AP3908GD

N and P-Channel Enhancement Mosfet

AllPOWER

DATA SHEET

Feature

- **N-Channel**

  V_{DD}=30V,I_D=36A

  $R_{DS (ON)}$〈13mΩ @V_{GS}=10V

  $R_{DS (ON)}$〈19mΩ @V_{GS}=4.5V

- **P-Channel**

  V_{DD}=-30V,I_D=-25A
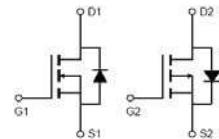
  $R_{DS (ON)}$〈23mΩ @V_{GS}=-10V

  $R_{DS (ON)}$〈34mΩ @V_{GS}=-4.5V
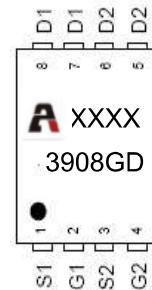
- Lead free product is acquired

- High power and current handing capability

- Surface mount package
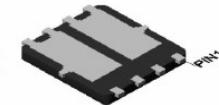
Schematic diagram

Marking and pin assignment

Application

- PWM applications

- Load Switch

- Power management

Top View   **Bottom View**

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
3908GD	AP3908GD	PDFN5X6	13 inch	-	5000

ABSOLUTE MAXIMUM RATINGS (T$_a$=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 (T$_a$ =25℃)	I_D	36	-25	A
Continuous Drain Current (T$_a$ =100℃)	I_D	22.8	-18.2	A
Pulsed Drain Currenr [1]	I_{DM}	90	-70	A
Power Dissipation	P_D	32		W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3.85		℃/W
Junction Temperature	T_J	150		℃
Storage Temperature	T_{STG}	-55~ +150		℃

N-CH ELECTRICAL CHARACTERISTICS(T_a=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 =10A		8.5	13	mΩ
		V_{GS} =4.5V, I_D =6A		13	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=3Ω		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	Qg	VDS=15V, ID=20A, VGS=10V		19		nC
Gate-Source Charge	Qgs			6.3		
Gate-Drain Charge	Qgd			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
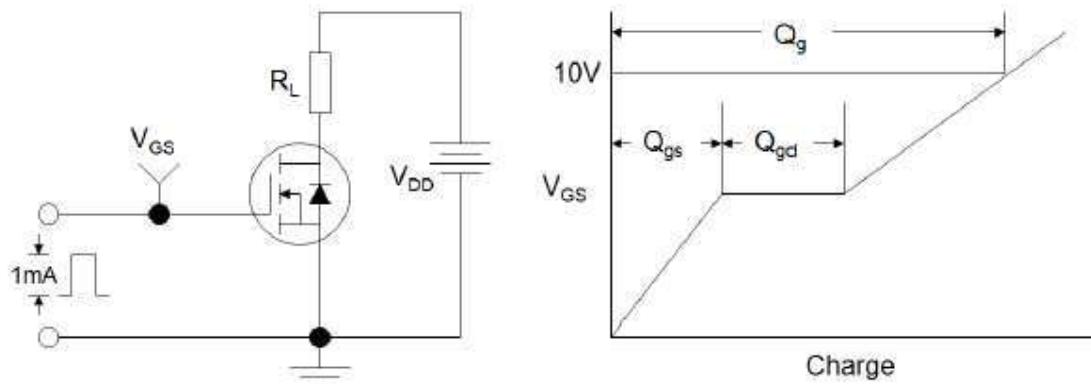
**Figure1:Gate Charge Test Circuit & Waveform**
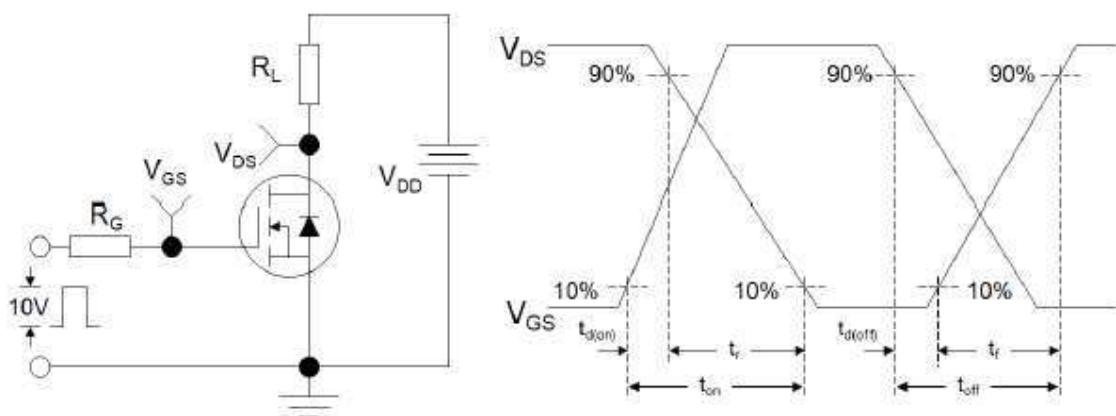
**Figure 2: Resistive Switching Test Circuit & Waveforms**
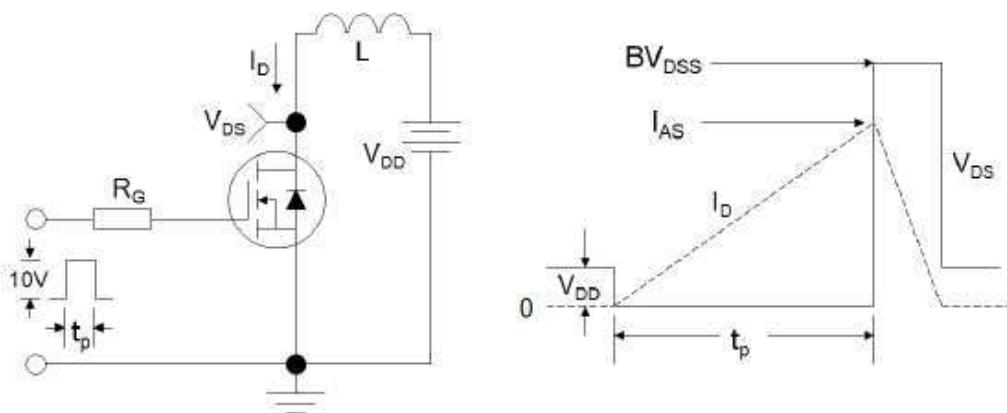
Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

