

## 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
- Increases maximum current capability
- Low power loss, high power density
- Solid design of source leadframe

## Applications

- Automotive applications
- Battery management
- Motor Drivers

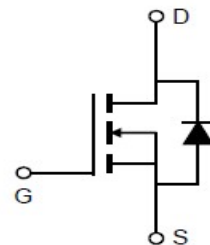
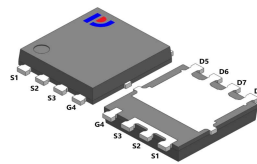


**100% DVDS Tested**  
**100% Avalanche Tested**

## Product Summary

$V_{DS}$	40V
$R_{DS(on)}@10V$ typ	1.1mΩ
$I_D$ (Silicon limit)	252A

UPDFN5x6



## Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWC013N04UESQ	C013N04UESQ	UPDFN5x6	Tape&Reel	13 inches	12mm	5000pcs

## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	40	V
Continuous drain current	$I_D$	252	A
$T_C = 25^\circ\text{C}$ (Silicon limit)		178	
$T_C = 100^\circ\text{C}$ (Silicon limit)		150	
$T_C = 25^\circ\text{C}$ (Package limit)		34	
$T_a = 25^\circ\text{C}$ (Note1)			
Pulsed drain current ( $T_C = 25^\circ\text{C}$ )	$I_{D \text{ pulse}}$	600	A
Avalanche energy, single pulse ( $L=0.1\text{mH}$ , $V_{ds}=32\text{V}$ )	$E_{AS}$	268	mJ
Gate-Source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation	$P_{tot}$	142	W
$T_C = 25^\circ\text{C}$		2.6	
$T_a = 25^\circ\text{C}$			
Operating junction and storage temperature	$T_j, T_{stg}$	-55...+175	$^\circ\text{C}$
Reflow soldering temperature (10s)	$T_{sold}$	260	$^\circ\text{C}$

## Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction - case.	RthJC	-	-	1.1	°C/W	-
Thermal resistance, junction - ambient	RthJA	-	-	59	°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	$BV_{DSS}$	40	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2.4	2.8	3.4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	$I_{DSS}$	-	0.05	1	$\mu A$	$V_{DS}=40V, V_{GS}=0V$ $T_j=25^\circ C$ $T_j=125^\circ C$
Gate-source leakage current	$I_{GSS}$	-	$\pm 10$	$\pm 100$	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	1.1	1.3	mΩ	$V_{GS}=10V, I_D=50A$
Transconductance	$g_{fs}$	-	109	-	S	$V_{DS}=5V, I_D=50A$

## Dynamic Characteristic

Input Capacitance	$C_{iss}$	-	4784	7176	pF	$V_{GS}=0V, V_{DS}=20V,$ $f=250KHz$
Output Capacitance	$C_{oss}$	-	1628	2442		
Reverse Transfer Capacitance	$C_{rss}$	-	52	105		
Gate Total Charge	$Q_G$	-	68	137	nC	$V_{DS}=20V, I_D=50A,$ $V_{GS}=10V$
Gate-Source charge	$Q_{gs}$	-	29	57		
Gate-Drain charge	$Q_{gd}$	-	8	16		
Turn-on delay time	$t_{d(on)}$	-	17	-	ns	$V_{GS}=10V, V_{DD}=20V,$ $R_G=1.6\Omega, I_D=50A$
Rise time	$t_r$	-	25	-		
Turn-off delay time	$t_{d(off)}$	-	46	-		
Fall time	$t_f$	-	14	-		
Gate resistance	$R_G$	-	2.1	-	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	$V_{GS}=0V, I_{SD}=50A$
Body Diode Continuous Forward Current	$I_S$	-	-	150	A	TC = 25°C
Body Diode Pulsed Current	$I_S$ pulse	-	-	600	A	TC = 25°C
Body Diode Reverse Recovery Time	$t_{rr}$	-	49	-	ns	$V_R=20V, I_F=50A,$ $dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	26	-	nC	

Note1. 1 inch<sup>2</sup>, 2oz single copper FR-4 PCB.

