

## Features

- Uses PingWei advanced PerfectMOS2 technology
- Extremely low on-resistance  $R_{DS(on)}$
- Excellent  $Q_g \times R_{DS(on)}$  product(FOM)
- Qualified according to AEC-Q101 criteria

## Benefits

- High robustness and reliability
- Lower  $R_{thja}$  Value
- Low power loss, high power density
- PCB Area Saving

## Applications

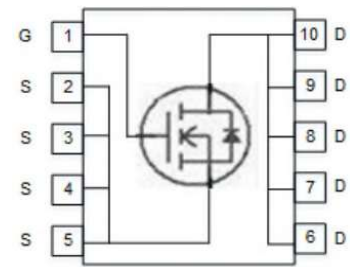
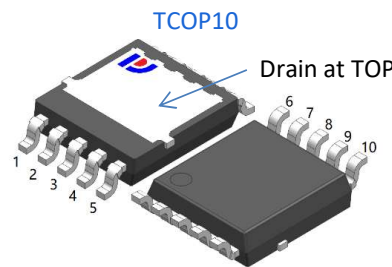
- General automotive applications
- High density power supply



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

## Product Summary

$V_{DS}$	100V
$R_{DS(on)}@10V$ typ	3.5mΩ
$I_D$	121A



## Package Marking and Ordering Information

Pins 10 - 6 & Tab on Drain

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWTC042N10PSQ	PWTC4210	TCOP10	Tape&Reel	13 inches	16mm	3000pcs

## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	100	V
Continuous drain current	$I_D$	121	A
$T_C = 25^\circ\text{C}$ (Silicon limit)		120	
$T_C = 25^\circ\text{C}$ (Package limit)		85	
$T_C = 100^\circ\text{C}$ (Silicon limit)		18	
$T_a = 25^\circ\text{C}$ (Note1)			
Pulsed drain current (TC = 25°C, tp = 100us)	$I_{D \text{ pulse}}$	480	A
Avalanche energy, single pulse (L=0.1mH)	$E_{AS}$	173	mJ
Gate-Source voltage	$V_{GS}$	±20	V
Power dissipation	$P_{tot}$	140	W
$T_C = 25^\circ\text{C}$		3.0	
$T_a = 25^\circ\text{C}$ (Note1)			
Operating junction and storage temperature	$T_j, T_{stg}$	-55...+175	°C
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	$T_{sold}$	260	°C

## Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction - top case.	RthJC	-	0.8	1.1	°C/W	-
Thermal resistance, junction - ambient	RthJA	-	50.4	-	°C/W	Note 1

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

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

## Static Characteristic

Drain-source breakdown voltage	$BV_{DSS}$	100	-	-	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	$I_{DSS}$	-	-	1 100	$\mu A$	$V_{DS}=100V, V_{GS}=0V$ $T_j=25^\circ C$ $T_j=150^\circ C$
Gate-source leakage current	$I_{GSS}$	-	-	$\pm 100$	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	3.5	4.2	mΩ	$V_{GS}=10V, I_D=30A$
Transconductance	$g_{fs}$	-	105	-	S	$V_{DS}=5V, I_D=30A$

## Dynamic Characteristic

Input Capacitance	$C_{iss}$	-	4181	-	pF	$V_{GS}=0V, V_{DS}=50V,$ $f=100KHz$
Output Capacitance	$C_{oss}$	-	1404	-		
Reverse Transfer Capacitance	$C_{rss}$	-	18	-		
Gate Total Charge	$Q_G$	-	56	-	nC	$V_{DS}=50V, I_D=30A,$ $V_{GS}=10V$
Gate-Source charge	$Q_{gs}$	-	19	-		
Gate-Drain charge	$Q_{gd}$	-	6	-		
Turn-on delay time	$t_{d(on)}$	-	19	-	ns	$V_{GS}=10V, V_{DD}=50V,$ $R_{G\_ext}=1.6\Omega, I_D=25A$
Rise time	$t_r$	-	31	-		
Turn-off delay time	$t_{d(off)}$	-	41	-		
Fall time	$t_f$	-	13	-		
Gate resistance	$R_G$	-	1.3	-	Ω	$V_{GS}=0V, V_{DS}=0V,$ $f=1MHz$

## Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$	-	-	1.2	V	$V_{GS}=0V, I_{SD}=30A$
Body Diode Continuous Forward Current	$I_S$	-	-	120	A	TC = 25°C
Body Diode Pulsed Current	$I_S$ pulse	-	-	480	A	TC = 25°C, tp = 100us
Body Diode Reverse Recovery Time	$t_{rr}$	-	84	-	ns	$I_F=30A,$ $dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	190	-	nC	

Note 1 : 27mm x 20mm x 1.6mm FR-4、1oz、1 layer PCB,Top plate has no heatsink.

## Typical Performance Characteristics

Fig 1: Output Characteristics

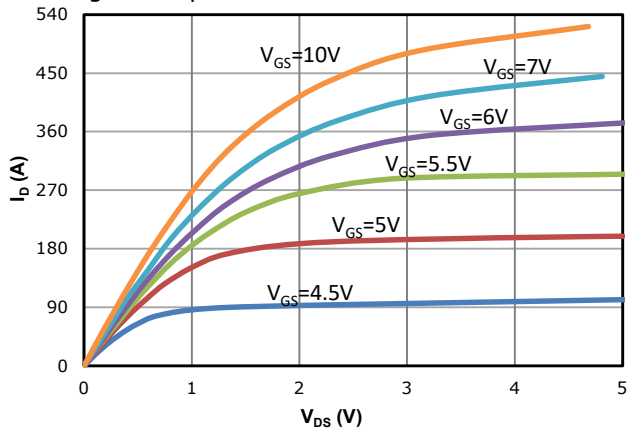


Fig 2: Transfer Characteristics

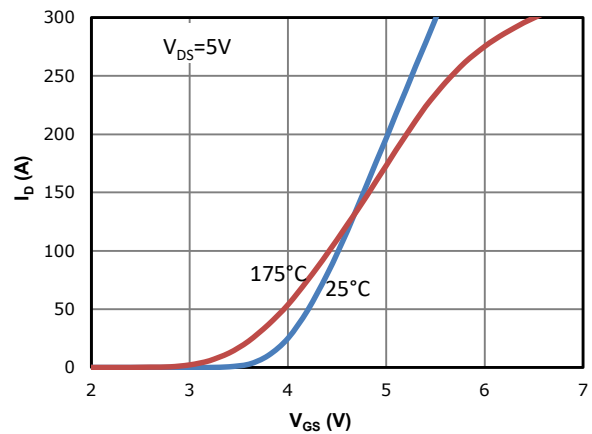


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

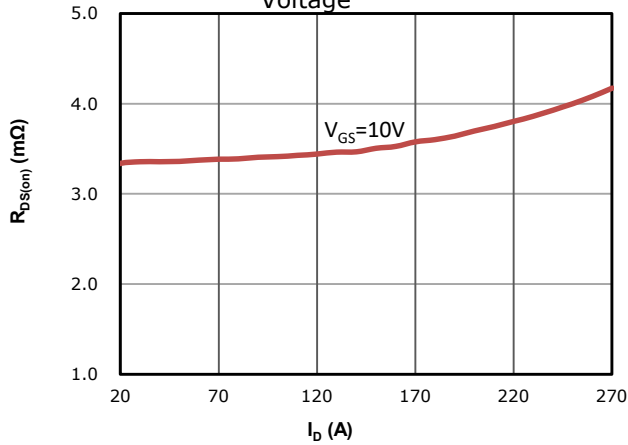


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

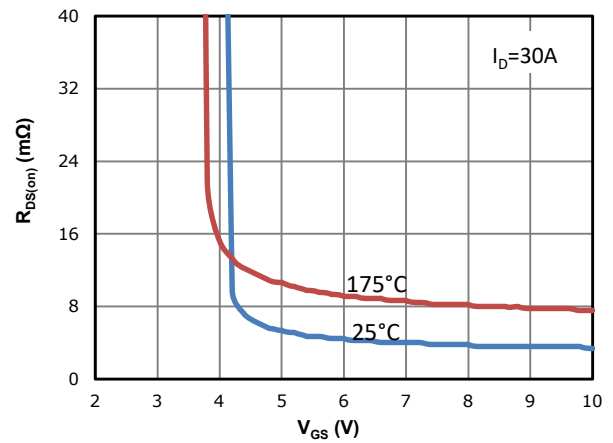


