

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
60V	50mΩ@10V	14A
	60mΩ@4.5V	

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
-60V	100mΩ@-10V	-11A
	125mΩ@-4.5V	

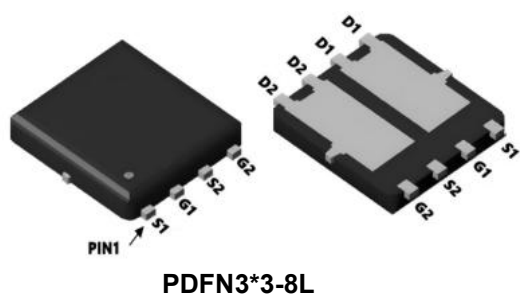
Feature

- Advanced trench technology
- Reliable and Rugged
- RoHS compliant with Halogen-free

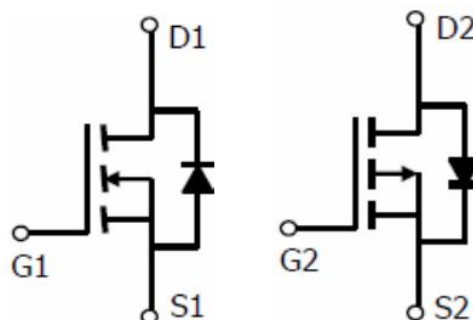
Application

- Synchronous Rectification
- Motor control
- Portable equipment application

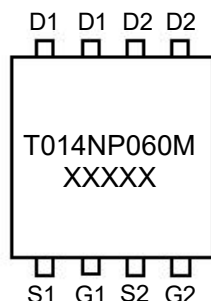
Package



Circuit diagram



Marking



Absolute maximum ratings ($T_c=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V_{DS}	60	-60	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current	I_D	14	-11	A
Continuous Drain Current ($T_c=100^\circ\text{C}$)	$I_{D(100^\circ\text{C})}$	9	-7	
Pulsed Drain Current ($t_p = 10\mu\text{s}$)	I_{DM}	56	-44	A
Single Pulse Avalanche Energy ¹⁾	E_{AS}	15	15	mJ
Power Dissipation	P_D	21	21	W
Thermal Resistance from Junction-to-Case	$R_{\theta JC}$	6	6	$^\circ\text{C/W}$
Operating Junction Temperature	T_J	-55 ~ +150	-55 ~ +150	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55 ~ +150	-55 ~ +150	$^\circ\text{C}$

N-CH Electrical characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =250μA	60			V
Zero gate voltage drain current	I _{DSS}	V _{DS} =60V, V _{GS} =0V			1	μA
Gate-body leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1	1.7	2.5	V
Drain-source on-resistance ²⁾	R _{DS(on)}	V _{GS} =10V, I _D =4A		40	50	mΩ
		V _{GS} =4.5V, I _D =3A		45	60	
Dynamic characteristics ³⁾						
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, f =1MHz		945		pF
Output Capacitance	C _{oss}			44		
Reverse Transfer Capacitance	C _{rss}			32		
Total Gate Charge	Q _g	V _{DS} =48V, V _{GS} =10V, I _D =3A		20.4		nC
Gate-Source Charge	Q _{gs}			3		
Gate-Drain Charge	Q _{gd}			3.3		
Turn-on delay time	t _{d(on)}	V _{DS} =30V, V _{GS} =10V,R _L =7.5Ω R _G =3Ω		8		nS
Turn-on rise time	t _r			4		
Turn-off delay time	t _{d(off)}			32		
Turn-off fall time	t _f			7		
Source-Drain Diode characteristics						
Diode Forward Current	I _S				14	A
Diode Forward voltage ²⁾	V _{SD}	V _{GS} =0V, I _S =4A			1.2	V
Reverse Recovery Time	T _{rr}	V _{GS} =0V, I _S = 3A di/dt = 100A/μs		17		nS
Reverse Recovery Charge	Q _{rr}			9		nC

