AP3906GD

N and P-Channel Enhancement Mosfet

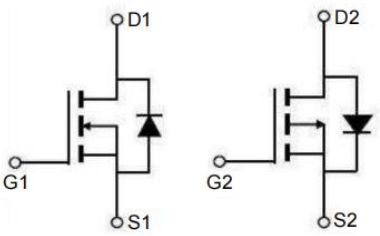
DATA SHEET

Features

- **N-Channel**
  30V,7A
  $R_{DS(ON)}$ <22mΩ @V_{GS}=10V TYP:16.5mΩ
  $R_{DS(ON)}$ <30mΩ @V_{GS}=4.5V TYP:23mΩ

- **P-Channel**
  -30V,-6A
  $R_{DS(ON)}$ <35mΩ @V_{GS}=-10V TYP:27mΩ
  $R_{DS(ON)}$ <50mΩ @V_{GS}=-4.5V TYP:38mΩ

- 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)
3906GD	AP3906GD	PDFN5X6-D	-	-	5000

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

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V_{DS}	30	-30	V
Gate-Source Voltage	V_{GS}	±20	±20	V
Continuous Drain Current (Tc=25℃)	I_D	7	-6	A
Continuous Drain Current (Tc=100℃)		4.5	-4	
Pulsed Drain Current (1)	I_{DM}	28	-24	A
Drain Power Dissipation	P_D	2.15		W
Thermal Resistance- Junction to Ambient	$R_{\theta JA}$	58		℃/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	30			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =30V, V_{GS} = 0V			1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V			±100	nA
Gate threshold voltage(2)	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250μA	1	1.5	2.5	V
Drain-source on-resistance(2)	$R_{DS(on)}$	V_{GS} =10V, I_D =5A		16.5	22	mΩ
		V_{GS} =4.5V, I_D =3A		23	30	
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =15V, V_{GS} =0V, f =1MHz		490		pF
Output Capacitance	C_{oss}			79		
Reverse Transfer Capacitance	C_{rss}			61		
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DD}=15V, I_D=3A, R_L=6Ω V_{GS}=10V, R_G=3Ω		4.5		ns
Turn-on rise time	t_r			2.5		
Turn-off delay time	$t_{d(off)}$			14.5		
Turn-off fall time	t_f			3.5		
Total Gate Charge	Qg	VDS=15V, ID=5A, VGS=10V		5.2		nC
Gate-Source Charge	Qgs			0.9		
Gate-Drain Charge	Qgd			1.3		
Source-Drain Diode characteristics						
Diode Forward voltage(2)	V_{DS}	V_{GS} =0V, I_S=7A			1.2	V
Diode Forward current(3)	I_S		-	-	7	A

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	-30			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =-30V, V_{GS} = 0V			1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V			±100	nA
Gate threshold voltage(2)	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =-250μA	-1	-1.5	-2.5	V
Drain-source on-resistance(2)	$R_{DS(on)}$	V_{GS} =-10V, I_D =-4A		27	35	mΩ
		V_{GS} =-4.5V, I_D =-3A		38	50	
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =-15V, V_{GS} =0V, f =1MHz		580		pF
Output Capacitance	C_{oss}			98		
Reverse Transfer Capacitance	C_{rss}			74		
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DD}=-15V, I_D=-1A, R_L=6Ω V_{GS}=-10V, R_G=1Ω		14		ns
Turn-on rise time	t_r			61		
Turn-off delay time	$t_{d(off)}$			19		
Turn-off fall time	t_f			10		
Total Gate Charge	Qg	VDS=-15V, ID=-4.1A, VGS=-10V		6.8		nC
Gate-Source Charge	Qgs			1		
Gate-Drain Charge	Qgd			1.4		
Source-Drain Diode characteristics						
Diode Forward voltage(2)	V_{DS}	V_{GS} =0V, I_S=-4A			1.2	V
Diode Forward current(3)	I_S		-	-	-5.1	A

Notes:

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. Pulse Test: pulse width≤300μs, duty cycle≤2%
3. Surface Mounted on FR4 Board,t≤10 sec

