

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

Applications

- Automotive applications
- Battery management
- Motor Drivers

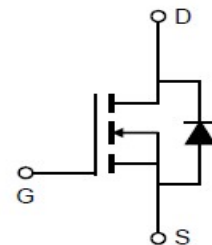
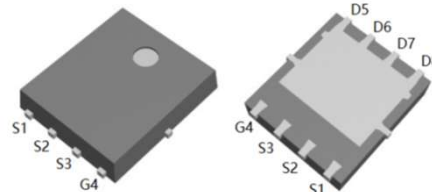


100% DVDS Tested
100% Avalanche Tested

Product Summary

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

DFN5x6



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWC013N04ESQ	C013N04ESQ	DFN5x6	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)		120	
$T_C = 25^\circ\text{C}$ (Package limit)		34	
$T_a = 25^\circ\text{C}$ (Note1)			
Pulsed drain current ($T_C = 25^\circ\text{C}$)	$I_{D\ pulse}$	480	A
Avalanche energy, single pulse ($L=0.3\text{mH}$, $V_{ds}=32\text{V}$)	E_{AS}	240	mJ
Gate-Source voltage	V_{GS}	± 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	$^\circ\text{C}$
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	-	-	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	$V_{GS(th)}$	2.0	-	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	0.05	1	μA	$V_{DS}=40V, V_{GS}=0V$ $T_j=25^\circ C$ $T_j=150^\circ C$
Gate-source leakage current	I_{GSS}	-	± 10	± 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	-	pF	$V_{GS}=0V, V_{DS}=20V,$ $f=250KHz$
Output Capacitance	C_{oss}	-	1628	-		
Reverse Transfer Capacitance	C_{rss}	-	52	-		
Gate Total Charge	Q_G	-	68	-	nC	$V_{DS}=20V, I_D=50A,$ $V_{GS}=10V$
Gate-Source charge	Q_{gs}	-	29	-		
Gate-Drain charge	Q_{gd}	-	8	-		
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	-	26	-		
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	-	-	120	A	TC = 25°C
Body Diode Pulsed Current	I_S pulse	-	-	480	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 inch², 2oz single copper FR-4 PCB.

