

40V N+P-CHANNEL ENHANCEMENT MODE MOSFET

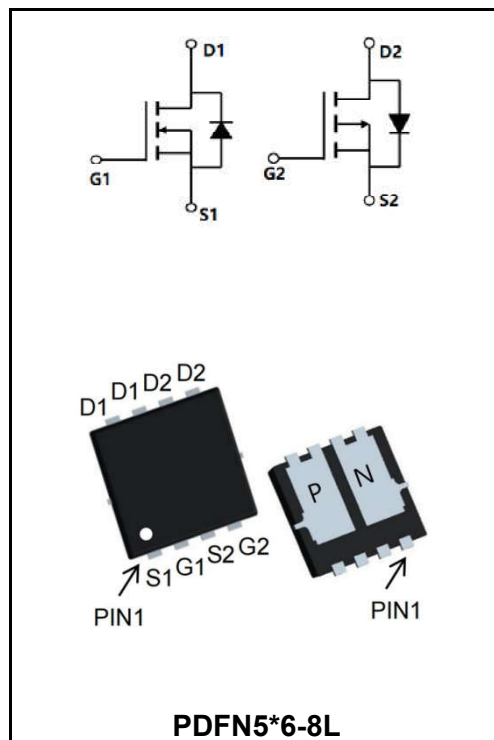
MAIN CHARACTERISTICS

I_D	23A
V_{DSS}	40V
$R_{DS(on)-typ}(@V_{GS}=10V)$	< 18mΩ (Type: 13.5 mΩ)
I_D	-20A
V_{DSS}	-40V
$R_{DS(on)-typ}(@V_{GS}=-10V)$	< 32mΩ (Type: 24 mΩ)



Application

- ◆ Wireless charging
- ◆ Boost driver
- ◆ Brushless motor



Product Specification Classification

Part Number	Package	Marking	Pack
YFW20G04NF	PDFN5*6-8L	YFW 20G04NF XXXXX	5000PCS/Tape

Maximum Ratings at $T_c=25^{\circ}\text{C}$ unless otherwise specified

Characteristics	Symbols	Value		Units
		N-Ch	P-Ch	
Drain-Source Voltage	V_{DS}	40	-40	V
Gate - Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current, $V_{GS} @ 10V^1 @ T_c=25^{\circ}\text{C}$	I_D	23	-20	A
Continuous Drain Current, $V_{GS} @ 10V^1 @ T_c=100^{\circ}\text{C}$	I_D	18	-16	A
Pulsed Drain Current ²	I_{DM}	46	-40	A
Single Pulse Avalanche Energy ³	E_{AS}	28	66	mJ
Avalanche Current	I_{AS}	17.8	-27.2	A
Total Power Dissipation ⁴ @ $T_c=25^{\circ}\text{C}$	P_D	25	31.3	W
Storage Temperature Range	T_{STG}	-55 to +150		$^{\circ}\text{C}$
Operating Junction Temperature Range	T_J	-55 to +150		$^{\circ}\text{C}$
Thermal Resistance Junction-Ambient ¹	$R_{\theta JA}$	62		$^{\circ}\text{C/W}$
Thermal Resistance Junction-Case ¹	$R_{\theta JC}$	5		$^{\circ}\text{C/W}$

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

Characteristics	Test Condition	Symbols	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	BV_{DSS}	40	-	-	V
BVDSS Temperature Coefficient	Reference to 25 °C, I _D =1mA	ΔBV_{DSS}/ΔT_J	-	0.032	-	V/°C
Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =15A	R_{DS(ON)}	-	13.5	18	mΩ
	V _{GS} =4.5V, I _D =10A		-	18.4	24	
Gate -Threshold Voltage	V _{DS} =V _{GS} , I _D =250uA	V_{GS(th)}	1.2	1.6	2.5	V
V _{GS(th)} Temperature Coefficient		ΔV_{GS(th)}	-	-4.8	-	mV/°C
Drain-Source Leakage Current	V _{DS} =32V, V _{GS} =0V T _J =25 °C	I_{DSS}	-	-	1	uA
	V _{DS} =32V, V _{GS} =0V, T _J =55 °C		-	-	5	
Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	I_{GSS}	-	-	±100	nA
Forward Transconductance	V _{DS} = 5V, I _D = 15A	g_{fs}	-	34	-	S
Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	R_g	-	2.1	-	Ω
Total Gate Charge(4.5V)	V _{DS} =32V V _{GS} =4.5V I _D =15A	Q_g	-	10	-	nC
Gate-Source Charge		Q_{gs}	-	2.55	-	
Gate-Drain Charge		Q_{gd}	-	4.8	-	
Turn-on delay time	V _{DD} =20V V _{GS} =10V R _G = 3.3 I _D = 15A	t_{d(on)}	-	2.8	-	ns
Rise Time		T_r	-	12.8	-	
Turn-Off Delay Time		t_{d(OFF)}	-	21.2	-	
Fall Time		t_f	-	6.4	-	
Input Capacitance	V _{DS} =15V V _{GS} =0V f=1MHz	C_{iss}	-	1013	-	pF
Output Capacitance		C_{oss}	-	107	-	
Reverse Transfer Capacitance		C_{rss}	-	76	-	
Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	I_S	-	-	40	A
Pulsed Source Current ^{2,5}		I_{SM}	-	-	85	A
Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25 °C	V_{SD}	-	-	1.2	V
Reverse Recovery Time	IF=15A, dI/dt=100A/μs, T _J =25 °C	t_{rr}	-	10	-	nS
Reverse Recovery Charge		Q_{rr}	-	3.1	-	nC