Typical Performance Characteristics

Figure1: Output Characteristics
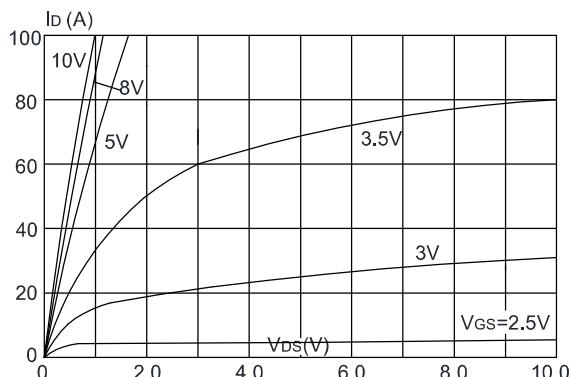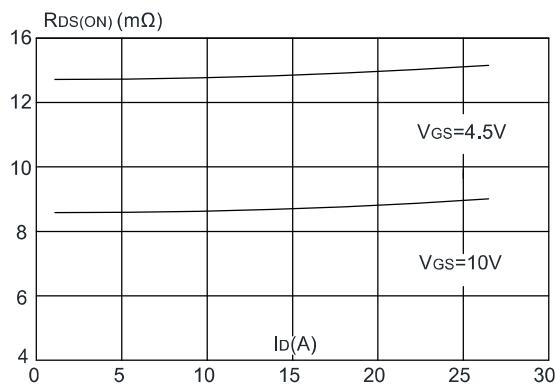
**Figure 2:** Typical Transfer Characteristics

