

AP3912GD

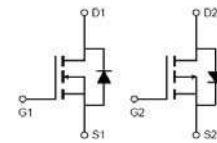
N and P-Channel Enhancement Mosfet

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Feature

- **N-Channel**
 $V_{DD}=30V, I_D=36A$
 $R_{DS(ON)} < 13m\Omega @ V_{GS}=10V$ TYP:10 m Ω
 $R_{DS(ON)} < 19m\Omega @ V_{GS}=4.5V$ TYP:14 m Ω
- **P-Channel**
 $V_{DD}=-30V, I_D=-28A$
 $R_{DS(ON)} < 15m\Omega @ V_{GS}=-10V$ TYP:12 m Ω
 $R_{DS(ON)} < 20m\Omega @ V_{GS}=-4.5V$ TYP:17 m Ω
- Lead free product is acquired
- High power and current handing capability
- Surface mount package



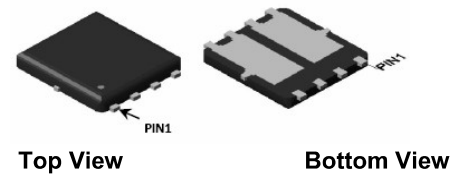
Schematic diagram



Marking and pin assignment

Application

- PWM applications
- Load Switch
- Power management



Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
3912GD	AP3912GD	PDFN5X6	13 inch	-	5000

ABSOLUTE MAXIMUM RATINGS ($T_a=25^{\circ}C$ 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 ($T_a = 25^{\circ}C$)	I_D	36	-28	A
Continuous Drain Current ($T_a = 100^{\circ}C$)	I_D	22.8	-19.6	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	90	-84	A
Power Dissipation	P_D	32		W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3.85		$^{\circ}C/W$
Junction Temperature	T_J	150		$^{\circ}C$
Storage Temperature	T_{STG}	-55~ +150		$^{\circ}C$

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N-CH ELECTRICAL CHARACTERISTICS($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	30			V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 30V, V_{GS} = 0V$			1	μA
Gate-body leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 100	nA
Gate threshold voltage ⁽²⁾	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1	1.5	2.5	V
Drain-source on-resistance ⁽²⁾	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 10A$		10	13	m Ω
		$V_{GS} = 4.5V, I_D = 6A$		14	19	
Forward tranconductance ⁽²⁾	g_{FS}	$V_{DS} = 10V, I_D = 10A$		10		S
Dynamic characteristics						
Input Capacitance	C_{iss}	$V_{DS} = 15V, V_{GS} = 0V, f = 1MHz$		900		pF
Output Capacitance	C_{oss}			140		
Reverse Transfer Capacitance	C_{rss}			120		
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15V, I_D = 10A$ $V_{GS} = 10V, R_G = 3\Omega$		6		ns
Turn-on rise time	t_r			5		
Turn-off delay time	$t_{d(off)}$			25		
Turn-off fall time	t_f			7		
Total Gate Charge	Q_g	$V_{DS} = 15V, I_D = 20A,$ $V_{GS} = 10V$		19		nC
Gate-Source Charge	Q_{gs}			6.3		
Gate-Drain Charge	Q_{gd}			4.5		
Source-Drain Diode characteristics						
Diode Forward voltage ⁽²⁾	V_{DS}	$V_{GS} = 0V, I_S = 10A$			1.2	V
Diode Forward current ⁽³⁾	I_S		-	-	36	A

