

## Features

- Uses PingWei advanced PerfectMOS technology
- Extremely low on-resistance  $R_{DS(on)}$
- Excellent  $Q_g \times R_{DS(on)}$  product(FOM)
- Excellent Low Ciss
- Qualified according to JEDEC criteria



**100% DVDS Tested**  
**100% Avalanche Tested**

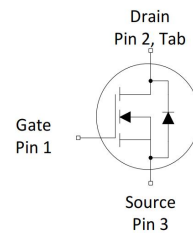
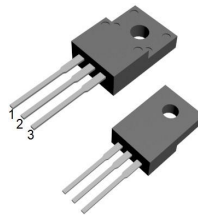
## Applications

- PFC stages, hard switching PWM stages and resonant switching
- PWM stages for e.g. PC Silverbox, Adapter, LCD & PDP TV, Lighting, Server, Telecom and UPS

## Product Summary

$V_{DS}$	650V
$R_{DS(on)@10V}$ typ	212mΩ
ID	15A

TO-220TF-3L



## Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWE300N65TFS	PWE300N65TFS	TO-220TF-3L	Tube	N/A	N/A	50pcs

## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	650	V
Continuous drain current	$I_D$	15	A
$T_C = 25^\circ\text{C}$ (Silicon limit)		58	
$T_C = 25^\circ\text{C}$ (Package limit)		9	
$T_C = 100^\circ\text{C}$ (Silicon limit)		2	
$T_a = 25^\circ\text{C}$			
Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p = 100\mu\text{s}$ )	$I_{D\ pulse}$	60	A
Avalanche energy, single pulse ( $L=60\text{mH}$ , $V_{ds}=50\text{V}$ )	$E_{AS}$	68	mJ
Gate-Source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation	$P_{tot}$	31	W
$T_C = 25^\circ\text{C}$		1.9	
$T_a = 25^\circ\text{C}$			
Operating junction and storage temperature	$T_j, T_{stg}$	-55...+150	$^\circ\text{C}$
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	$T_{sold}$	260	$^\circ\text{C}$

## Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case.	RthJC	-	2.71	4.1	°C/W	-
Thermal resistance, junction - ambient(min. footprint)	RthJA	-	-	66	°C/W	-

## Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

## Static Characteristic

Drain-source breakdown voltage	$BV_{DSS}$	650	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2	-	4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	$I_{DSS}$	-	0.04	1	$\mu A$	$V_{DS}=650V, V_{GS}=0V$ $T_j=25^\circ C$ $T_j=150^\circ C$
Gate-source leakage current	$I_{GSS}$	-	$\pm 10$	$\pm 100$	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	212	300	mΩ	$V_{GS}=10V, I_D=7.5A$
Transconductance	$g_{fs}$	-	11	-	S	$V_{DS}=5V, I_D=7.5A$

## Dynamic Characteristic

Input Capacitance	$C_{iss}$	-	1182	-	pF	$V_{GS}=0V, V_{DS}=400V,$ $f=250KHz$
Output Capacitance	$C_{oss}$	-	29	-		
Reverse Transfer Capacitance	$C_{rss}$	-	4	-		
Gate Total Charge	$Q_G$	-	25	-	nC	$V_{DS}=325V, I_D=7.5A,$ $V_{GS}=10V$
Gate-Source charge	$Q_{gs}$	-	7	-		
Gate-Drain charge	$Q_{gd}$	-	8	-		
Turn-on delay time	$t_{d(on)}$	-	21	-	ns	$V_{GS}=10V, V_{DD}=325V,$ $R_{G\_ext}=2.5\Omega, I_D=6.5A$
Rise time	$t_r$	-	18	-		
Turn-off delay time	$t_{d(off)}$	-	112	-		
Fall time	$t_f$	-	16	-		
Gate resistance	$R_G$	-	32	-	Ω	$V_{GS}=0V, f=1MHz$



## Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$	-	-	1.5	V	$V_{GS}=0V, I_{SD}=7.5A$
Body Diode Continuous Forward Current	$I_S$	-	-	15	A	TC = 25°C
Body Diode Pulsed Current	$I_S$ pulse	-	-	60	A	TC = 25°C
Body Diode Reverse Recovery Time	$t_{rr}$	-	211	-	ns	$V_R=400V, I_F=5.2A,$ $dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	1700	-	nC	