Note :

- 1.The data tested by surface mounted on a 1 inch² 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}=25A
- 4.The power dissipation is limited by 150 °C 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 °C, unless otherwise noted)

Characteristics	Test Condition	Symbols	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	BV_{DSS}	-40	-	-	V
BVDSS Temperature Coefficient	Reference to 25 °C, I _D =-1mA	ΔBV_{DSS}/ΔT_J	-	-0.012	-	V/°C
Static Drain-Source On-Resistance ²	V _{GS} =-10V, I _D =-8A	R_{DS(ON)}	-	24	32	mΩ
	V _{GS} =-4.5V, I _D =-4A		-	32	42	
Gate -Threshold Voltage	V _{DS} =V _{GS} , I _D =-250uA	V_{GS(th)}	-1.0	-1.6	-2.5	V
V _{GS(th)} Temperature Coefficient		ΔV_{GS(th)}	-	4.32	-	mV/°C
Drain-Source Leakage Current	V _{DS} =-32V, V _{GS} =0V T _J =25 °C	I_{DSS}	-	-	1	uA
	V _{DS} =-32V, V _{GS} =0V, T _J =55 °C		-	-	5	
Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	I_{GSS}	-	-	±100	nA
Forward Transconductance	V _{DS} = -5V, I _D = -8A	g_{fs}	-	12.6	-	S
Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	R_g	-	13	16	
Total Gate Charge(-4.5V)	V _{DS} =-20V V _{GS} =-4.5V I _D =-12A	Q_g	-	9	-	nC
Gate-Source Charge		Q_{gs}	-	2.54	-	
Gate-Drain Charge		Q_{gd}	-	3.1	-	
Turn-on delay time	V _{DD} =-15V V _{GS} =-10V R _G = 3.3Ω I _D =-1A	t_{d(on)}	-	19.2	-	ns
Rise Time		T_r	-	12.8	-	
Turn-Off Delay Time		t_{d(OFF)}	-	48.6	-	
Fall Time		t_f	-	4.6	-	
Input Capacitance	V _{DS} =-15V V _{GS} =0V f=1MHz	C_{iss}	-	1004	-	pF
Output Capacitance		C_{oss}	-	108	-	
Reverse Transfer Capacitance		C_{rss}	-	80	-	
Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	I_S	-	-	-20	A
Pulsed Source Current ^{2,5}		I_{SM}	-	-	-40	A
Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25 °C	V_{SD}	-	-	-1	V

Note :

- 1.The data tested by surface mounted on a 1 inch² 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}=-27.2A
- 4.The power dissipation is limited by 150 °C 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.