Typical Performance Characteristics

Fig 1: Output Characteristics

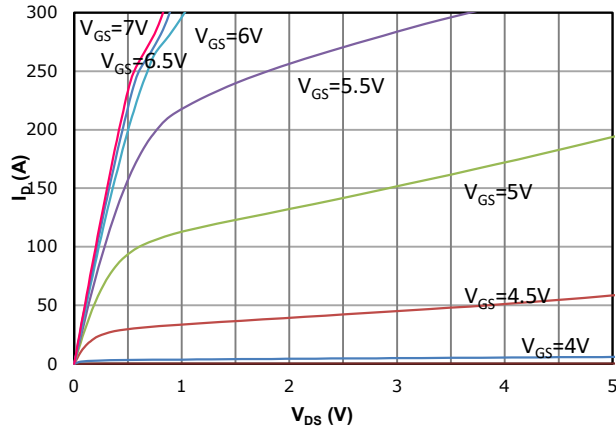


Fig 2: Transfer Characteristics

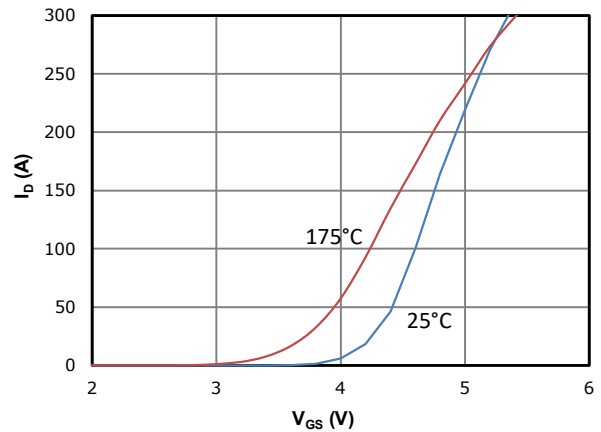


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

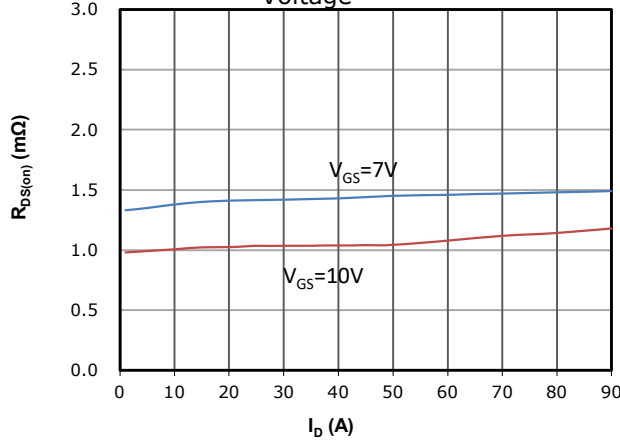


Fig 4: $R_{DS(on)}$ vs Gate Voltage

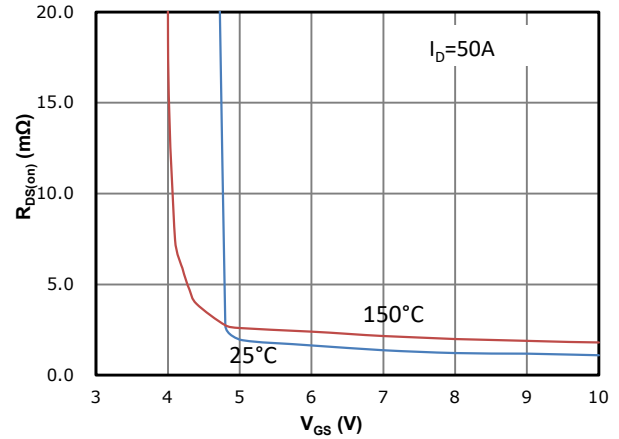


Fig 5: $R_{DS(on)}$ vs. Temperature