Test Circuit

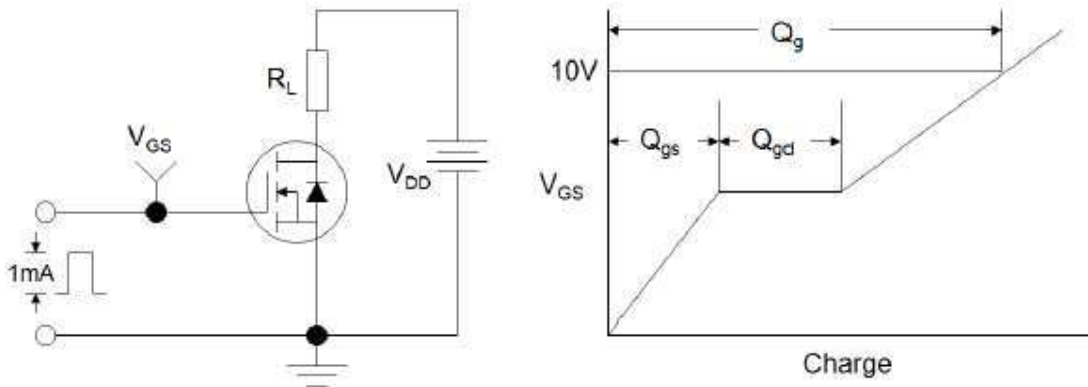


Figure1:Gate Charge Test Circuit & Waveform

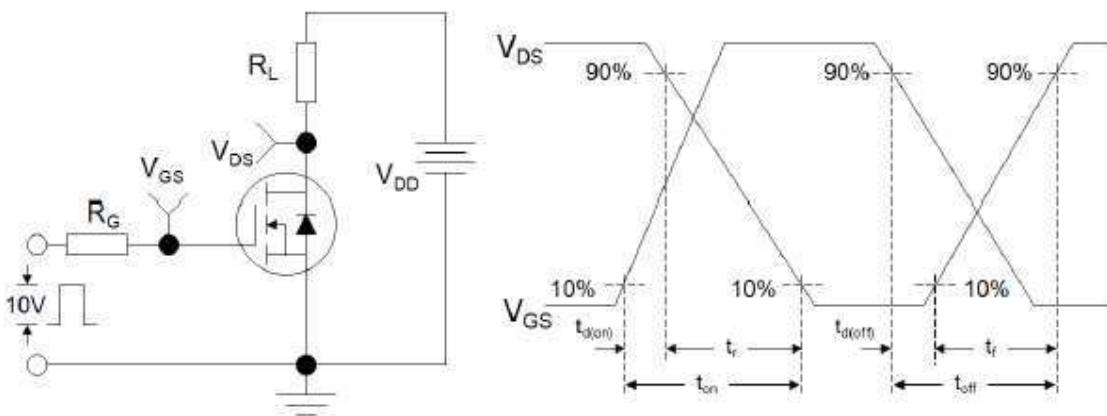


Figure 2: Resistive Switching Test Circuit & Waveforms

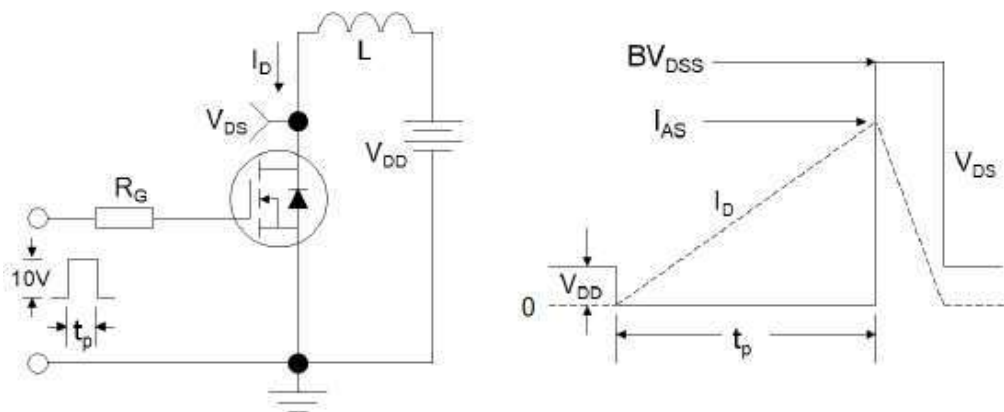


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

Typical Performance Characteristics

Figure 1: Output Characteristics

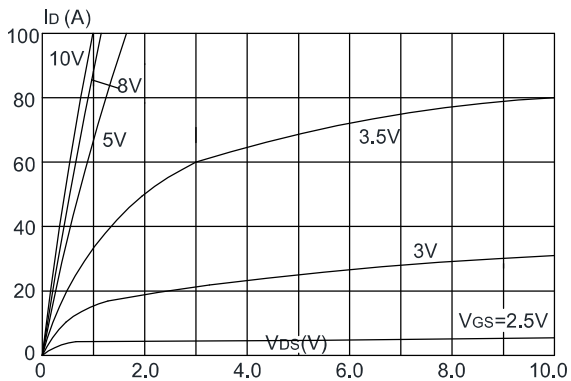