N Test Circuit

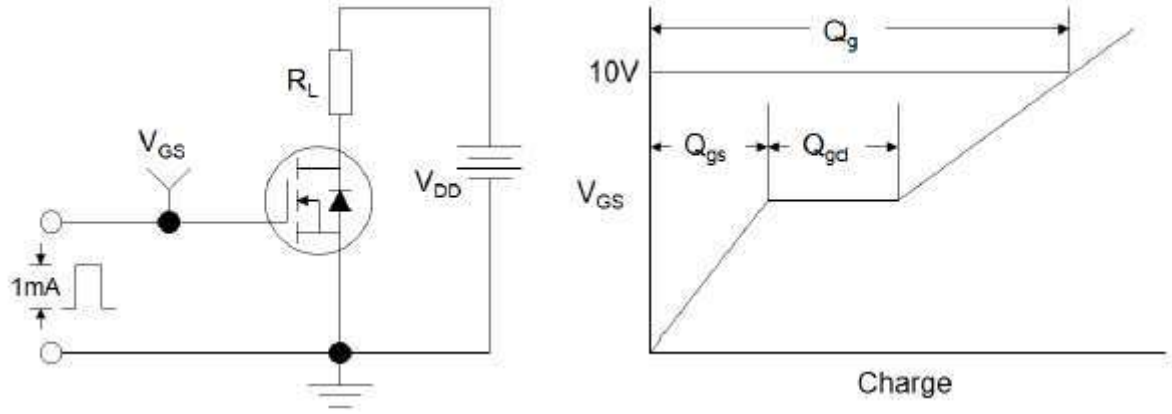


Figure1:Gate Charge Test Circuit & Waveform

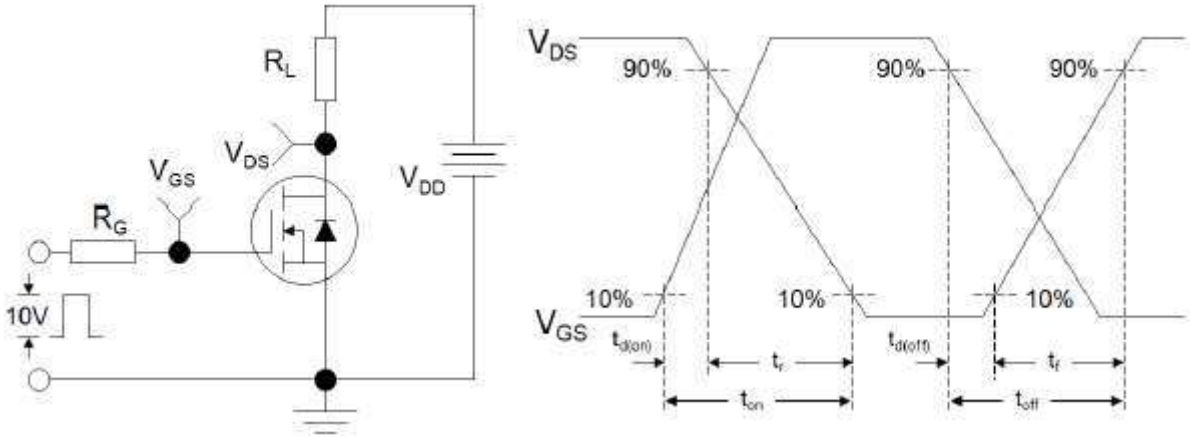


Figure 2: Resistive Switching Test Circuit & Waveforms

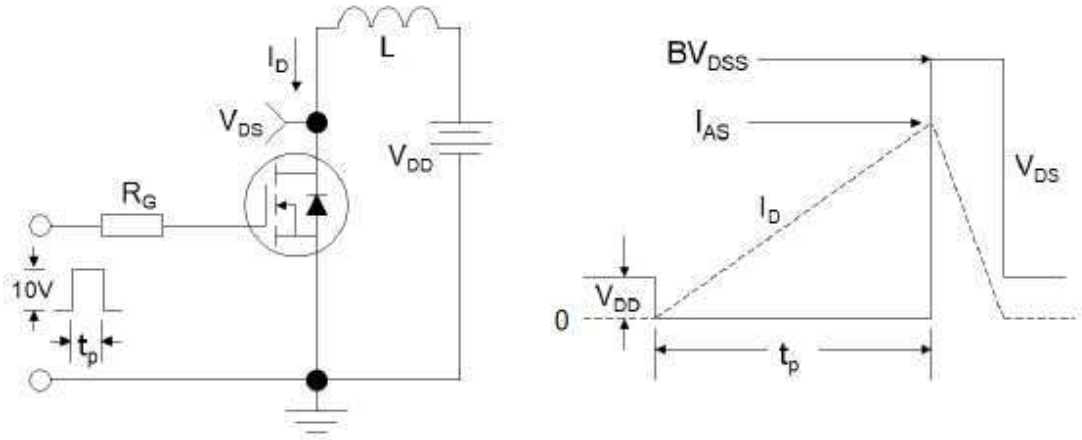


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

Figure1: Output Characteristics

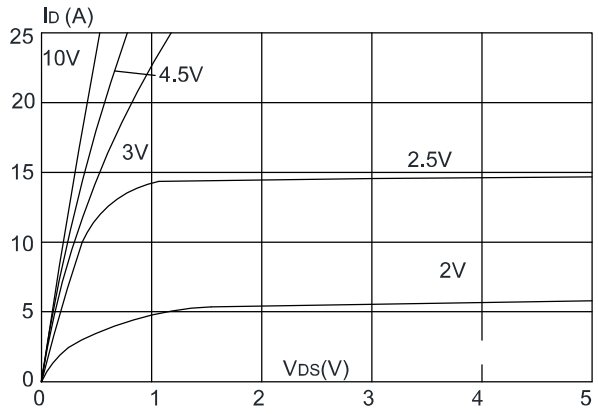