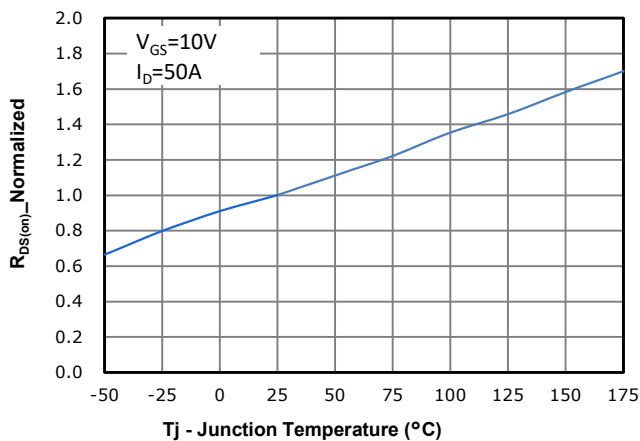


Fig 6: $V_{GS(th)}$ vs. Temperature

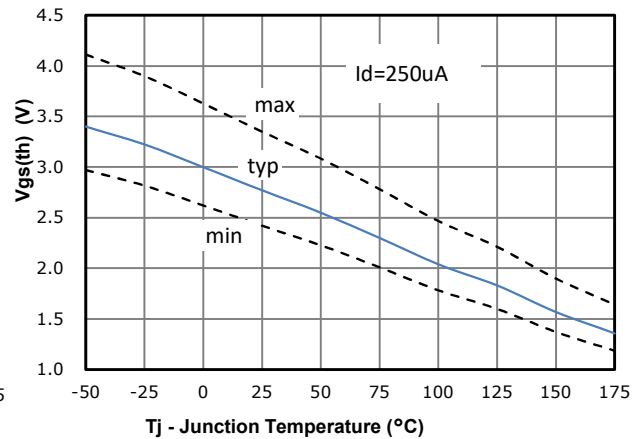


Fig 7: BVdss vs. Temperature

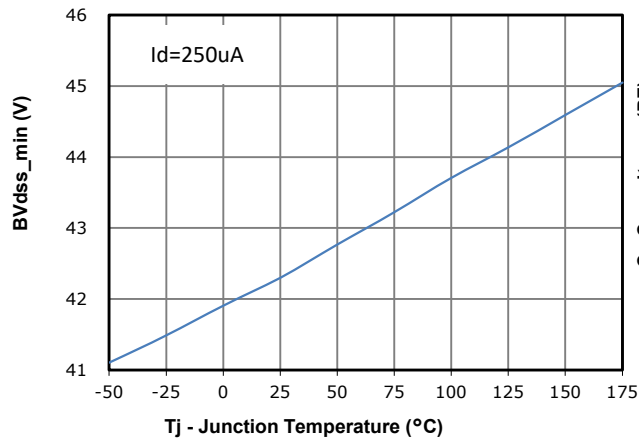


Fig 8: Capacitance Characteristics

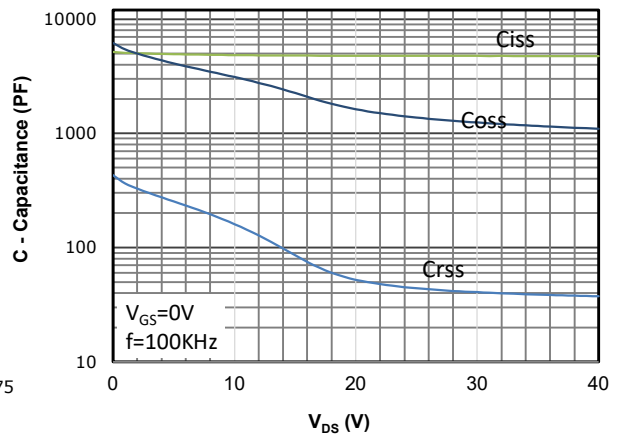


Fig 9: Gate Charge Characteristics

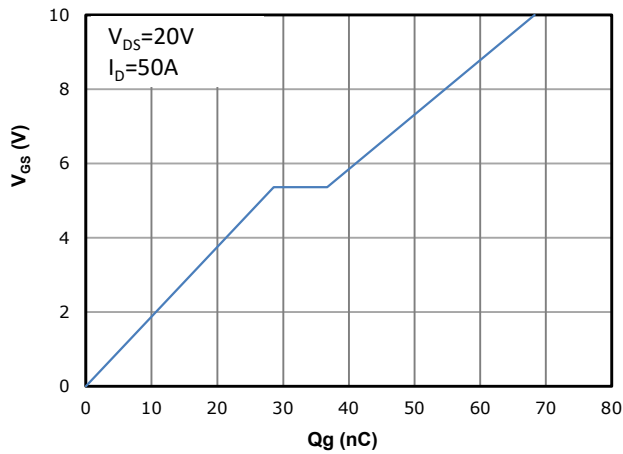


Fig 10: Body-diode Forward Characteristics

