

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

- General Automotive Applications
- Motor Drivers
- Switching Voltage Regulators

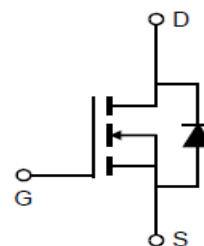
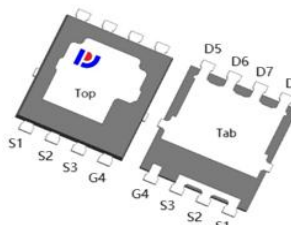


100% DVDS Tested
100% Avalanche Tested

Product Summary

V_{DS}	40V
$R_{DS(on)}@10V$ typ	1mΩ
I_D (Silicon limit)	260A

UDFN5x6 Double Cooling



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWDC012N04UESQ	PW1204U	UDFN5x6 Double Cooling	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	260	A
$T_C = 25^\circ\text{C}$ (Silicon limit)		184	
$T_C = 100^\circ\text{C}$ (Silicon limit)		175	
$T_C = 25^\circ\text{C}$ (Package limit)		35	
$T_a = 25^\circ\text{C}$ (Note1)			
Pulsed drain current ($T_C = 25^\circ\text{C}$)	$I_{D \text{ pulse}}$	700	A
Avalanche energy, single pulse ($L=0.1\text{mH}$)	E_{AS}	268	mJ
Gate-Source voltage	V_{GS}	± 20	V
Power dissipation	P_{tot}	150	W
$T_C = 25^\circ\text{C}$		2.8	
$T_a = 25^\circ\text{C}$ (Note1)			
Operating junction and storage temperature	T_j, T_{stg}	-55...+175	$^\circ\text{C}$
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	T_{sld}	260	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case.	RthJC	-	-	1.0	°C/W	-
Thermal resistance , Channel to Top Plate	Rth(ch-tp)	-	-	1.0	°C/W	Note2
Thermal resistance, junction - ambient	RthJA	-	-	54	°C/W	Note1

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 =250uA
Gate threshold voltage	V _{GS(th)}	2.0	-	4.0	V	V _{DS} =V _{GS} , I _D =250uA
Zero gate voltage drain current	I _{DSS}	-	0.05	1	μA	V _{DS} =40V, V _{GS} =0V T _j =25°C T _j =150°C
Gate-source leakage current	I _{GSS}	-	±10	±100	nA	V _{GS} =±20V, V _{DS} =0V
Drain-source on-state resistance	R _{DS(on)}	-	1.0	1.2	mΩ	V _{GS} =10V, I _D =50A
Drain-source on-state resistance	R _{DS(on)}	-	1.2	1.5	mΩ	V _{GS} =7V, I _D =50A
Transconductance	g _{fs}	-	115	-	S	V _{DS} =5V, I _D =50A

Dynamic Characteristic

Input Capacitance	C _{iss}	-	4790	7185	pF	V _{GS} =0V, V _{DS} =20V, f=100KHz
Output Capacitance	C _{oss}	-	1600	2400		
Reverse Transfer Capacitance	C _{rss}	-	51	102		
Gate Total Charge	Q _G	-	63	126	nC	V _{DS} =20V, I _D =30A, V _{GS} =10V
Gate-Source charge	Q _{gs}	-	25	50		
Gate-Drain charge	Q _{gd}	-	7	16		
Turn-on delay time	t _{d(on)}	-	18	-	ns	V _{GS} =10V, V _{DD} =20V, R _G =1.6Ω, I _D =20A
Rise time	t _r	-	29	-		
Turn-off delay time	t _{d(off)}	-	47	-		
Fall time	t _f	-	16	-		
Gate resistance	R _G	-	2.5	-	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	-	-	175	A	TC = 25°C
Body Diode Pulsed Current	I_S pulse	-	-	700	A	TC = 25°C
Body Diode Reverse Recovery Time	t_{rr}	-	45	-	ns	$V_R=20V, I_F=50A,$ $dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	28	-	nC	

Note1. 1 inch², 2oz single copper FR-4 PCB.

Note2. A maximum of the $z_{th}(ch-tp)$ measured at Pingwei's test environment is only used for reference. Be aware that the top-plate has the same electric potential as the sources; however, not intended for an Electrode.