P-CH Electrical characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =-250μA	-60			V
Zero gate voltage drain current	I _{DSS}	V _{DS} =-60V, V _{GS} =0V			-1	μA
Gate-body leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.0	-1.6	-2.5	V
Drain-source on-resistance ²⁾	R _{DS(on)}	V _{GS} =-10V, I _D =-4A		75	100	mΩ
		V _{GS} =-4.5V, I _D =-3A		90	125	
Dynamic characteristics ³⁾						
Input Capacitance	C _{iss}	V _{DS} =-30V, V _{GS} =0V, f =1MHz		912		pF
Output Capacitance	C _{oss}			58		
Reverse Transfer Capacitance	C _{rss}			46		
Total Gate Charge	Q _g	V _{DS} =-30V, V _{GS} =-10V I _D =-4A		20		nC
Gate-Source Charge	Q _{gs}			3.3		
Gate-Drain Charge	Q _{gd}			3.4		
Turn-on delay time	t _{d(on)}	V _{DS} =-30V, V _{GS} =-10V R _L =7.5Ω, R _G =3Ω		8		nS
Turn-on rise time	t _r			4		
Turn-off delay time	t _{d(off)}			32		
Turn-off fall time	t _f			7		
Source-Drain Diode characteristics						
Diode Forward Current	I _S				-11	A
Diode Forward voltage ²⁾	V _{SD}	V _{GS} =0V, I _S =-4A			-1.2	V
Reverse Recovery Time	T _{rr}	V _{GS} =0V, I _F =-4A di/dt =-100A/μs		23		nS
Reverse Recovery Charge	Q _{rr}			11		nC

Notes:

1) The EAS data shows Max. rating. The test condition is N: V_{DD} = 30V, V_{GS} = 10V, L = 0.5mH; P: V_{DD} = -30V, V_{GS} = -10V, L = 0.5mH.

2) The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%.

3) Guaranteed by design, not subject to production.