## Typical Performance Characteristics

Fig 1: Output Characteristics

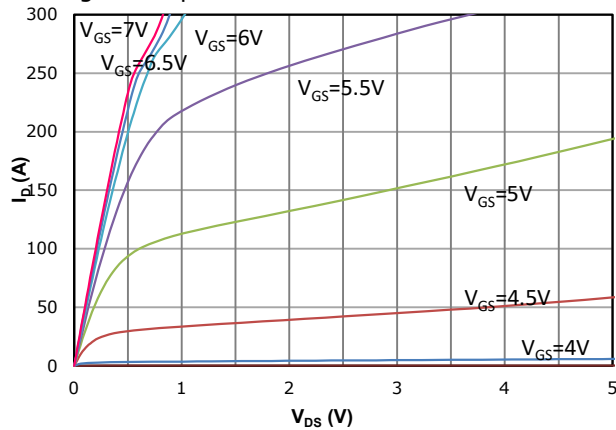


Fig 2: Transfer Characteristics

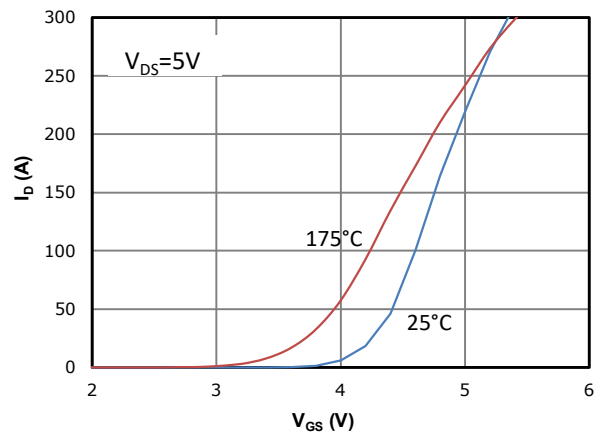


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

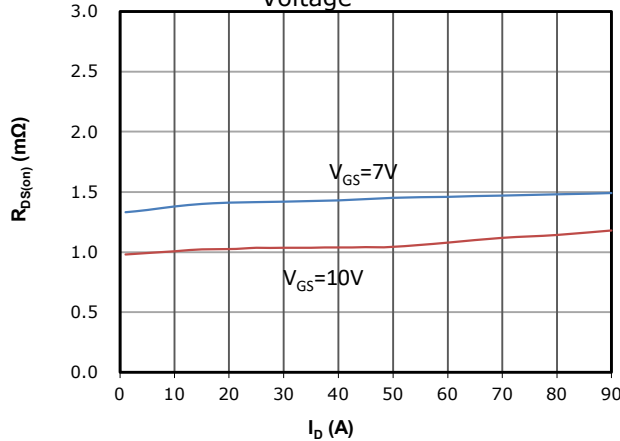


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