## Typical Performance Characteristics

Fig 1: Output Characteristics

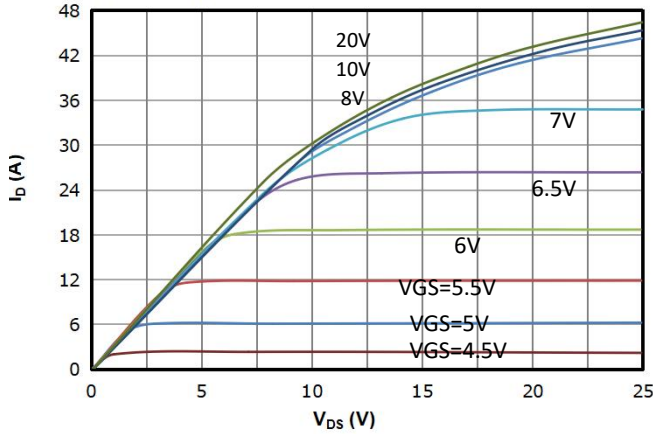


Fig 2: Transfer Characteristics

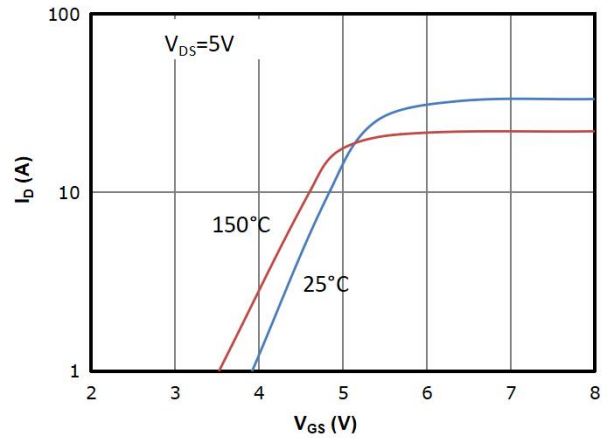


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

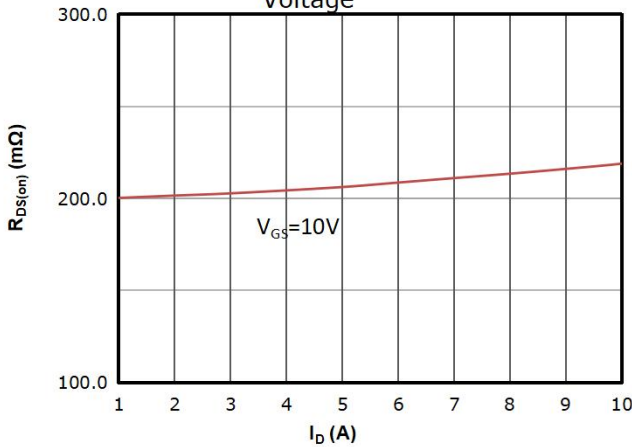


