PWC012N04USQ

Perfect MOS N-MOSFET 40V, 1mΩ, 278A

重庆平伟实业股份有限公司

Features

- Uses PingWei advanced PerfectMOS2 technology
- Extremely low on-resistance $R_{DS(on)}$
- Excellent $Q_g x R_{DS(on)}$ 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

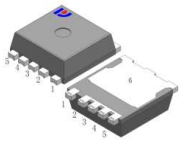
- General automotive applications
- Motor Drivers
- Switching Voltage Regulators

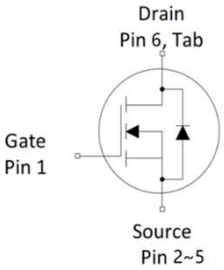
100% DVDS Tested
100% AvalancheTested

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°C (Silicon limit) T_C = 100°C (Silicon limit) T_C = 25°C (Package limit) Ta = 25°C (See RthJA)	I_D	 278 196 250 46	A
Pulsed drain current (T_C = 25°C, tp =100uS)	$I_{D\ pulse}$	1055	A
Avalanche energy, single pulse (L=0.043mH)	E_{AS}	175	mJ
Gate-Source voltage	V_{GS}	±20	V
Power dissipation T_C = 25°C Ta = 25°C (See RthJA)	P_{tot}	 157 4.3	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+175	°C
Reflow soldering temperature（10s）	Tsold	260	°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	Vgs=10V,Id=50A
Transconductance	g_{fs}	-	111	-	S	V_{DS}=5V,I_D=50A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	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	Vds=32V,Id=180A ,Vgs=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	-	24	-		
Turn-off delay time	$t_{d(off)}$	-	46	-		
Fall time	t_f	-	17	-		
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	Is	-	-	250	A	TC = 25°C
Body Diode Pulsed Current	Is pulse	-	-	1055	A	TC = 25°C, tp =100uS
Body Diode Reverse Recovery Time	t_{rr}	-	21	-	ns	V_R=20V,I_F=30A, dI/dt=215A/μs
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