Figure 2: Typical Transfer Characteristics

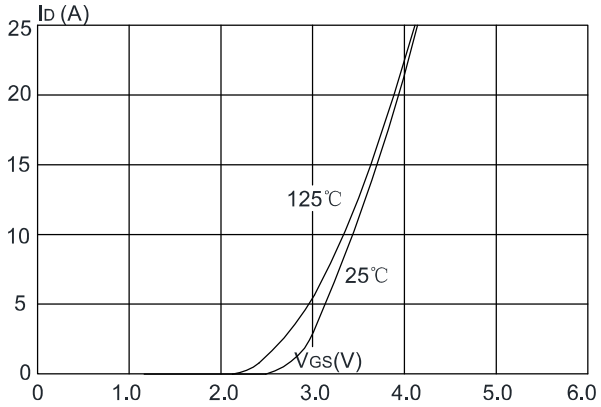


Figure 3: On-resistance vs. Drain Current

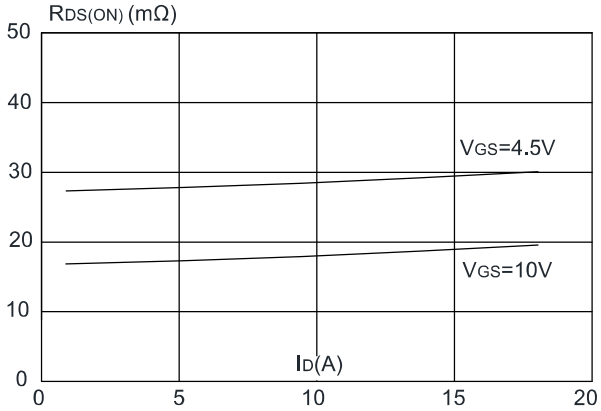


Figure 4: Body Diode Characteristics

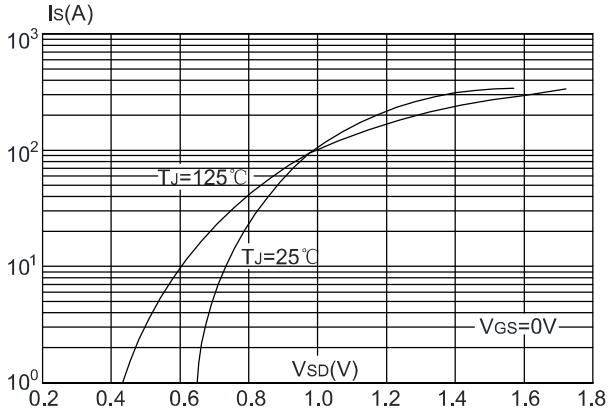


Figure 5: Gate Charge Characteristics

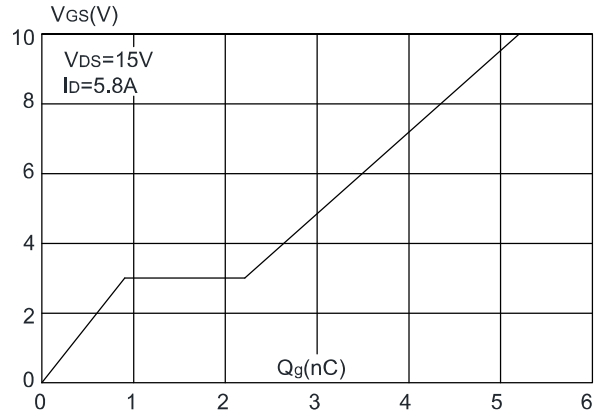


Figure 6: Capacitance Characteristics