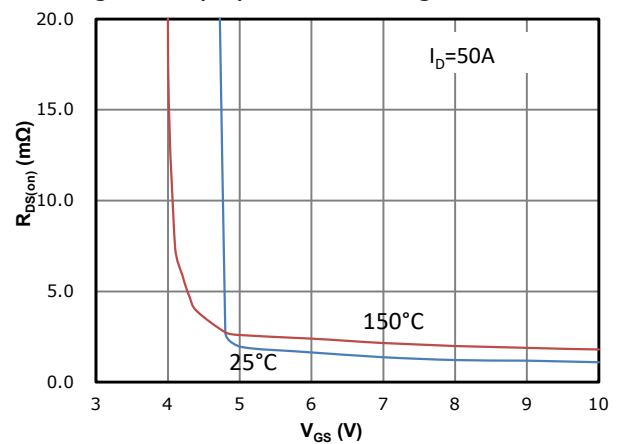


Fig 5:  $R_{DS(on)}$  vs. Temperature

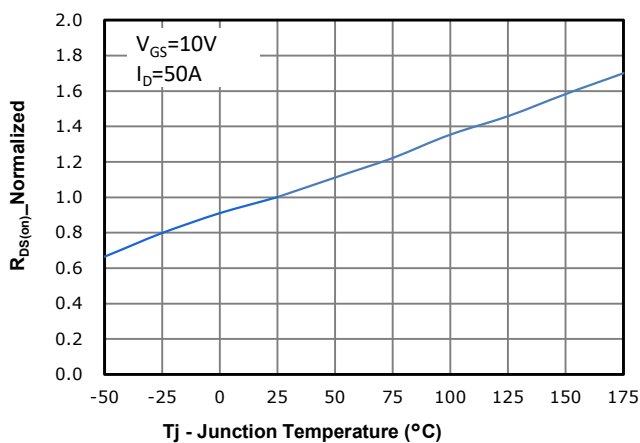


Fig 6:  $V_{GS(th)}$  vs. Temperature

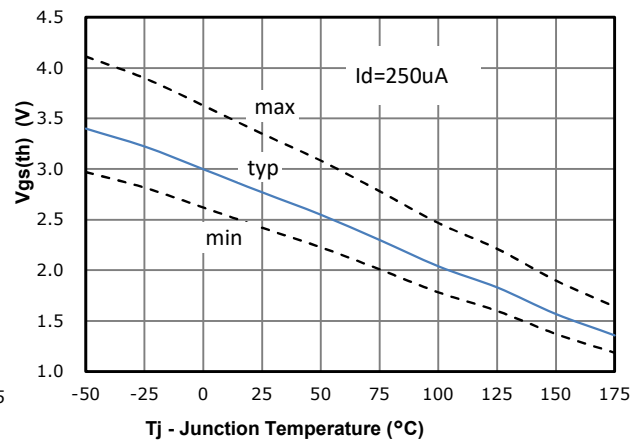


Fig 7: BVdss vs. Temperature

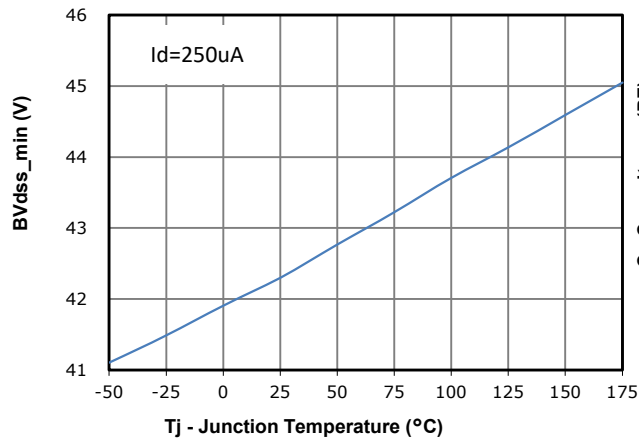


Fig 8: Capacitance Characteristics

