

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
- Easy paralleling

Applications

- General automotive applications
- Motor Drivers
- Switching Voltage Regulators

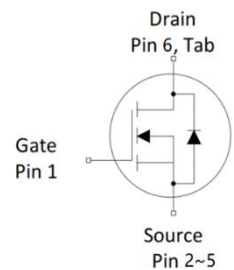
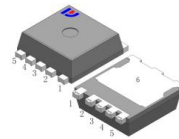


100% DVDS Tested
100% Avalanche Tested

Product Summary

V_{DS}	40V
$R_{DS(on)}@10V$ typ	1mΩ
I_D (Silicon)	278A

STOLL

**Package Marking and Ordering Information**

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWC012N04USQ	C012N04USQ	STOLL	Tape&Reel	13 inches	16mm	1800pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	40	V
Continuous drain current $T_C = 25^\circ\text{C}$ (Silicon limit) $T_C = 100^\circ\text{C}$ (Silicon limit) $T_C = 25^\circ\text{C}$ (Package limit) $T_a = 25^\circ\text{C}$ (See RthJA)	I_D	278 196 250 46	A
Pulsed drain current ($T_C = 25^\circ\text{C}$, $t_p = 100\mu\text{s}$)	$I_{D \text{ pulse}}$	1055	A
Avalanche energy, single pulse ($L=0.043\text{mH}$)	E_{AS}	175	mJ
Gate-Source voltage	V_{GS}	± 20	V
Power dissipation $T_C = 25^\circ\text{C}$ $T_a = 25^\circ\text{C}$ (See RthJA)	P_{tot}	157 4.3	W
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	-	0.7	1.0	°C/W	-
Thermal resistance, junction - ambient	RthJA	-	35	-	°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 =250uA
Gate threshold voltage	V _{GS(th)}	2.2	-	3.5	V	V _{DS} =V _{GS} , I _D =250uA
Zero gate voltage drain current	I _{DSS}	-	-	1 100	μA	V _{DS} =40V, V _{GS} =0V T _j =25°C T _j =150°C
Gate-source leakage current	I _{GSS}	-	-	±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
Transconductance	g _{fs}	-	111	-	S	V _{DS} =5V, I _D =50A

Dynamic Characteristic

Input Capacitance	C _{iss}	0	4971	6611	pF	V _{GS} =0V, V _{DS} =25V, f=1MHz
Output Capacitance	C _{oss}	-	1316	1750		
Reverse Transfer Capacitance	C _{rss}	-	50	75		
Input Capacitance	C _{iss}	-	4946	6578	pF	V _{GS} =0V, V _{DS} =20V, f=100Kz
Output Capacitance	C _{oss}	-	1493	1986		
Reverse Transfer Capacitance	C _{rss}	-	55	83		
Gate Total Charge	Q _G	-	68	88	nC	V _{DS} =32V, I _D =180A , V _{GS} =10V
Gate-Source charge	Q _{gs}	-	28	40		
Gate-Drain charge	Q _{gd}	-	28	42		
Gate plateau voltage	V _{plateau}	-	5.6	-	V	
Turn-on delay time	t _{d(on)}	-	17	-	ns	V _{GS} =10V, V _{DD} =20V, R _G =1.6Ω, I _D =50A
Rise time	t _r	-	43	-		
Turn-off delay time	t _{d(off)}	-	46	-		
Fall time	t _f	-	22	-		
Gate resistance	R _G	-	2.6	-	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}	-	0.81	1.2	V	$V_{GS}=0V, I_{SD}=50A$
Body Diode Continuous Forward Current	I_S	-	-	250	A	$TC = 25^{\circ}C$
Body Diode Pulsed Current	I_S pulse	-	-	1055	A	$TC = 25^{\circ}C, t_p = 100\mu S$
Body Diode Reverse Recovery Time	t_{rr}	-	21	-	ns	$V_R=20V, I_F=30A,$ $dI/dt=215A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	17	-	nC	

