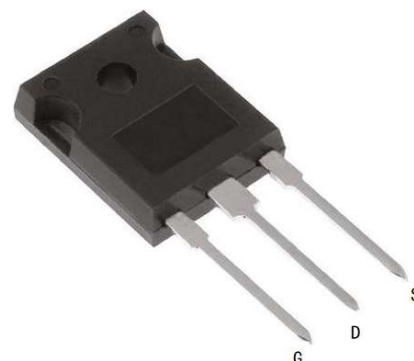


TO247



Applications

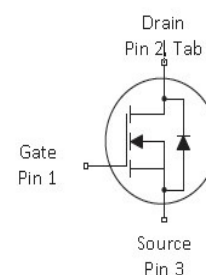
For Soft Switching Boost PFC switch, HB or AHB or LLC half bridge and full bridge topologies.
Such as phase-shift-bridge(ZVS),LLC Application-Server Power, Telecom Power, EV Charging,Solar inverter.

Features

Low drain-source on-resistance: $R_{DS(ON)} = 0.056\Omega$ (typ.)
Easy to control Gate switching
Enhancement mode: $V_{th} = 2.5$ to 4.5 V

Table 1 Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	650	V
$R_{DS(on),max}$	68	m Ω
$Q_{g,typ}$	87.22	nC
I_D	54	A



Packaging and Internal Circuit

Part Name	Package	Marking
WTM54N65AMP	TO247	WPM 54N65AMP XXX YYWW

Thermal characteristics

Table 2 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.43	$^{\circ}\text{C/W}$	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	62	$^{\circ}\text{C/W}$	device on PCB, minimal footprint

Maximum ratings

at $T_j = 25^\circ\text{C}$, unless otherwise specified

Table 3 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current ¹⁾	I_D		-	54	A	$T_C = 25^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	162	A	$T_C = 25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}	-	-	624	mJ	
MOSFET dv/dt ruggedness	dv/dt	-	-	50	V/ns	$V_{DS} = 0 \dots 400\text{V}$
Gate source voltage (static)	V_{GS}	-20	-	20	V	static;
Gate source voltage (dynamic)	V_{GS}	-30	-	30	V	AC ($f > 1\text{ Hz}$)
Power dissipation	P_{tot}	-	-	178.1	W	$T_C = 25^\circ\text{C}$
Storage temperature	T_{stg}	-55	-	150	$^\circ\text{C}$	
Operating junction temperature	T_j	-55	-	150	$^\circ\text{C}$	
Continuous diode forward current	I_S	-	-	48	A	$T_C = 25^\circ\text{C}$
Diode pulse current ²⁾	$I_{S,pulse}$	-	-	162	A	$T_C = 25^\circ\text{C}$
Reverse diode dv/dt ³⁾	dv/dt	-	-	15	V/s	$V_R = 400\text{V}$, $I_F = 25\text{ A}$, $di_F/dt = 100\text{A}/\mu\text{s}$; see table 8

1) Limited by $T_{j,max}$. Maximum Duty Cycle $D = 0.50$

2) Pulse width t_p limited by $T_{j,max}$

3) Identical low side and high side switch with identical R_G

Table 4 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.68	-	V	$V_{GS} = 0\text{V}$, $I_F = 3.8\text{ A}$, $T_j = 25^\circ\text{C}$
Reverse recovery time	t_{rr}	-	458.8	-	ns	$V_R = 400\text{V}$, $I_F = 25.8\text{A}$, $di_F/dt = 100\text{A}/\mu\text{s}$; see table 8
Reverse recovery charge	Q_{rr}	-	8.739	-	μC	$V_R = 400\text{V}$, $I_F = 25.8\text{A}$, $di_F/dt = 100\text{A}/\mu\text{s}$; see table 8
Peak reverse recovery current	I_{rrm}	-	39.6	-	A	$V_R = 400\text{V}$, $I_F = 25.8\text{A}$, $di_F/dt = 100\text{A}/\mu\text{s}$; see table 8

Electrical characteristics

at $T_j=25^{\circ}\text{C}$, unless otherwise specified

Table 5 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	655	-	-	V	$V_{GS}=0V$, $I_D=10mA$
Gate threshold voltage	$V_{(GS)th}$	2.5		4.5	V	$V_{DS}=V_{GS}$, $I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=655V$, $V_{GS}=0V$, $T_j=25^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=30V$, $V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.056	0.068	Ω	$V_{GS}=10V$, $I_D=14A$, $T_j=25^{\circ}\text{C}$
Gate resistance	R_G	-	12.6	-	Ω	$f=1MHz$, open drain