Typical Performance Characteristics

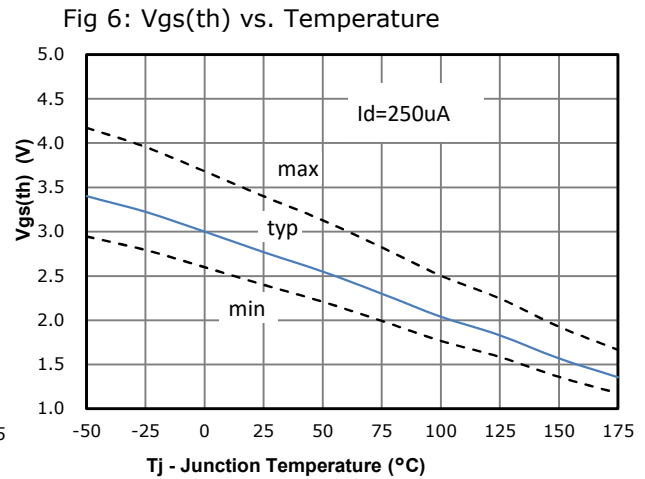
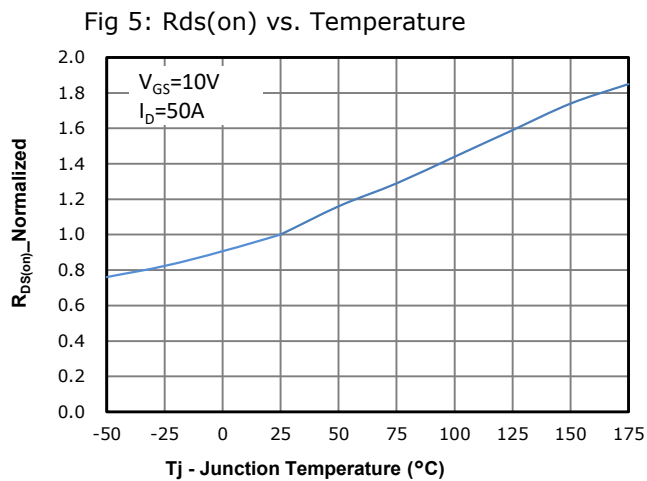
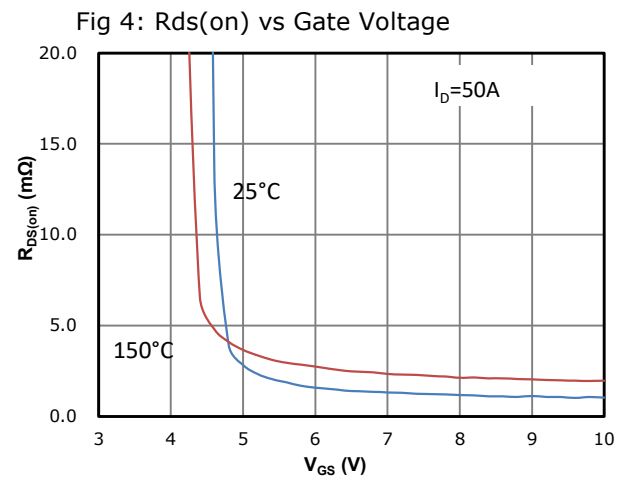
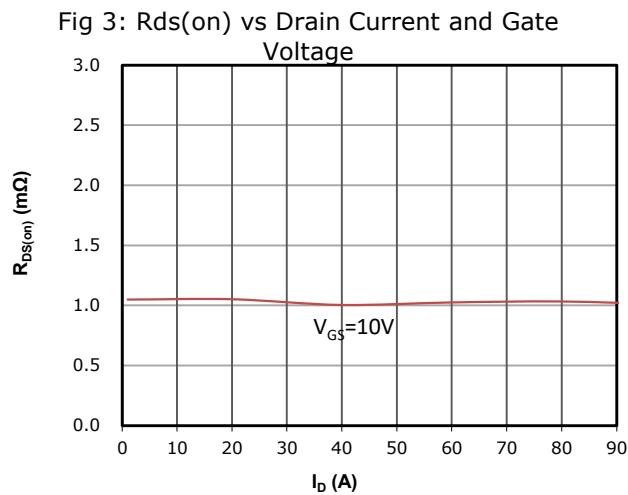
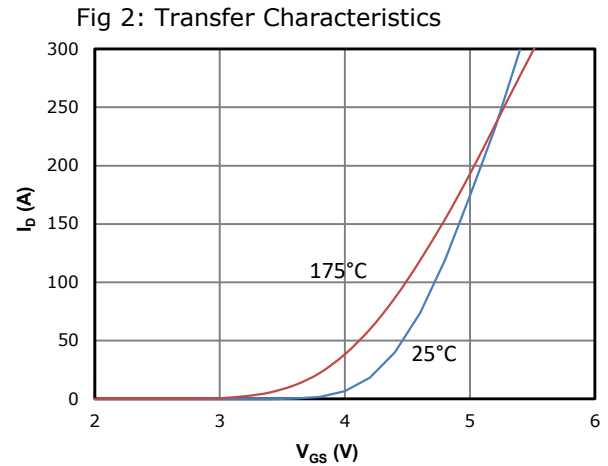
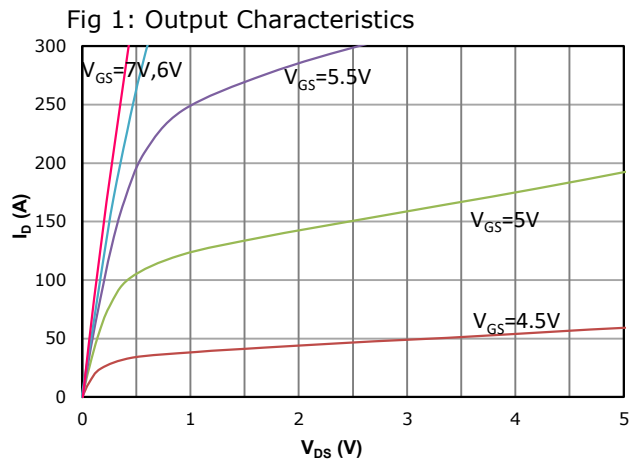