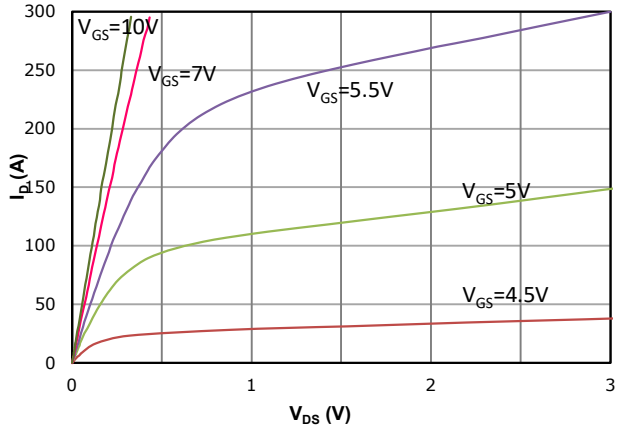


Fig 2: Transfer Characteristics

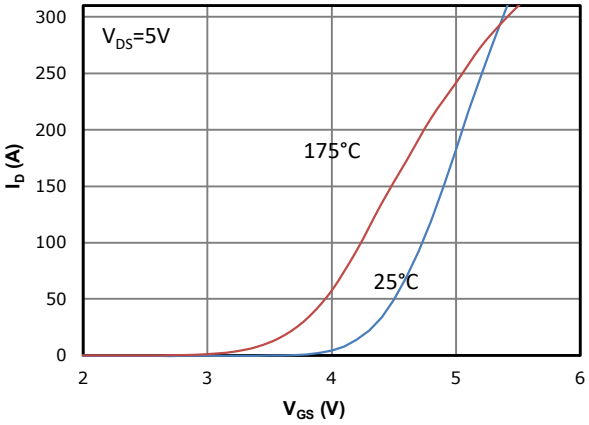


Fig 3: Rds(on) vs Drain Current and Gate Voltage

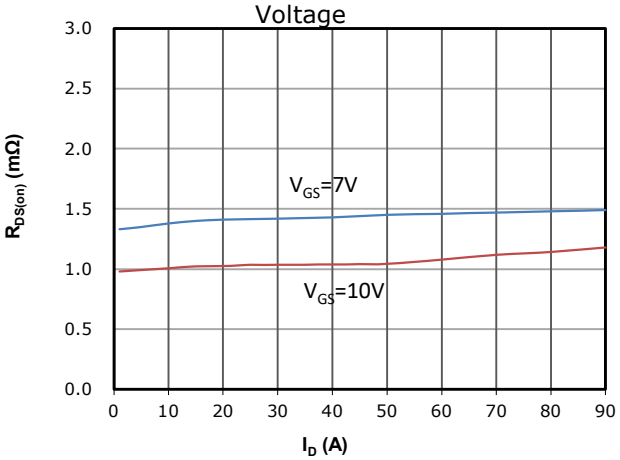


Fig 4: Rds(on) vs Gate Voltage