**Figure 3:** On-resistance vs. Drain Current
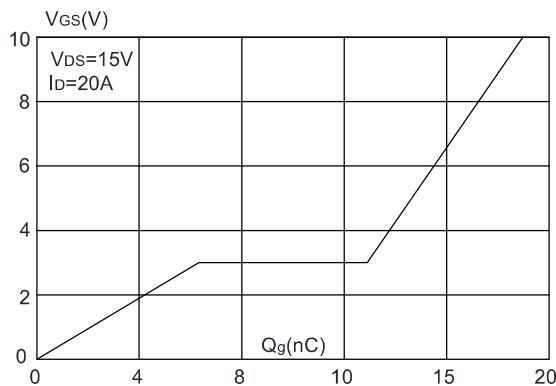
Figure 4: Body Diode Characteristics
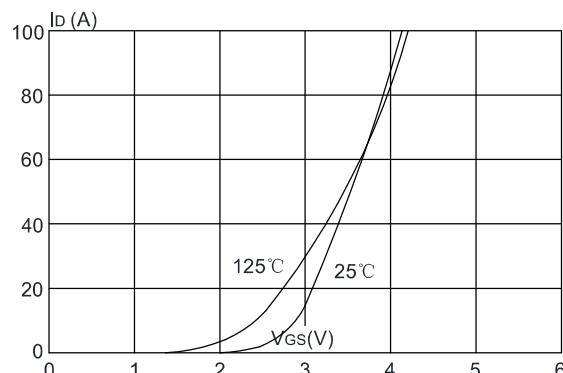
Figure 5: Gate Charge Characteristics
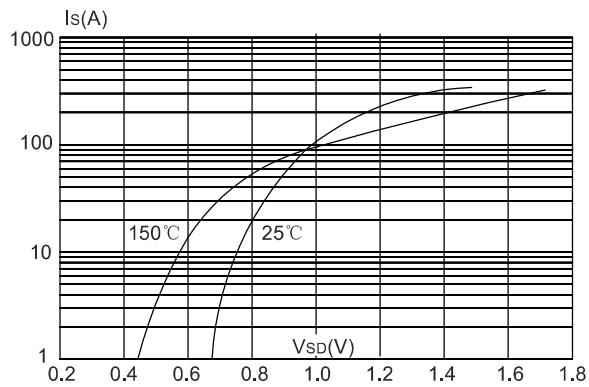
Figure 6: Capacitance Characteristics
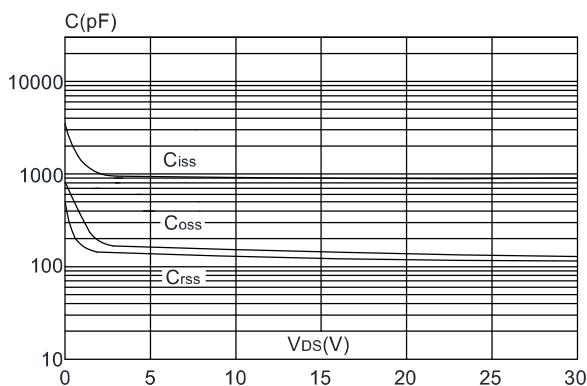
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature
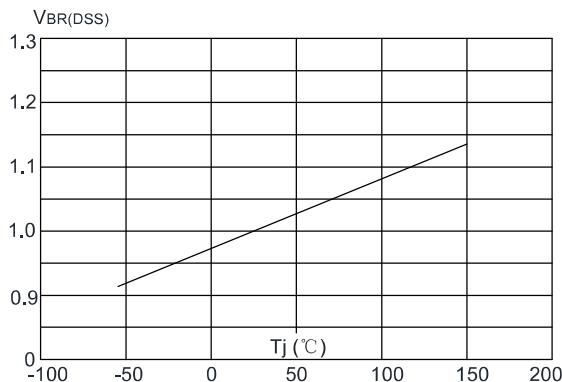
**Figure 8:** Normalized on Resistance vs. Junction Temperature
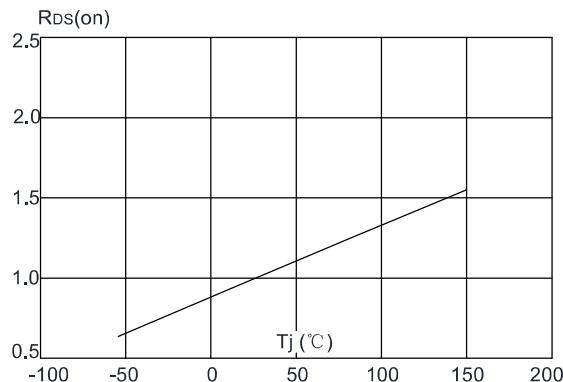
**Figure 9:** Maximum Safe Operating Area