Figure 2: Typical Transfer Characteristics

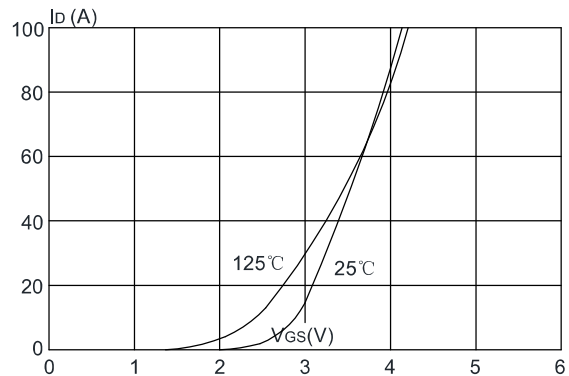


Figure 3: On-resistance vs. Drain Current

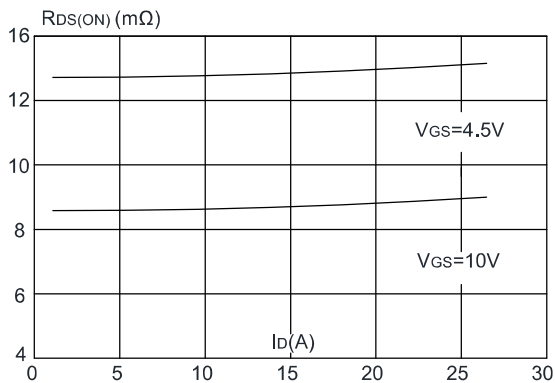


Figure 4: Body Diode Characteristics

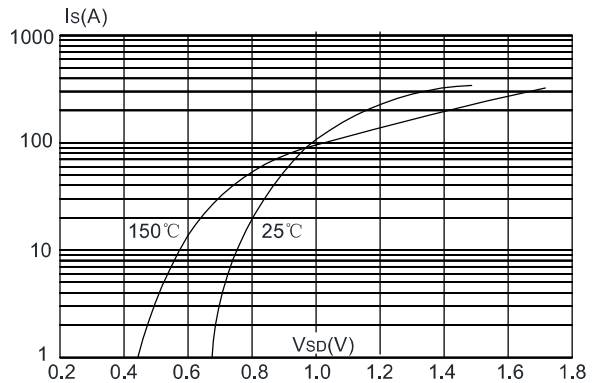


Figure 5: Gate Charge Characteristics

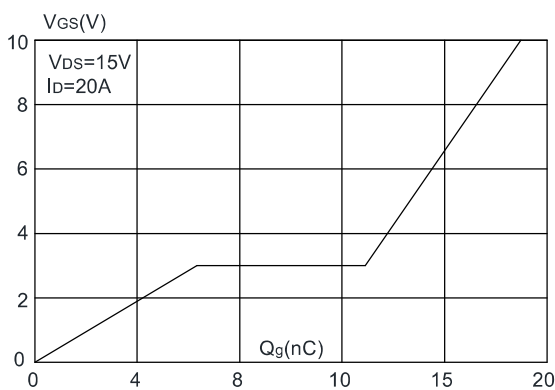


Figure 6: Capacitance Characteristics

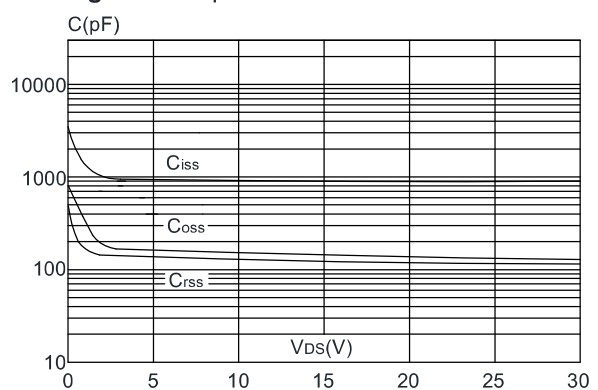