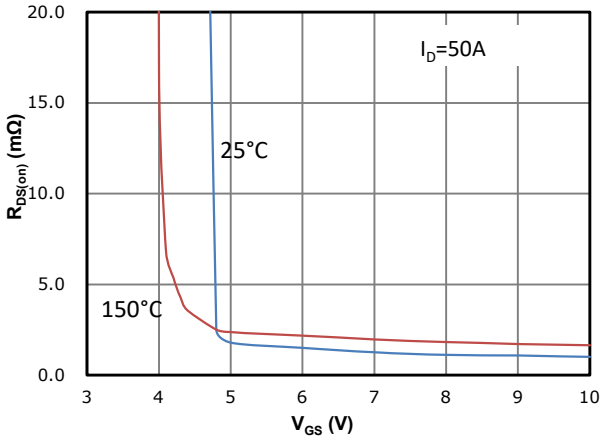


Fig 5: Rds(on) vs. Temperature

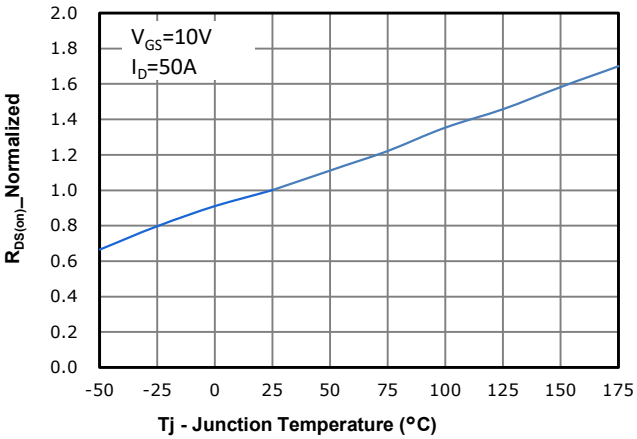


Fig 6: Vgs(th) vs. Temperature

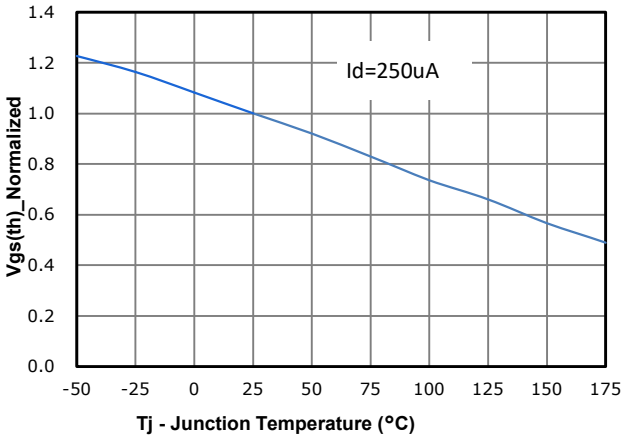


Fig 7: BVdss vs. Temperature

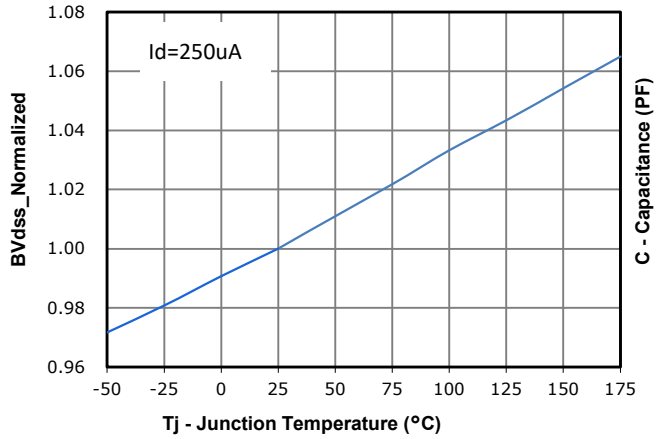