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

Typical Performance Characteristics

Fig 1: Output Characteristics

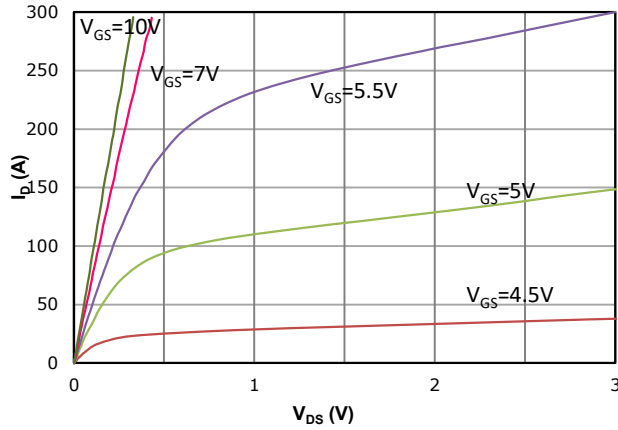


Fig 2: Transfer Characteristics

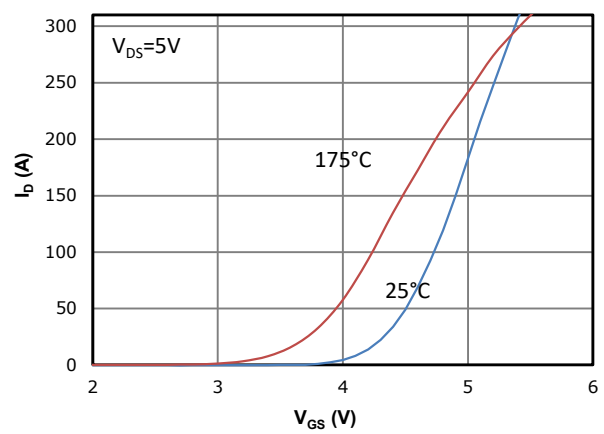


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