**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature
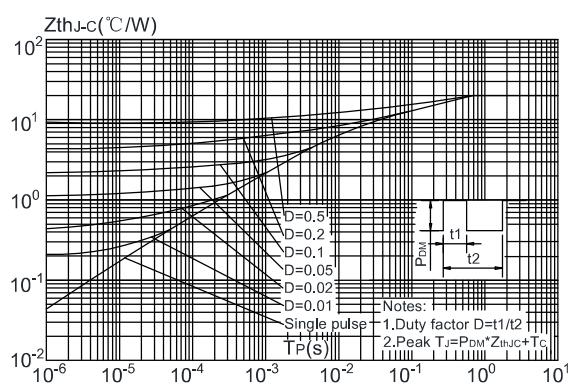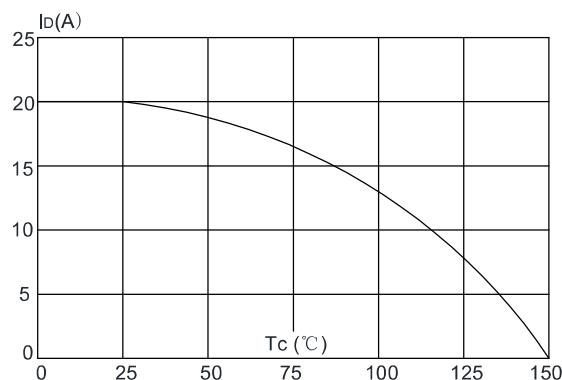
Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case
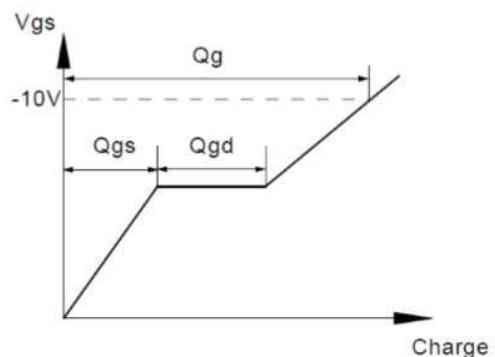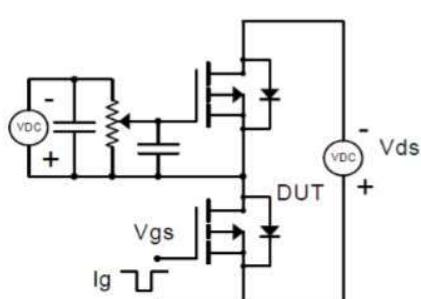
P-CH ELECTRICAL CHARACTERISTICS(T$_a$=25℃ unless otherwise noted)

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$_D$ =-10A		16	23	mΩ
		V$_{GS}$ =-4.5V, I$_D$ =-5A		25	34	
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		1550		pF
Output Capacitance	C$_{oss}$			327		
Reverse Transfer Capacitance	C$_{rss}$			278		
Switching characteristics						
Turn-on delay time	t$_{d(on)}$	V$_{DD}$=-15V, I$_D$=-6A V$_{GS}$=-10V, R$_G$=2.5Ω		14		ns
Turn-on rise time	t$_r$			20		
Turn-off delay time	t$_{d(off)}$			95		
Turn-off fall time	t$_f$			65		
Total Gate Charge	Qg	VDS=-15V, ID=-10A, VGS=-10V		30		nC
Gate-Source Charge	Qgs			5.3		
Gate-Drain Charge	Qgd			7.6		
Source-Drain Diode characteristics						
Diode Forward voltage[2]	V$_{DS}$	V$_{GS}$ =0V, I$_S$=-10A			1.2	V
Diode Forward current[3]	I$_S$		-	-	-20	A
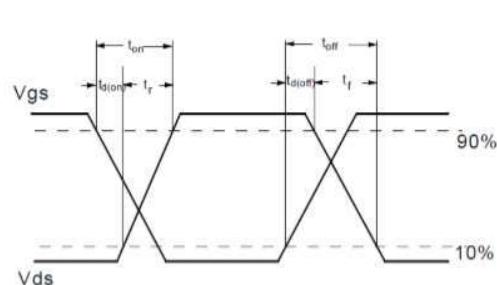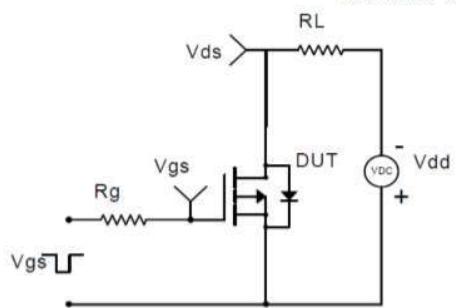
**Notes:**