N-Channel Typical Characteristics

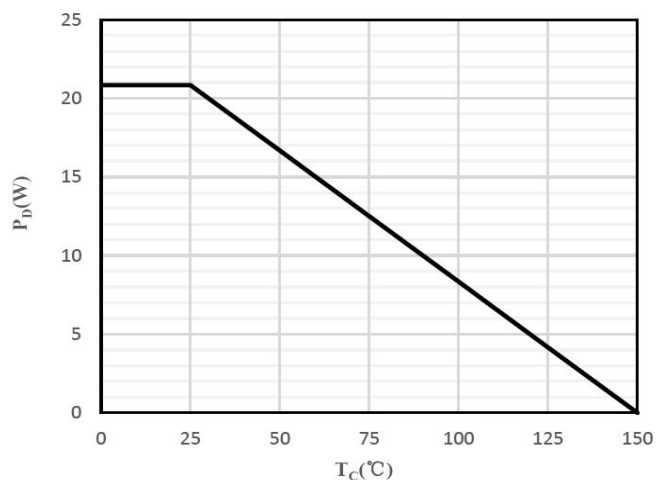


Fig 1 Power Dissipation

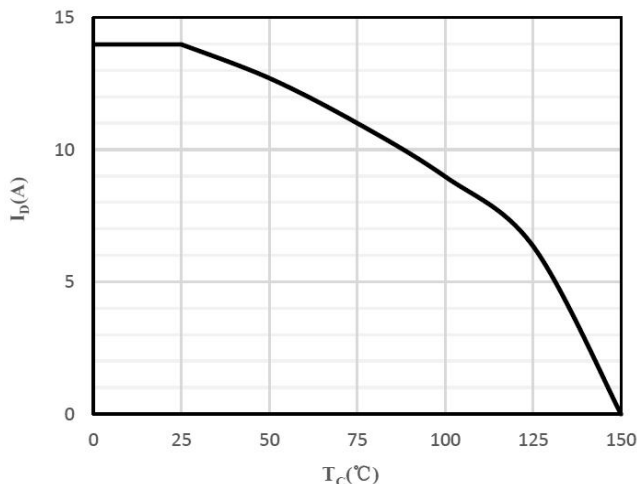


Fig 2 Drain Current

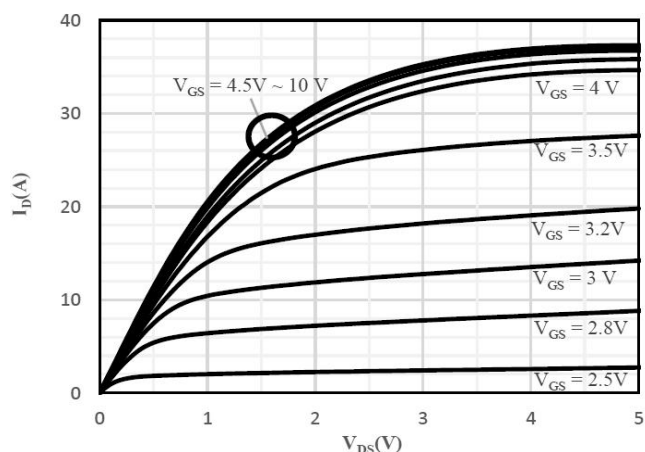


Fig 3 Typical Output Characteristics

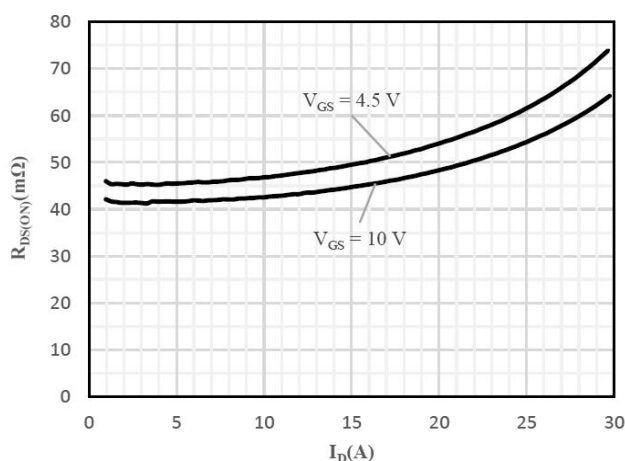


Fig 4 On-Resistance vs. Drain Current and Gate Voltage

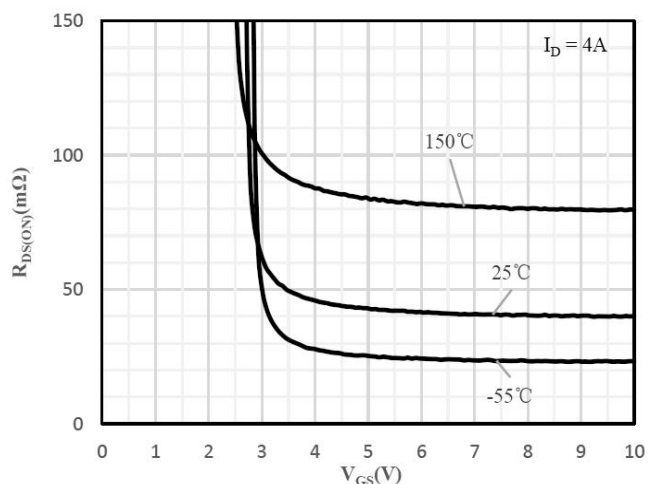


Fig 5 On-Resistance vs. Gate-Source Voltage

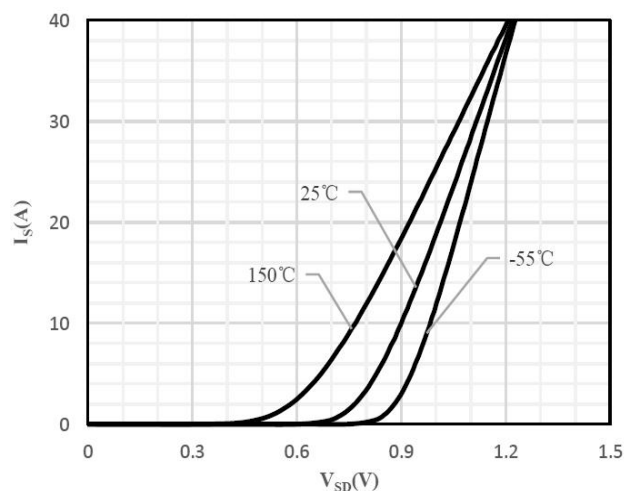


Fig 6 Body-Diode Characteristics

N-Channel Typical Characteristics

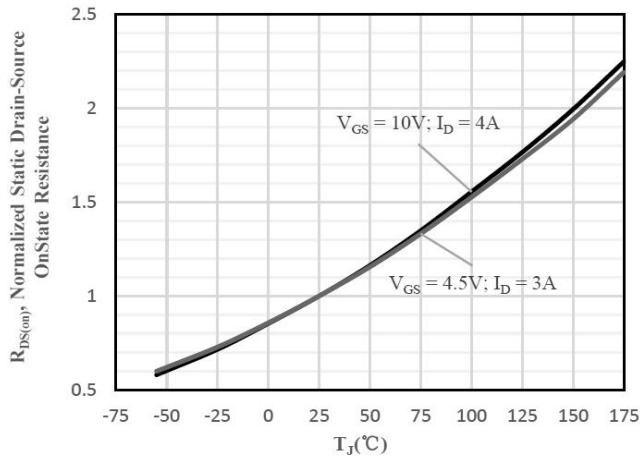


Fig 7 Normalized On-Resistance vs. Junction Temperature

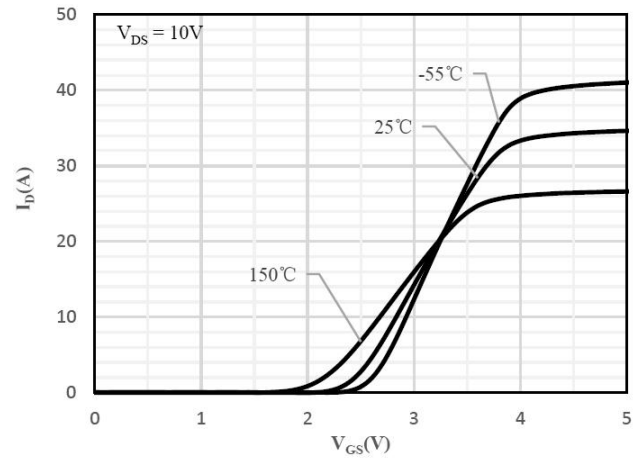


Fig 8 Transfer Characteristics

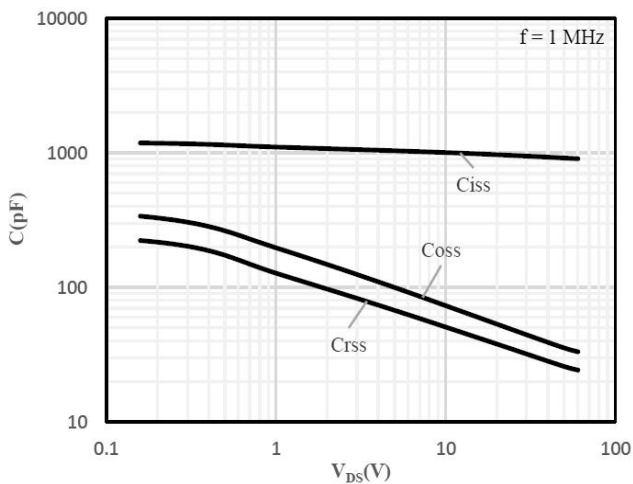


Fig 9 Capacitance Characteristics