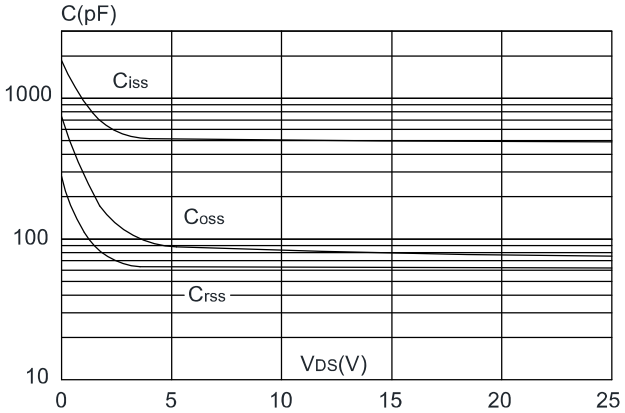


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

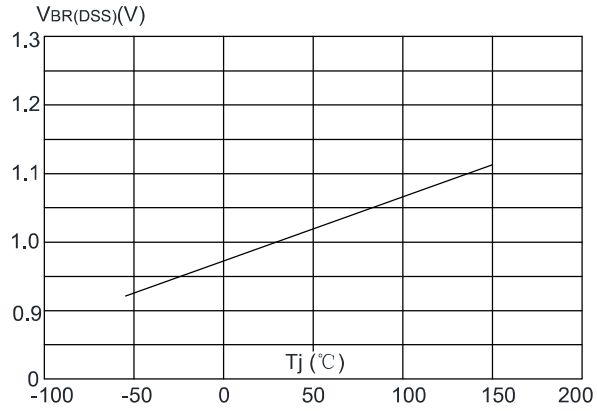


Figure 8: Normalized on Resistance vs. Junction Temperature

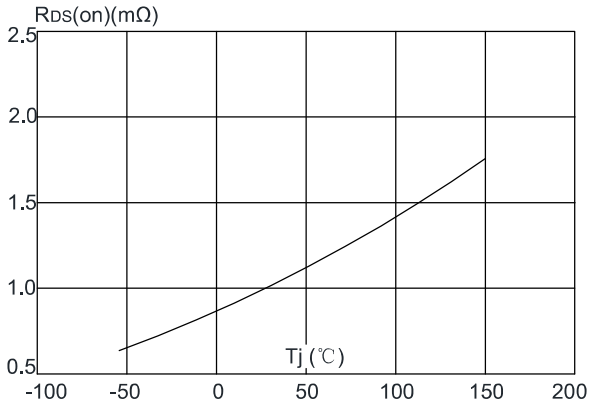


Figure 9: Maximum Safe Operating Area

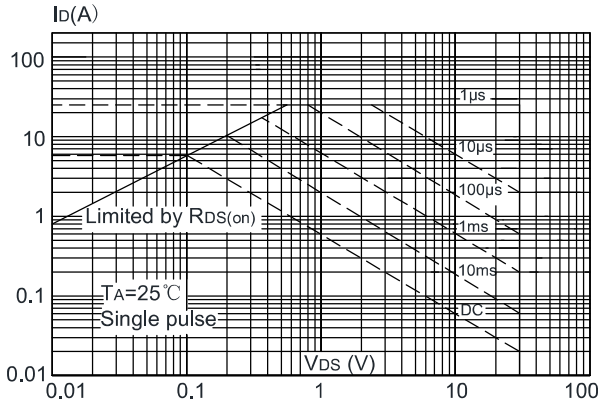


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