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

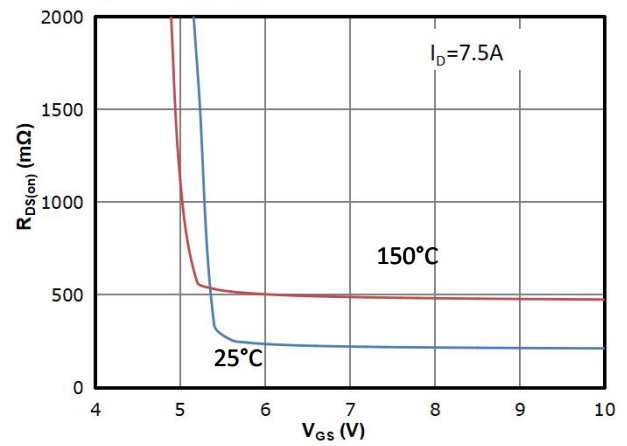


Fig 5:  $R_{DS(on)}$  vs. Temperature

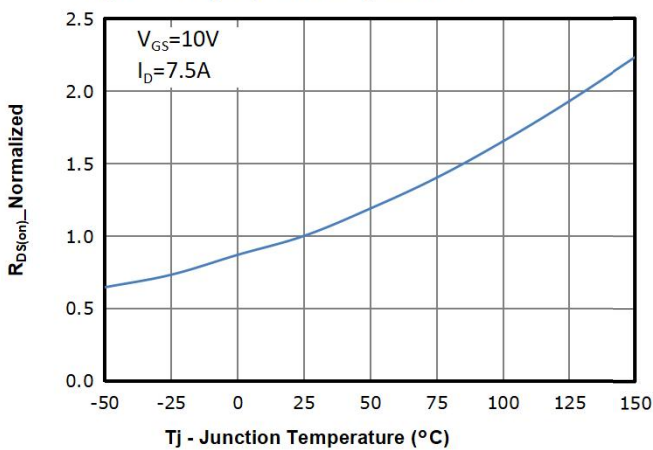


Fig 6:  $V_{GS(th)}$  vs. Temperature

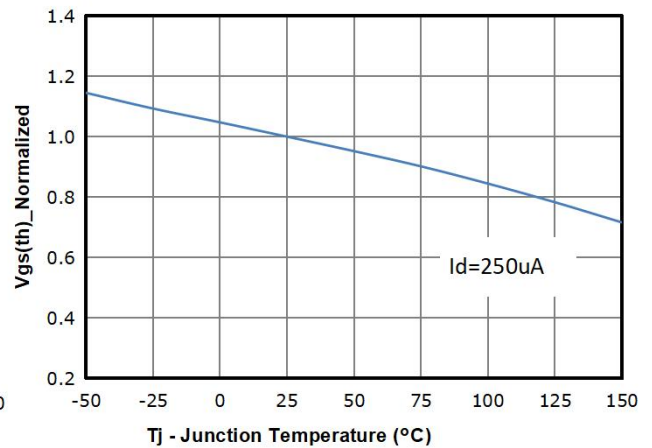




Fig 7: BVdss vs. Temperature

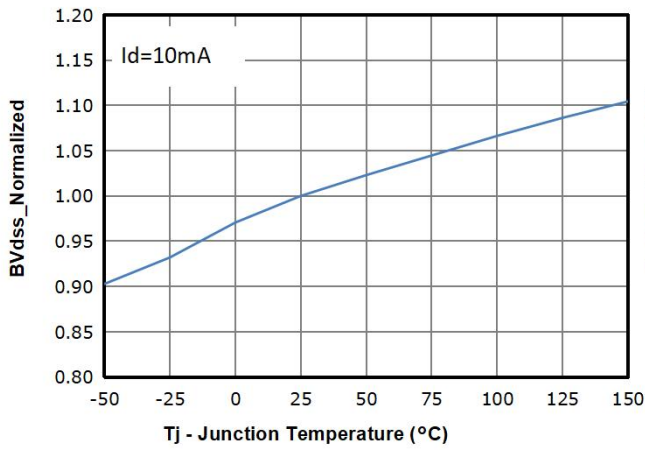