Fig 7: BVdss vs. Temperature

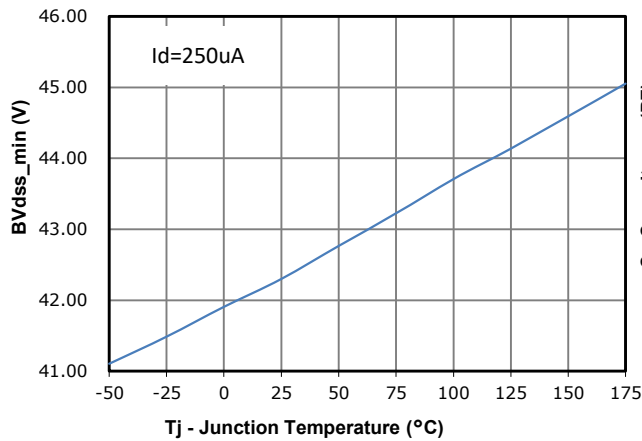


Fig 8: Capacitance Characteristics

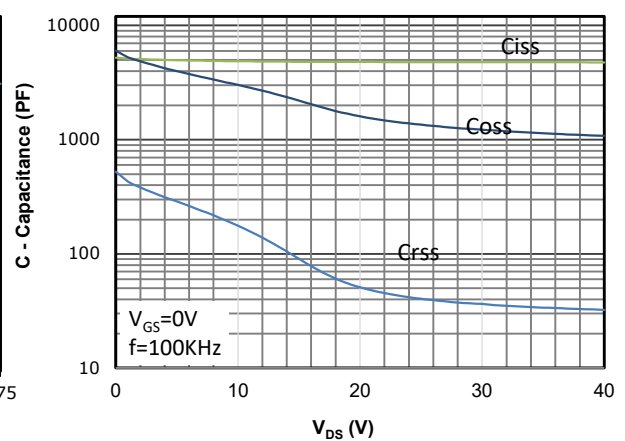


Fig 9: Gate Charge Characteristics

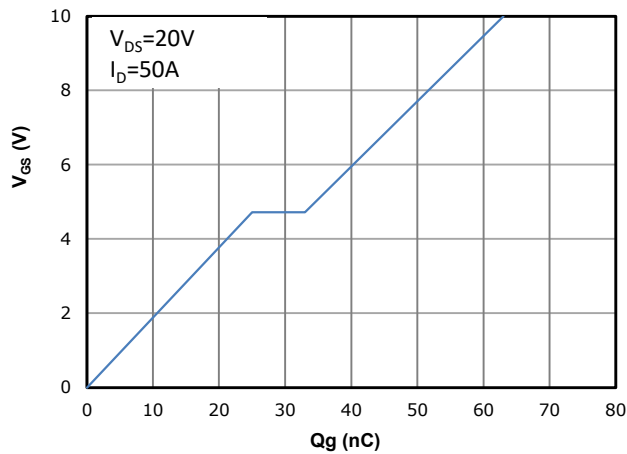


Fig 10: Body-diode Forward Characteristics