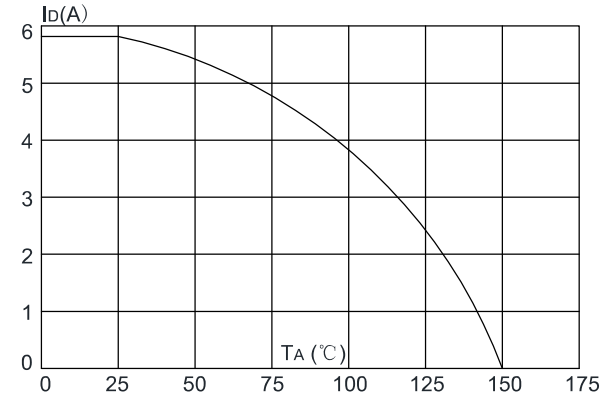
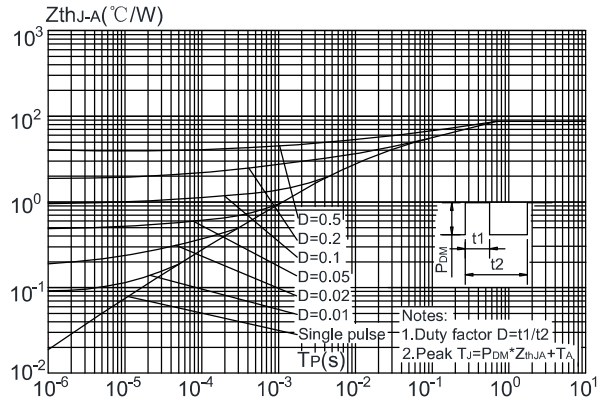
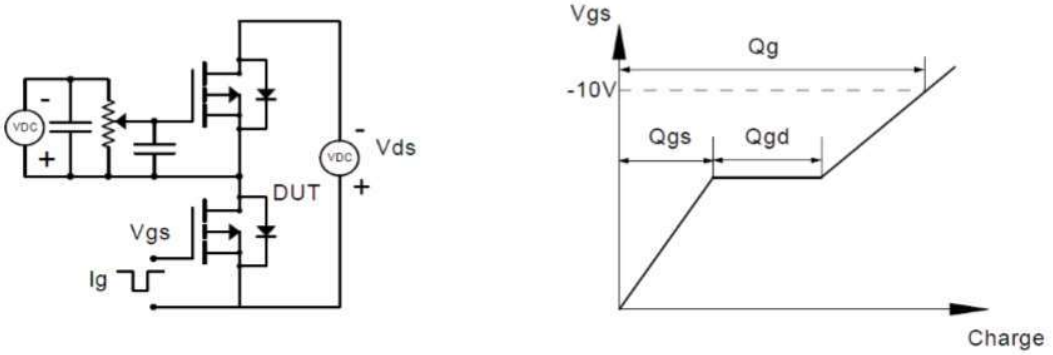


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

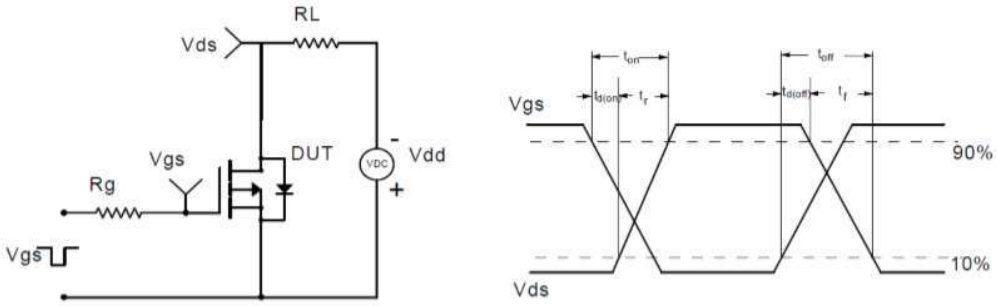


P Typical Performance Characteristics

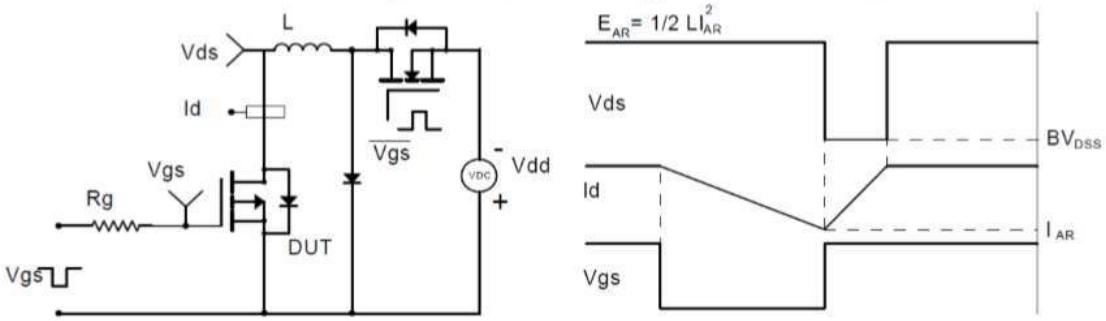
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