Ratings and Characteristic Curves

Typical Characteristics-N

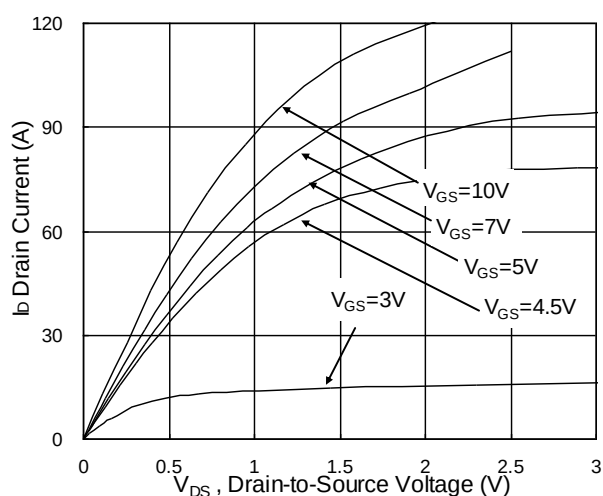


Fig.1 Typical Output Characteristics

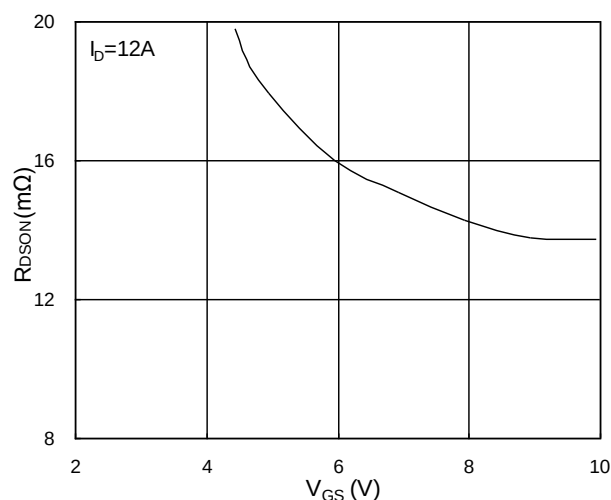


Fig.2 On-Resistance vs. G-S Voltage

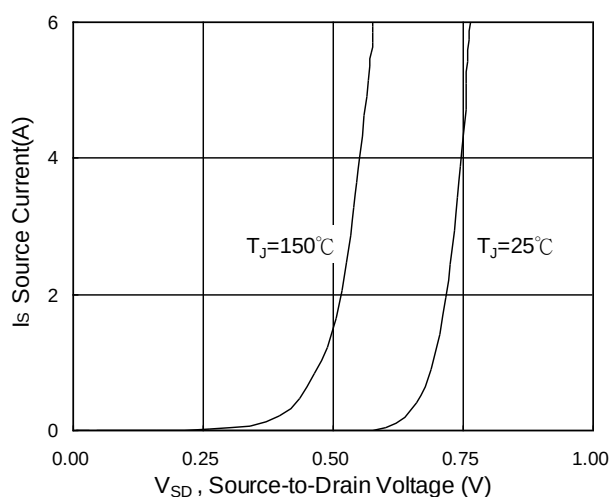


Fig.3 Forward Characteristics of Reverse

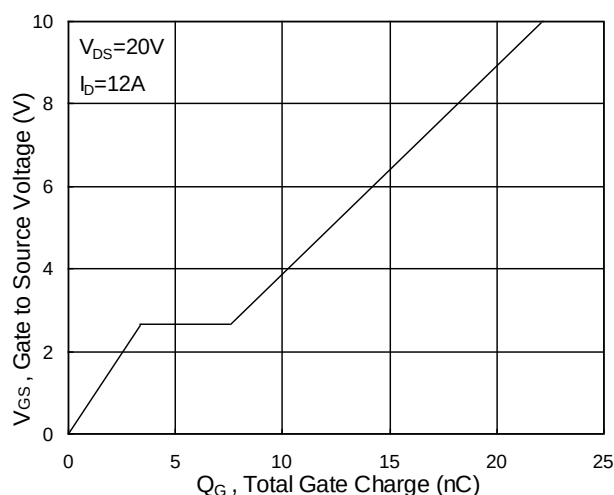


Fig.4 Gate-Charge Characteristics