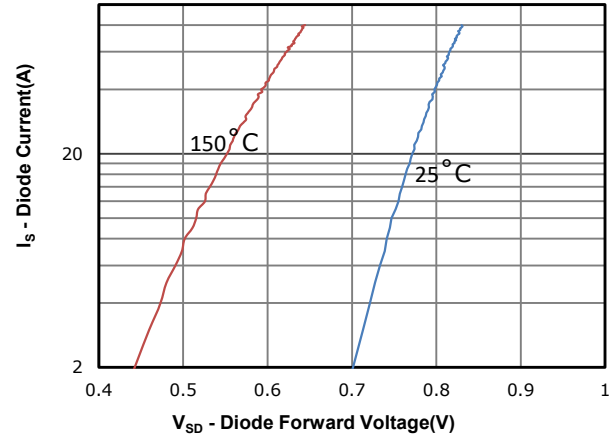


Fig 11: Power Dissipation

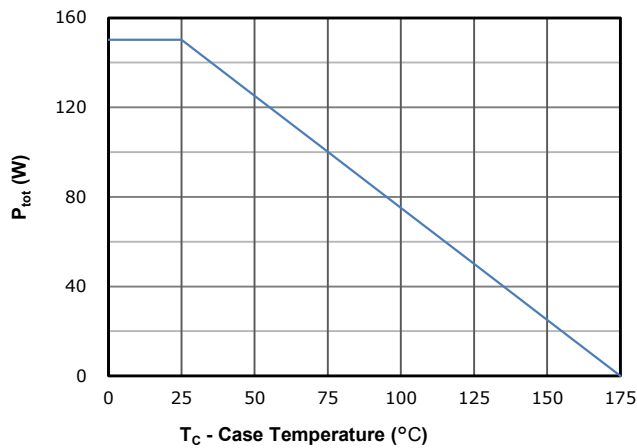


Fig 12: Drain Current Derating

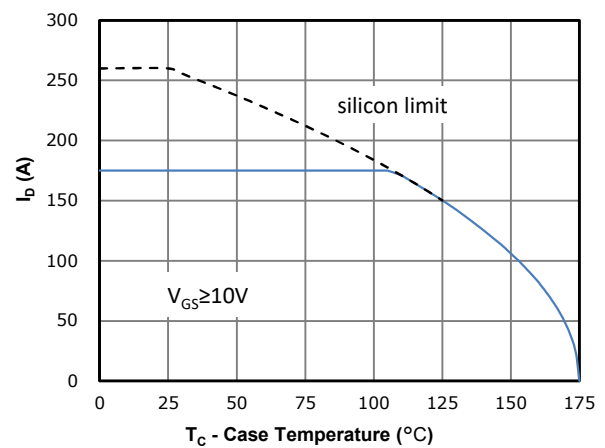


Fig 13: Safe Operating Area

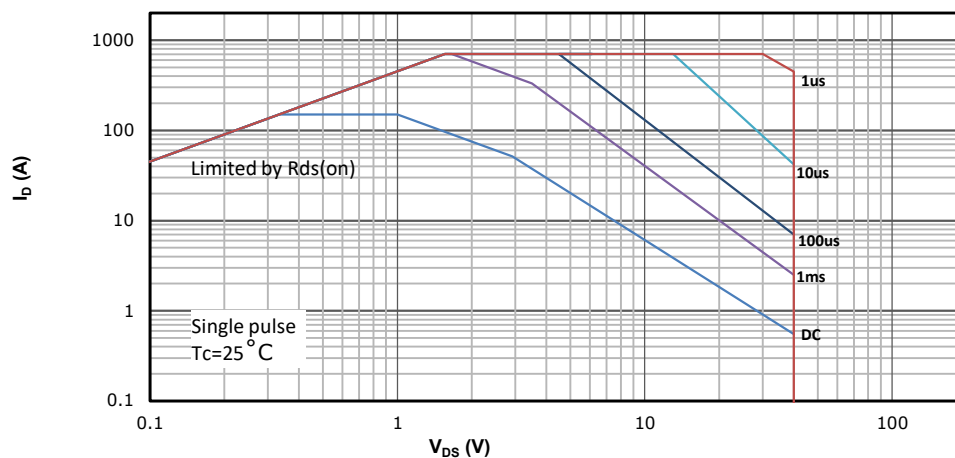