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

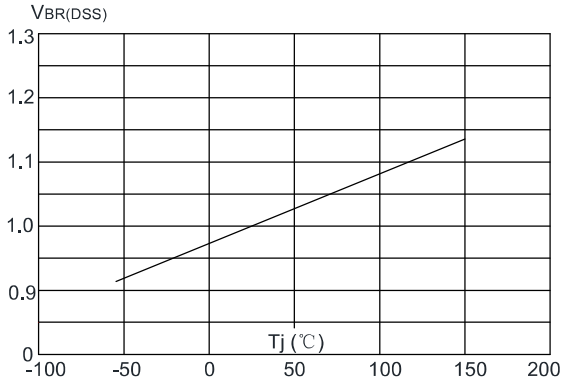


Figure 8: Normalized on Resistance vs. Junction Temperature

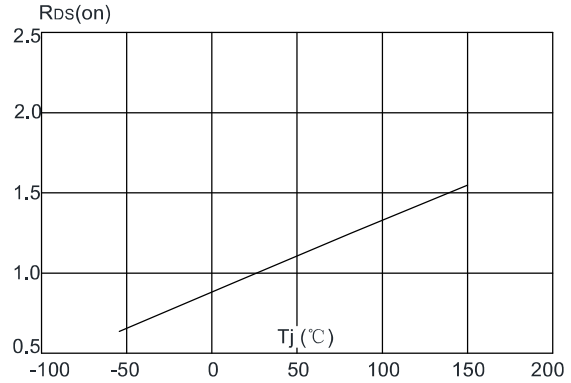


Figure 9: Maximum Safe Operating Area

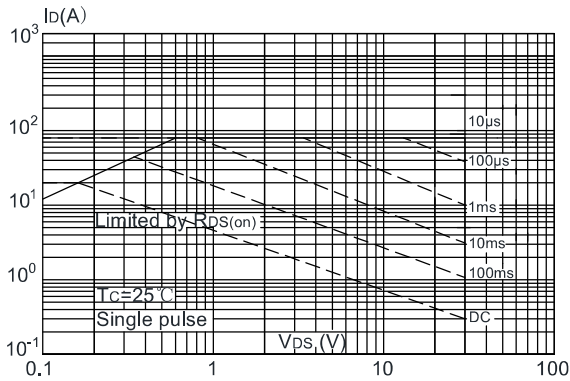


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

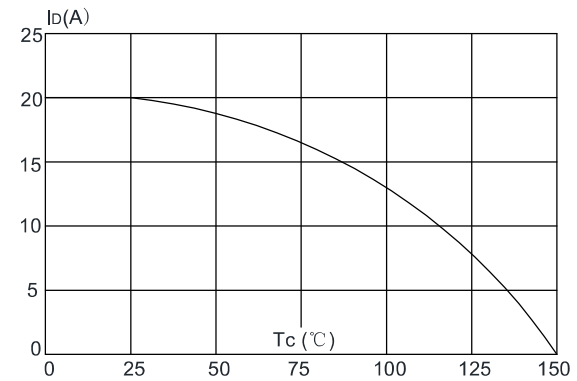
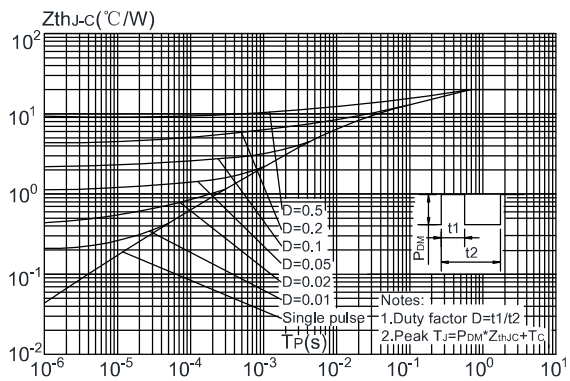