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
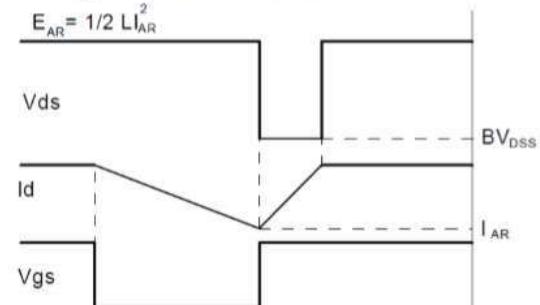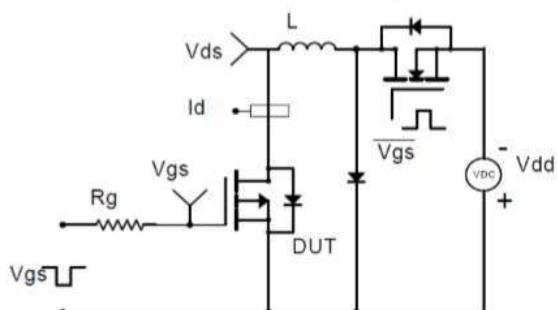
Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2\, LI_{AR}^2$$

Diode Recovery Test Circuit & Waveforms
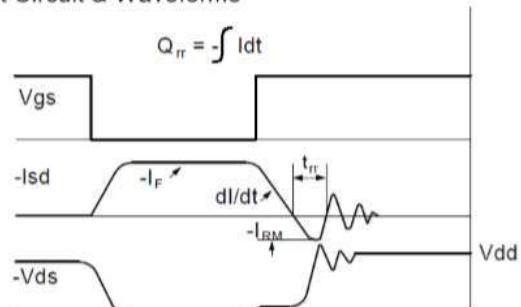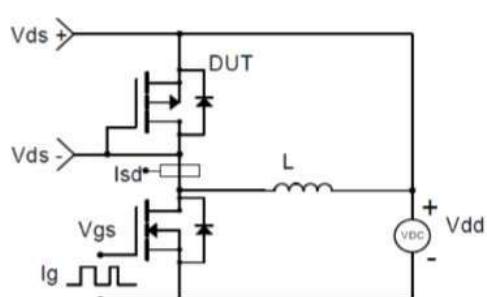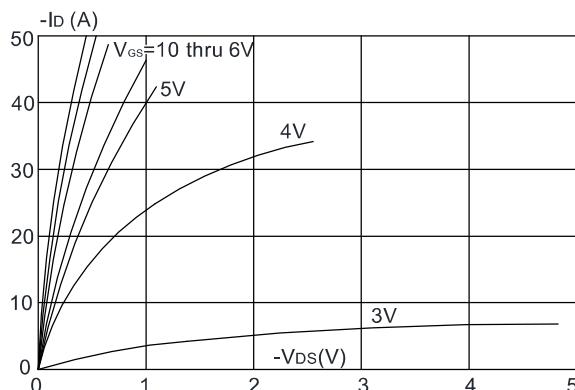
$$Q_{rr} = \int I\,dt$$

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

$V_{BR(DSS)}(V)$

Tj (℃)

Figure 8: Normalized on Resistance vs. Junction Temperature

$R_{DS}(on)(m\Omega)$

Tj (℃)

Figure 9: Maximum Safe Operating Area

$-I_D(A)$

10μs
100μs
1ms
DC

Limited by $R_{DS(on)}$

Tc=25℃
Single pulse

V_{DS} (V)