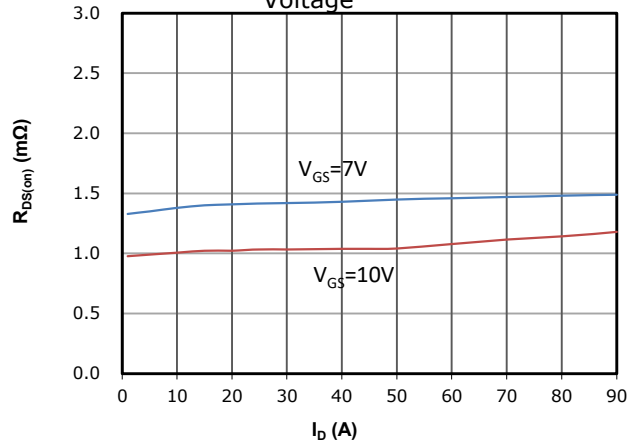


Fig 4: $R_{DS(on)}$ vs Gate Voltage

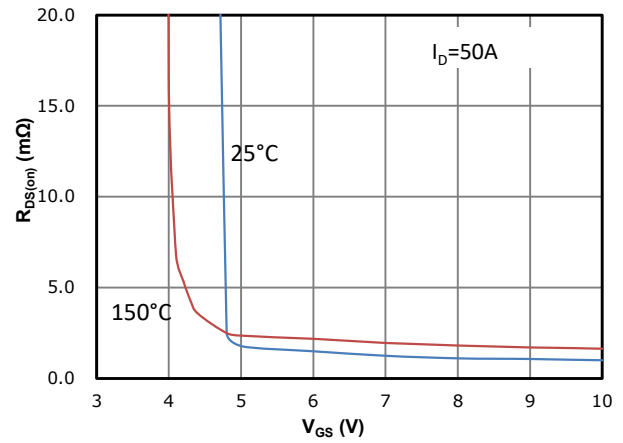


Fig 5: $R_{DS(on)}$ vs. Temperature

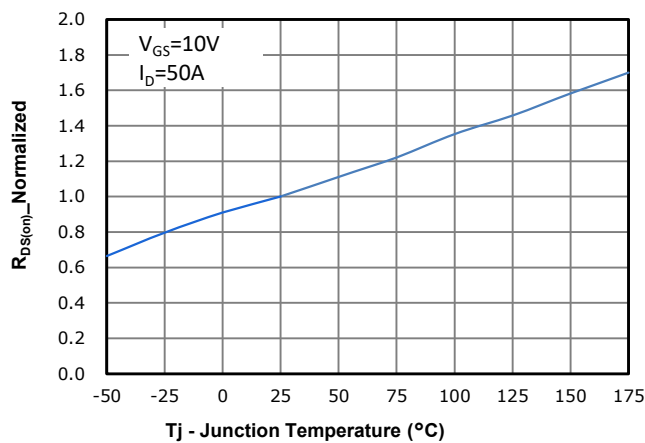


Fig 6: $V_{GS(th)}$ vs. Temperature

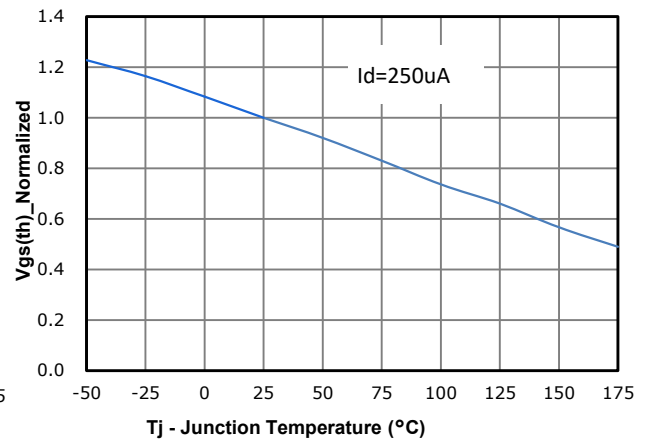


Fig 7: BVdss vs. Temperature

