AP5N4P06SD

N and P-Channel Enhancement Mosfet

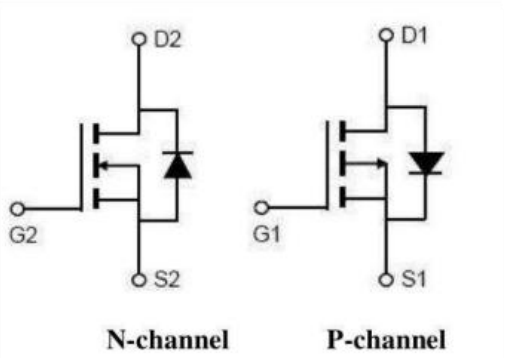
DATA SHEET

Features

- **N-Channel**
  60V,5A
  $R_{DS(ON)}$ <30mΩ @V_{GS}=10V TYP:24mΩ
  $R_{DS(ON)}$ <36mΩ @V_{GS}=4.5V TYP:30mΩ

- **P-Channel**
  -60V,-4A
  $R_{DS(ON)}$ <90mΩ @V_{GS}=-10V TYP:71mΩ
  $R_{DS(ON)}$ <110mΩ @V_{GS}=-4.5V TYP:88mΩ

- Lead free product is acquired
- High power and current handing capability
- Surface mount package



Schematic diagram



Marking and pin assignment

Applications

- PWM applications
- Load switch
- Power management

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
5N4P06SD	AP5N4P06SD	SOP-8	-	-	4000

ABSOLUTE MAXIMUM RATINGS (T_J=25℃ unless otherwise noted)

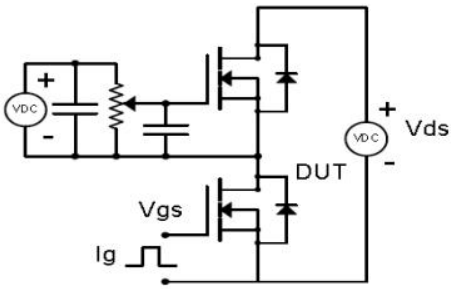
Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V_{DS}	60	-60	V
Gate-Source Voltage	V_{GS}	±20	±20	V
Continuous Drain Current (Tc=25℃)	I_D	5	-4	A
Continuous Drain Current (Tc=100℃)		3.4	-2.6	
Pulsed Drain Current (1)	I_{DM}	20	-16	A
Drain Power Dissipation	P_D	2		W
Thermal Resistance- Junction to Ambient	$R_{\theta JA}$	62.5		℃/W
Junction Temperature	T_J	-55~ +150		℃
Storage Temperature	T_{STG}	-55~ +150		℃

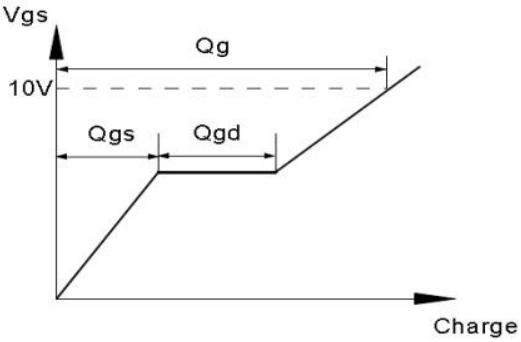
N-CH ELECTRICAL CHARACTERISTICS(T_J=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =250μA	60	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} =60V, V_{GS} = 0V	-	-	1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V	-	-	±100	nA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250μA	1.0	1.7	2.5	V
Drain-source on-resistance	$R_{DS(on)}$	V_{GS} =10V, I_D =10A	-	24	30	mΩ
		V_{GS} =4.5V, I_D =8A	-	30	36	
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =30V, VGS=0V, f=1MHz	-	985	-	pF
Output Capacitance	C_{oss}		-	52	-	
Reverse Transfer Capacitance	C_{rss}		-	50	-	
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DS}=30V, I_D=10A, R_G=3Ω, V_{GS}=10V	-	13	-	nS
Turn-on rise time	t_r		-	2.5	-	
Turn-off delay time	$t_{d(off)}$		-	27	-	
Turn-off fall time	t_f		-	3	-	
Total Gate Charge	Qg	V_{DS}=30V, I_D=10A, V_{GS}=10V	-	32.5	-	nC
Gate-Source Charge	Qgs		-	3.4	-	
Gate-Drain Charge	Qgd		-	6.5	-	
Source-Drain Diode characteristics						
Diode Forward voltage	V_{SD}	T_J=25℃, V_{GS} =0V, I_S=10A	-	-	1.2	V
Diode Forward current	I_S	T_C=25℃	-	-	5	A
Body Diode Reverse Recovery Time	Trr	di/dt=100A/us,IF=10A	-	19.5	-	ns
Body Diode Reverse Recovery Charge	Qrr	di/dt=100A/us,IF=10A	-	16	-	nC