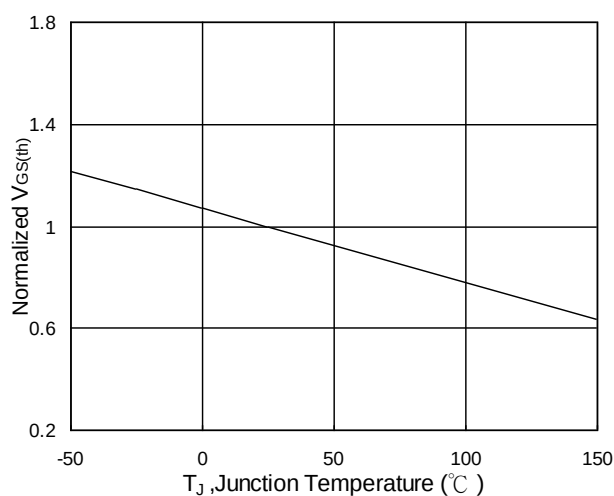


Fig.5 $V_{GS(th)}$ vs. T_J

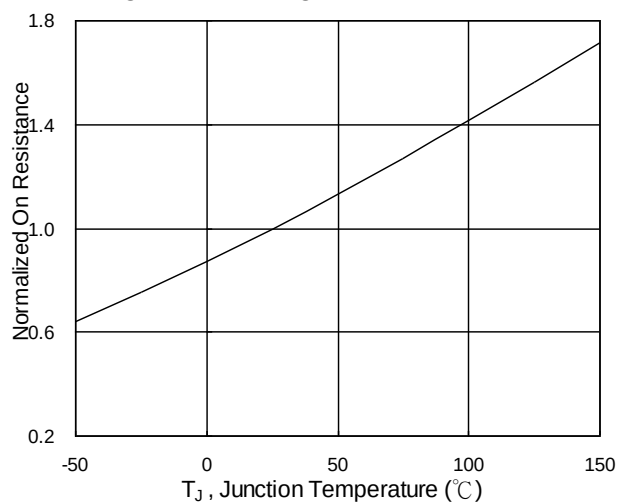


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

Ratings and Characteristic Curves

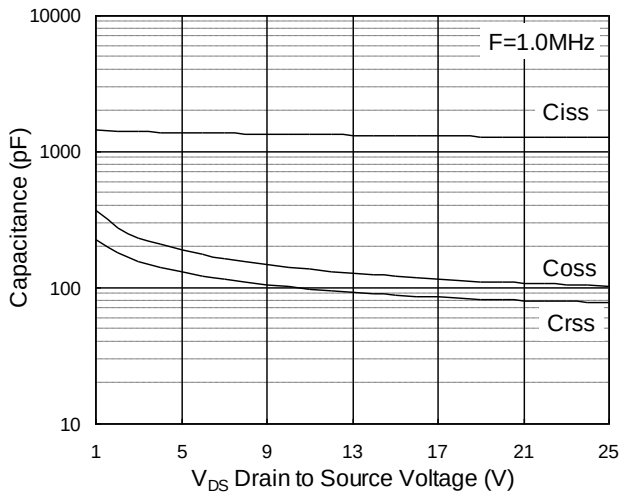


Fig.7 Capacitance

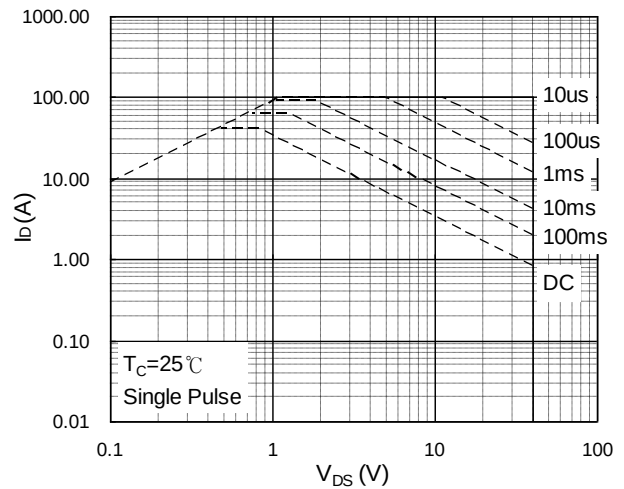


Fig.8 Safe Operating Area

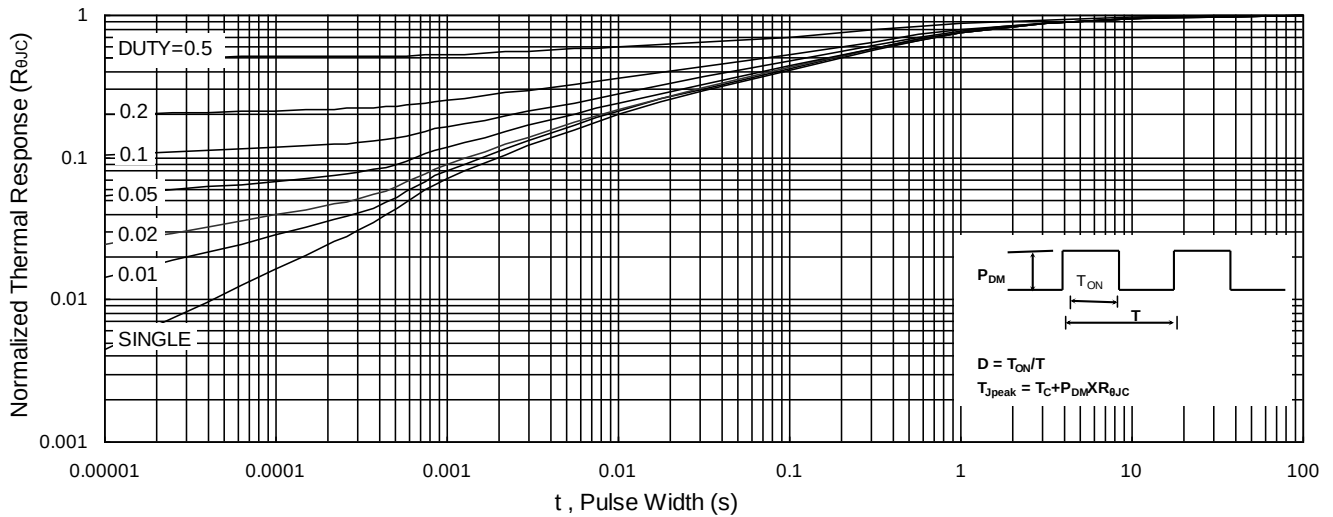