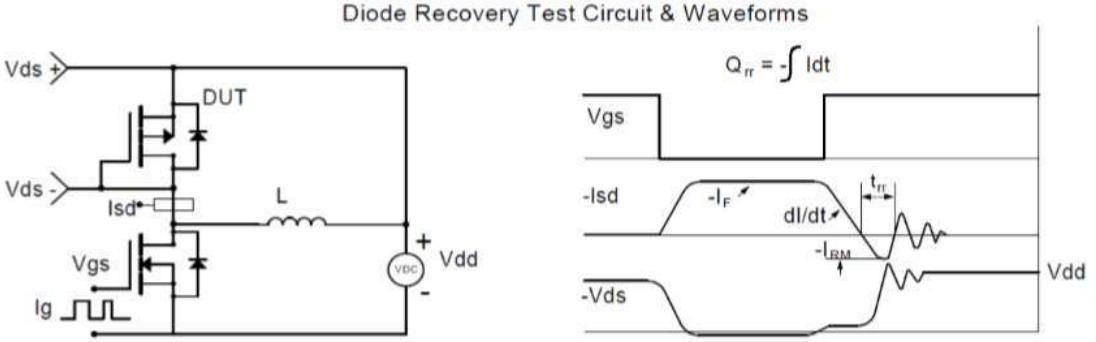


Figure1: Output Characteristics

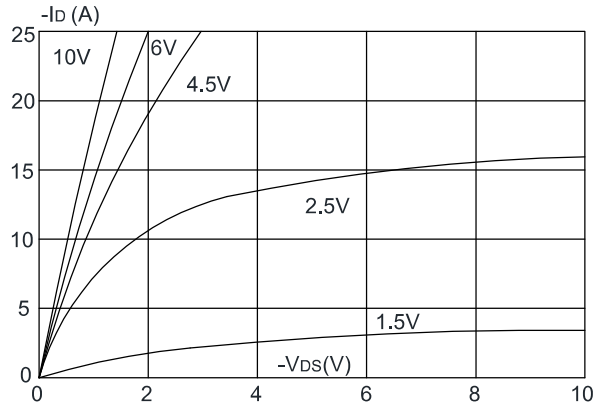


Figure 2: Typical Transfer Characteristics

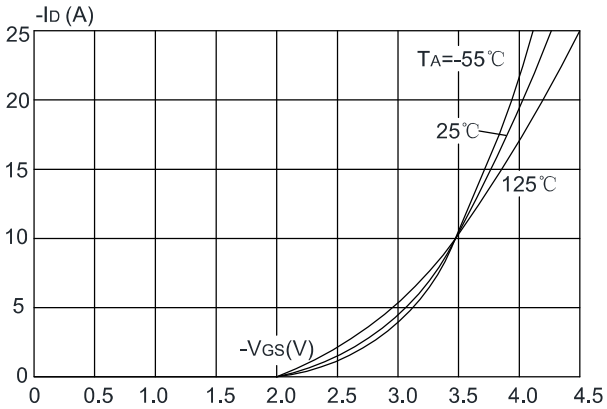


Figure 3: On-resistance vs. Drain Current

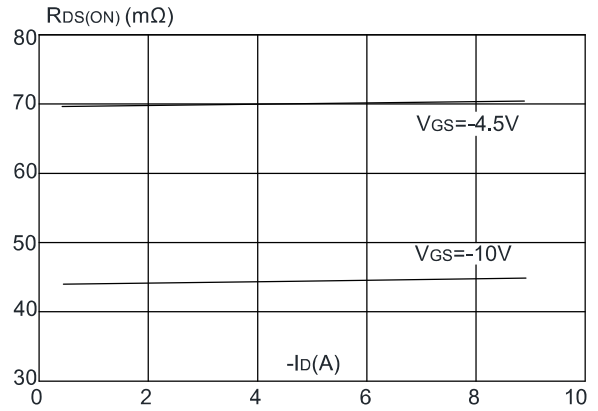


Figure 4: Body Diode Characteristics