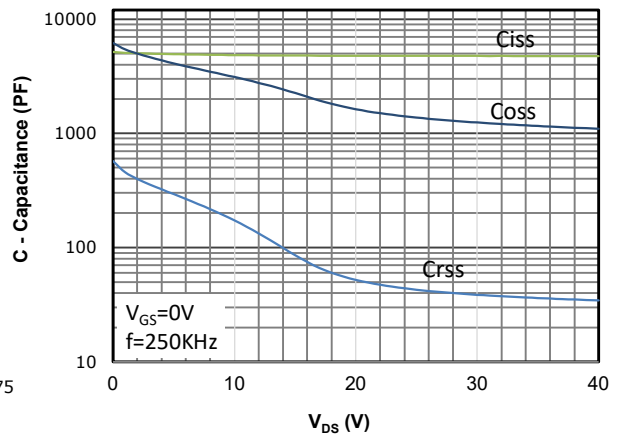


Fig 9: Gate Charge Characteristics

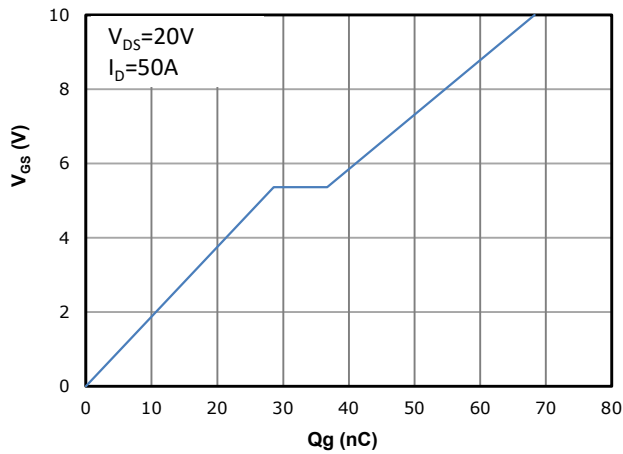


Fig 10: Body-diode Forward Characteristics

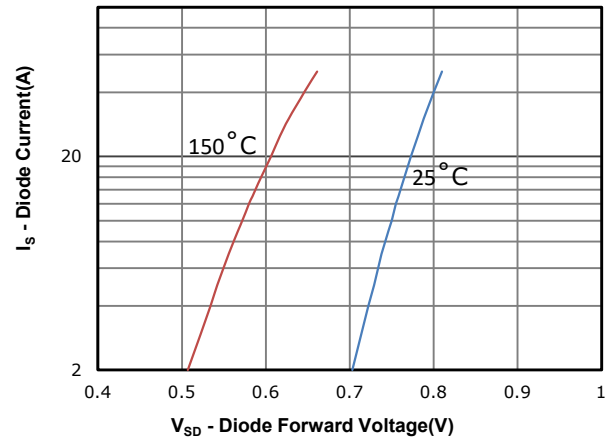


Fig 11: Power Dissipation

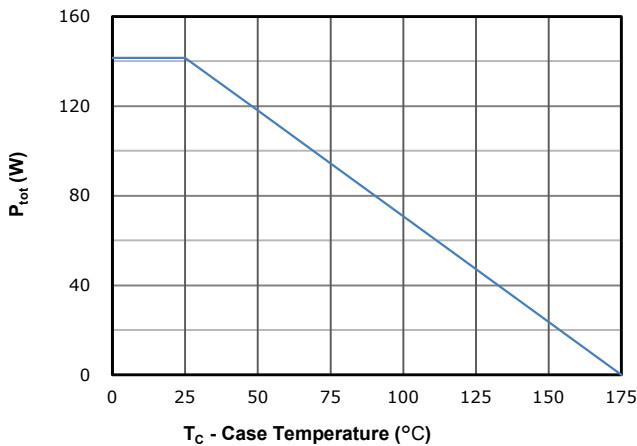


Fig 12: Drain Current Derating

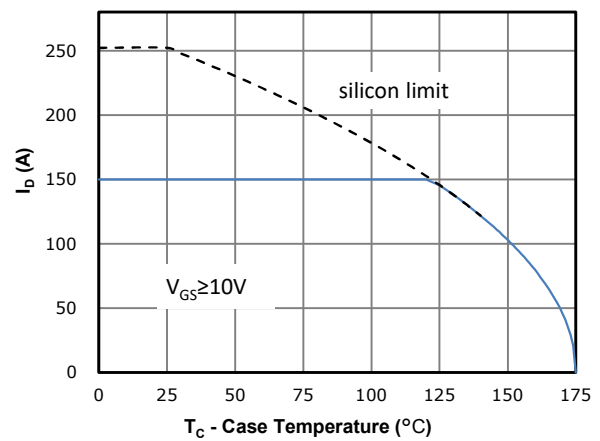