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



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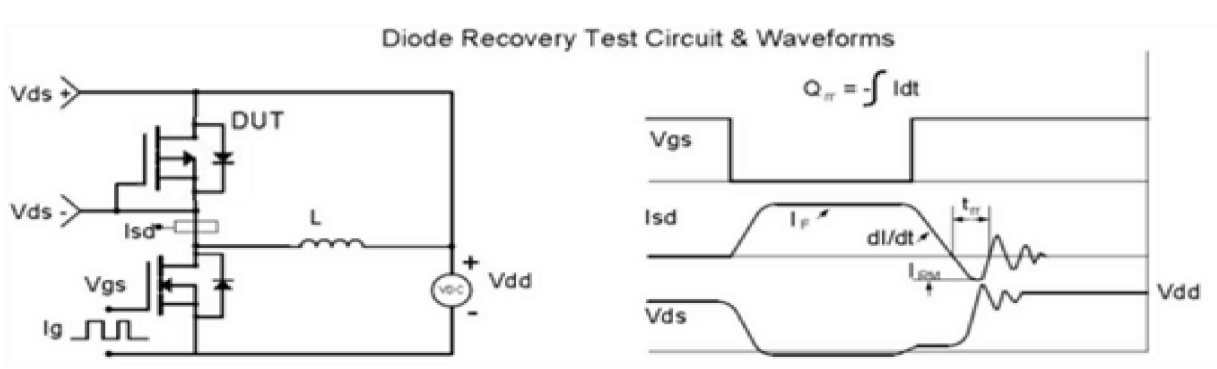
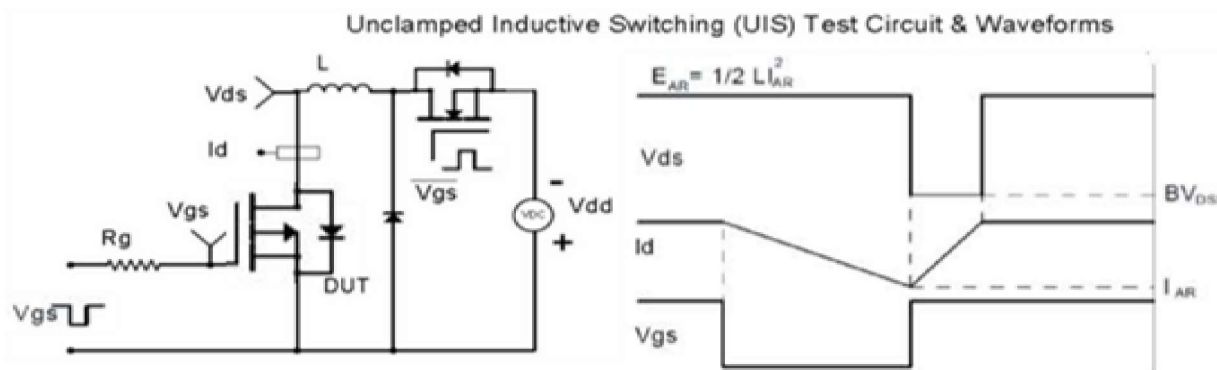
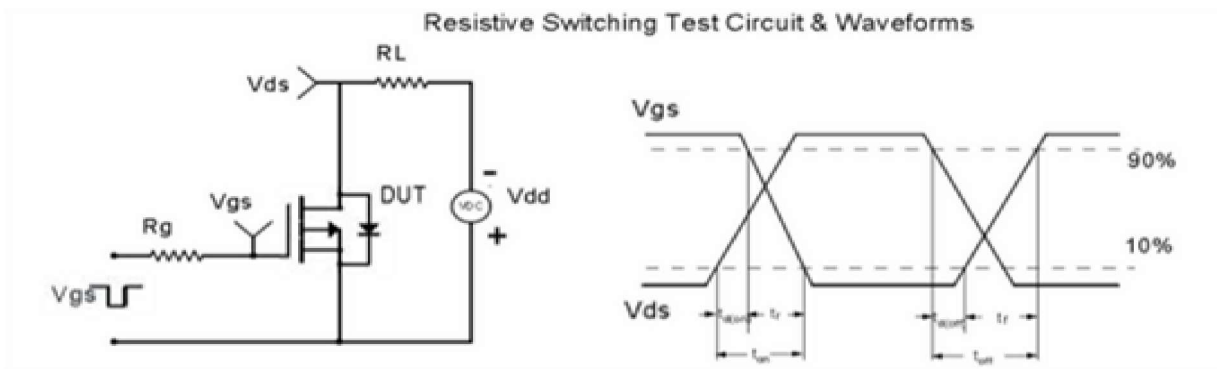
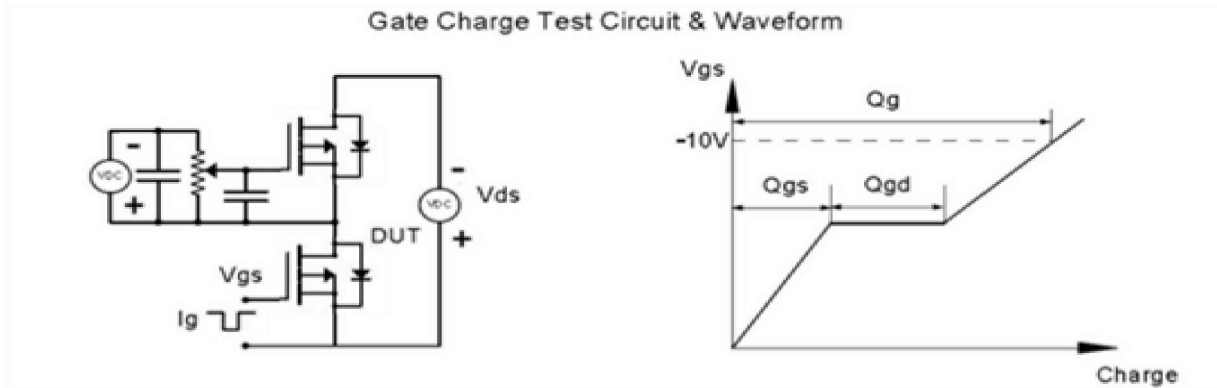
P-CH ELECTRICAL CHARACTERISTICS($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-30			V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = -30V, V_{GS} = 0V$			1	μA
Gate-body leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 100	nA
Gate threshold voltage ⁽²⁾	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1	-1.5	-2.5	V
Drain-source on-resistance ⁽²⁾	$R_{DS(on)}$	$V_{GS} = -10V, I_D = -10A$		12	15	m Ω
		$V_{GS} = -4.5V, I_D = -5A$		17	20	
Forward tranconductance ⁽²⁾	g_{FS}	$V_{DS} = -10V, I_D = -10A$		20		S
Dynamic characteristics						
Input Capacitance	C_{iss}	$V_{DS} = -15V, V_{GS} = 0V, f = 1MHz$	-	2863		pF
Output Capacitance	C_{oss}		-	349		
Reverse Transfer Capacitance	C_{rss}		-	237		
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -15V, I_D = -12A$ $V_{GS} = -10V, R_G = 2.5\Omega$	-	11.5		ns
Turn-on rise time	t_r		-	38.5		
Turn-off delay time	$t_{d(off)}$		-	89		
Turn-off fall time	t_f		-	19		
Total Gate Charge	Q_g	$V_{DS} = -15V, I_D = -10A,$ $V_{GS} = -10V$	-	54.8		nC
Gate-Source Charge	Q_{gs}		-	7.5		
Gate-Drain Charge	Q_{gd}		-	12.5		
Source-Drain Diode characteristics						
Diode Forward voltage ⁽²⁾	V_{DS}	$V_{GS} = 0V, I_S = -10A$			1.2	V
Diode Forward current ⁽³⁾	I_S		-	-	-28	A