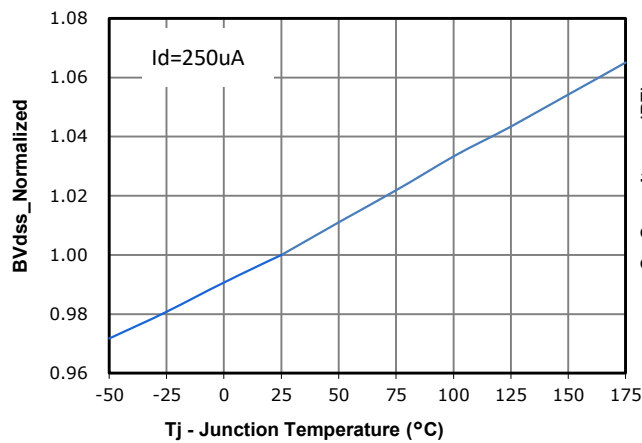


Fig 8: Capacitance Characteristics

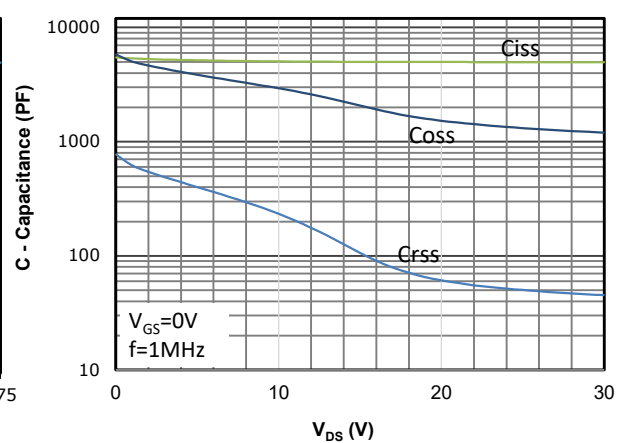


Fig 9: Gate Charge Characteristics

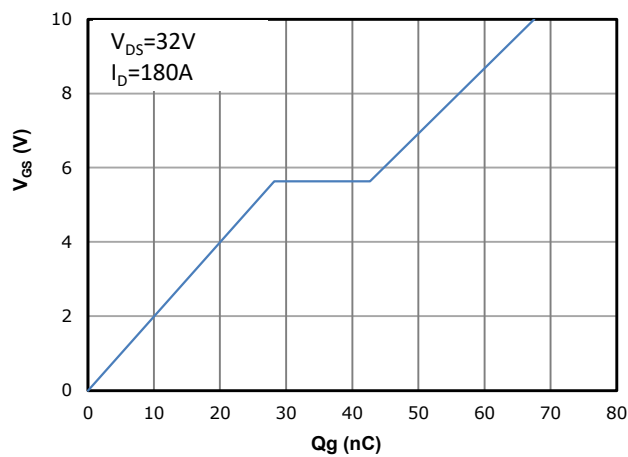


Fig 10: Body-diode Forward Characteristics

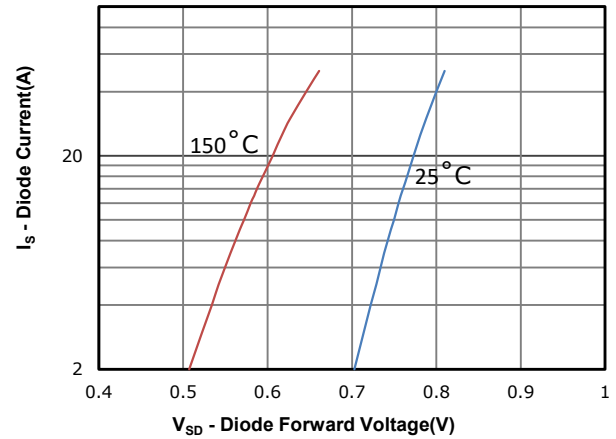


Fig 11: Power Dissipation