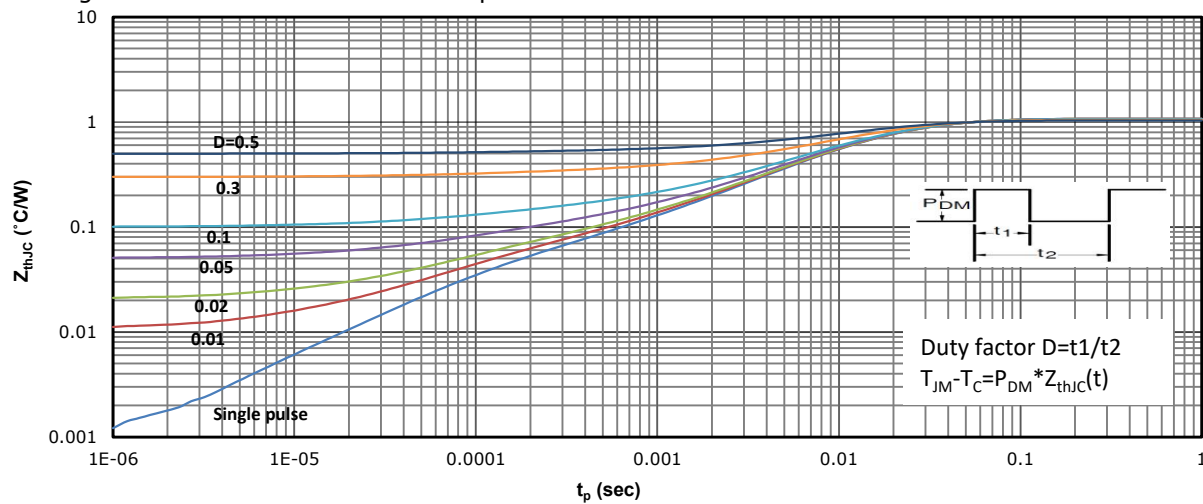
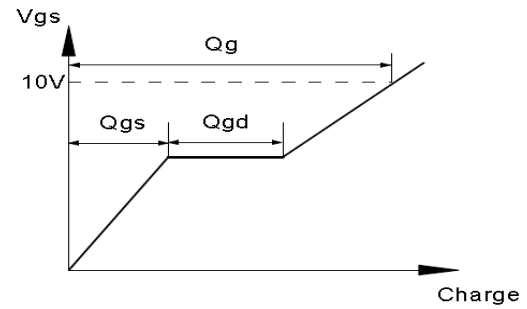
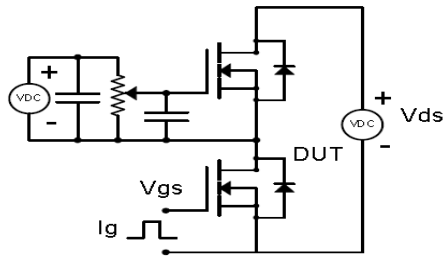


Fig 14: Max. Transient Thermal Impedance

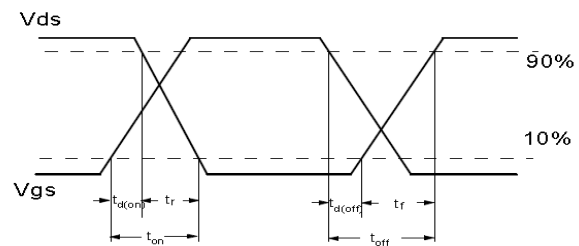
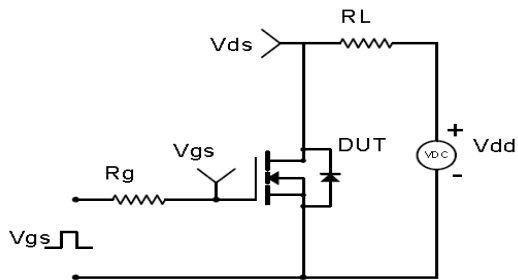