Notes:

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

Test Circuit & Waveform



Typical Performance Characteristics

Fig.1 Power Dissipation Derating Curve

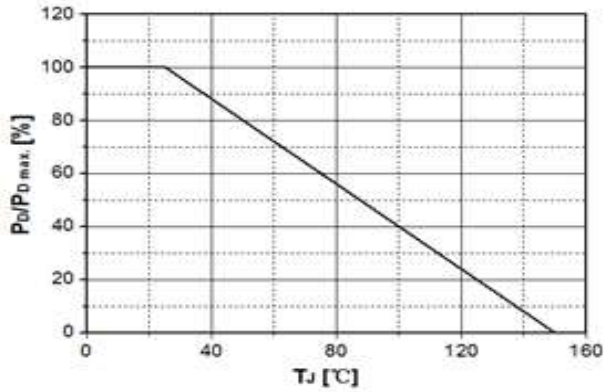


Fig.2 Avalanche Energy Derating Curve vs. Junction Temperature

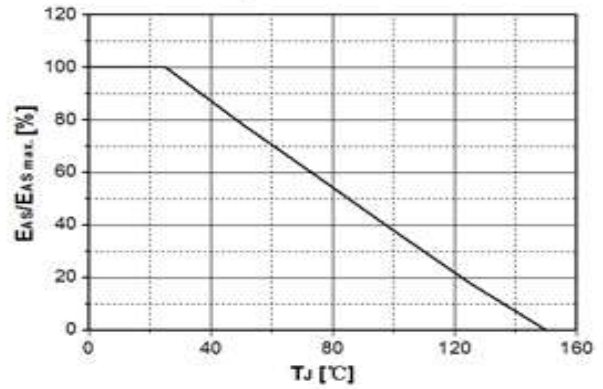


Fig.3 Typical Output Characteristics

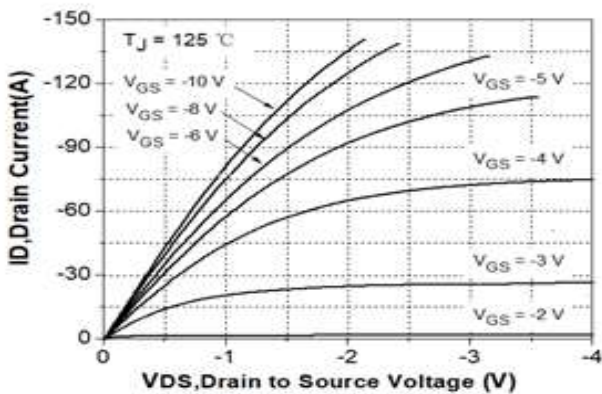


Fig. 4 Transconductance vs. Drain Current

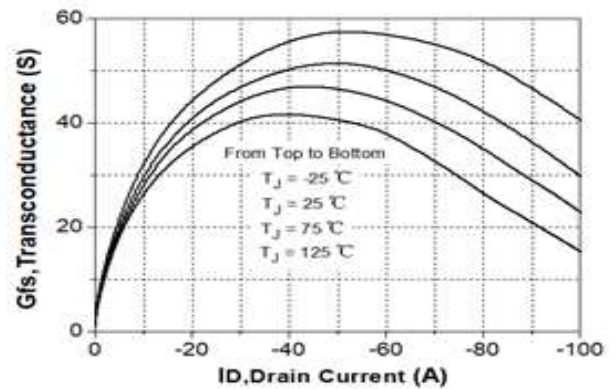