Fig.9 Normalized Maximum Transient Thermal Impedance

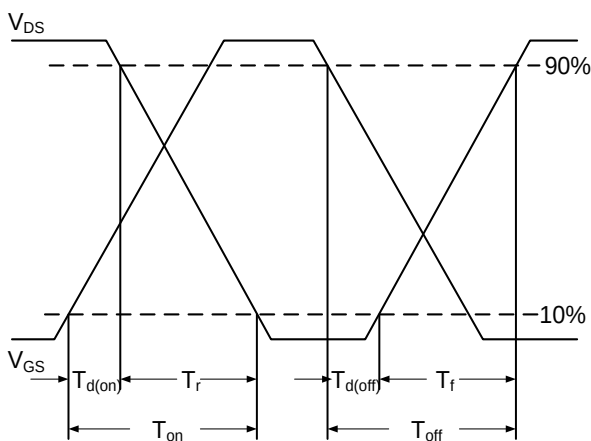


Fig.10 Switching Time Waveform

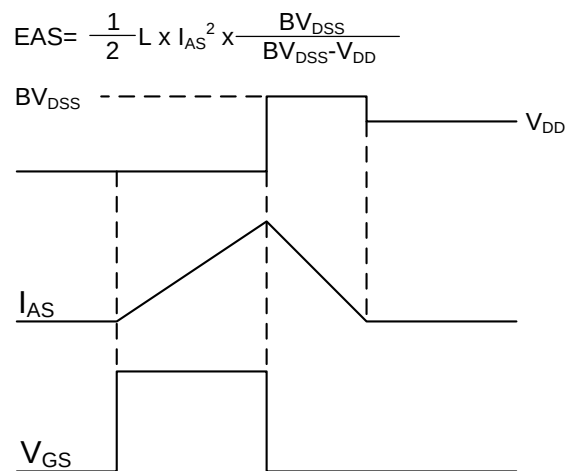


Fig.11 Unclamped Inductive Switching Waveform

Ratings and Characteristic Curves

Typical Characteristics-P

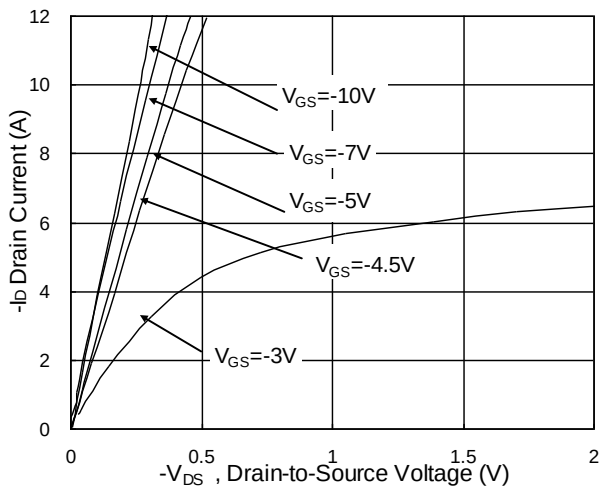


Fig.1 Typical Output Characteristics