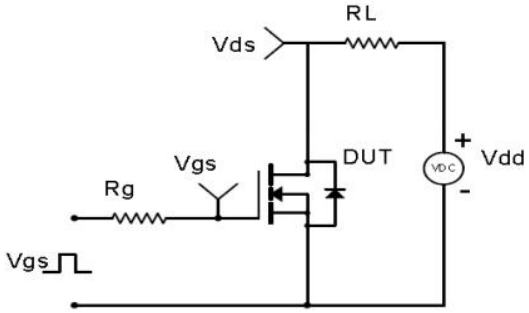
Test Circuit & Waveform

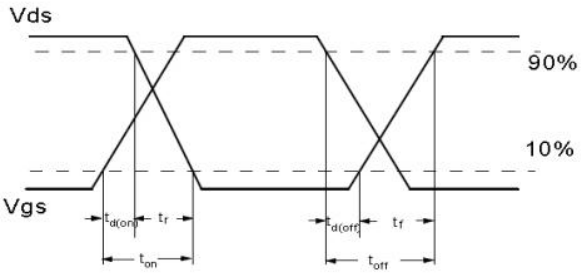
Gate Charge Test Circuit & Waveform



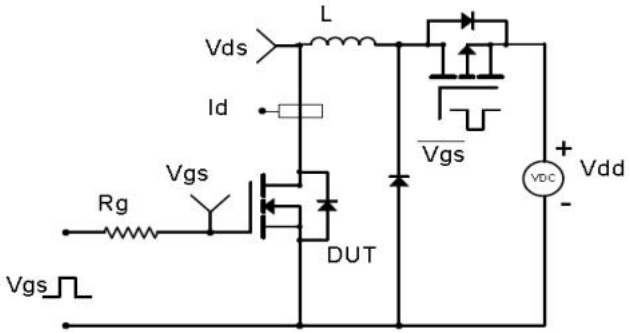


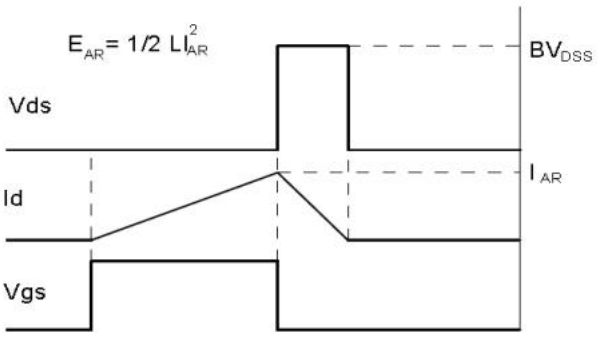
Resistive Switching Test Circuit & Waveforms



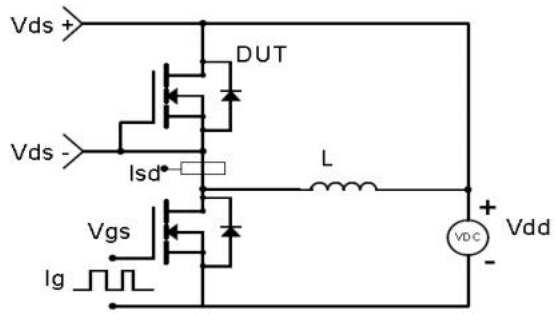


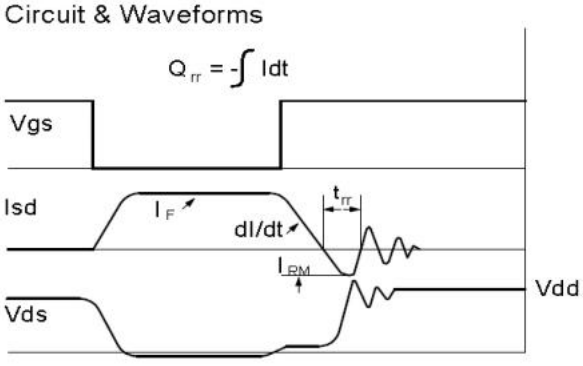
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms





Typical Characteristics：N-Channel

Figure 1. Output Characteristics

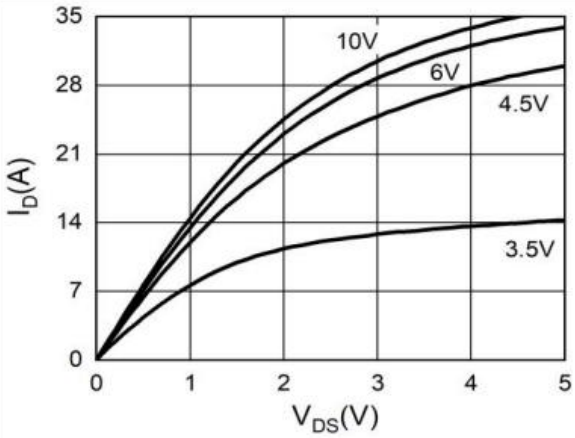


Figure 2. Transfer Characteristics

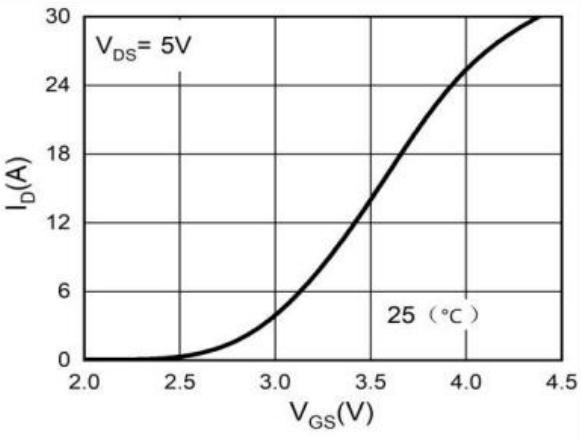


Figure 3. Power Dissipation

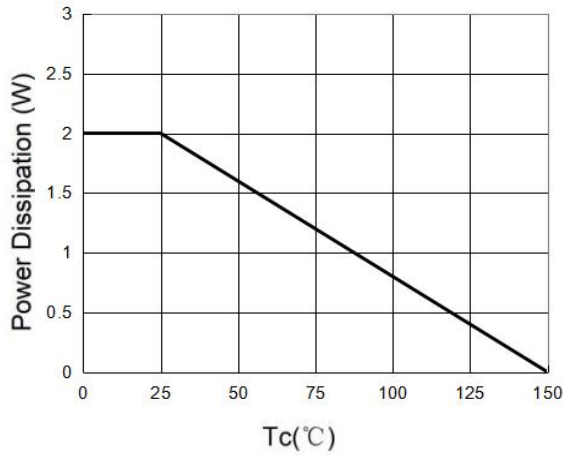


Figure 4. Drain Current

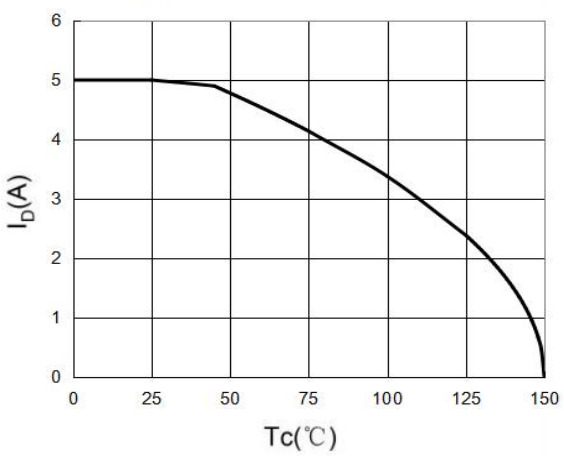


Figure 5. BV_{DSS} vs Junction Temperature

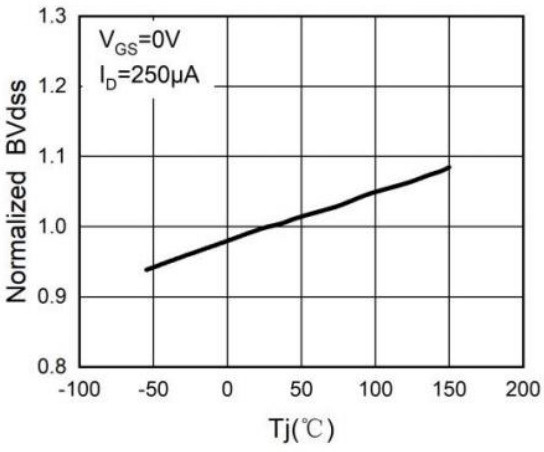
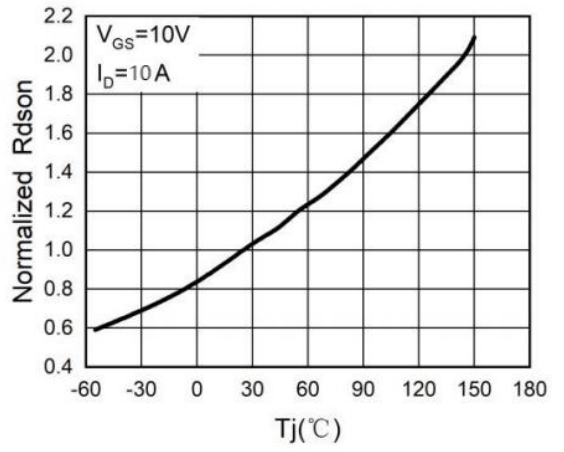