Fig 8: Capacitance Characteristics

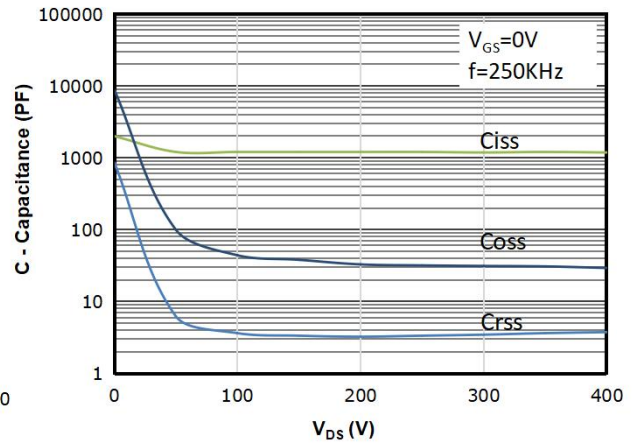


Fig 9: Gate Charge Characteristics

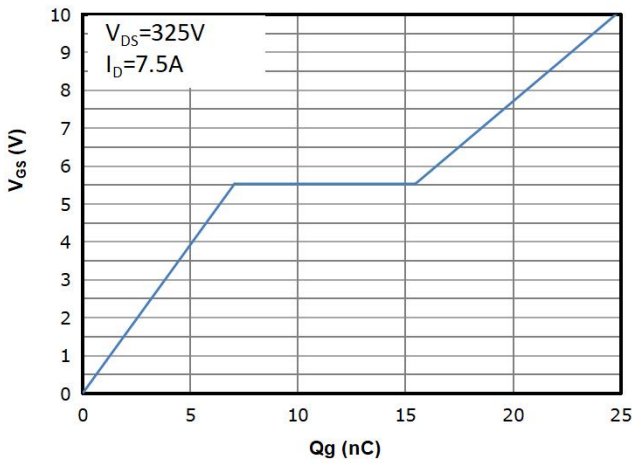


Fig 10: Body-diode Forward Characteristics

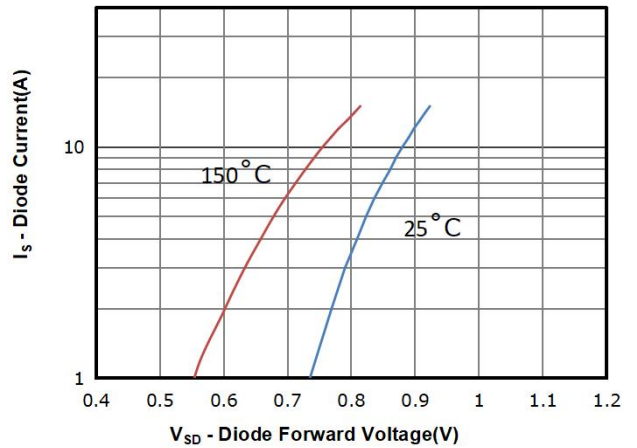


Fig 11: Power Dissipation

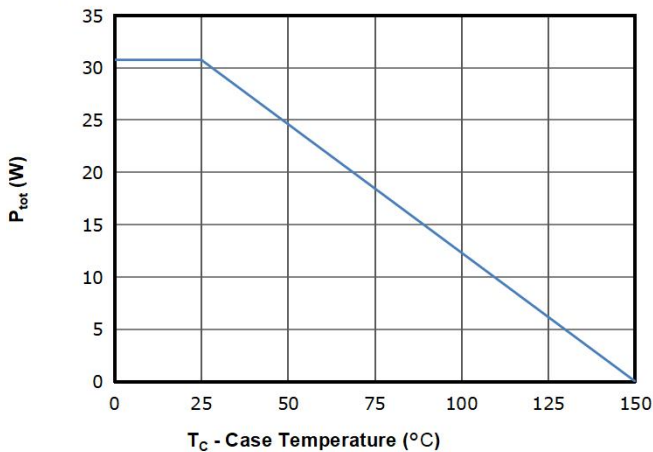