Table 6 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	6884	-	pF	$V_{GS}=0V$, $V_{DS}=50V$, $f=1MHz$
Output capacitance	C_{oss}	-	440	-	pF	$V_{GS}=0V$, $V_{DS}=50V$, $f=1MHz$
Reverse transfer capacitance	C_{rss}		9.0		pF	$V_{GS}=0V$, $V_{DS}=50V$, $f=1MHz$
Turn-on delay time	$t_{d(on)}$	-	34.4	-	ns	$V_{DD}=400V$, $V_{GS}=13V$, $I_D=25.8A$, $R_G=1.7\Omega$; see table 9
Rise time	t_r	-	27.2	-	ns	$V_{DD}=400V$, $V_{GS}=13V$, $I_D=25.8A$, $R_G=1.7\Omega$; see table 9
Turn-off delay time	$t_{d(off)}$	-	185	-	ns	$V_{DD}=400V$, $V_{GS}=13V$, $I_D=25.8A$, $R_G=1.7\Omega$; see table 9
Fall time	t_f	-	22	-	ns	$V_{DD}=400V$, $V_{GS}=13V$, $I_D=25.8A$, $R_G=1.7\Omega$; see table 9

Table 7 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	19.13	-	nC	$V_{DD}=400V$, $I_D=25.8A$, $V_{GS}=0$ to $10V$
Gate to drain charge	Q_{gd}	-	39.46	-	nC	$V_{DD}=400V$, $I_D=25.8A$, $V_{GS}=0$ to $10V$
Gate charge total	Q_g	-	87.22	-	nC	$V_{DD}=400V$, $I_D=25.8A$, $V_{GS}=0$ to $10V$
Gate plateau voltage	$V_{plateau}$	-	6.4	-	V	$V_{DD}=400V$, $I_D=25.8A$, $V_{GS}=0$ to $10V$

¹⁾ $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 400V

²⁾ $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 400V

Test Circuits

Table 8 Diode characteristics

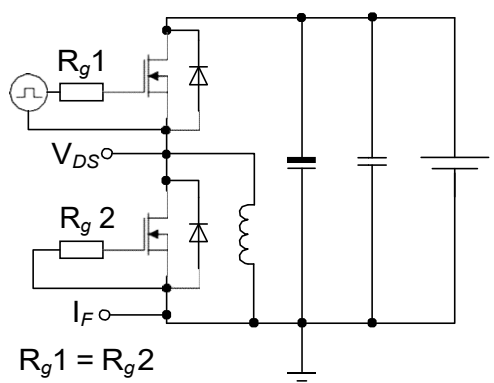
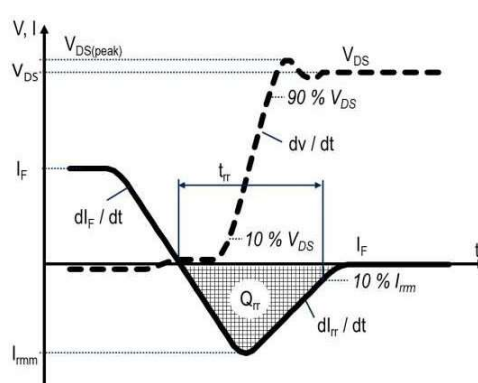
Test circuit for diode characteristics	Diode recovery waveform
 $R_{g1} = R_{g2}$	

Table 9 Switching times

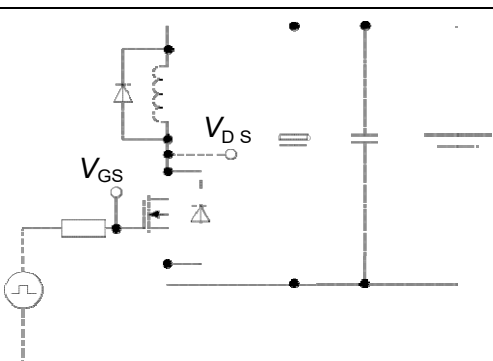
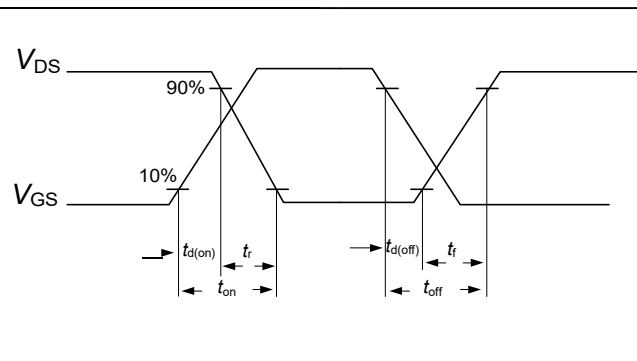
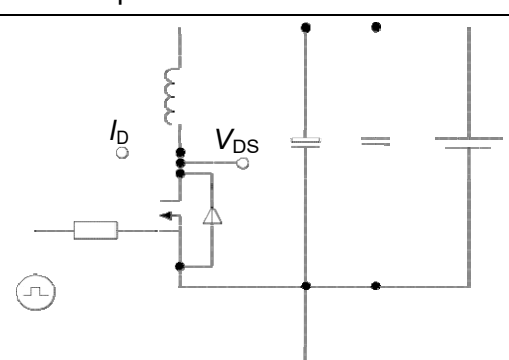
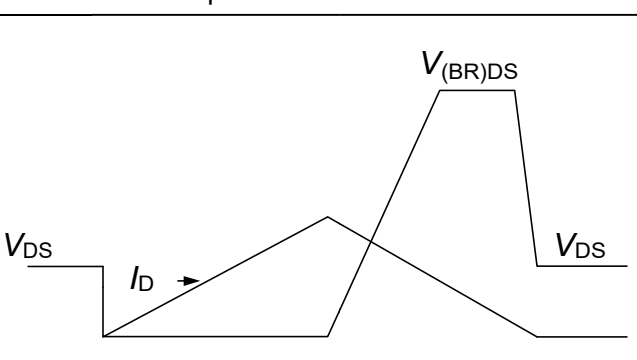
Switching times test circuit for inductive load	Switching times waveform
	