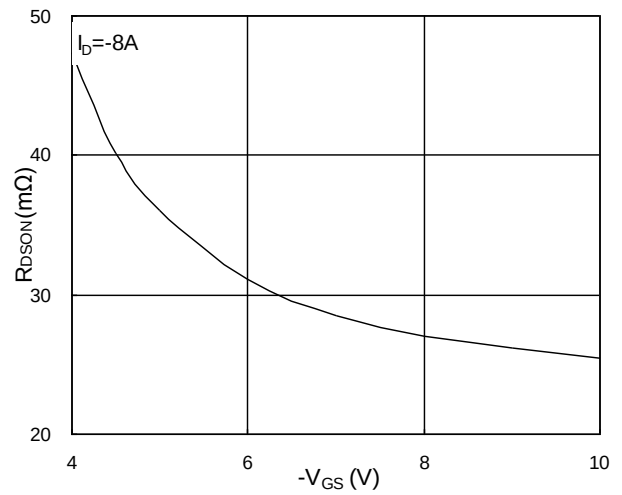


Fig.2 On-Resistance v.s Gate-Source

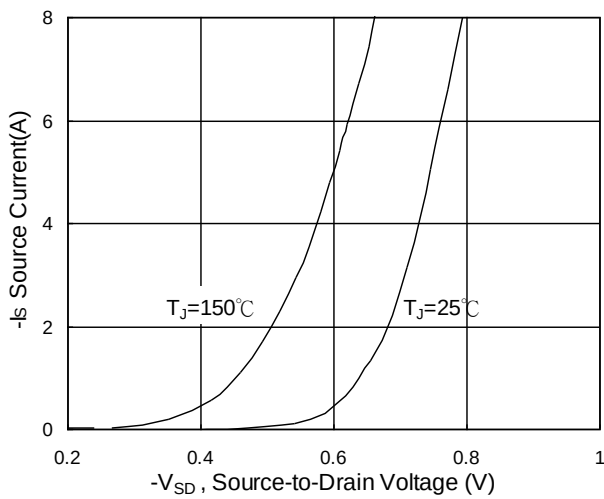


Fig.3 Forward Characteristics Of Reverse

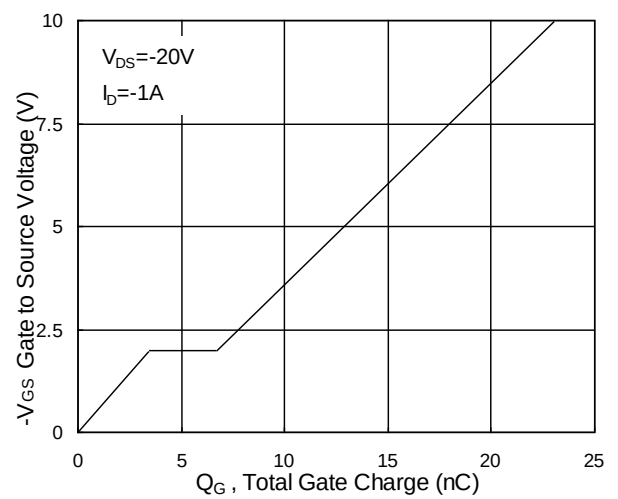


Fig.4 Gate Charge Characteristics

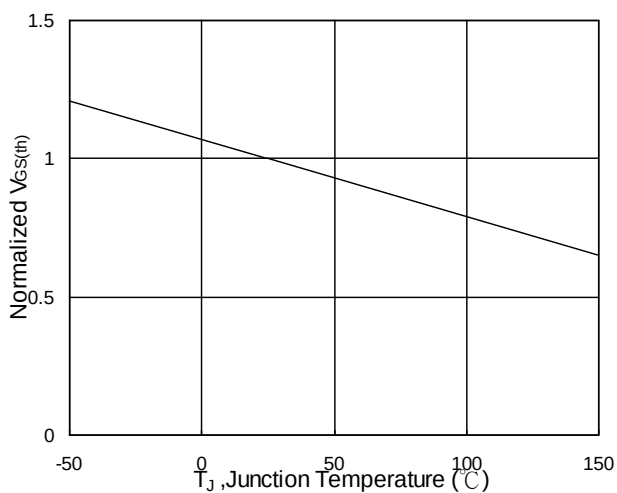


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

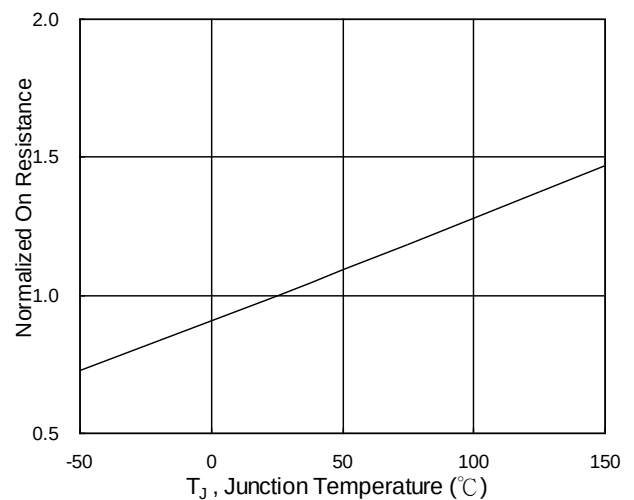


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

Ratings and Characteristic Curves

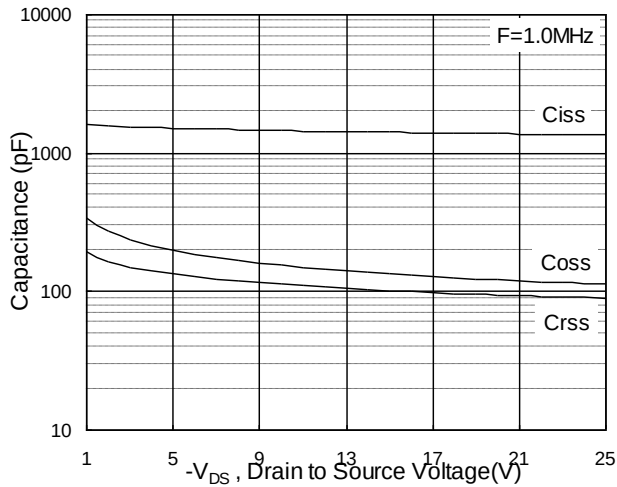


Fig.7 Capacitance

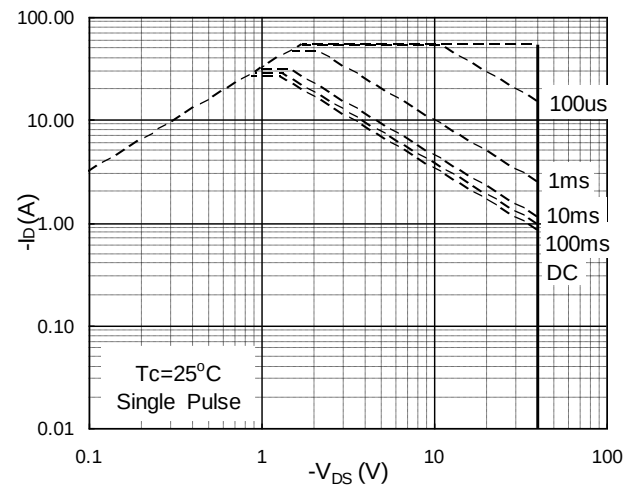


Fig.8 Safe Operating Area

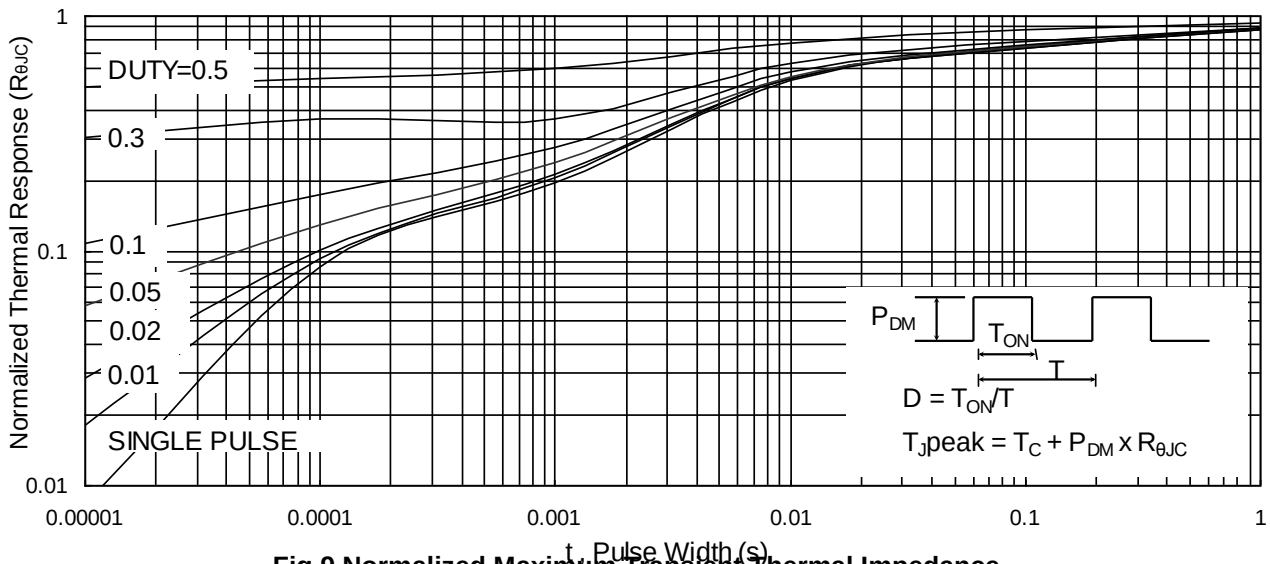


Fig.9 Normalized Maximum Transient Thermal Impedance

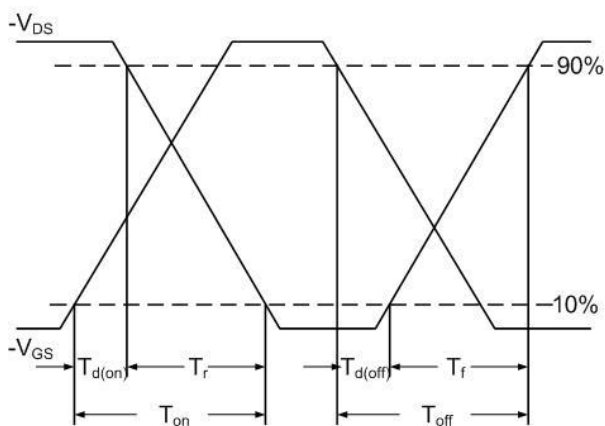


Fig.10 Switching Time Waveform

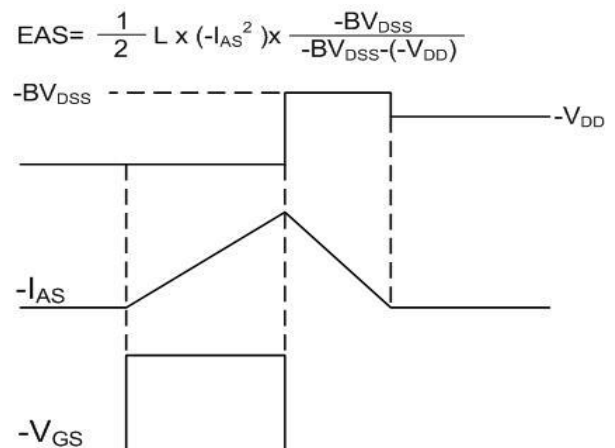
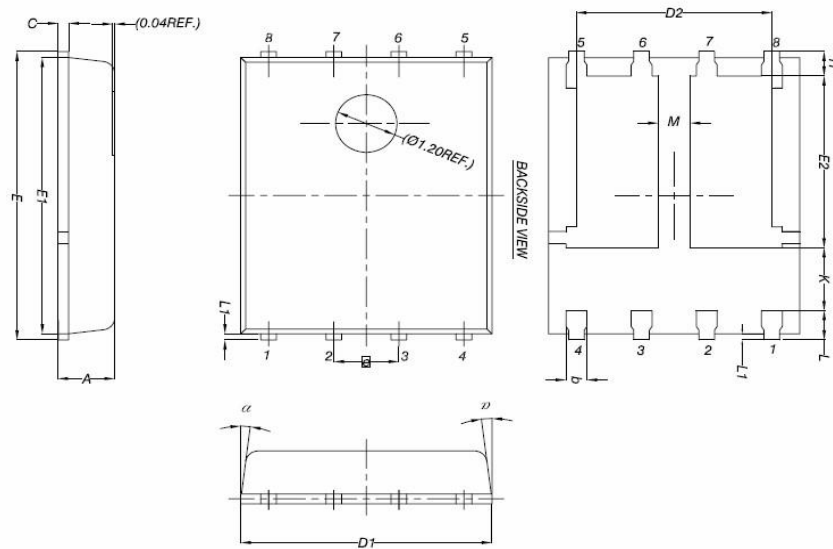


Fig.11 Unclamped Inductive Waveform

PDFN5*6-8L



Symbol	Common		
	mm		
	Mim	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	5.66	5.76	5.83
E2	3.37	3.47	3.58
e	1.27BSC		
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	--	--
a	0°	--	12°