Fig 12: Drain Current Derating

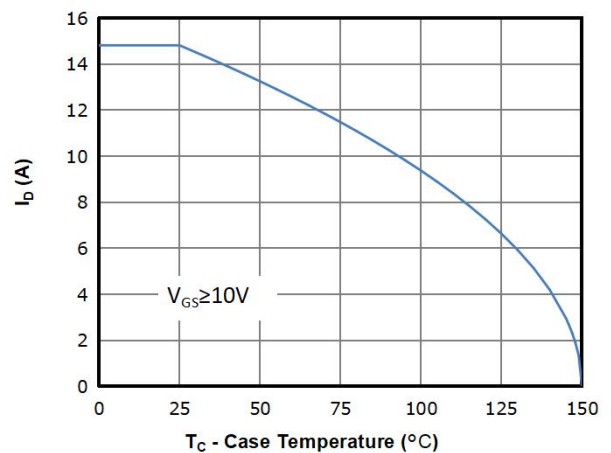




Fig 13: Safe Operating Area

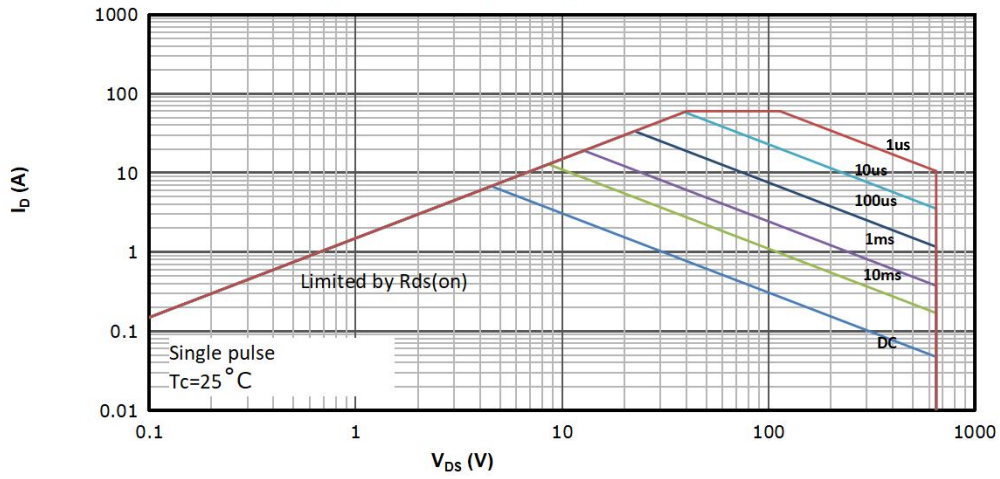
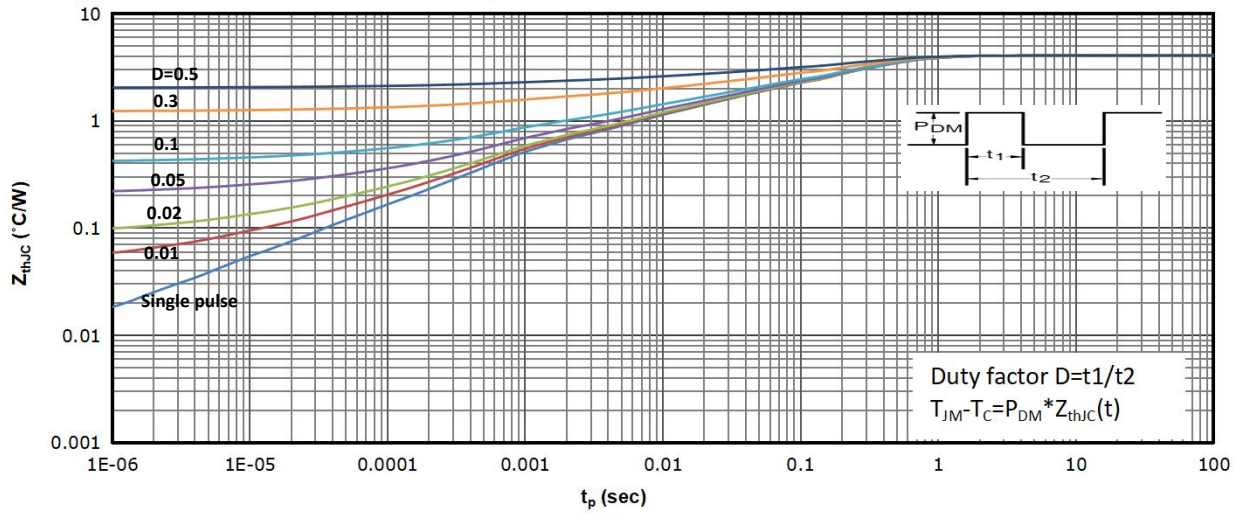


Fig 14: Max. Transient Thermal Impedance

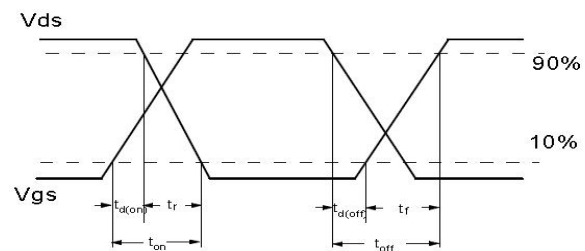
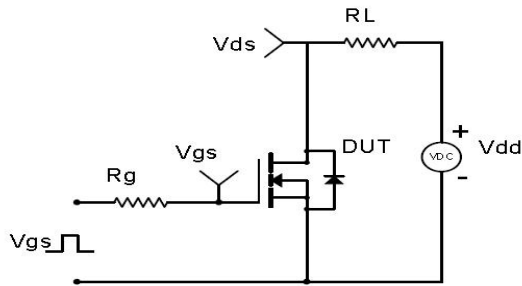