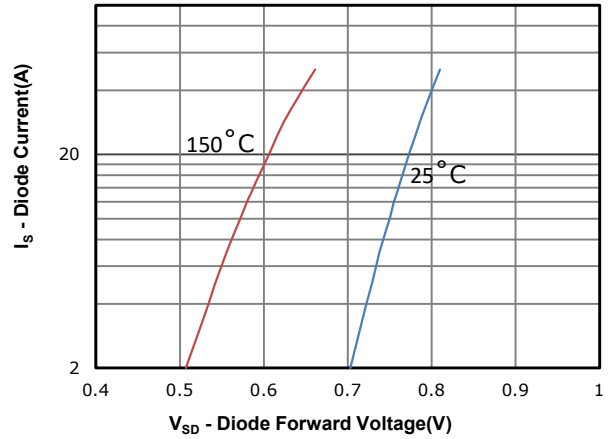


Fig 11: Power Dissipation

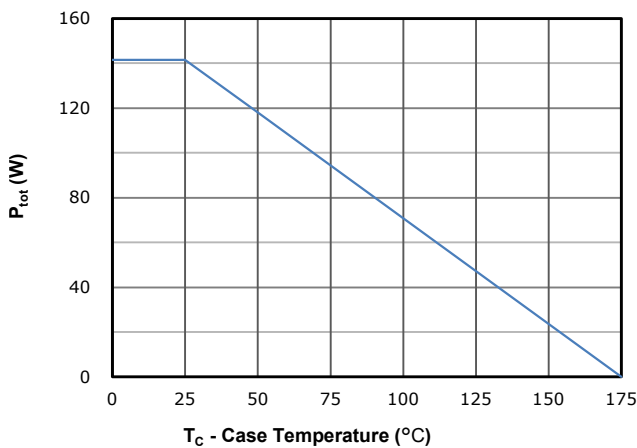


Fig 12: Drain Current Derating

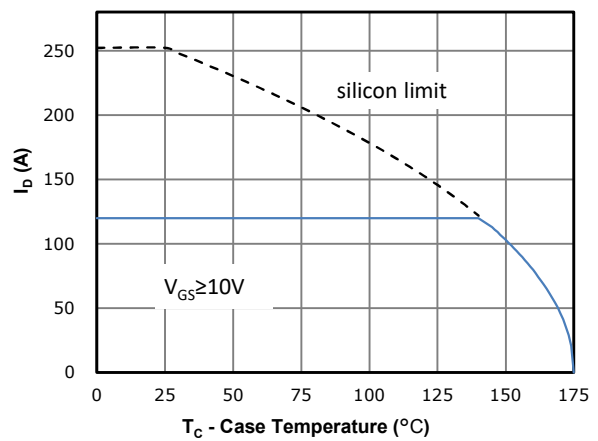


Fig 13: Safe Operating Area

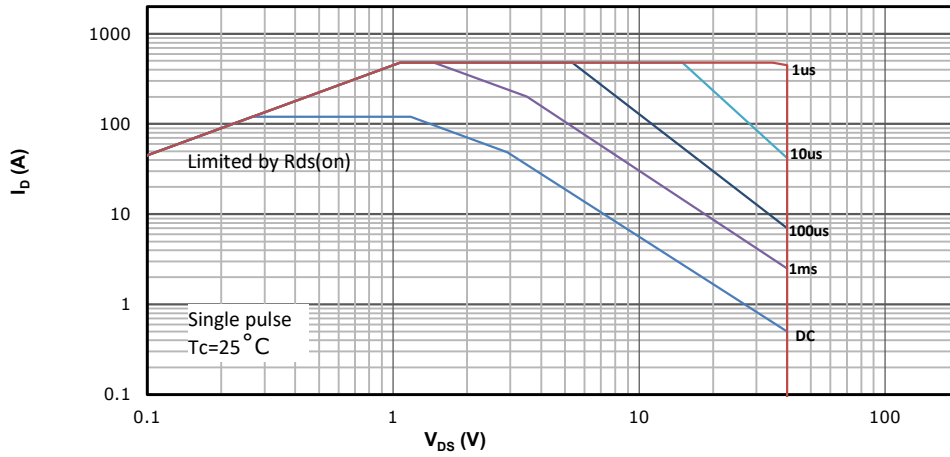
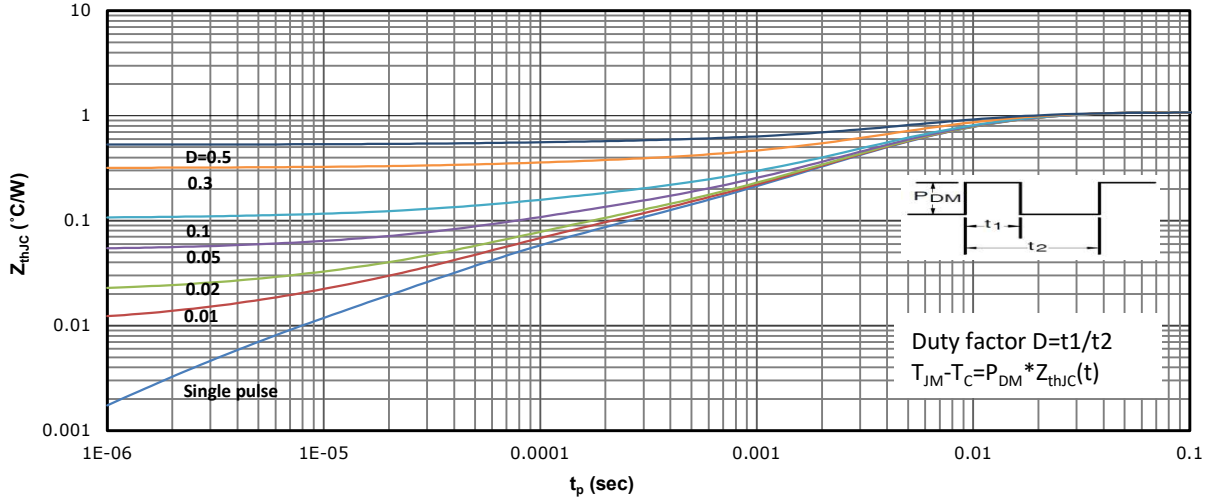
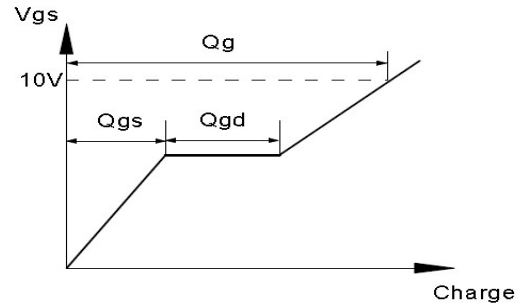
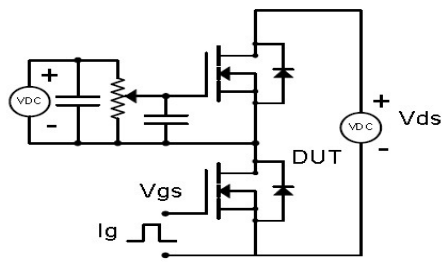