Fig 8: Capacitance Characteristics

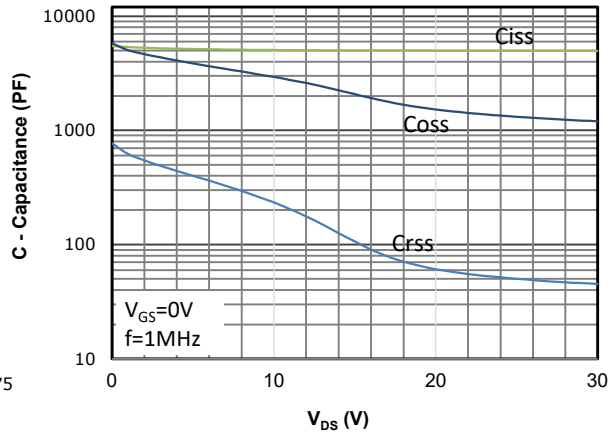


Fig 9: Gate ChargeCharacteristics

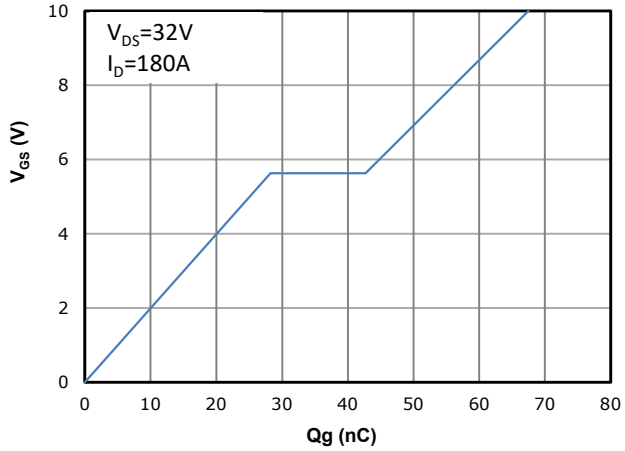


Fig 10: Body-diode Forward Characteristics

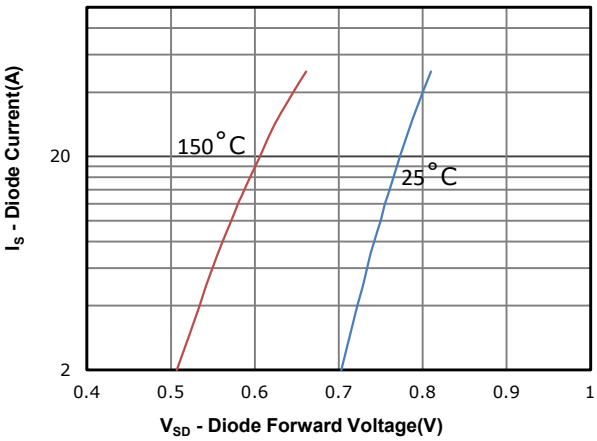


Fig 11: Power Dissipation