## Test Circuit & Waveform

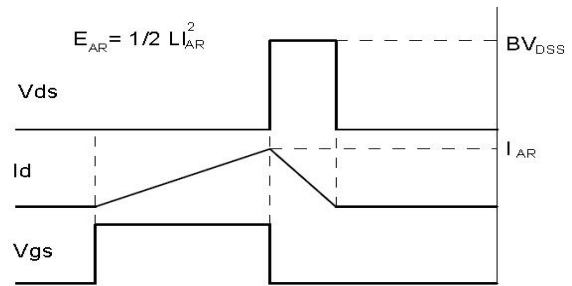
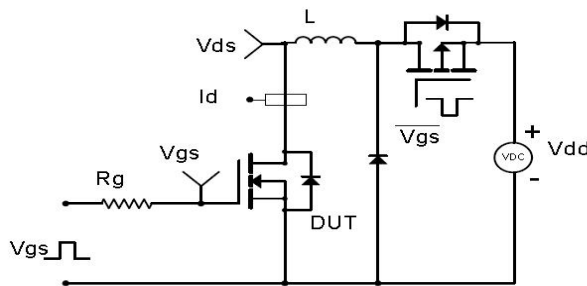
Gate Charge Test Circuit & Waveform



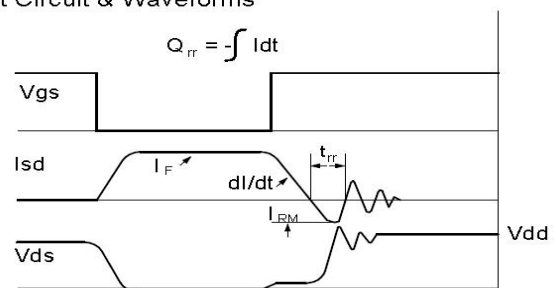
Resistive Switching Test Circuit & Waveforms



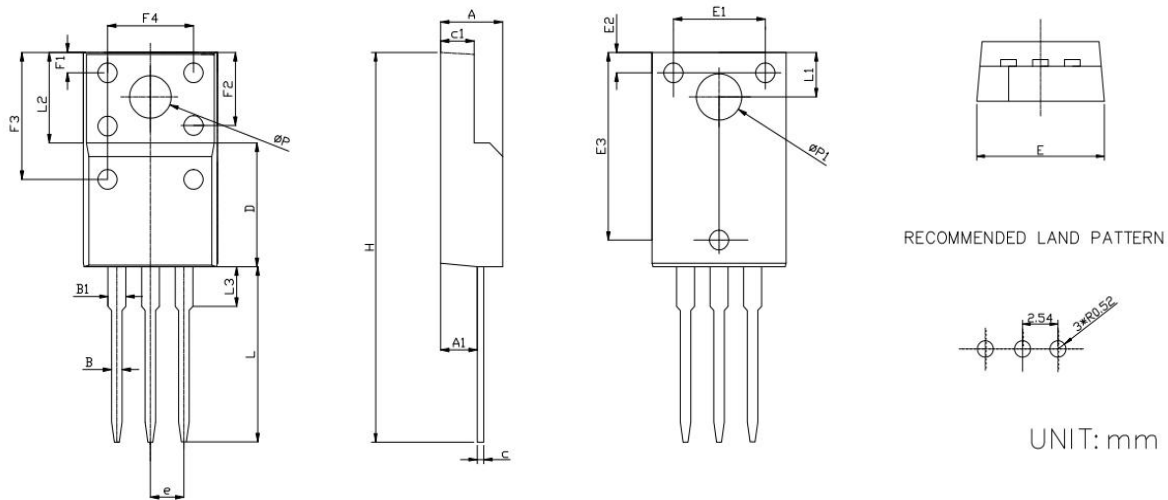
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Package Outline: TO-220TF-3L



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.50	4.90	0.177	0.193
A1	2.63	2.89	0.104	0.114
B	0.75	0.90	0.030	0.035
B1	1.15	1.55	0.045	0.061
C	0.40	0.60	0.016	0.024
C1	2.34	2.74	0.092	0.108
D	8.87	9.47	0.349	0.373
e	2.54		0.100	
E	9.86	10.46	0.388	0.412
E1	6.86	7.06	0.270	0.278
E2	1.40	1.60	0.055	
E3	13.80	14.00	0.543	0.551
F1	1.40	1.60	0.055	
F2	5.15	5.65	0.203	0.222
F3	9.10	9.70	0.358	0.382
F4	6.70	7.30	0.264	0.287
H	28.50	29.50	1.122	1.161
L	12.58	13.38	0.495	0.527
L1	3.15	3.45	0.124	0.136
L2	6.70		0.264	
L3	2.63	3.23	0.104	0.127
φP	2.90	3.48	0.114	0.137
φP1	3.15	3.75	0.124	0.148





## Revision History

Revision	Date	Major changes
1.0	2023/7/22	Release of Formal Version.

## Disclaimer

Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.

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