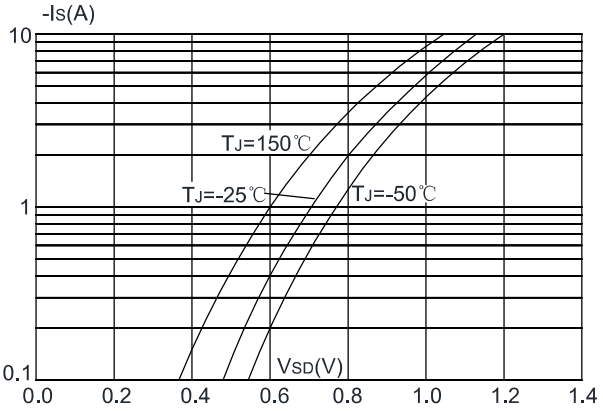


Figure 5: Gate Charge Characteristics

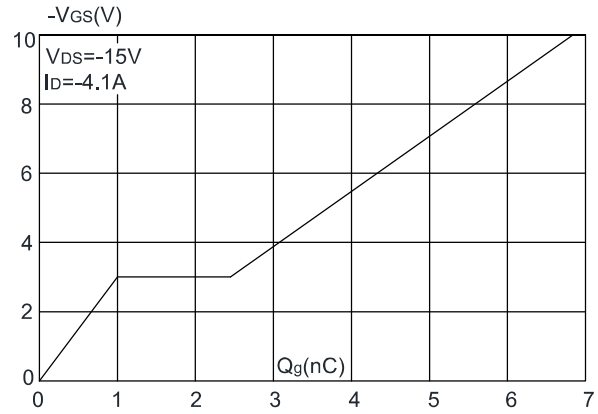


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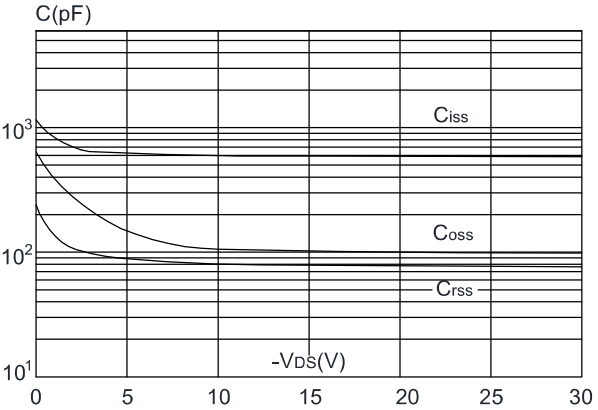


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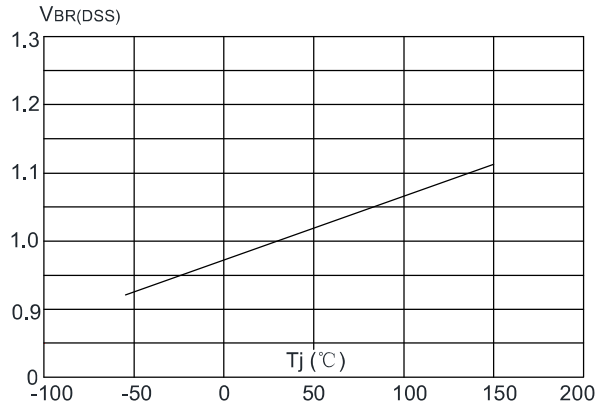