Figure 6. $R_{DS(ON)}$ vs Junction Temperatur



Typical Characteristics：N-Channel

Figure 7. Gate Charge Waveforms

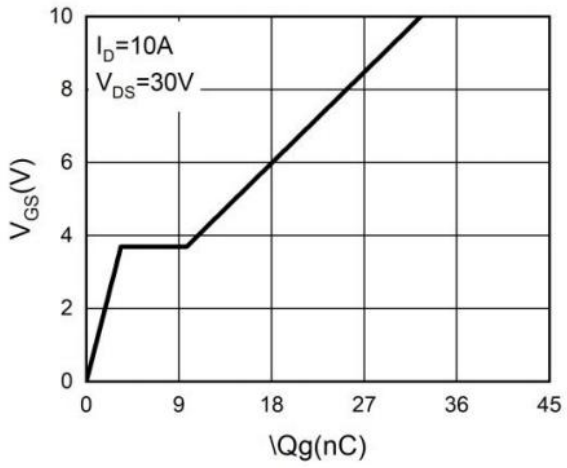


Figure 8. Capacitance

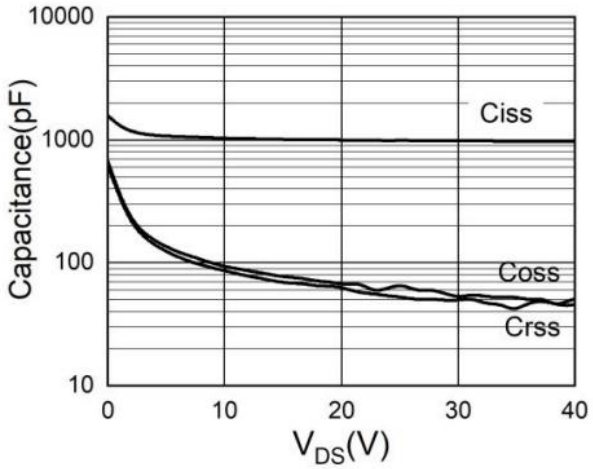


Figure 9. Body-Diode Characteristics

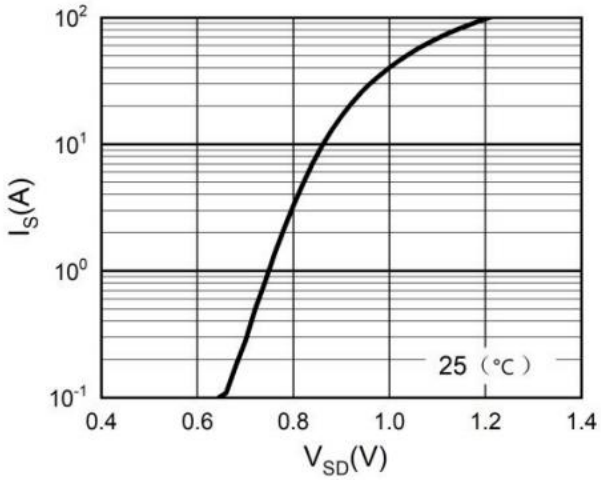
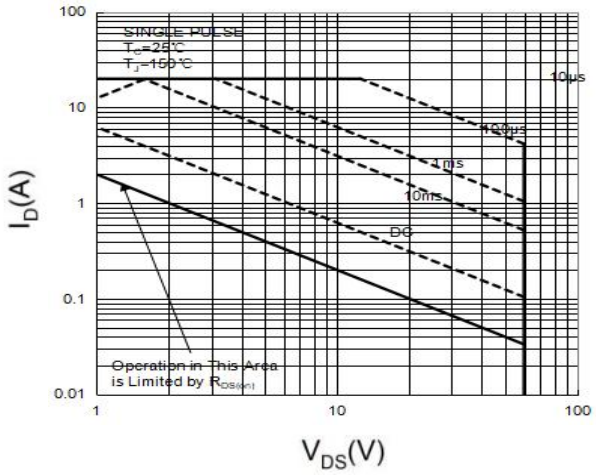