Table 10 Unclamped inductive load

Unclamped inductive load test circuit	Unclamped inductive waveform
	

Package Outlines

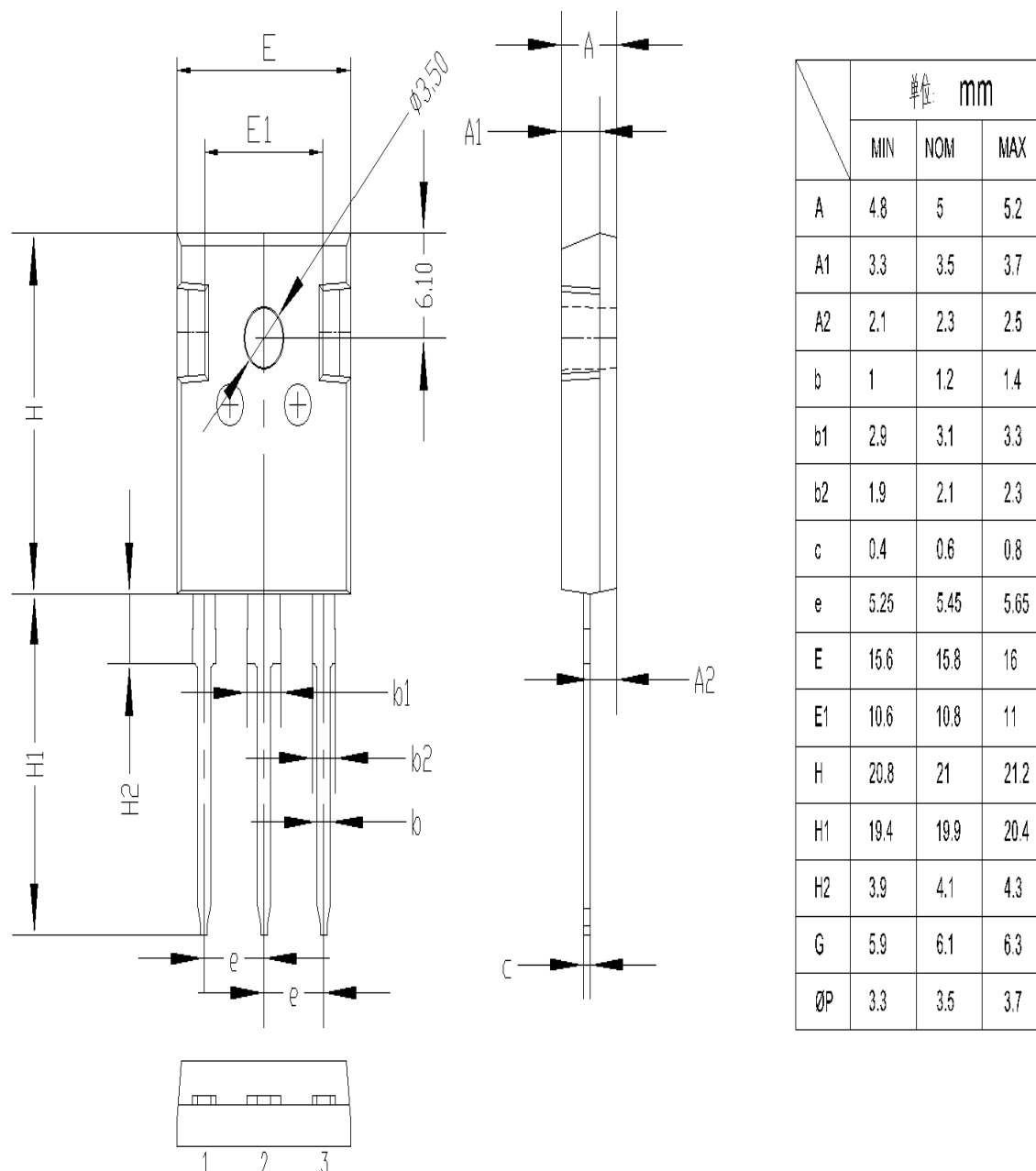


Figure1: Outline PG-T0247

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