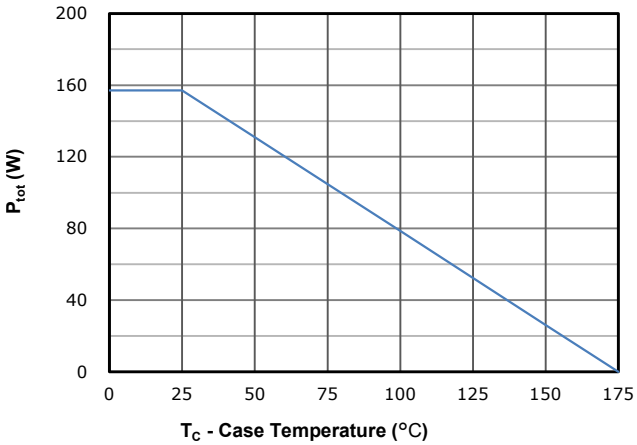


Fig 12: Drain Current Derating

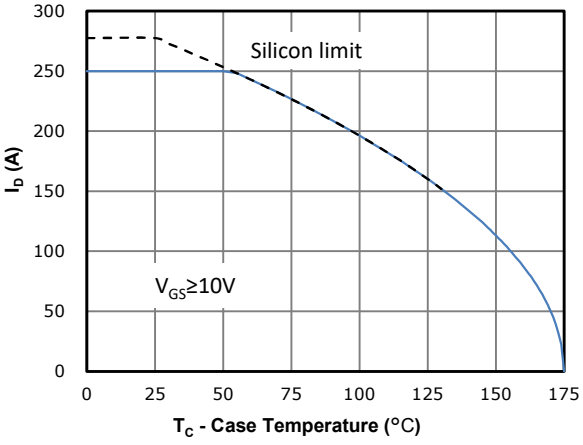


Fig 13: Safe Operating Area

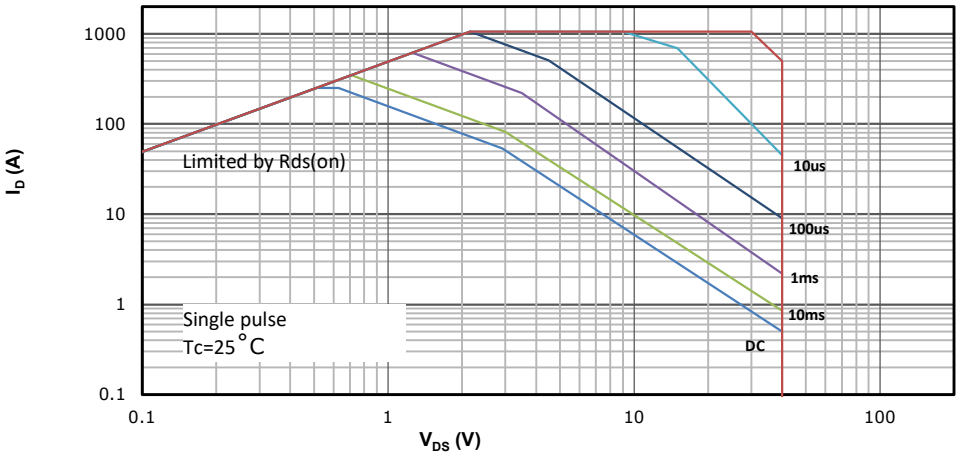
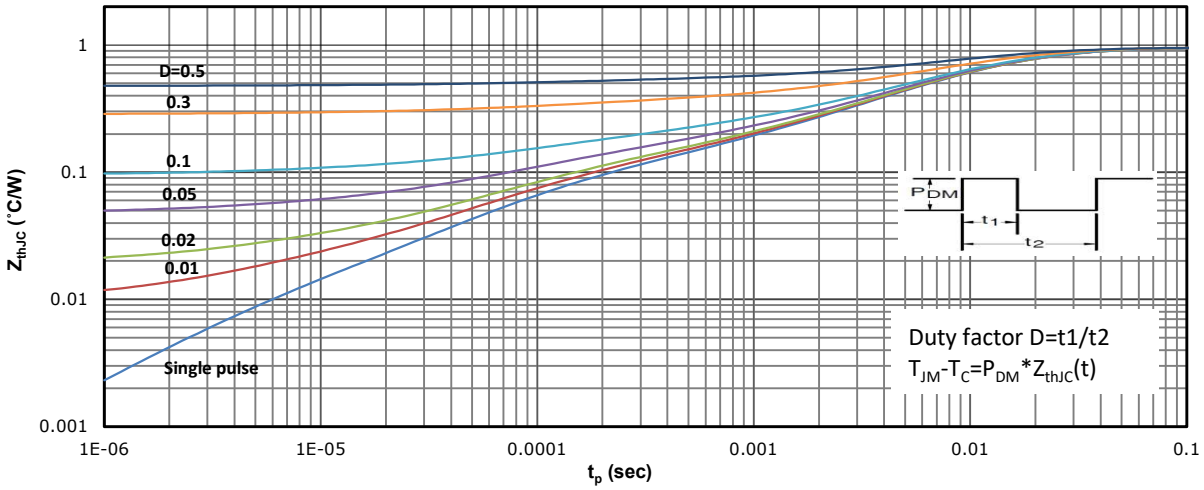
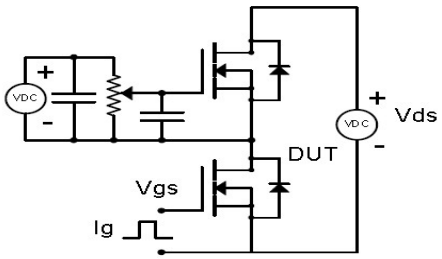