Figure 10. Maximum Safe Operating Area

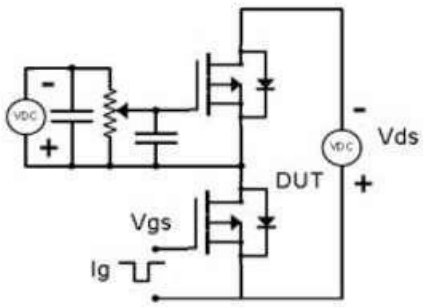


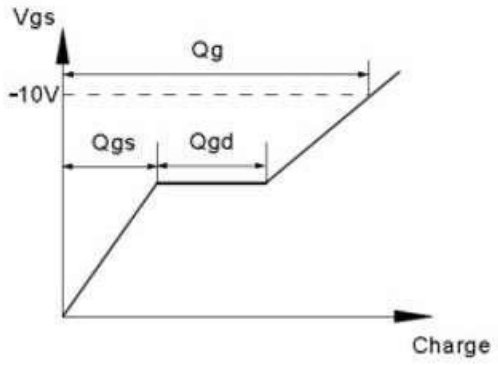
P-CH ELECTRICAL CHARACTERISTICS(T_J=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =-250μA	-60	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} =-60V, V_{GS} = 0V	-	-	-1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V	-	-	±100	nA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =-250μA	-1.0	-1.8	-2.5	V
Drain-source on-resistance	$R_{DS(on)}$	V_{GS} =-10V, I_D =-7A	-	71	90	mΩ
		V_{GS} =-4.5V, I_D =-5A	-	88	110	
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =-30V, VGS=0V, f=1MHz	-	2065	-	pF
Output Capacitance	C_{oss}		-	70	-	
Reverse Transfer Capacitance	C_{rss}		-	59	-	
Switching characteristics(						
Turn-on delay time	$t_{d(on)}$	V_{DS}=-30V, I_D=-5A, R_G=3Ω, V_{GS}=-10V	-	8	-	nS
Turn-on rise time	t_r		-	37	-	
Turn-off delay time	$t_{d(off)}$		-	65	-	
Turn-off fall time	t_f		-	20	-	
Total Gate Charge	Qg	V_{DS}=-30V, I_D=-5A, V_{GS}=-10V	-	78	-	nC
Gate-Source Charge	Qgs		-	12.5	-	
Gate-Drain Charge	Qgd		-	13.5	-	
Source-Drain Diode characteristics						
Diode Forward voltage(	V_{SD}	T_J=25℃, V_{GS} =0V, I_S=-5A	-	-	-1.2	V
Diode Forward current	I_S	T_C=25℃	-	-	-4	A
Body Diode Reverse Recovery Time	Trr	di/dt=-100A/us,IF=-5A	-	24	-	ns
Body Diode Reverse Recovery Charge	Qrr	di/dt=-100A/us,IF=-5A	-	25	-	nC

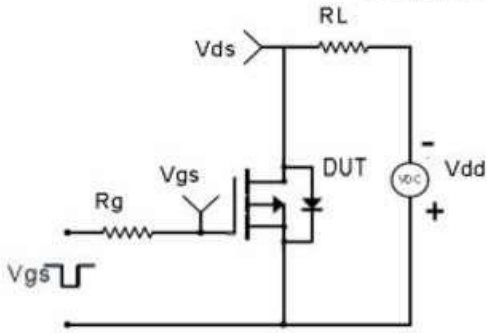
Test Circuit & Waveform

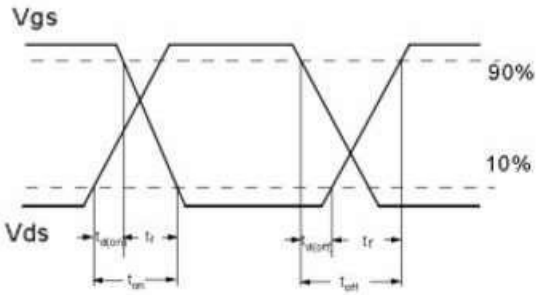
Gate Charge Test Circuit & Waveform



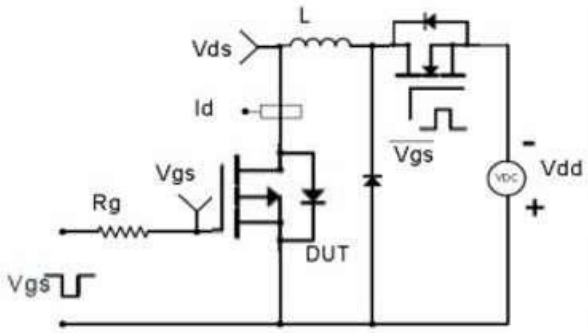


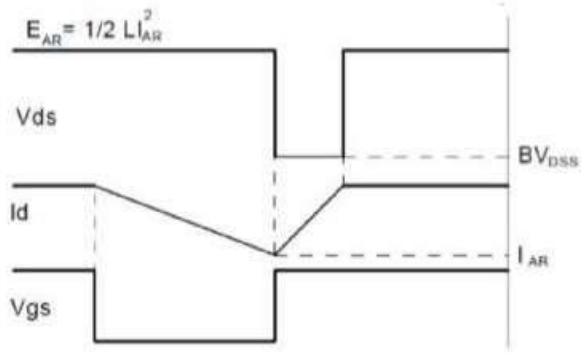
Resistive Switching Test Circuit & Waveforms



