Features

- Strong gate with a high threshold, no need for negative gate drive,and a high repetitive input voltage tolerance of ±20V.
- Fast turn-on/off speed for reduced cross-over losses.
- Low Qg and simple gate drive for lowest driver consumption at high frequencies.
- Negligible Qrr for outstanding hard-switched bridge applications.
- Fast turn-on/off speed for reduced cross-over losses.

Benefits

- Enable very high conversion efficiencies.
- Enable higher frequency for compact power supplies
- End-product cost & size savings due to reduced cooling requirements.
- Improved safety & reliability due to cooler operation temperature.

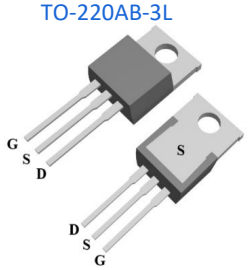
Applications

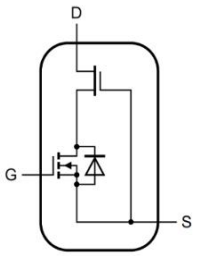
- Half-bridge buck/boost, totem-pole PFC circuits or inverter circuits.
- High-efficiency/High-frequency LLC or other soft-switching topologies.
- High-frequency compact chargers with QR or ACF flyback topologies.

Product Summary

V_{DS}	650V
$R_{DS(on)@10V\ typ}$	150mΩ
I_D	21A

TO-220AB-3L





Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWDG180N65	PWDG180N65	TO-220AB-3L	Tube	N/A	N/A	50pcs

Absolute Maximum Ratings

Parameter	Symbol	Limit value	Unit
Drain-source voltage（T_J=-55°C to 150°C）	V_{DSS}	650	V
Drain to source voltage-transient[a]	$V_{(TR)DSS}$	800	
Gate to source voltage	V_{GSS}	-20~+20	V
Continuous drain current@T_C = 25°C [b] Continuous drain current@T_C = 125°C[b]	I_D	21 9	A
Pulse drain current (pulse width: 10μs)	I_{DM}	35	A
Maximum power dissipation @ T_C=25°C	P_D	125	W
Operating temperature	T_J	-55~150	°C
Storage temperature	T_S	-55~150	°C

a.In off-state, spike duty cycle D<0.01, spike duration <1μs
b. For increased stability at high current operation

Thermal Resistance

Parameter	Symbol	Limit value			Unit	Test Condition
		min.	typ.	max.		
Junction-to-case thermal resistance	R_{thJC}	-	-	1	°C/W	-
Junction -to-ambient Thermal resistance	R_{thJA}	-	-	79	°C/W	-

Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Drain-source maximum voltage	V_{DSS}	650	-	-	V	V_{GS}=0V
Gate threshold voltage	$V_{GS(th)}$	3.3	3.9	4.5	V	V_{DS}=1V,I_{DS}=1mA
Drain-to-source leakage current	I_{DSS}	- -	2 10	10 100	μA	V_{DS}=650V,V_{GS}=0V T_j=25°C T_j=150°C
Gate-source leakage current	I_{GSS}	-	-	±100	nA	V_{GS}=±20V
Drain-source on-resistance	$R_{DS(on)}$		150	180	mΩ	V_{GS}=10V,I_D=1A,T_J=25°C
			270	-	mΩ	V_{GS}=10V,I_D=1A,T_J=150°C
Input Capacitance	C_{iss}	-	343	-	pF	V_{GS}=0V, V_{DS}=400V, f=1MHz
Output Capacitance	C_{oss}	-	26	-		
Reverse Transfer Capacitance	C_{rss}	-	2	-		
Gate Total Charge	Q_G	-	6.9	-	nC	V_{DS}=400V,I_D=1A ,V_{GS}=0V~10V
Gate-Source charge	Q_{gs}	-	2	-		
Gate-Drain charge	Q_{gd}	-	3	-		
Output charge	Q_{OSS}	-	48	-	nC	V_{GS}=0V, V_{DS}=0V~400V, f=1MHz
Turn-on delay time	$t_{d(on)}$	-	3.2	-	ns	V_{GS}=0V-10V, V_{DS}=400V, $R_{G\_on(ext)}$=6.8Ω,I_D=2.1A, $R_{G\_off(ext)}$=2.2Ω, L=250μH
Rise time	t_r	-	5.5	-		
Turn-off delay time	$t_{d(off)}$	-	7.4	-		
Fall time	t_f	-	8.4	-		

Reverse Device Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Source-Drain reverse voltage	V_{SD}	-	2.1	-	V	V_{GS}=0V,I_{SD}=10A
Reverse recovery time	t_{rr}	-	14	-	ns	I_S=10A, V_{DD}=400V, di/dt=165A/μs
Reverse recovery charge	Q_{rr}	-	6.5	-	nC	

Typical Performance Characteristics

Fig 1:Typical Output Characteristics

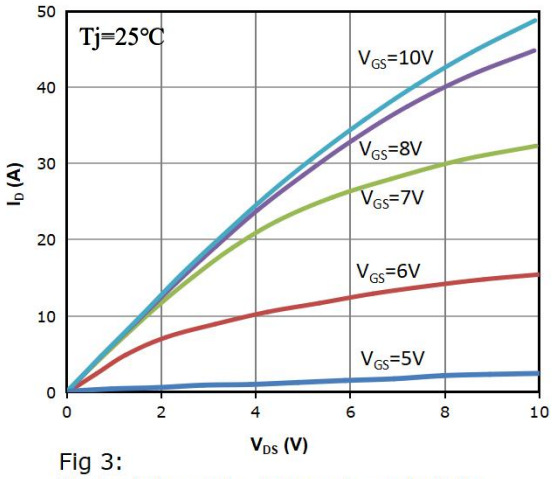


Fig 2:Typical Output Characteristics

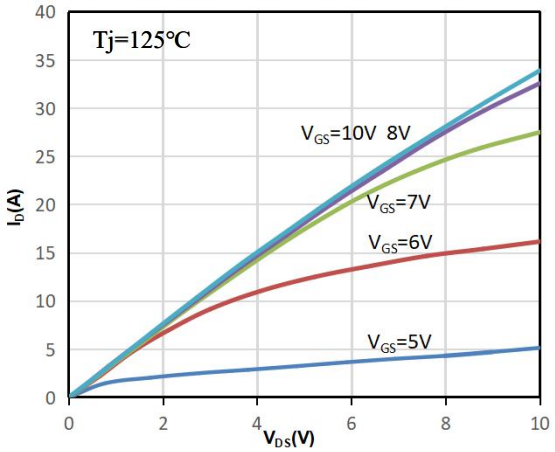


Fig 3:
Typical channel reverse characteristics

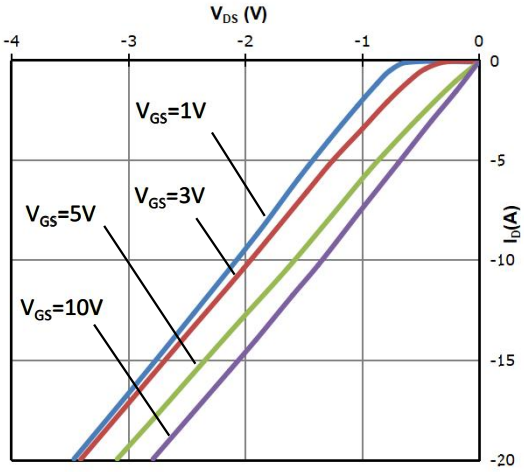


Fig4: Typical Transfer Characteristics

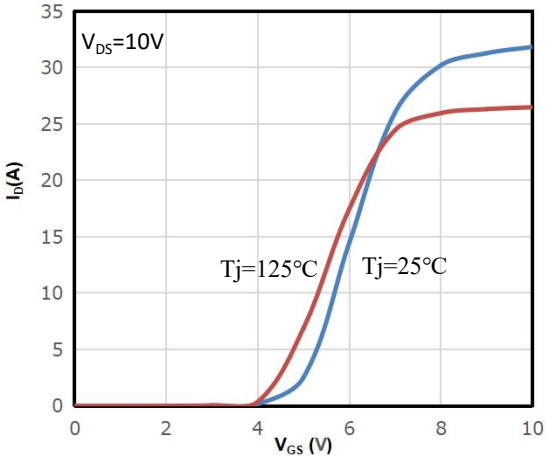


Fig 5: Rds(on) vs. Temperature

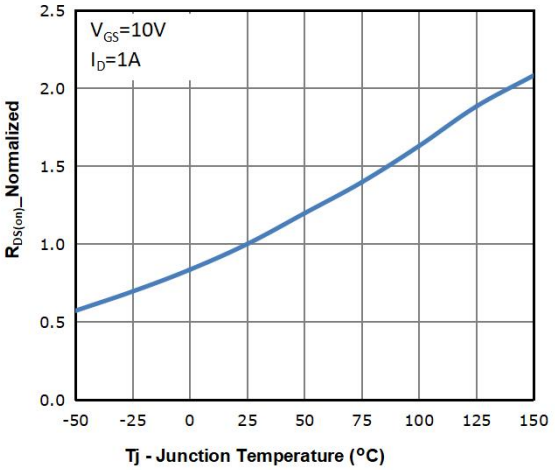


Fig 6: Capacitance Characteristics

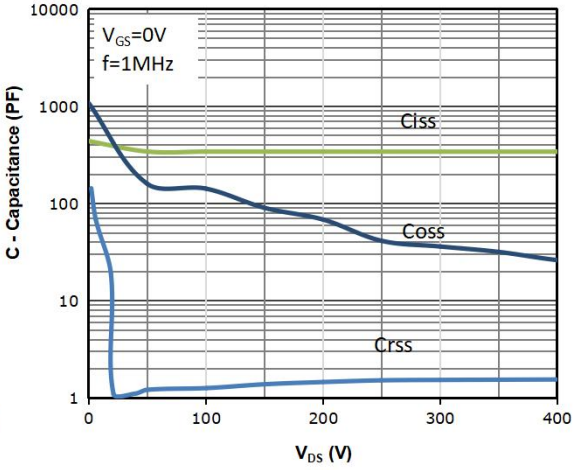


Fig 7: Typ. output charge

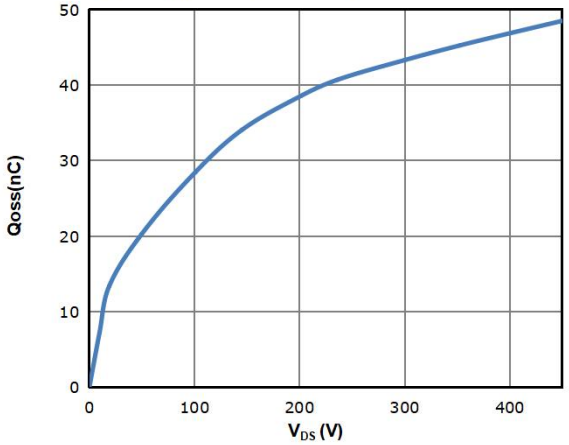


Fig 8: Typ. C_{OSS} stored Energy

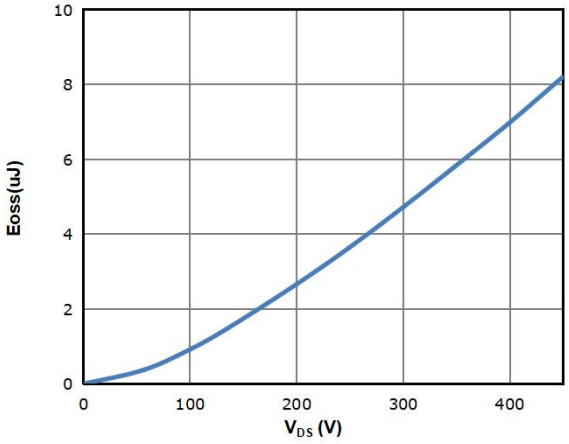