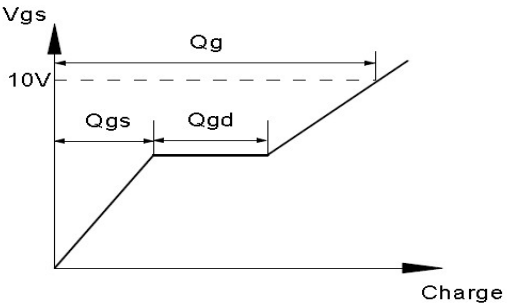
Fig 14: Max. Transient Thermal Impedance



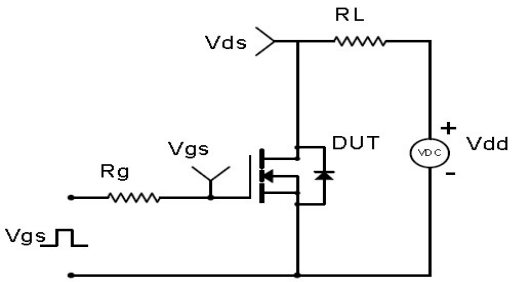
Test Circuit & Waveform

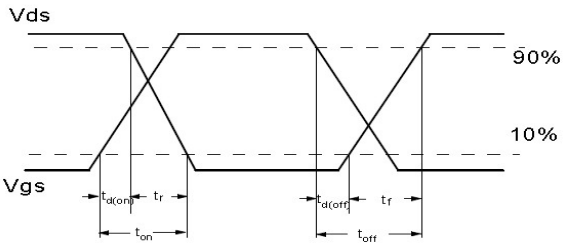
Gate Charge Test Circuit & Waveform



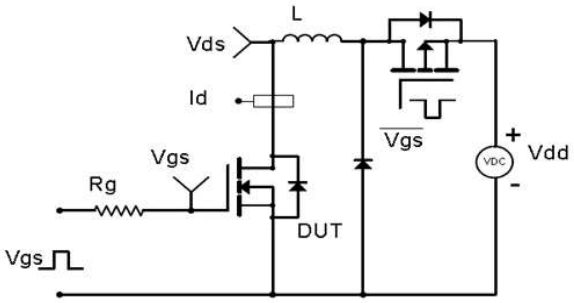


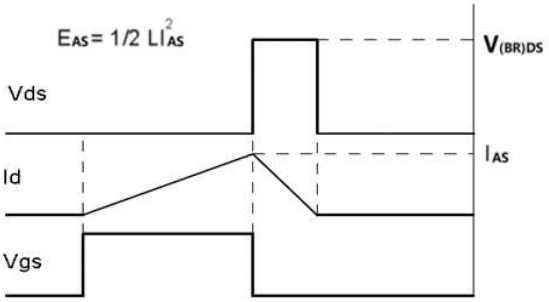
Resistive Switching Test Circuit & Waveforms



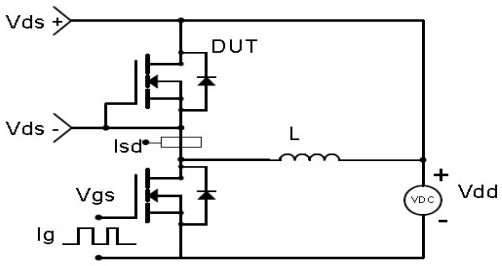


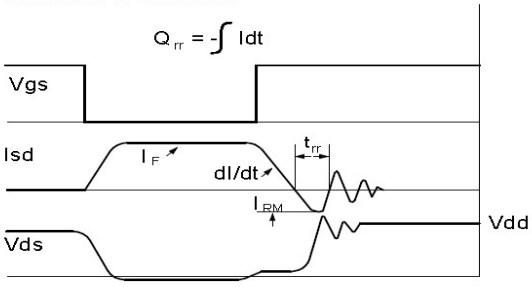
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



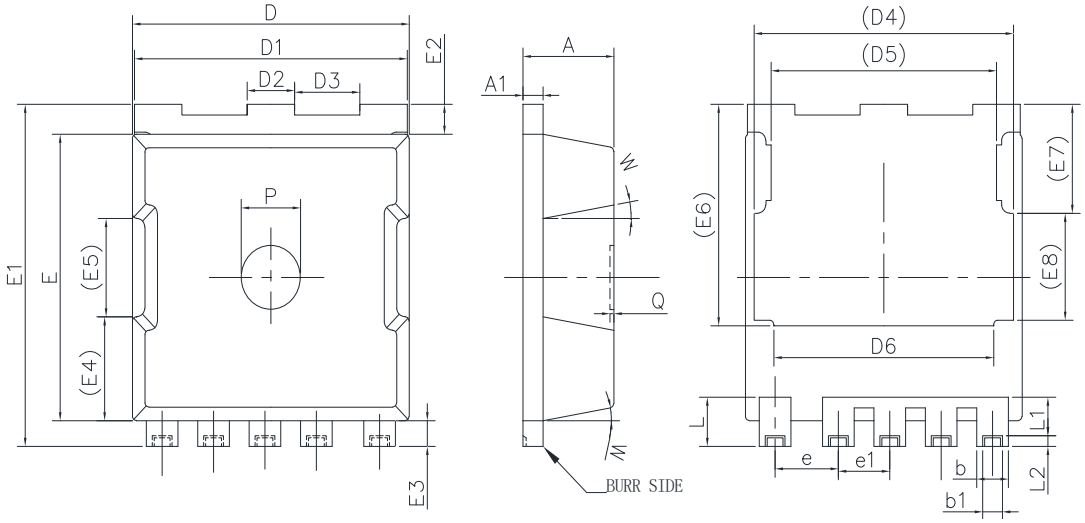


Diode Recovery Test Circuit & Waveforms





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

Revison	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 $V_{plateau}$
1.4	2026/4/8	Update tr from 43 to 24，tf from 22 to 17;

Disclaimer

Any and all semicondutor 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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