Fig 14: Max. Transient Thermal Impedance

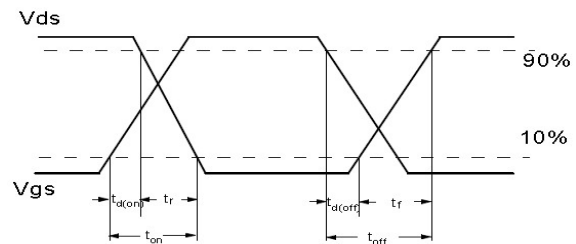
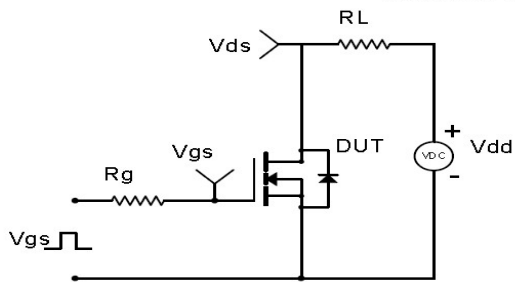


Test Circuit & Waveform

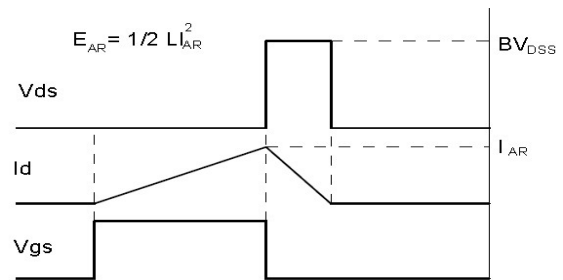
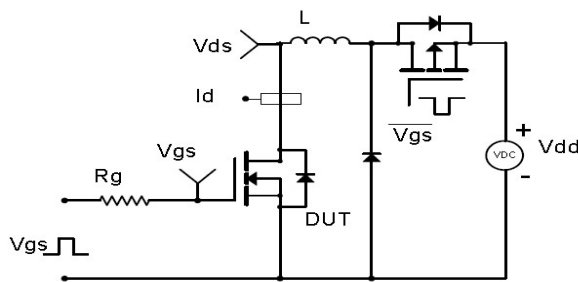
Gate Charge Test Circuit & Waveform