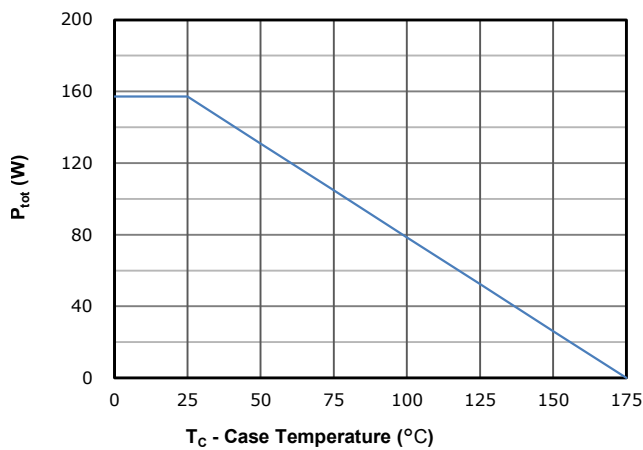


Fig 12: Drain Current Derating

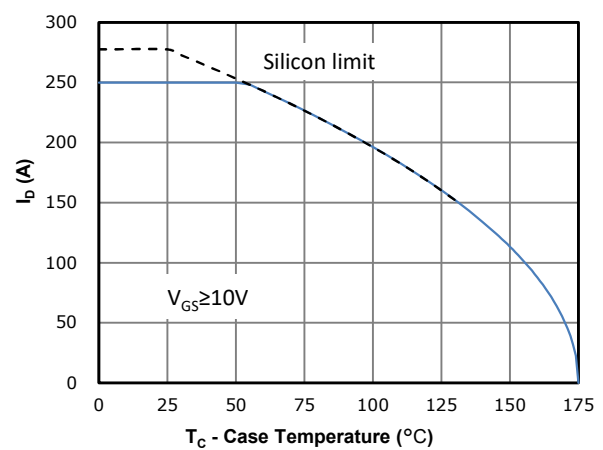


Fig 13: Safe Operating Area

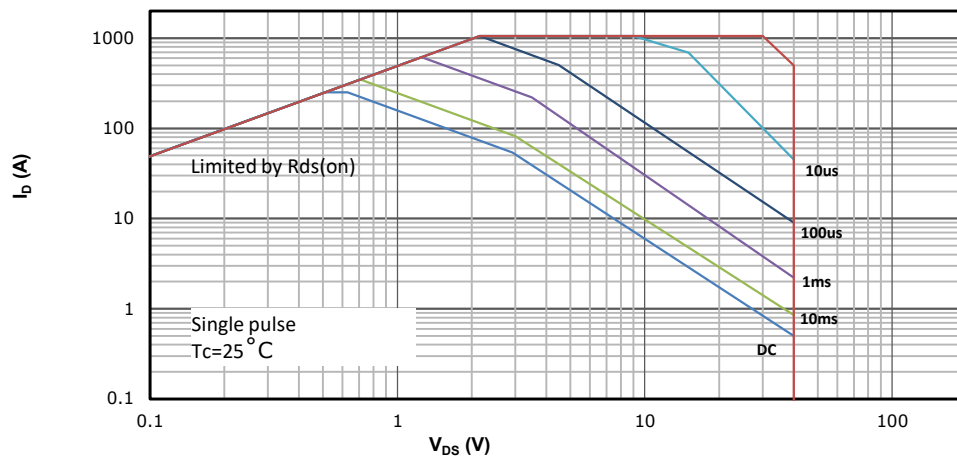
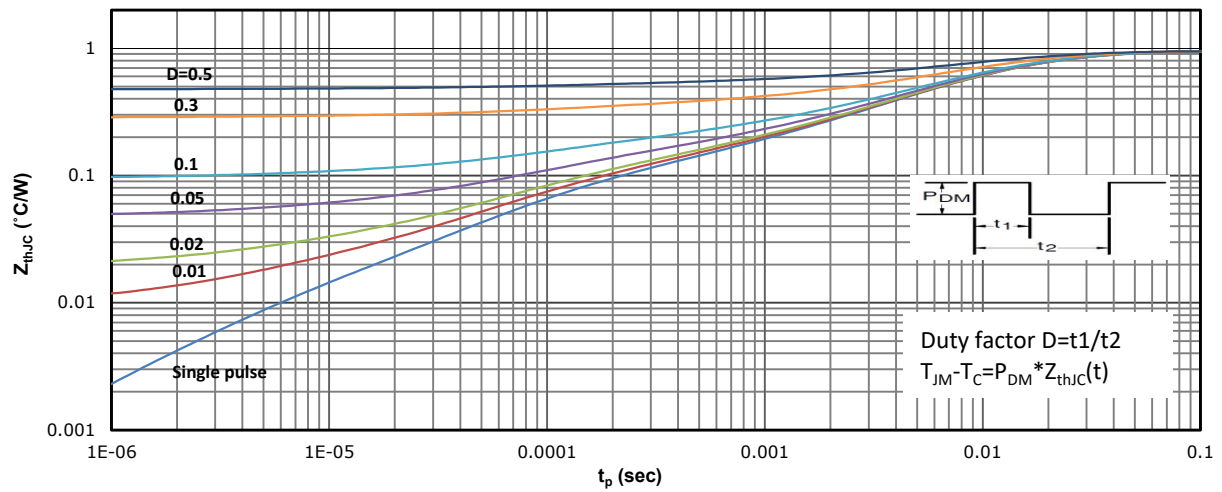
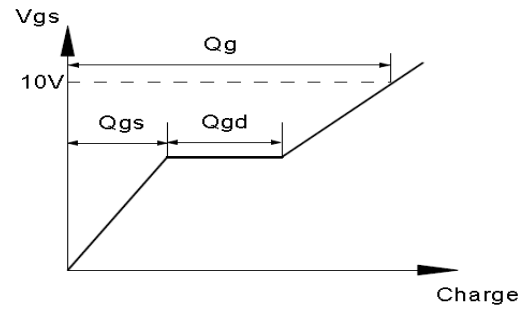
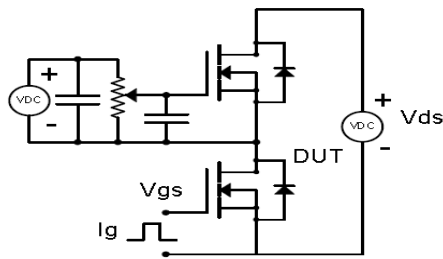