Figure 10: Maximum Continuous Drain Current vs. Case Temperature

$-I_D(A)$

Tc (℃)
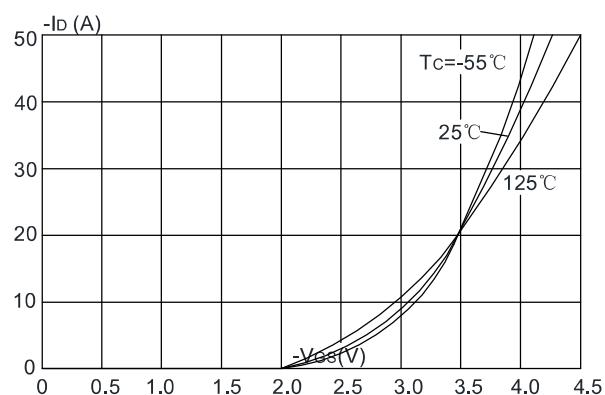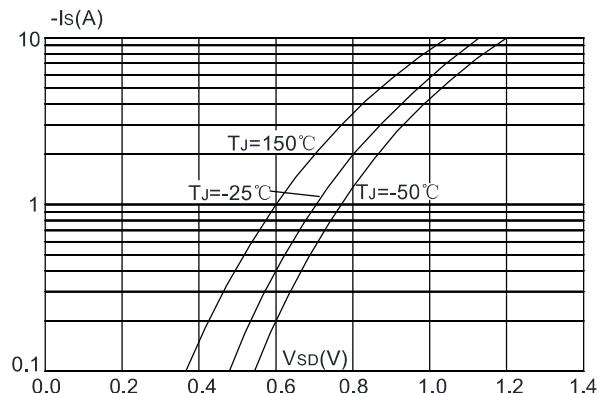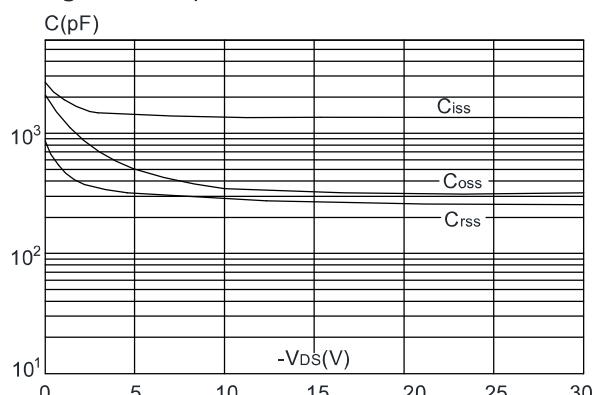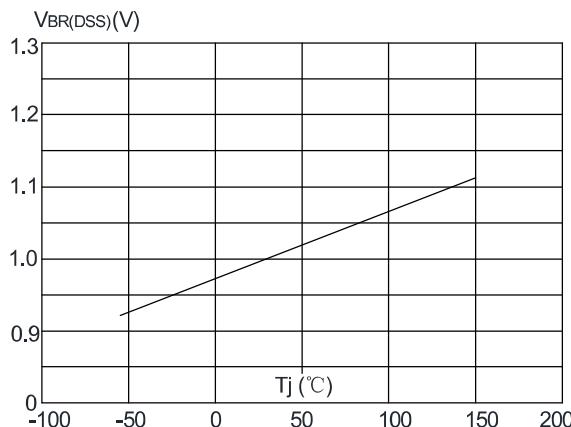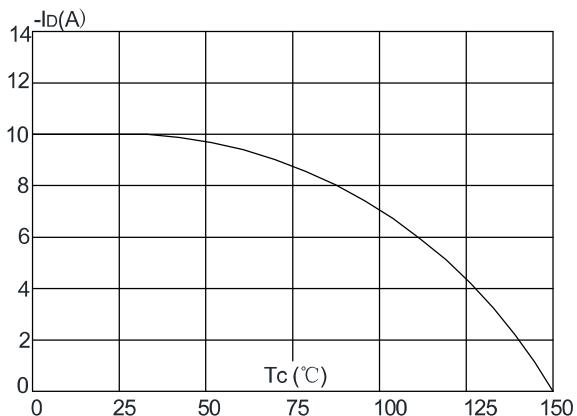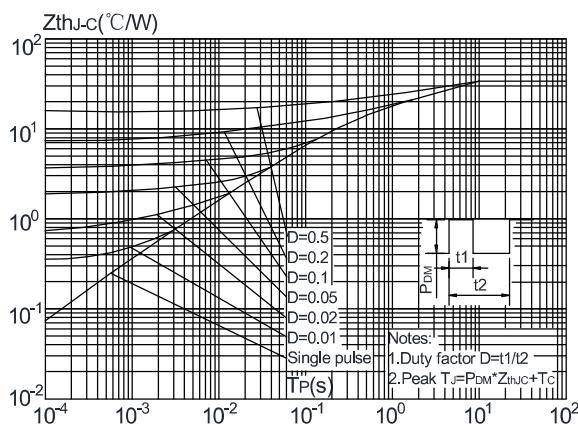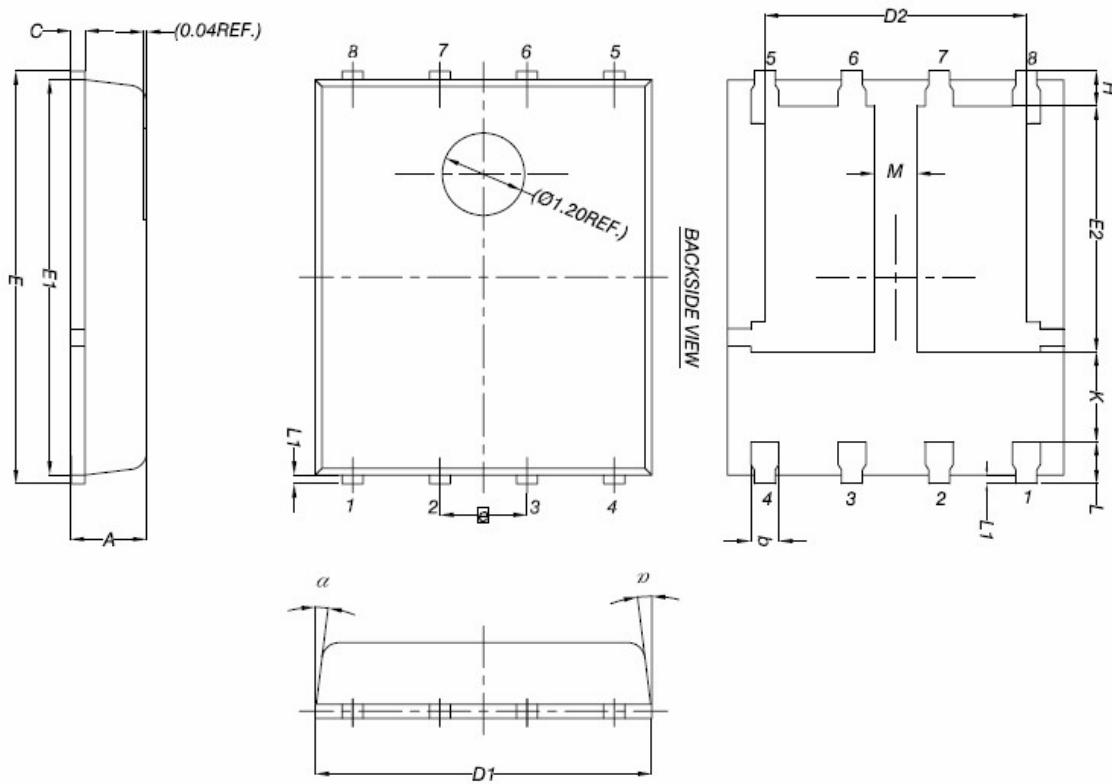
Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

$Zth_{J-C}(℃/W)$

D=0.5
D=0.2
D=0.1
D=0.05
D=0.02
D=0.01
Single pulse

P_{DM}
t1
t2

Notes:
1.Duty factor D=t1/t2
2.Peak $T_J=P_{DM}*Zth_{JC}+T_C$

$T_P(s)$

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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