Test Circuit & Waveform

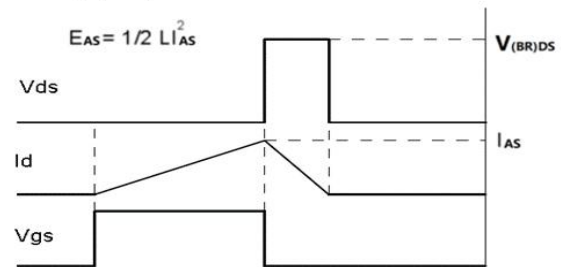
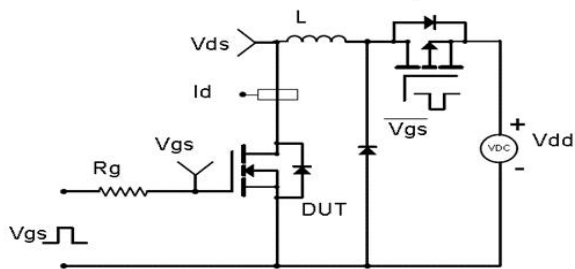
Gate Charge Test Circuit & Waveform



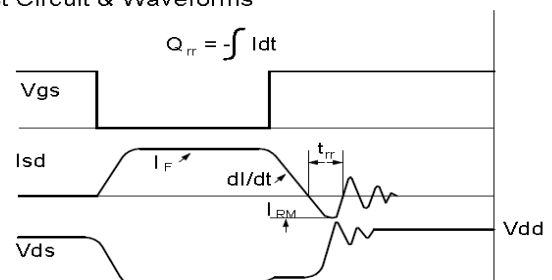
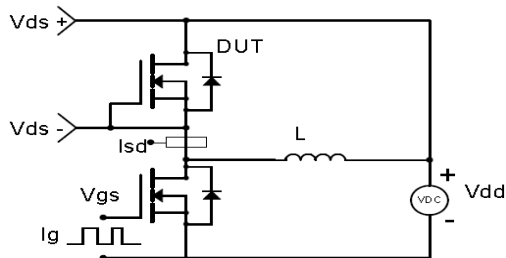
Resistive Switching Test Circuit & Waveforms

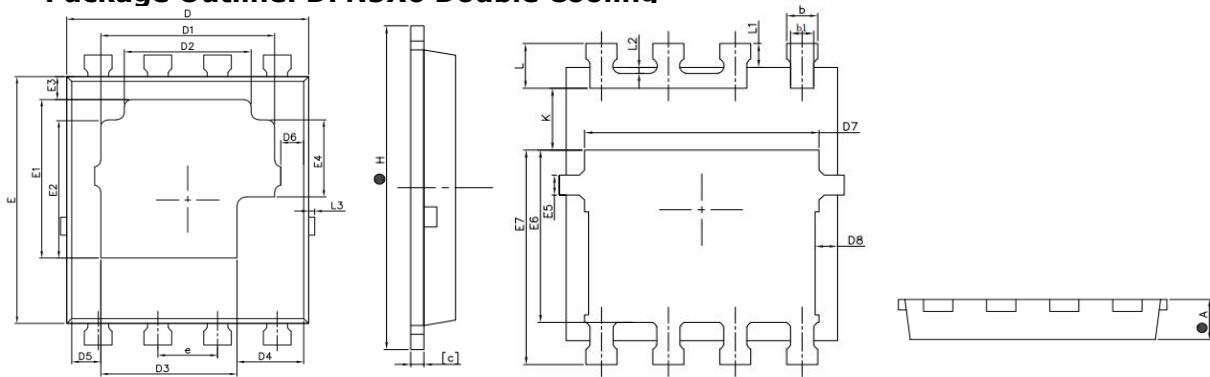


Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: DFN5X6 Double Cooling

SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.75	0.95	0.030	0.037
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	3.45	3.95	0.136	0.156
D2	2.45	2.95	0.096	0.116
D3	2.65	3.15	0.104	0.124
D4	1.17	1.67	0.046	0.066
D5	0.37	0.87	0.015	0.034
D6	0.29	0.69	0.011	0.027
D7	4.45	4.85	0.175	0.191
D8	0.23	0.63	0.009	0.025
E	5.28	5.68	0.208	0.224
E1	3.27	3.77	0.129	0.148
E2	2.80	3.30	0.110	0.130
E3	0.50	1.10	0.020	0.043
E4	1.46	1.96	0.057	0.077
E5	0.25	0.60	0.010	0.024
E6	3.20	3.70	0.126	0.146
E7	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	2025/4/8	Release of Formal Version.
1.1	2025/11/8	Update package limit ID;Update EAS @ L=0.1mH;

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.

Buyer is responsible for its products and applications using PingWei products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by PingWei.

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