Fig 5:  $R_{DS(on)}$  vs. Temperature

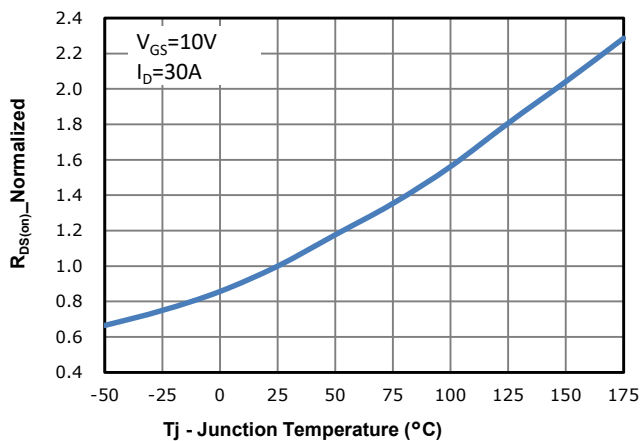


Fig 6:  $V_{GS(th)}$  vs. Temperature

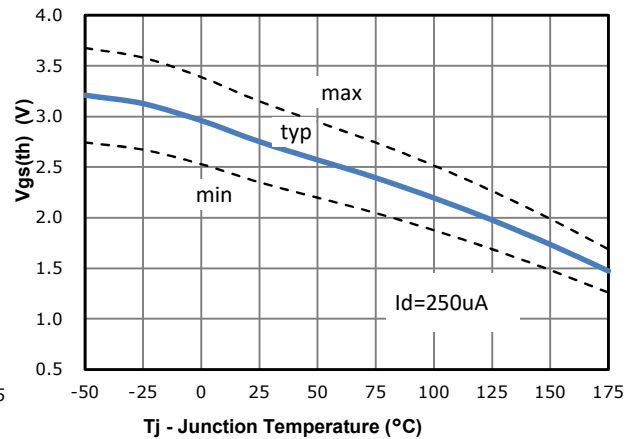


Fig 7: BVdss vs. Temperature

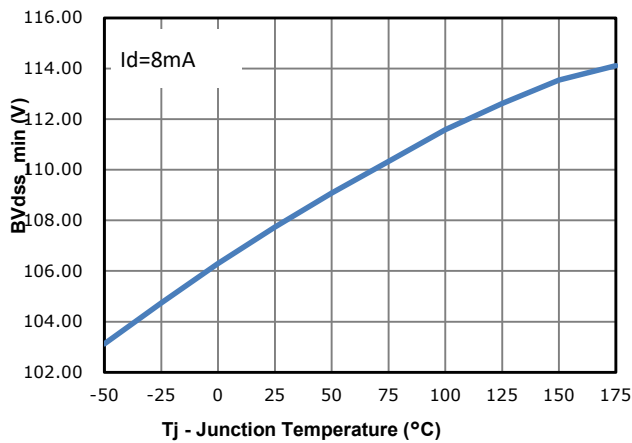


Fig 8: Capacitance Characteristics

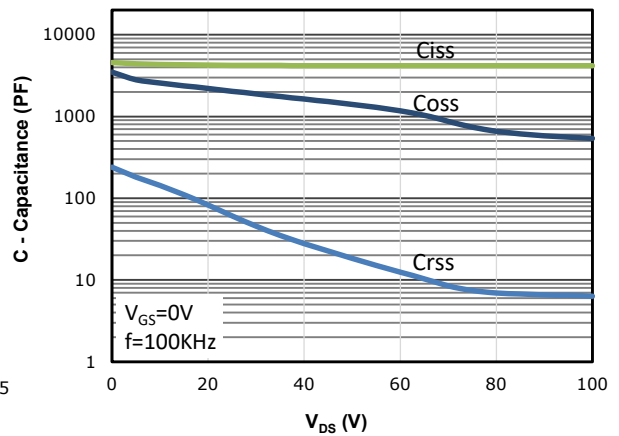


Fig 9: Gate Charge Characteristics

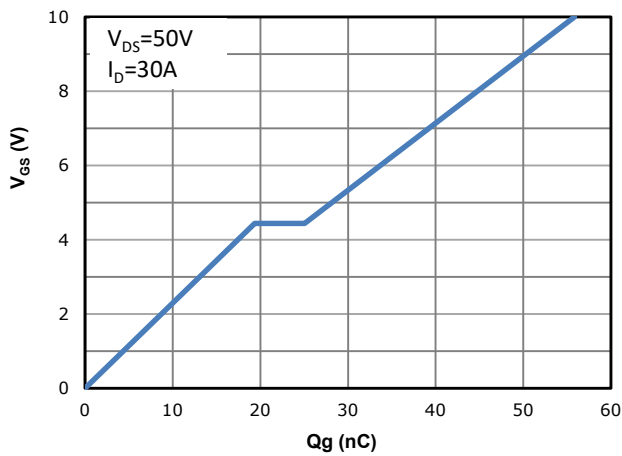