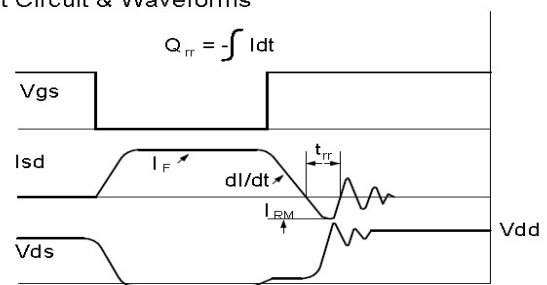
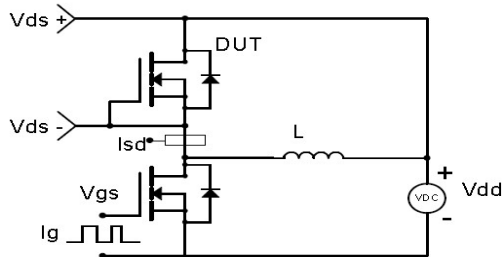
Resistive Switching Test Circuit & Waveforms



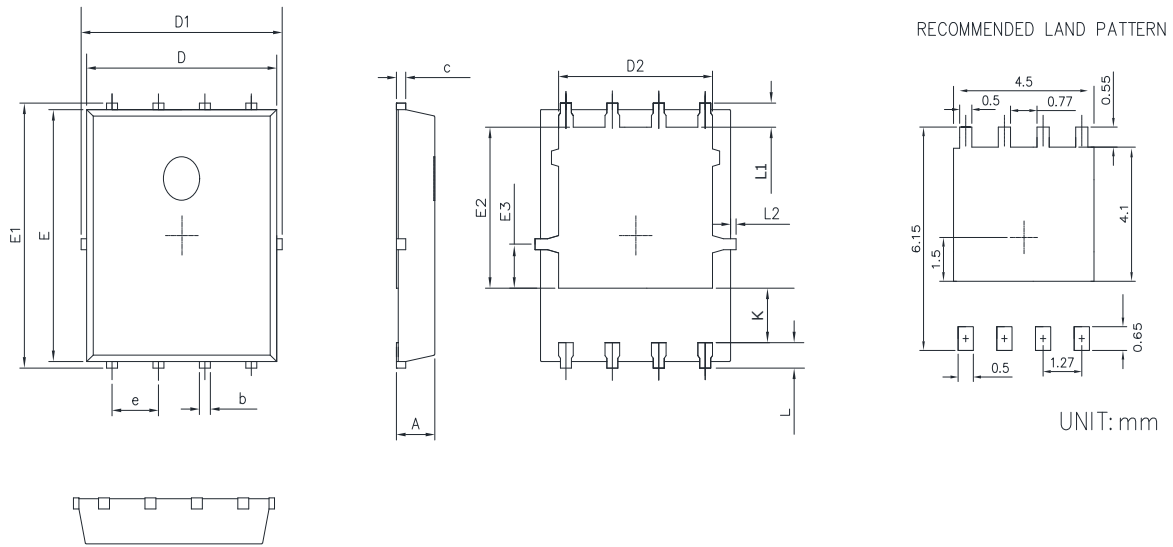
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: DFN5X6



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.10	0.035	0.043
b	0.25	0.50	0.010	0.020
c	0.10	0.30	0.004	0.012
D	4.80	5.30	0.189	0.209
D1	4.90	5.50	0.193	0.217
D2	3.92	4.20	0.154	0.165
E	5.65	5.85	0.222	0.230
E1	5.90	6.20	0.232	0.244
E2	3.33	3.78	0.131	0.149
E3	0.80	1.00	0.031	0.039
e	1.27		0.050	
L	0.40	0.70	0.016	0.028
L1	0.65		0.026	
L2	0.00	0.15	0.000	0.006
K	1.00	1.50	0.039	0.059



Revision History

Revision	Date	Major changes
1.0	2023/3/19	Release of Formal Version.
1.1	2024/11/23	Updated the ID from 260A to 120A.
2.0	2025/2/28	Updated Rth,SOA,etc.
2.1	2025/8/11	Updated Ciss/Coss/Crss test condition to 250KHZ and value
2.2	2026/4/8	Updated tr from 43 to 26, 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.

Unless otherwise specified in the datasheet, the product is designed and qualified as a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability, such as automotive, 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.

"Typical" parameters which may be provided in PingWei data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE