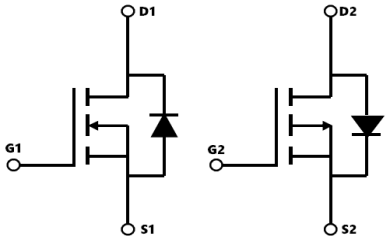
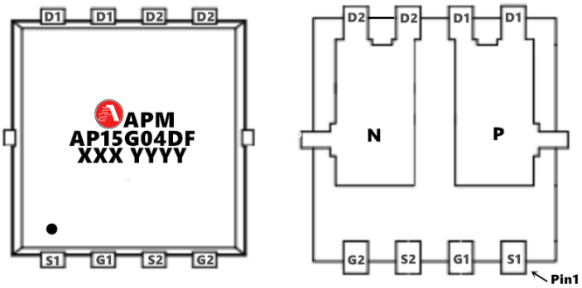
AP15G04DF

40V N+P-Channel Enhancement Mode MOSFET

Description

The AP15G04DF uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.





General Features

V_{DS} = 40V I_D =16A

$R_{DS(ON)}$ < 20mΩ @ V_{GS}=10V **（Type：16mΩ）**

V_{DS} = -40V I_D =-15A

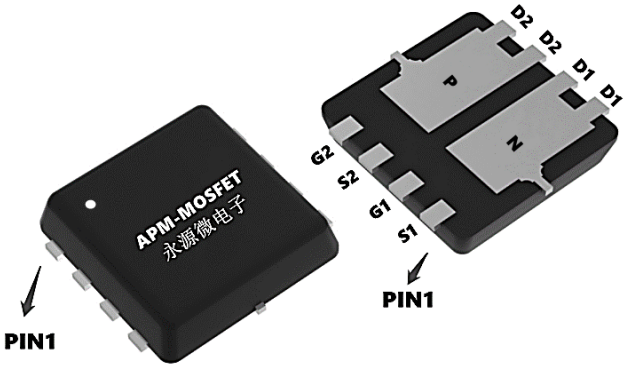
$R_{DS(ON)}$ < 38mΩ @ V_{GS}=-10V **（Type：32mΩ）**

Application

Wireless charging

Boost driver

Brushless motor



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP15G04DF	PDFN3*3-8L	AP15G04DF XXX YYYY	5000

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Symbol	Parameter	Value		Unit
		N-Ch	P-Ch	
VDS	Drain-Source Voltage	40	-40	V
VGS	Gate-Source Voltage	±20	±20	V
I_D@T_A=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	16	-15	A
I_D@T_A=70℃	Continuous Drain Current, V_{GS} @ 10V[1]	12	-11	A
IDM	Pulsed Drain Current[2]	48	-45	A
EAS	Single Pulse Avalanche Energy[3]	66	66	mJ
IAS	Avalanche Current	12	-11	A
P_D@T_A=25℃	Total Power Dissipation[4]	1.67		W
TSTG	Storage Temperature Range	-55 to 150		℃
T_J	Operating Junction Temperature Range	-55 to 150		℃
$R_{\theta}JA$	Thermal Resistance Junction-Ambient [1]	85		℃/W
$R_{\theta}JC$	Thermal Resistance Junction-Case[1]	30		℃/W

N-Channel Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	40	47	---	V
△BVDSS/△TJ	BVDSS Temperature Coefficient	Reference to 25℃ , I_D=1mA	---	0.034	---	V/℃
RDS(ON)	Static Drain-Source On-Resistance[2]	V_{GS}=10V , I_D=5A	---	16	20	mΩ
		V_{GS}=4.5V , I_D=4A	---	18	28	
VGS(th)	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.0	1.6	2.5	V
△$V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.56	---	mV/℃
IDSS	Drain-Source Leakage Current	V_{DS}=32V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=32V , V_{GS}=0V , T_J=55℃	---	---	5	
IGSS	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=5V , I_D=5A	---	14	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	2.6	---	Ω
Q_g	Total Gate Charge (4.5V)	V_{DS}=20V , V_{GS}=4.5V , I_D=5A	---	5.5	---	nC
Q_{gs}	Gate-Source Charge		---	1.25	---	
Q_{gd}	Gate-Drain Charge		---	2.5	---	
Td(on)	Turn-On Delay Time	V_{DD}=20V , V_{GS}=10V , R_G=3.3Ω I_D=1A	---	8.9	---	ns
T_r	Rise Time		---	2.2	---	
Td(off)	Turn-Off Delay Time		---	41	---	
T_f	Fall Time		---	2.7	---	
C_{iss}	Input Capacitance	V_{DS}=15V , V_{GS}=0V , f=1MHz	---	593	---	pF
Coss	Output Capacitance		---	76	---	
Crss	Reverse Transfer Capacitance		---	56	---	
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	6.1	A
ISM	Pulsed Source Current[2,5]		---	---	23	A
VSD	Diode Forward Voltage[2]	V_{GS}=0V , I_S=1A , T_J=25℃	---	---	1.2	V

Note :

1、The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.
2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3、The EAS data shows Max. rating . The test condition is V_{DD}=25V,V_{GS}=10V,L=0.1mH,I_{AS}=10A
4、The power dissipation is limited by 150℃ junction temperature
5 、The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

P-Channel Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=-250uA	-40	-44	---	V
△BVDSS/△TJ	BV_{DSS} Temperature Coefficient	Reference to 25℃ , I_D=-1mA	---	-0.02	---	V/℃
RDS(ON)	Static Drain-Source On-Resistance[2]	V_{GS}=-10V , I_D=-6A	---	32	38	mΩ
		V_{GS}=-4.5V , I_D=-3A	---	43	53	
VGS(th)	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =-250uA	-1.0	-1.6	-2.5	V
△$V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	3.72	---	mV/℃
IDSS	Drain-Source Leakage Current	V_{DS}=-32V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=-32V , V_{GS}=0V , T_J=55℃	---	---	5	
IGSS	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=-5V , I_D=-6A	---	13	---	S
Q_g	Total Gate Charge (-4.5V)	V_{DS}=-20V , V_{GS}=-4.5V , I_D=-6A	---	11.5	---	nC
Q_{gs}	Gate-Source Charge		---	3.5	---	
Q_{gd}	Gate-Drain Charge		---	3.3	---	
Td(on)	Turn-On Delay Time	V_{DD}=-15V , V_{GS}=-10V , R_G=3.3Ω, I_D=-1A	---	22	---	ns
T_r	Rise Time		---	15.7	---	
Td(off)	Turn-Off Delay Time		---	59	---	
T_f	Fall Time		---	5.5	---	
C_{iss}	Input Capacitance	V_{DS}=-15V , V_{GS}=0V , f=1MHz	---	1415	---	pF
Coss	Output Capacitance		---	134	---	
Crss	Reverse Transfer Capacitance		---	102	---	
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	-6	A
ISM	Pulsed Source Current[2,5]		---	---	-22	A
VSD	Diode Forward Voltage[2]	V_{GS}=0V , I_S=-1A , T_J=25℃	---	---	-1.2	V

Note :

1、The data tested by surface mo unted on a 1 inch^2 FR-4 board with 2OZ copper.
2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3、The EAS data shows Max. rating . The test condition is V^{DD}=-25V,V^{GS}=-10V,L=0.1mH,I^{AS}=-10A
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5 、The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

N-Channel Typical Characteristics

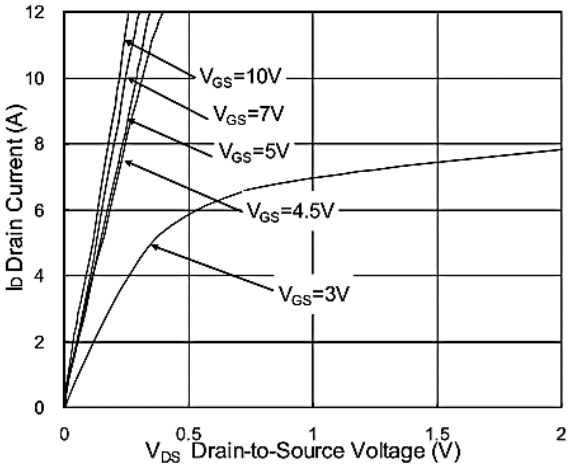


Fig.1 Typical Output Characteristics

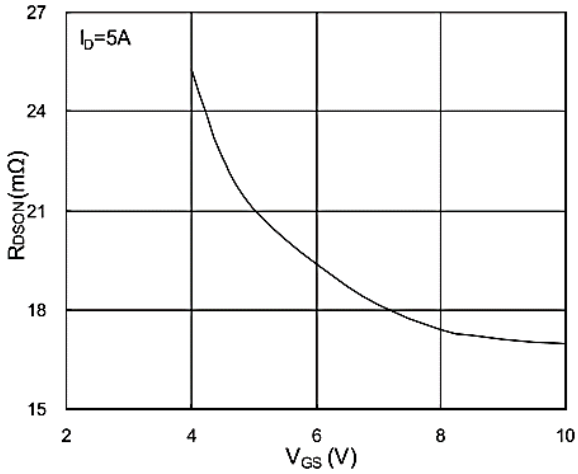


Fig.2 On-Resistance vs. G-S Voltage

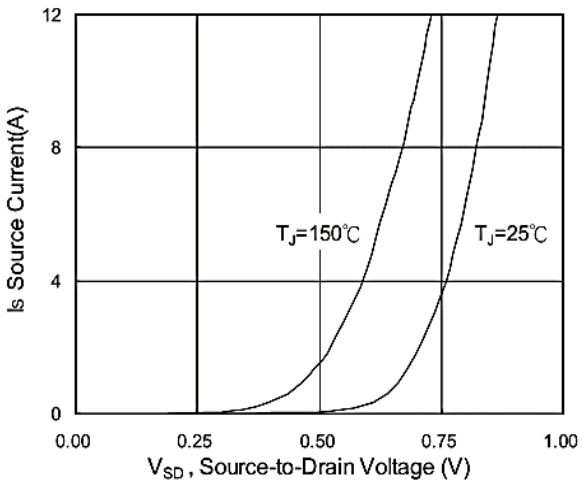


Fig.3 Source Drain Forward Characteristics

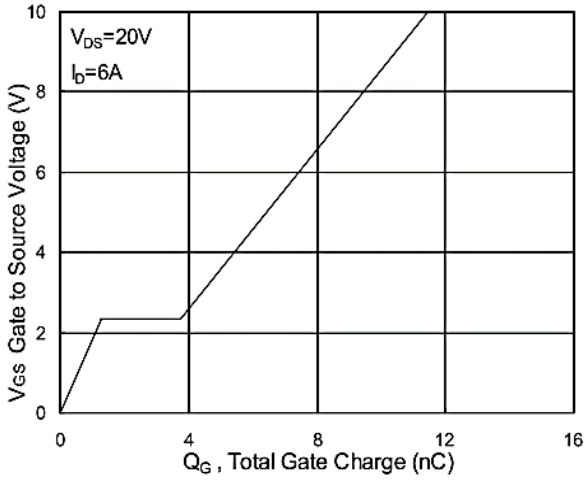


Fig.4 Gate-Charge Characteristics

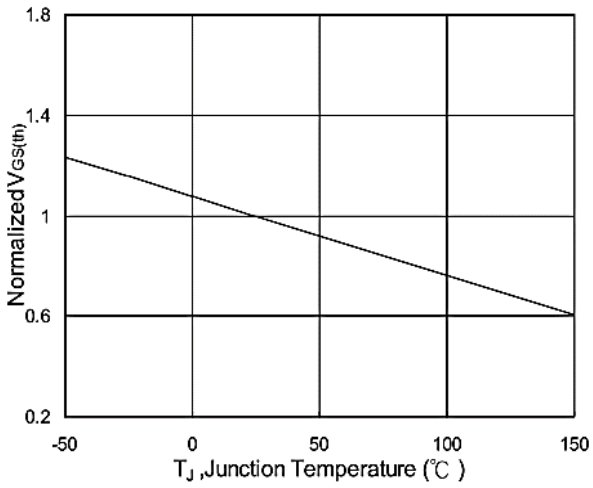


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

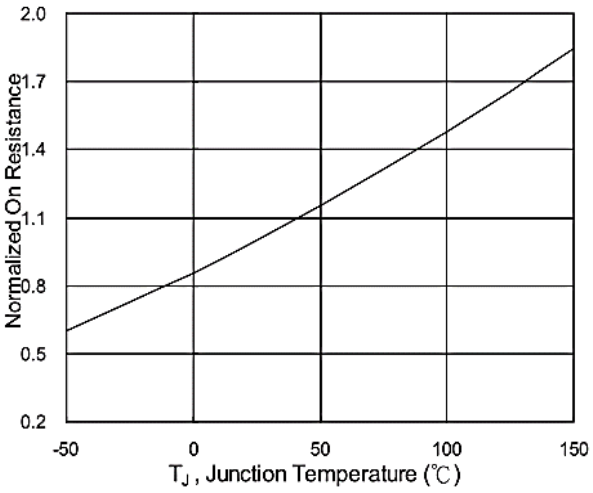


Fig.6 Normalized R_{DSON} vs. T_J

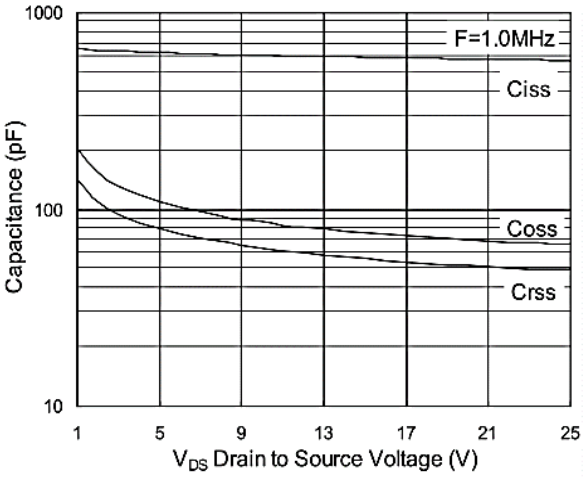


Fig.7 Capacitance

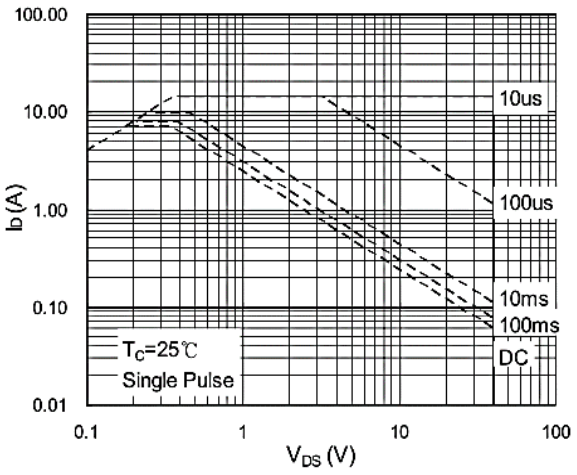


Fig.8 Safe Operating Area

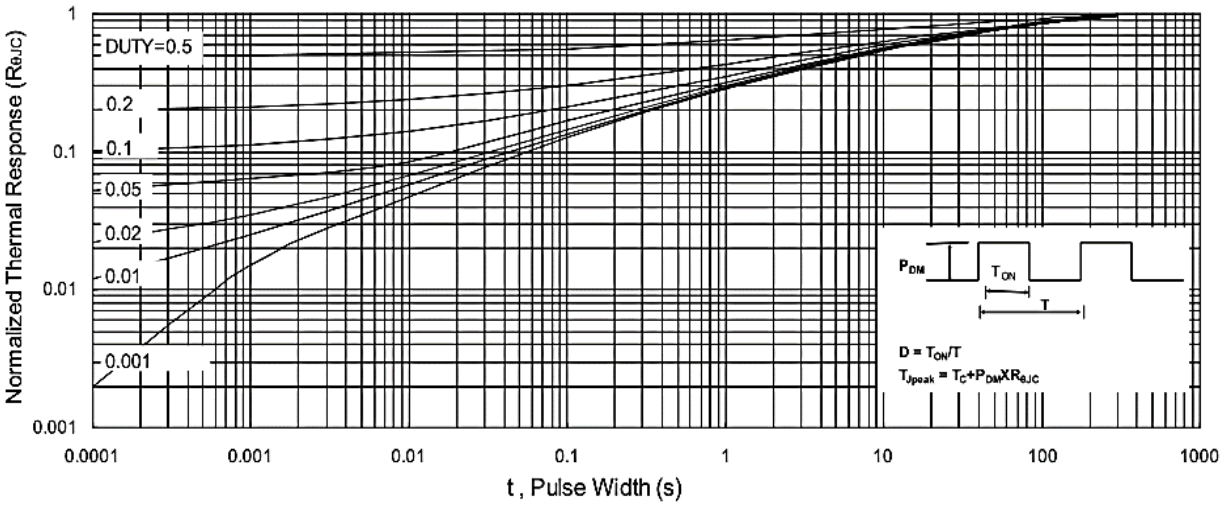


Fig.9 Normalized Maximum Transient Thermal Impedance

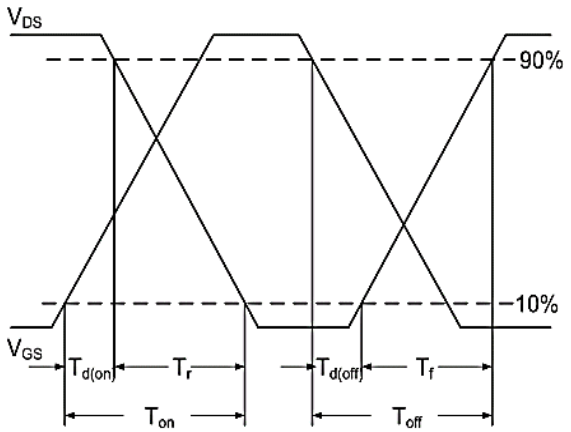


Fig.10 Switching Time Waveform

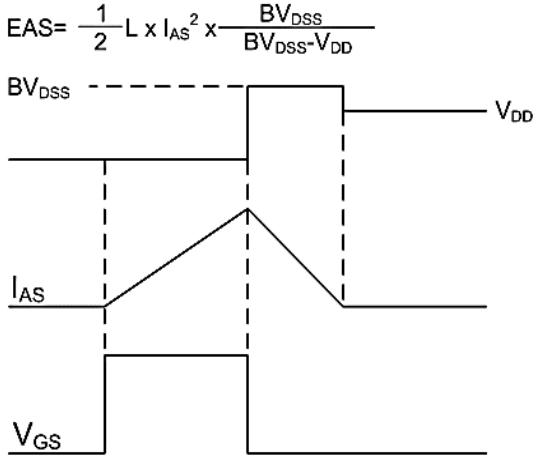


Fig.11 Unclamped Inductive Waveform

P-Channel Typical Characteristics

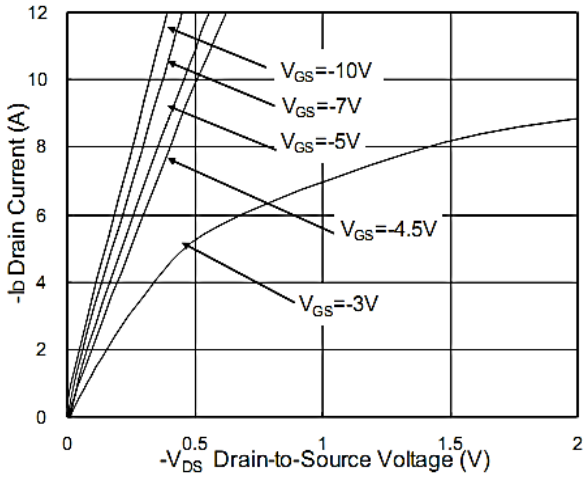
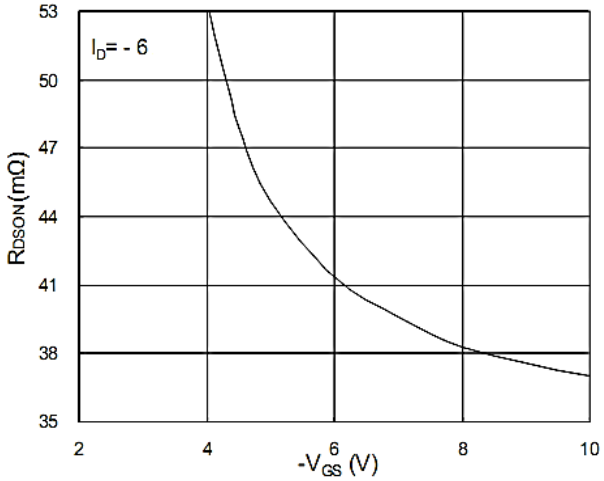


Fig.1 Typical Output Characteristics



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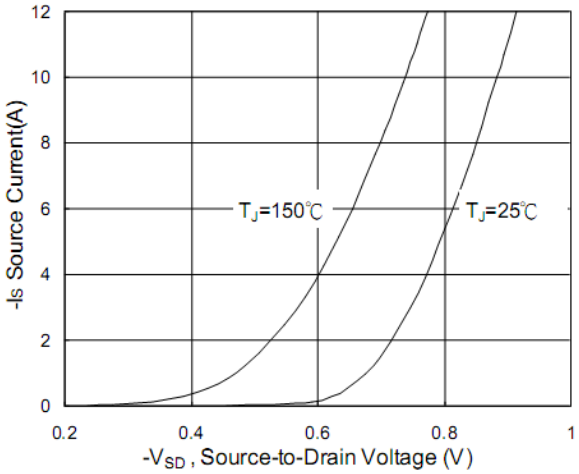


Fig.3 Source Drain Forward Characteristics

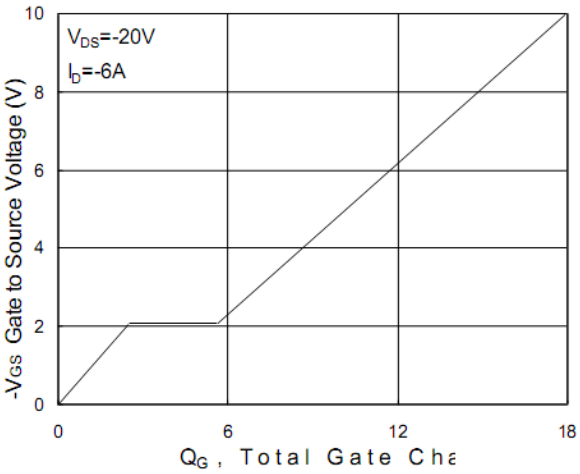


Fig.4 Gate-Charge Characteristics

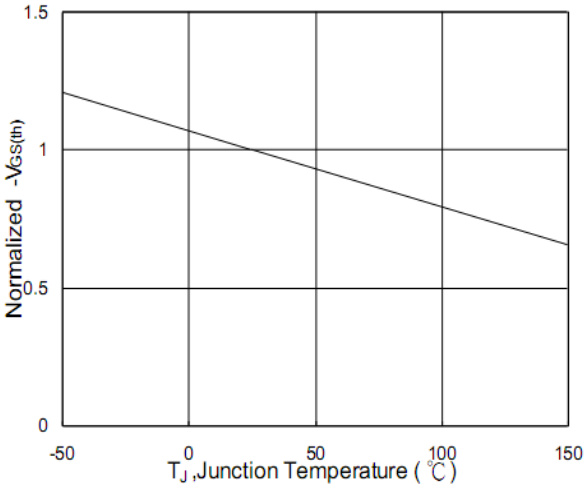


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

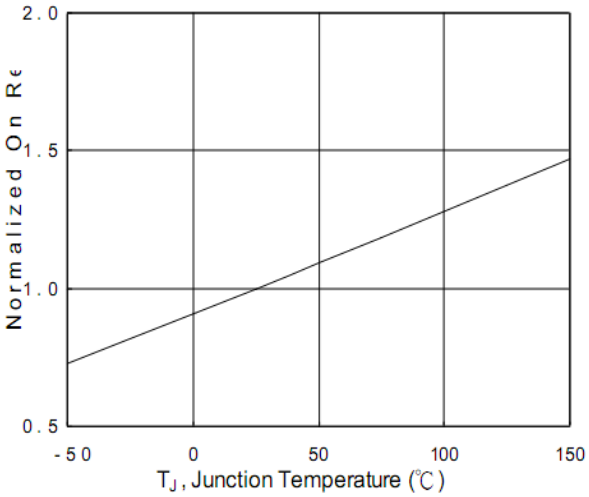


Fig.6 Normalized R_{DSON} vs. T_J

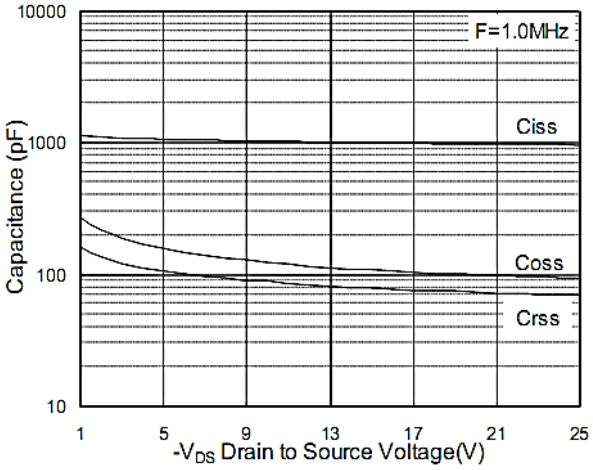


Fig.7 Capacitance

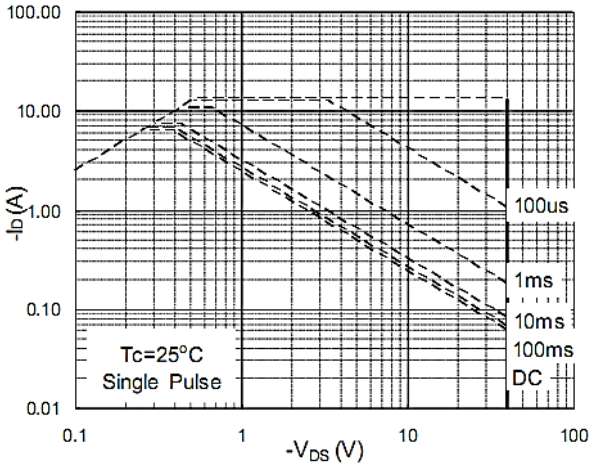
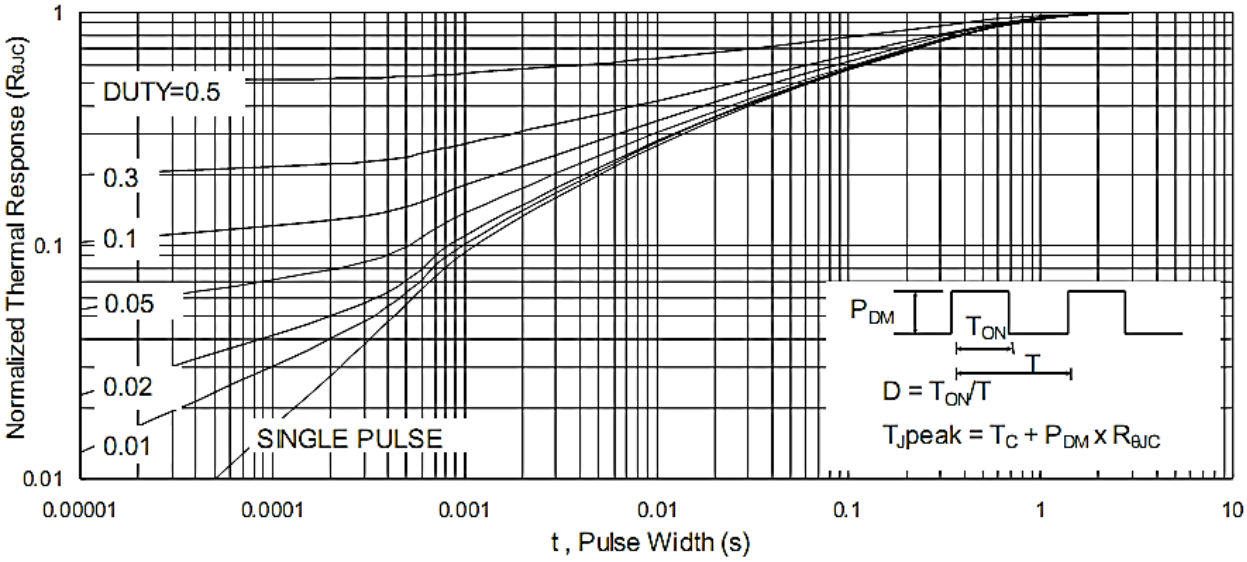