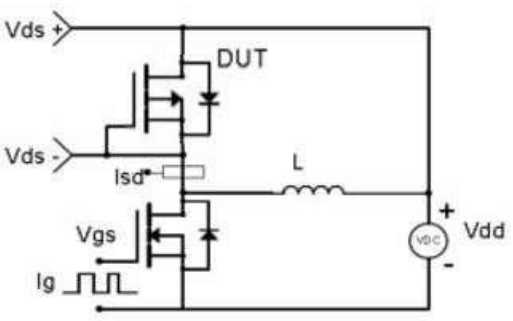


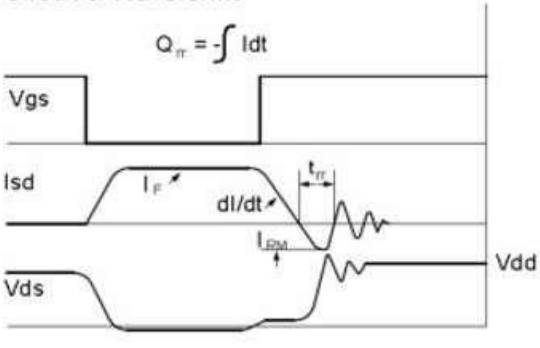
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms





Typical Characteristic：P-Channel

Figure 1. Output Characteristics

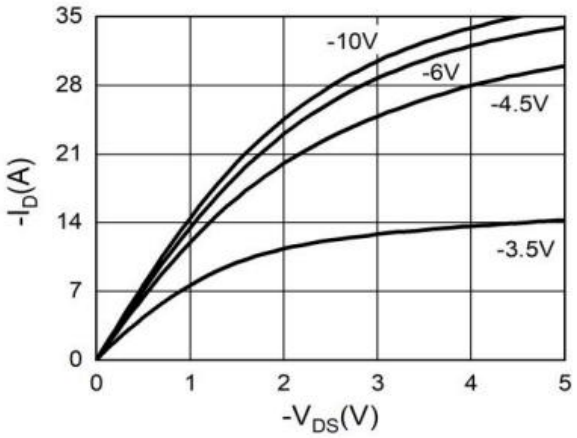


Figure 2. Transfer Characteristics

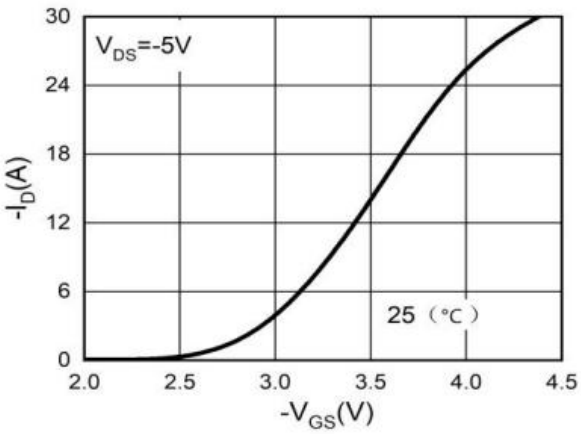


Figure 3. Power Dissipation

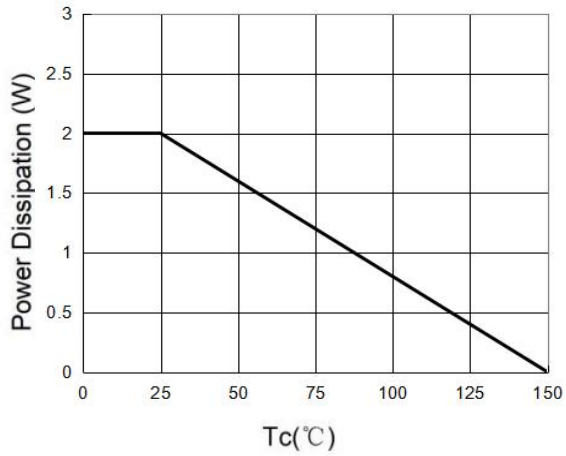


Figure 4. Drain Current

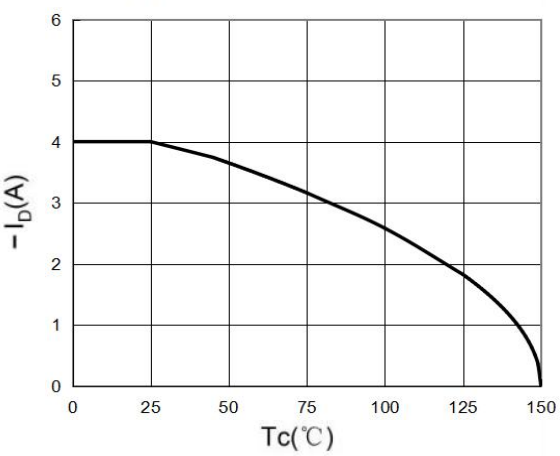


Figure 5. BV_{DSS} vs Junction Temperature

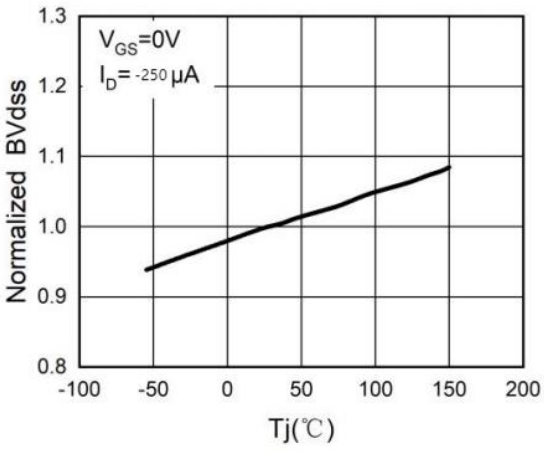
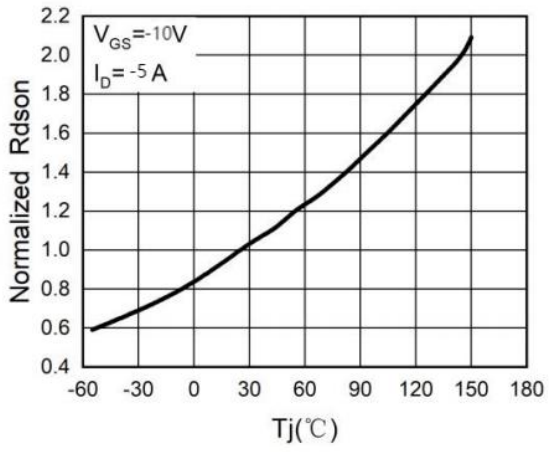