Figure 8: Normalized on Resistance vs. Junction Temperature

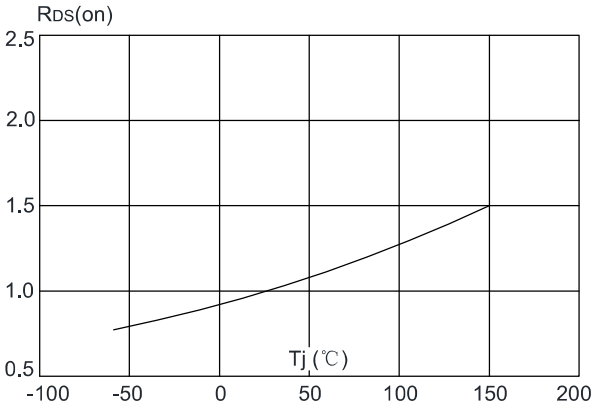


Figure 9: Maximum Safe Operating Area

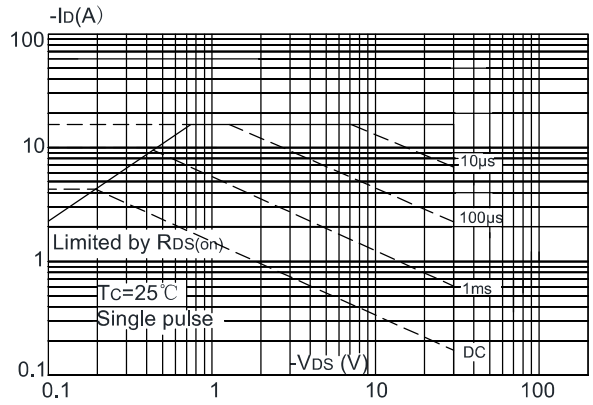


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

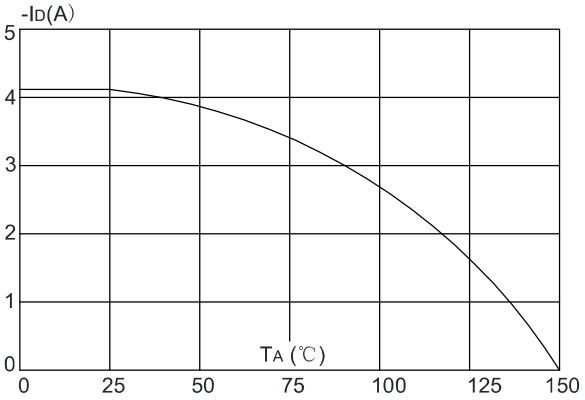
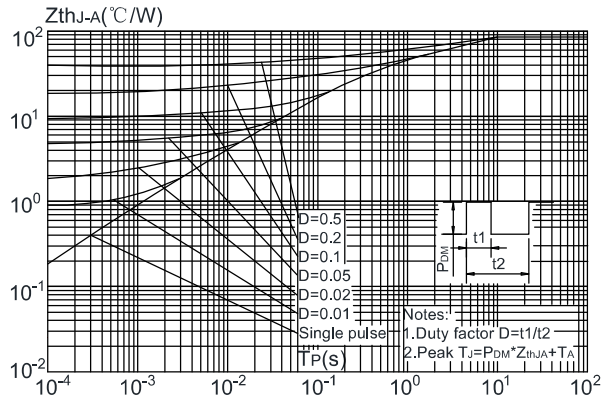
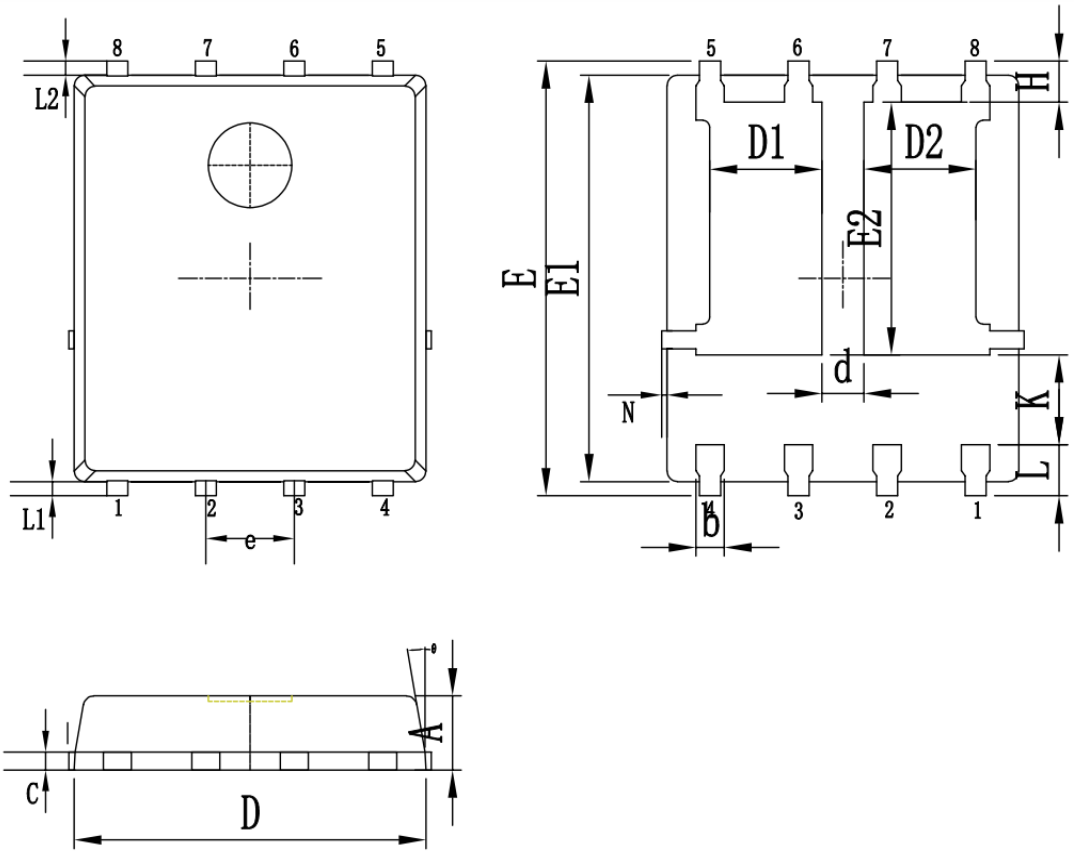


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



Package Mechanical Data



Symbols	Millimeters		
	MIN.	NOM.	MAX.
A	0.90	1.05	1.20
b	0.20	0.40	0.50
C	0.20	0.25	0.35
D	4.80	5.05	5.20
D1/D2	1.60	1.70	1.80
E	5.90	6.00	6.20
E1	5.60	5.75	5.90
E2	3.40	3.50	3.60
e	1.27 BSC.		
H	0.40	0.60	0.70
K	1.17	1.27	1.37
L	0.50	0.74	0.84
L1/L2	0.10	0.16	0.20
θ	8°	10°	12°
N	0	-	0.15
d	0.50	0.60	0.70