Fig.5 Typical Transfer Characteristics

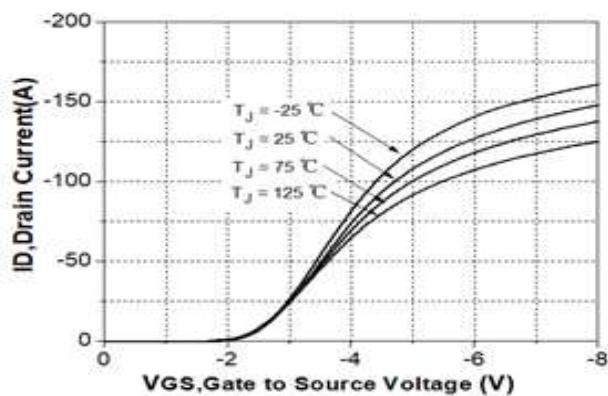


Fig. 6 State Resistance vs. Drain Current @-25°C

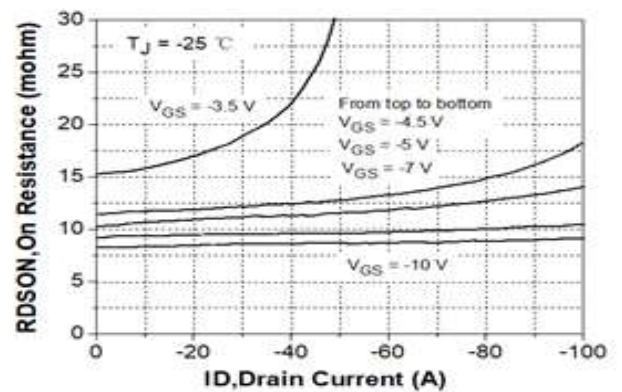


Fig.7 State Resistance vs. Drain Current @25°C

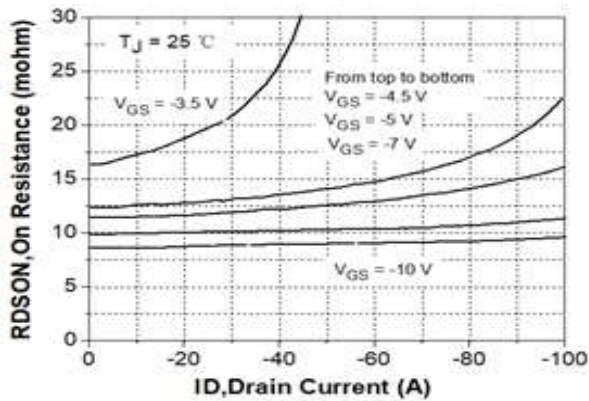


Fig. 8 State Resistance vs. Drain Current @125°C

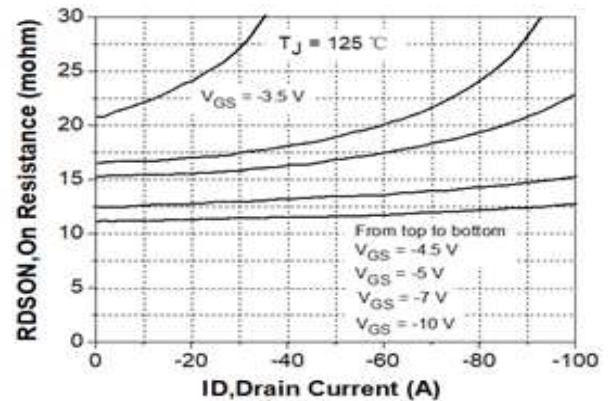


Fig.9 Typical Capacitance vs. Drain Source Voltage

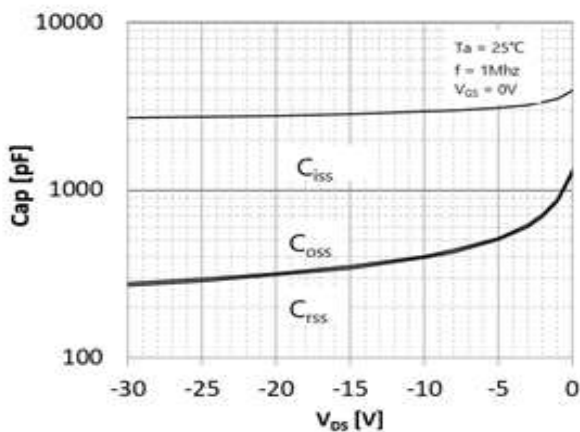


Fig.10 Dynamic Input Characteristics

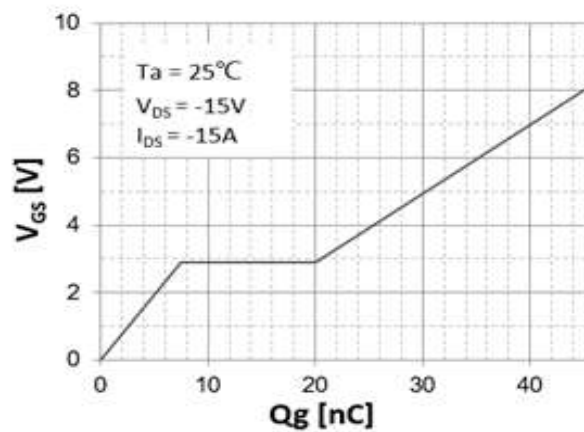