Figure 6. $R_{DS(ON)}$ vs Junction Temperatur



Typical Characteristic：P-Channel

Figure 7. Gate Charge Waveforms

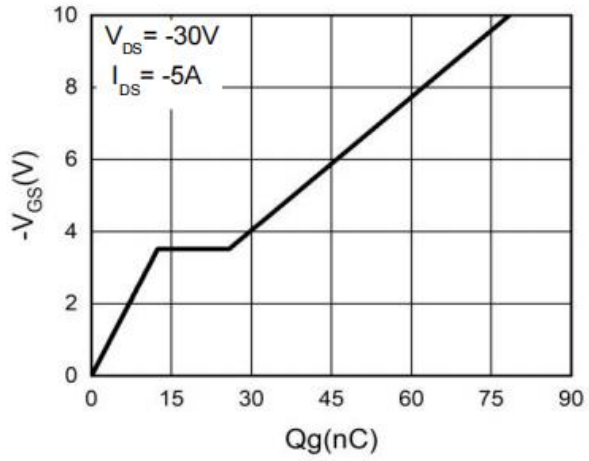


Figure 8. Capacitance

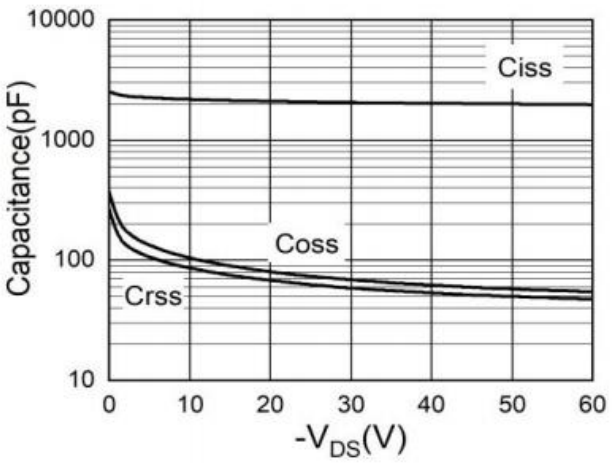


Figure 9. Body-Diode Characteristics

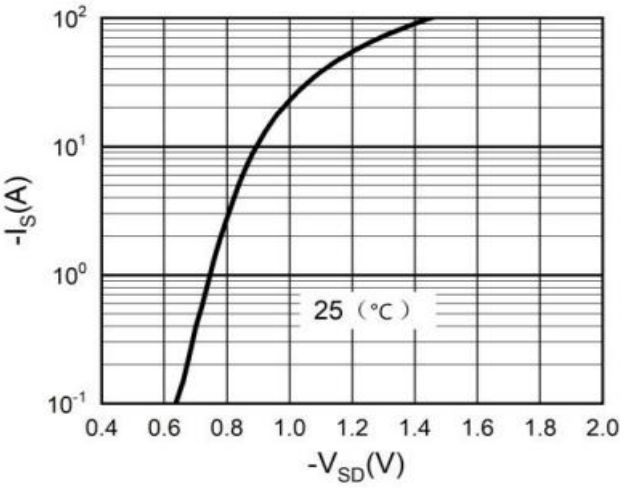
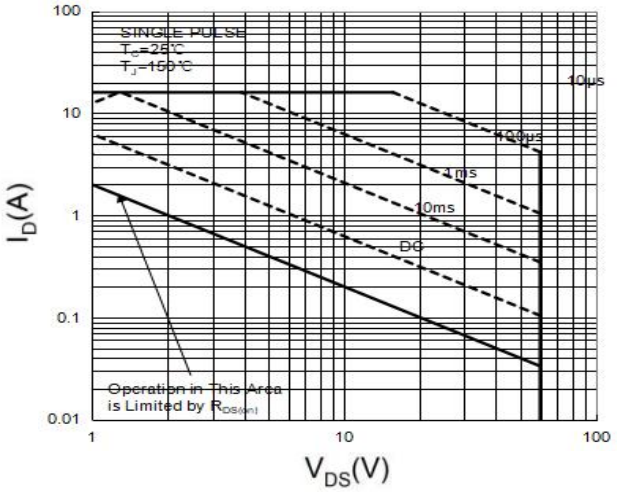
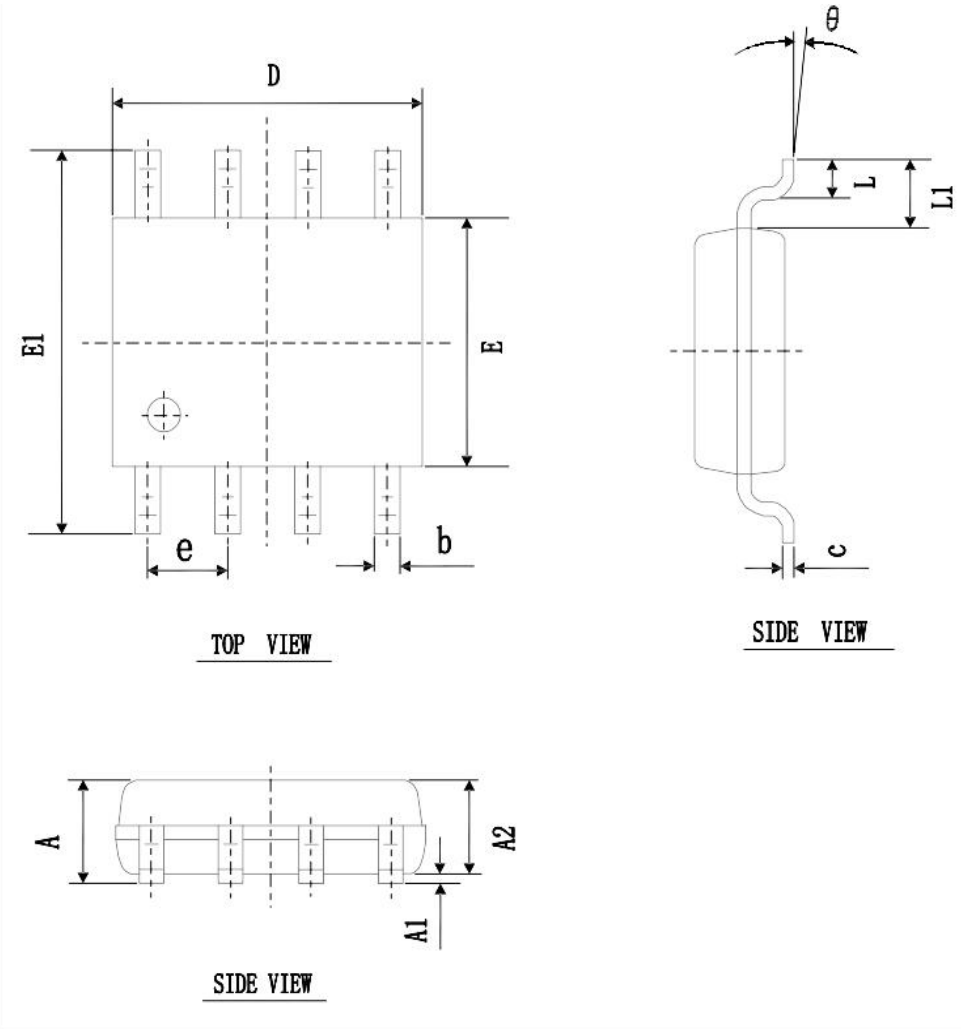


Figure 10. Maximum Safe Operating Area



Package Dimensions of SOP-8 Package



COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	1.35	1.60	1.80
A1	0.05	0.15	0.25
A2	1.30	1.45	1.60
b	0.30	0.40	0.50
C	0.153	0.203	0.253
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
L	0.40	0.70	1.25
θ	0°		7°
L1	1.04 REF		
e	1.27 BSC		

Revision History

Revision	Release	Remark
V1.0	2024/08/21	Initial Release

Disclaimer

The information given in this document describes the independent performance of the product,but similar performance is not guaranteed under other working conditions,and cannot be guaranteed when installed with other products or equipment.To achieve the required performance of the product in actual scenarios,the customer should conduct a complete application test to assess the functionality of the product.

Allpower assumes no responsibility for equipment failures result from using products at values that exceed the ratings,operating conditions,or other parameters listed in the product specifications.

The product described in this specification is not applicable for aerospace or other applications which
requires high reliability.Customers using or selling these products for use in medical,life-saving,or life-sustaining applications do so at their own risk and agree to fully indemnify.

Due to product or technical improvements,the information described or contained herein may be changed without prior notice.