Fig 9: Gate ChargeCharacteristics

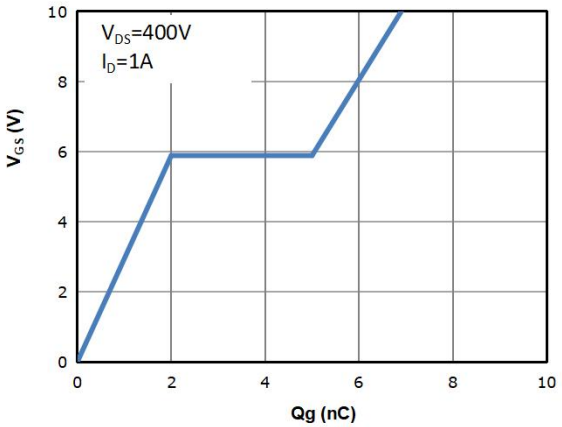


Fig 10: Power Dissipation

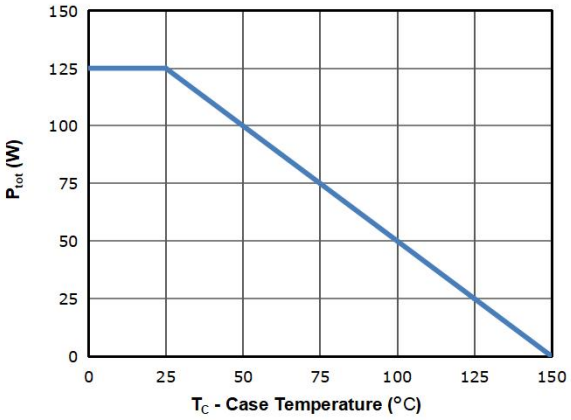


Fig 11:
Max. Transient Thermal Impedance

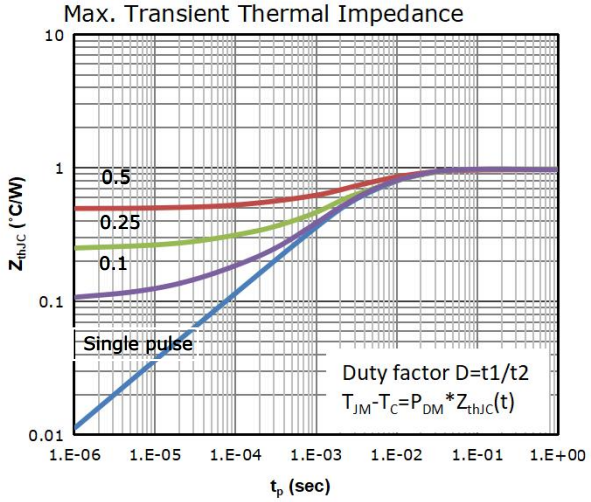
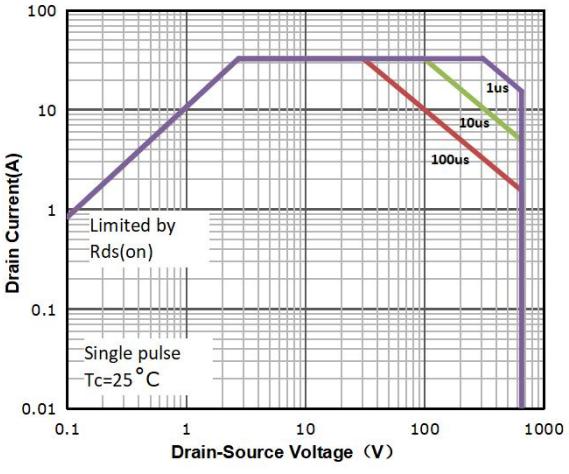


Fig 12: Safe Operating Area



Test Circuit & Waveform

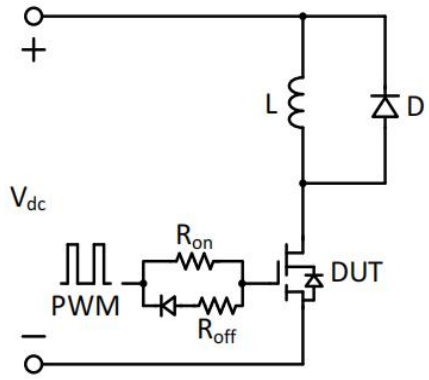


Figure 13. Switching times with inductive load

V_{DS}=400V, V_{GS}=0V to 10V, I_D=2.1A,
$R_{G\text{-}on(ext)}$=6.8Ω, $R_{G\text{-}off(ext)}$=2.2Ω, L=250μH

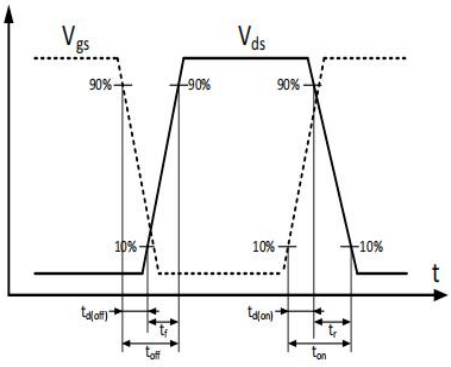
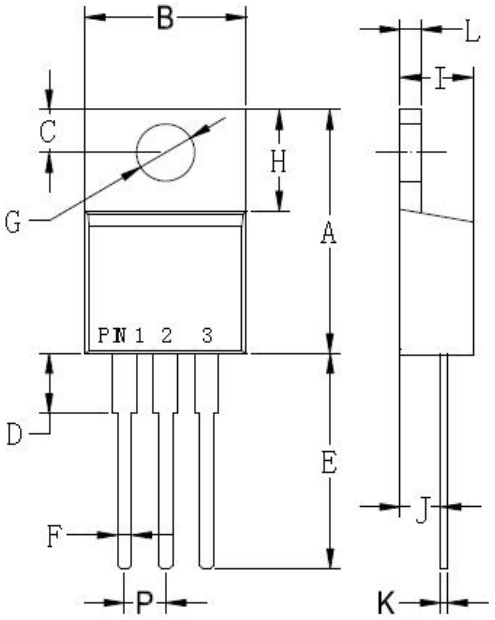


Figure 14. Switching times with waveform

Package Outline: TO-220AB-3L



TO-220AB		
Dim	Min	Max
A	.573(14.55)	.603(15.32)
B	——	.412(10.5)
C	.103(2.62)	.113(2.87)
D	.140(3.56)	.160(4.06)
E	.510(13.0)	.560(14.3)
F	.027(0.68)	.037(0.94)
G	.148(3.74)	.154(3.91)
H	.230(5.84)	.270(6.86)
I	.175(4.44)	.185(4.86)
J	.100(2.54)	.110(2.79)
K	.014(0.35)	.025(0.64)
L	.045(1.14)	.055(1.40)
P	.095(2.41)	.105(2.67)

Dimensions in inches and (millimeters)

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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.
Unless otherwise specified in the datasheet, the product is designed and qulified 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.
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