Fig 13: Safe Operating Area

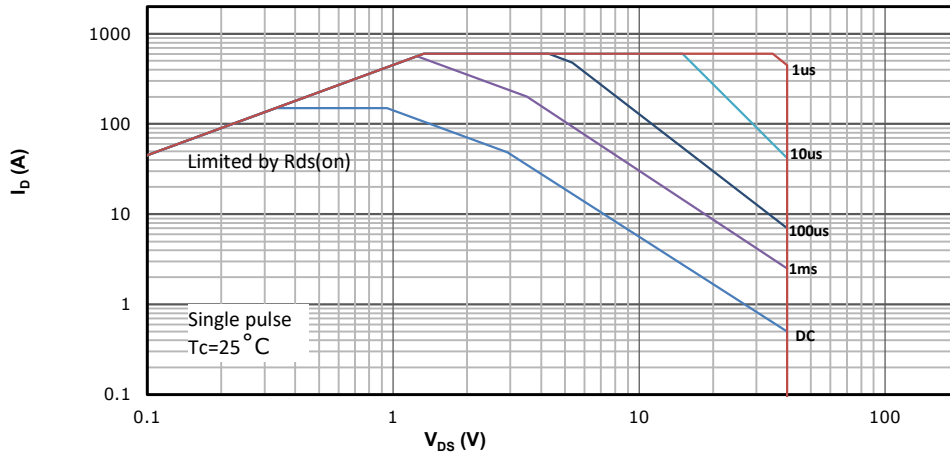
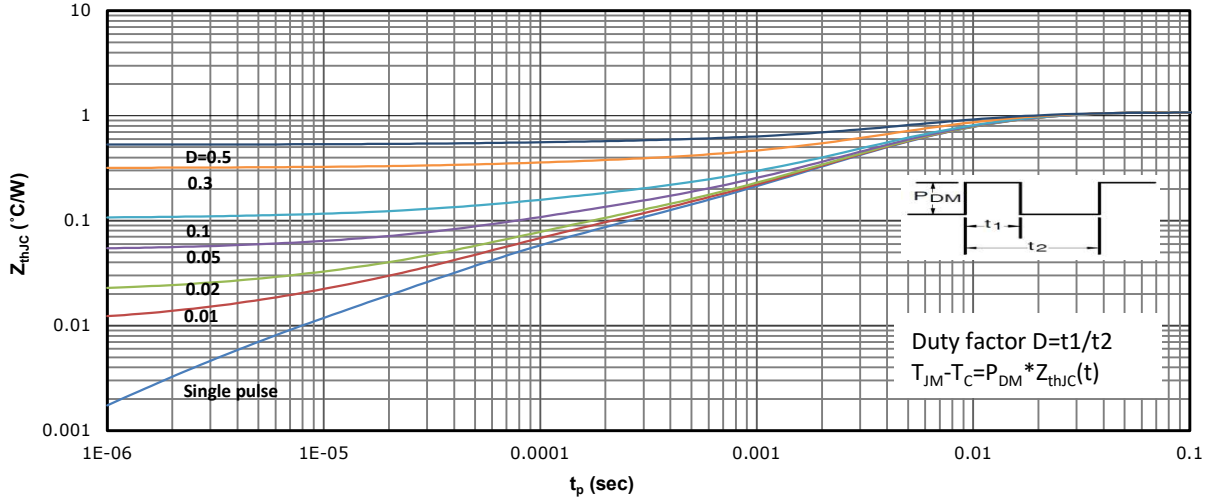
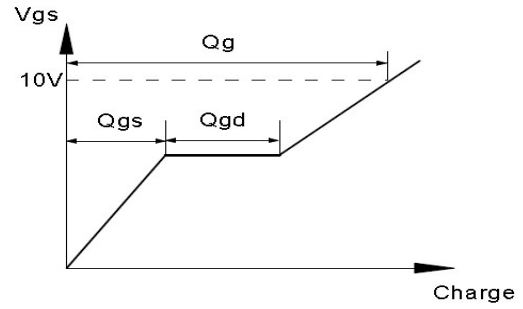
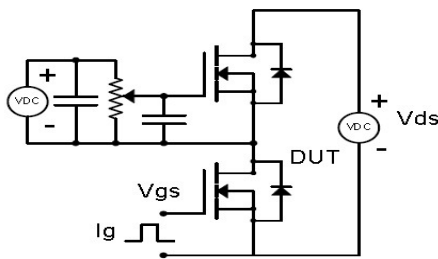


Fig 14: Max. Transient Thermal Impedance

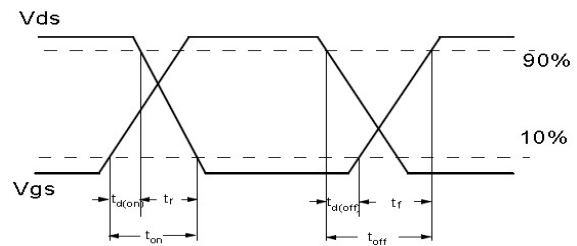
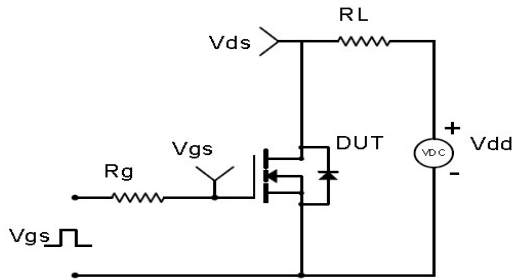