Fig.11 Breakdown Voltage vs. Junction Temperature

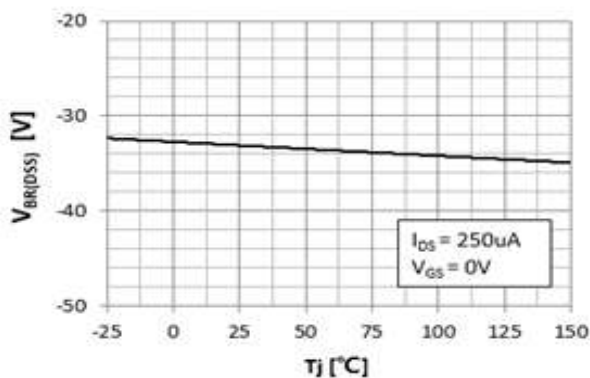
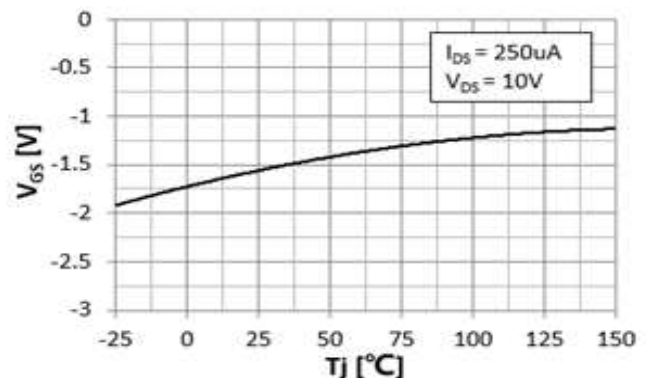
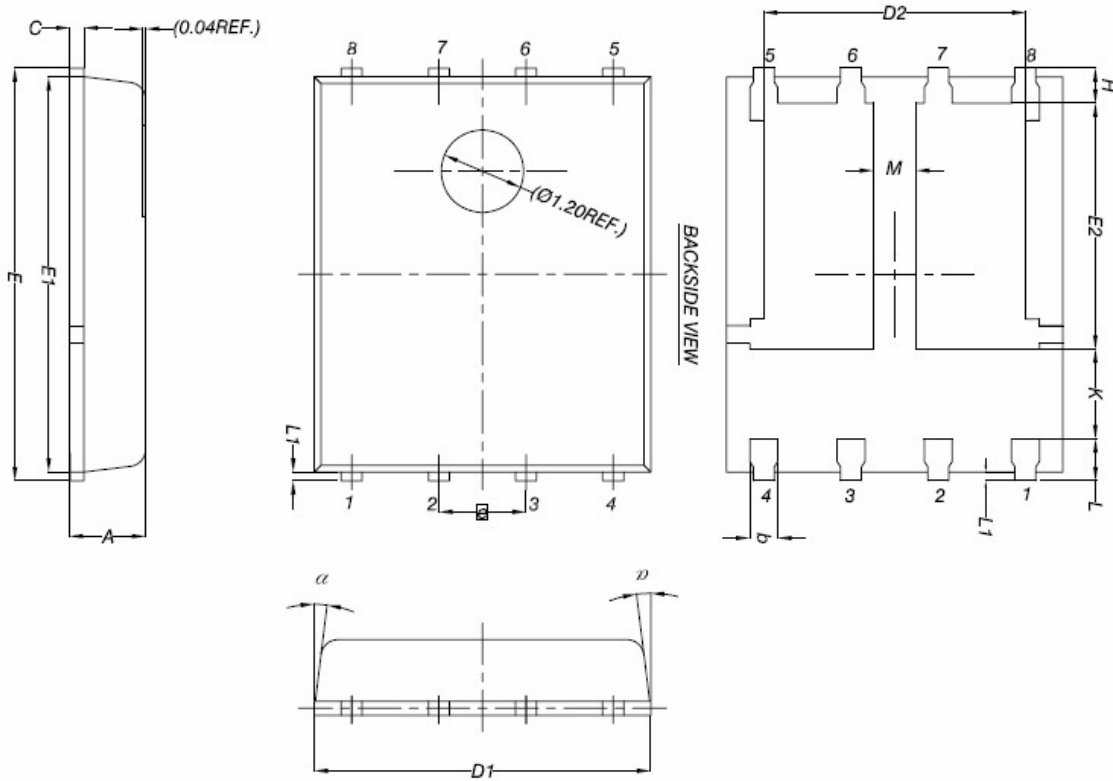


Fig. 12 Gate Threshold Voltage vs. Junction Temperature



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PDFN5X6-8L Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
e	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
M	0.50	-	-
α	0°	-	12°

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