Fig 14: Max. Transient Thermal Impedance

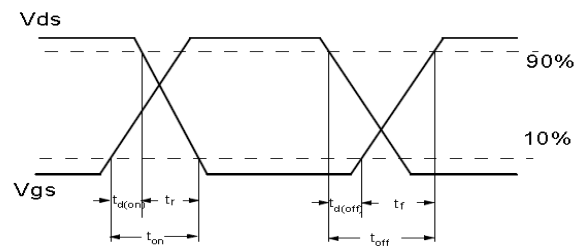
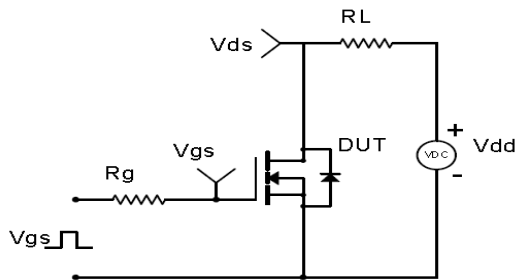


Test Circuit & Waveform

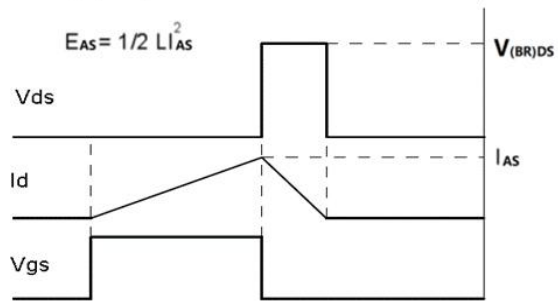
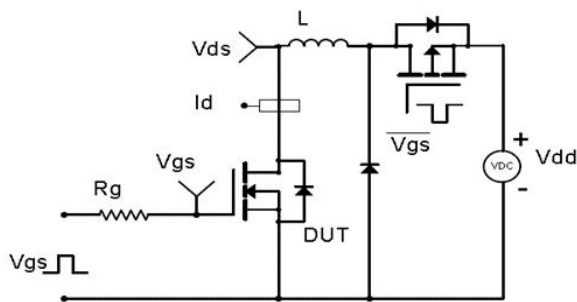
Gate Charge Test Circuit & Waveform



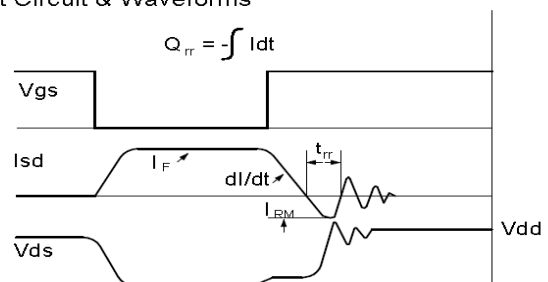
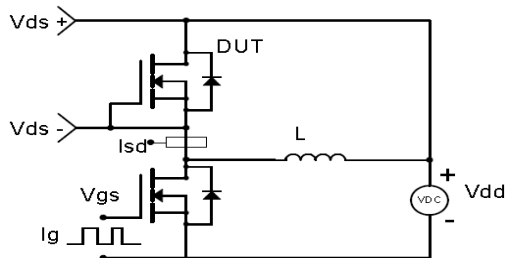
Resistive Switching Test Circuit & Waveforms