## Test Circuit & Waveform

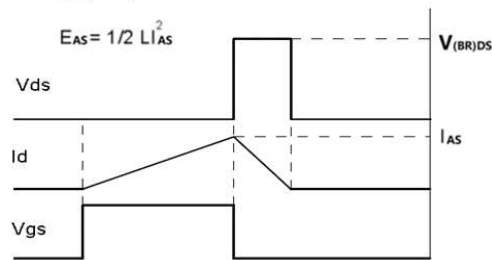
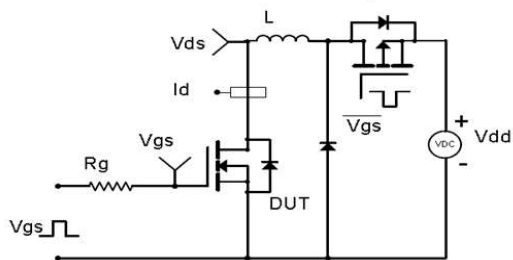
Gate Charge Test Circuit & Waveform



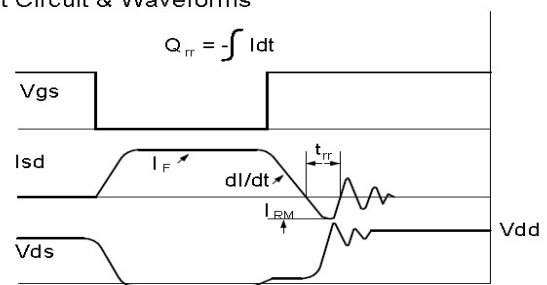
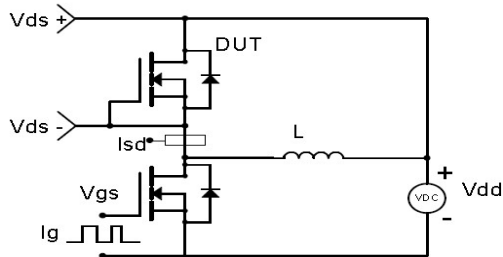
Resistive Switching Test Circuit & Waveforms



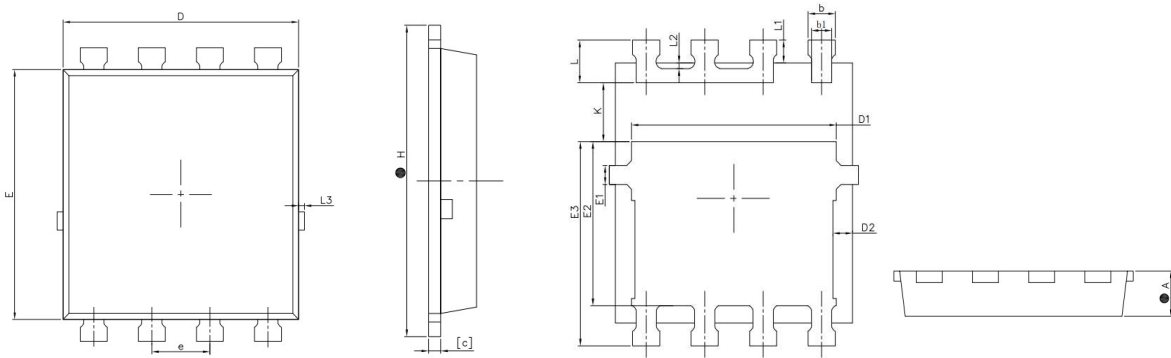
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Package Outline: UPDFN5\*6-C



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.10	0.035	0.043
b	0.49	0.69	0.019	0.027
b1	0.34	0.54	0.013	0.021
c	0.20	0.30	0.008	0.012
D	4.95	5.35	0.195	0.211
D1	4.45	4.85	0.175	0.191
D2	0.23	0.63	0.009	0.025
E	5.28	5.68	0.208	0.224
E1	0.25	0.60	0.010	0.024
E2	3.20	3.70	0.126	0.146
E3	4.05	4.55	0.159	0.179
e	1.27		0.050	
H	6.19	6.69	0.244	0.263
L	0.65	1.15	0.026	0.045
L1	0.28	0.68	0.011	0.027
L2	0.12		0.005	
L3	-	0.23	-	0.009
K	1.04	1.44	0.041	0.057



## Revision History

Revision	Date	Major changes
1.0	2025/10/14	Release of Formal Version.
1.1	2025/11/18	Update EAS@L=0.1mH.
1.2	2025/12/24	Update Package Outline L2&L3.
1.3	2026/4/8	Update tr from 43 to 25,tf from 22 to 14.

## 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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