Fig.8 Safe Operating Area



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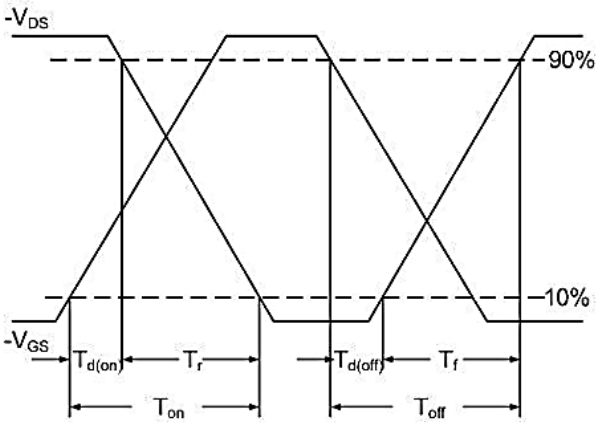


Fig.10 Switching Time Waveform

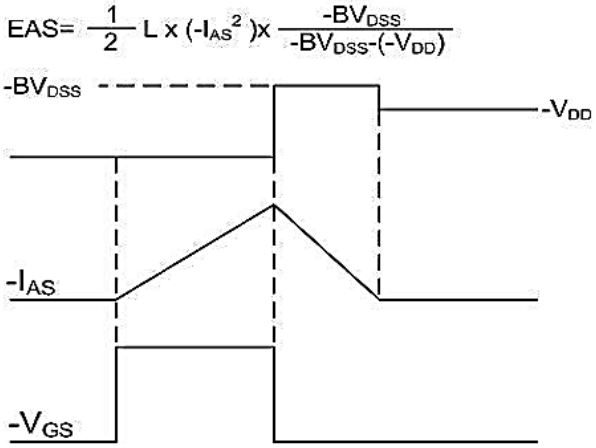
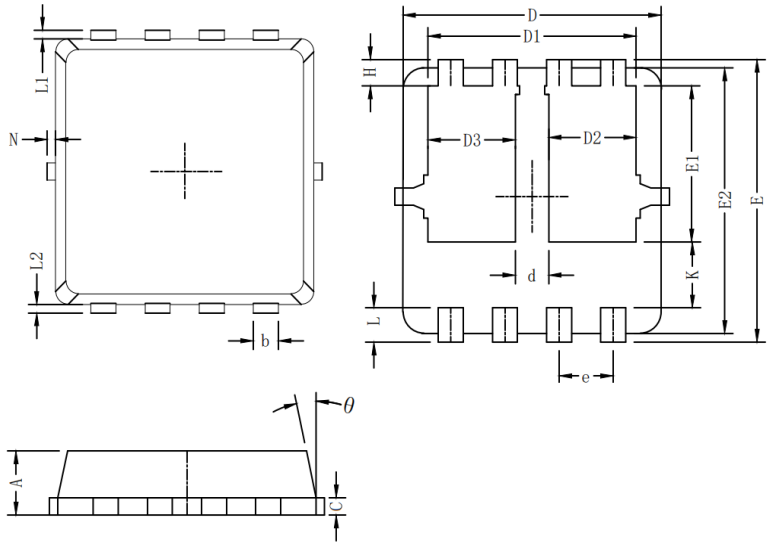


Fig.11 Unclamped Inductive Waveform

Package Mechanical Data-PDFN3*3-8L



Symbol	Dimensions In Millimeters		
	min.	typ.	max.
A	0.60	0.75	0.90
b	0.20	0.30	0.40
C	0.15	0.20	0.25
D	3.00	3.10	3.20
D1	2.30	2.45	2.60
D2/D3	0.80	1.00	1.20
E	3.15	3.30	3.45
E1	1.43	1.73	1.93
E2	2.90	3.05	3.20
e	0.65BSC		
H	0.20	0.35	0.50
K	0.57	0.77	0.87
L	0.30	0.40	0.50
L1/L2	0.1REF		
θ	8°	10°	13°
N	0.00		0.15
d	0.30	0.40	0.50

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Edition	Date	Change
REV1.0	2025/5/31	Initial release

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