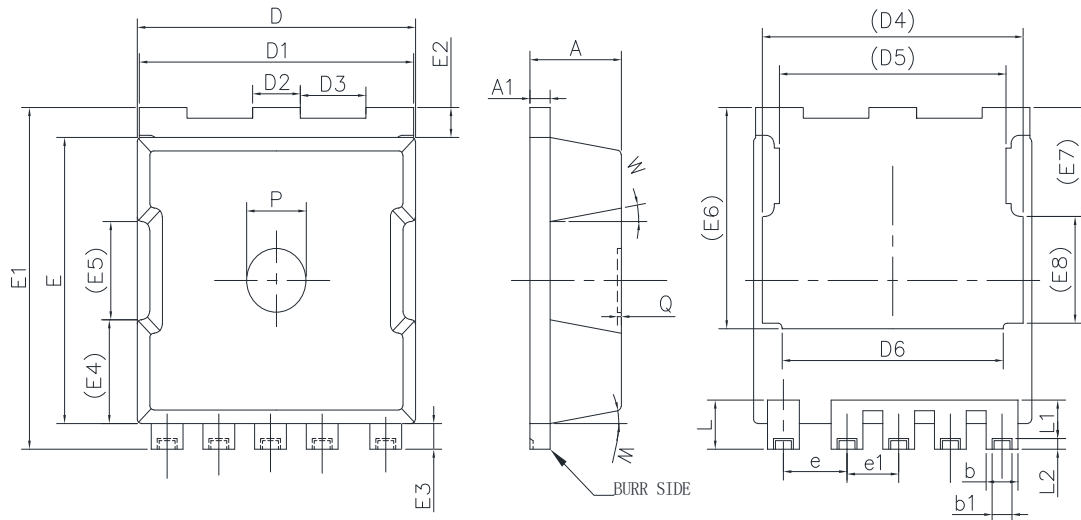


Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: STOLL

SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.20	2.40	0.087	0.094
A1	0.40	0.60	0.016	0.024
b	0.70	0.90	0.028	0.035
b1	0.40	0.60	0.016	0.024
D	6.80	7.20	0.268	0.283
D1	6.80	7.20	0.268	0.283
D2	1.10	1.30	0.043	0.051
D3	1.55	1.75	0.061	0.069
D4	6.56		0.258	
D5	5.70		0.224	
D6	5.56		0.219	
E	6.50	6.90	0.256	0.272
E1	7.80	8.20	0.307	0.323
E2	0.60	0.80	0.024	0.031
E3	0.50	0.70	0.020	0.028
E4	2.43		0.096	
E5	2.30		0.091	
E6	5.18		0.204	
E7	2.55		0.100	
E8	2.50		0.098	
e	1.60		0.063	
e1	1.30		0.051	
L	1.05	1.25	0.041	0.049
L1	0.80	1.00	0.031	0.039
L2	0.15	0.35	0.006	0.014
P	1.40	1.60	0.055	0.063
Q	0.00	0.10	0.000	0.004
W	8°	11°	8°	11°

Revision History

Revision	Date	Major changes
1.0	2023/7/17	Release of Design Version.
1.1	2023/8/15	Update EAS/CISS/COSS/CRSS/Qg/Qgs/Qgd Output and Transfer Characteristics parameters.
1.2	2025/4/17	Update Continuous Id,Rth,Zth,SOA,etc.
1.3	2025/8/11	Update Pakage limit from 150A to 250A;Update ID Pulse;Update Qty from 2000 to 1800;Add V _{plateau}

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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