Fig 10: Body-diode Forward Characteristics

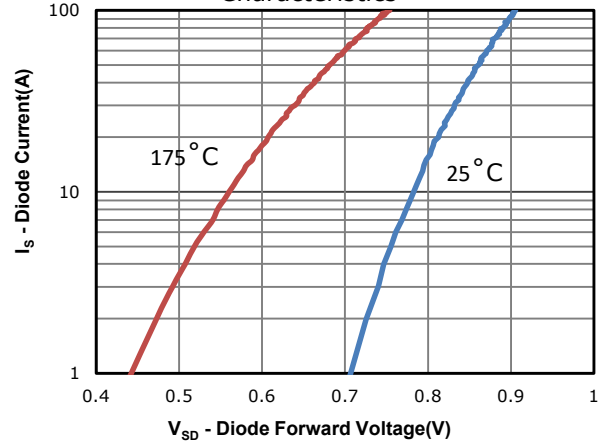


Fig 11: Power Dissipation

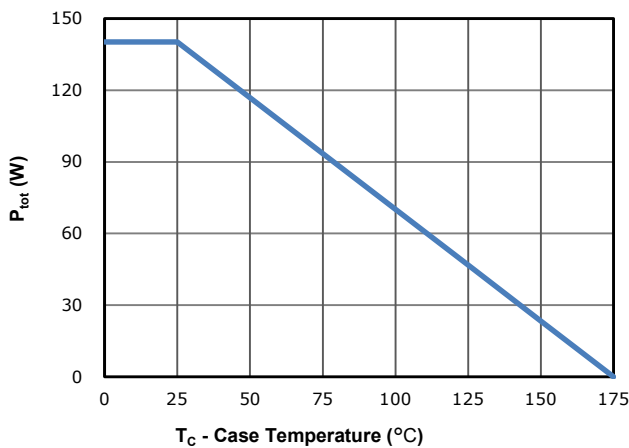


Fig 12: Drain Current Derating

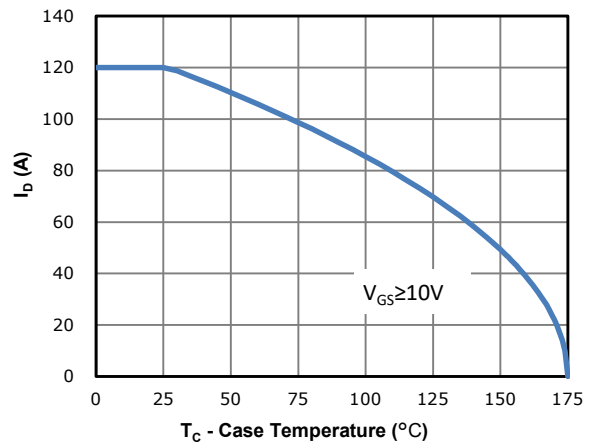


Fig 13: Safe Operating Area

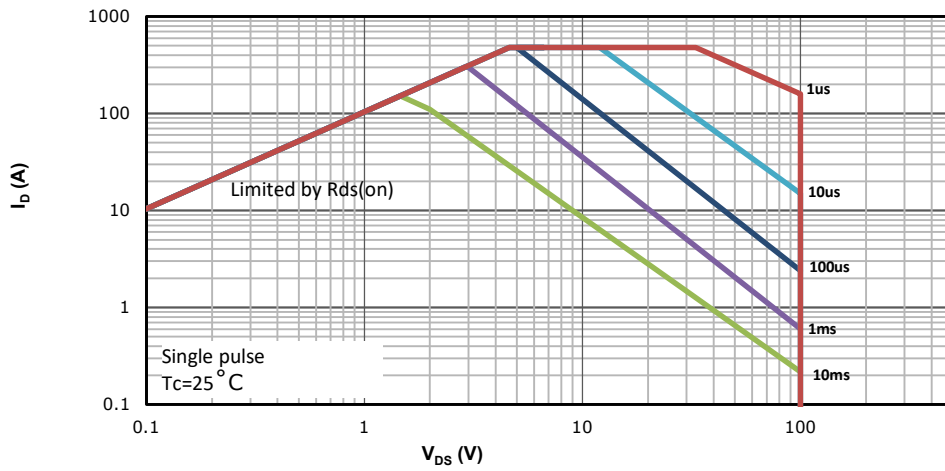
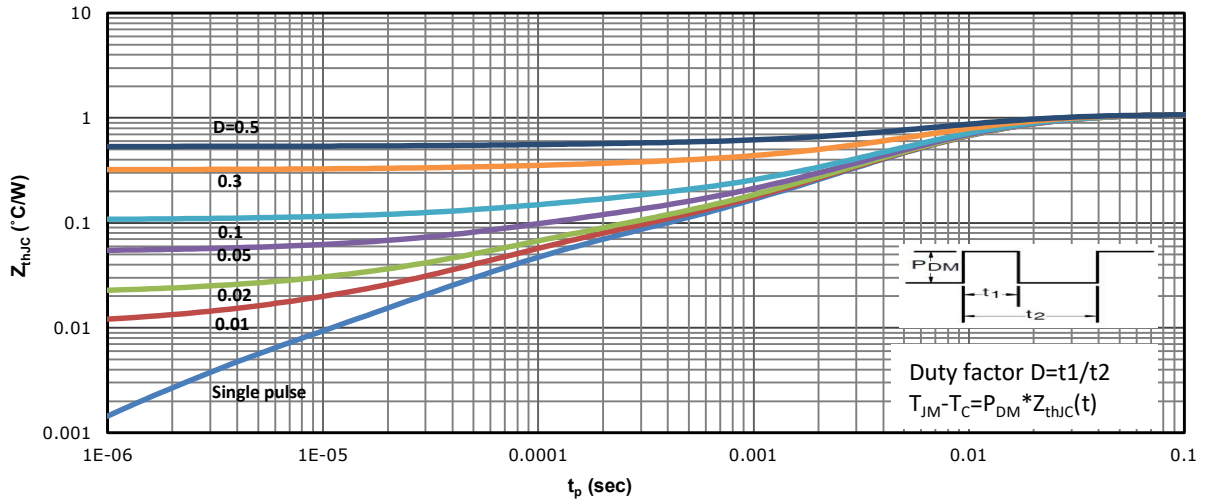
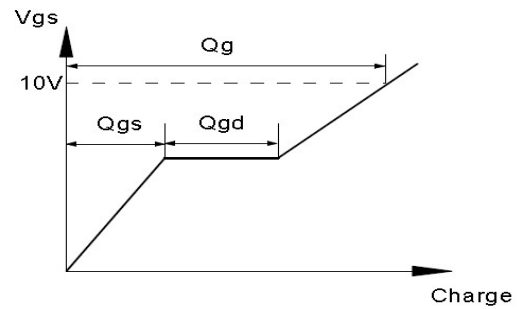
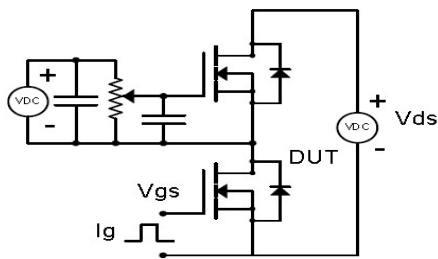


Fig 14: Max. Transient Thermal Impedance

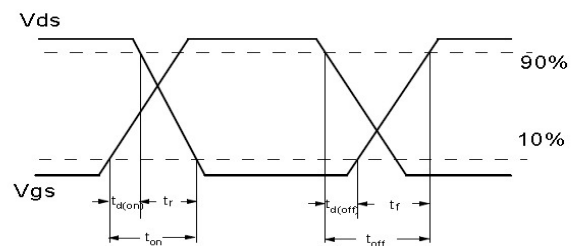
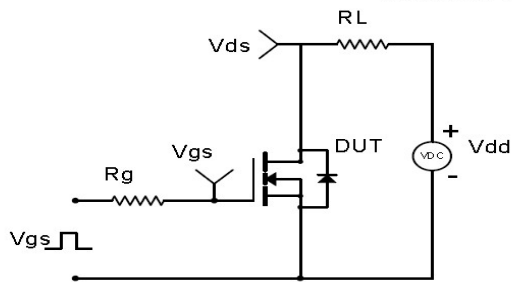


## Test Circuit & Waveform

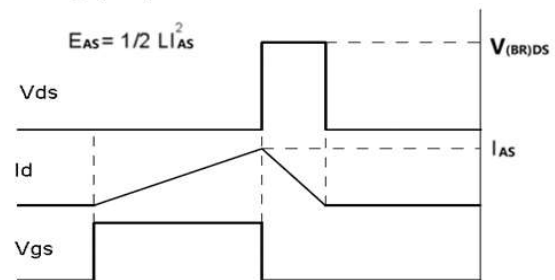
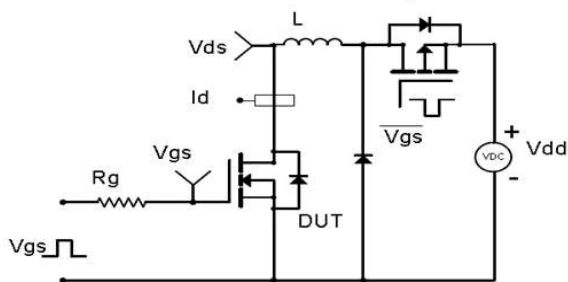
Gate Charge Test Circuit & Waveform



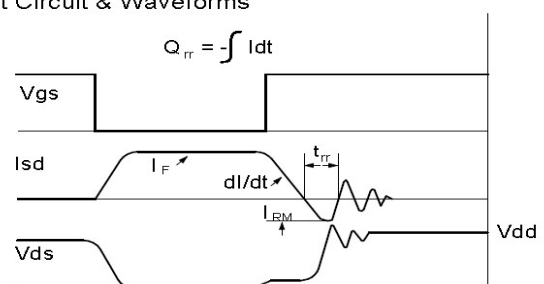
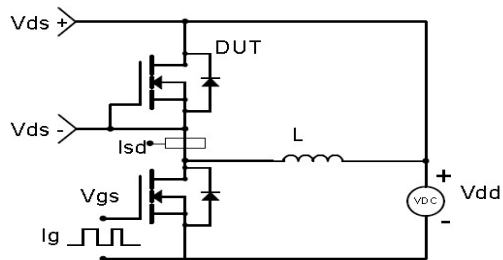
Resistive Switching Test Circuit & Waveforms



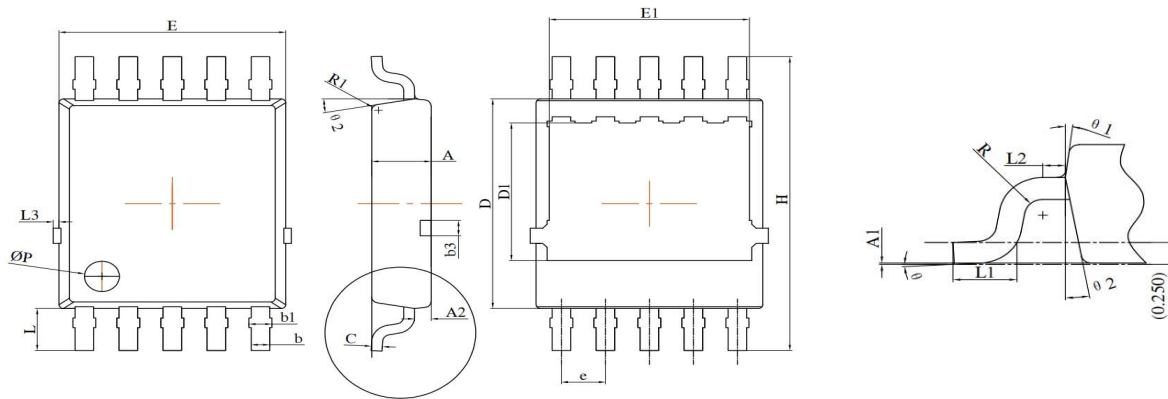
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Package Outline: TCOP10



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.25	1.45	0.049	0.057
A1	0.00	0.10	0.000	0.004
A2	0.275	0.475	0.011	0.019
b	0.32	0.52	0.013	0.020
b1	0.37	0.67	0.015	0.026
c	0.20	0.30	0.008	0.012
D	5.33	5.63	0.210	0.222
D1	3.45	3.75	0.136	0.148
E	5.05	5.25	0.199	0.207
E1	4.30	4.80	0.169	0.189
e	1.00bsc		1.00bsc	
H	7.48	7.88	0.294	0.310
L	0.95	1.25	0.037	0.049
L1	0.50	0.80	0.020	0.031
L2	0.16	0.36	0.006	0.014
L3	0.00	0.15	0.000	0.006
P	0.85	1.15	0.033	0.045
R	0.10	0.28	0.004	0.011
R1	0.10	0.25	0.004	0.010
θ	0°	6°	0°	6°
θ1	5°	9°	5°	9°
θ2	8°	12°	8°	12°



## Revision History

Revision	Date	Major changes
1.0	2022/6/21	Release of Design Version.
1.1	2025/3/6	update Rthjc,Rthja,id,etc.

## 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.

The product is not intended for use in applications that require extraordinary levels of quality and reliability, such as aviation/aerospace and life-support devices or systems.

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