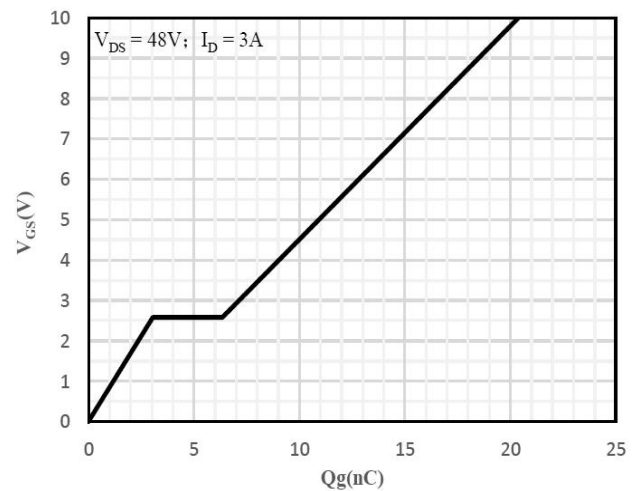


Fig 10 Gate-Charge Characteristics

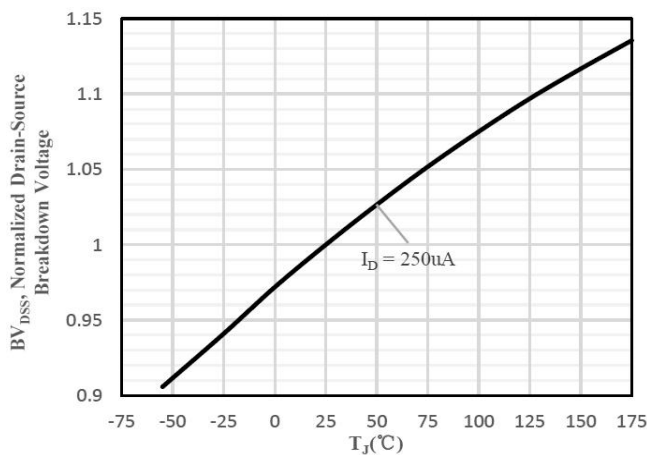


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

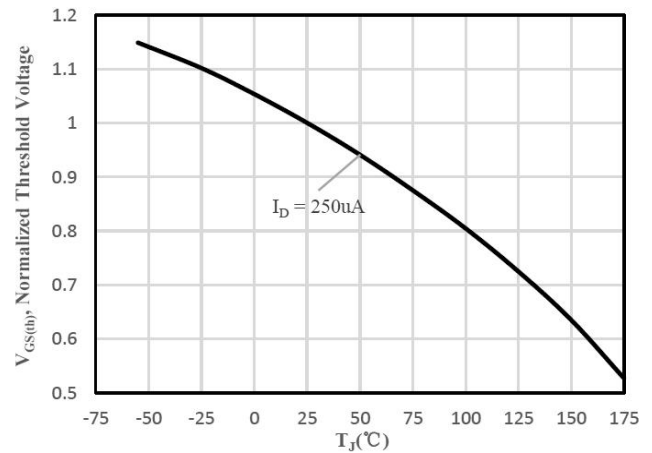


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature

N-Channel Typical Characteristics

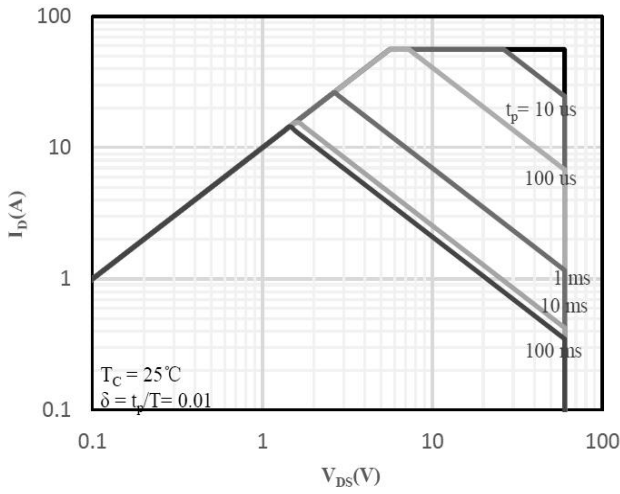


Fig 13 Safe Operating Area

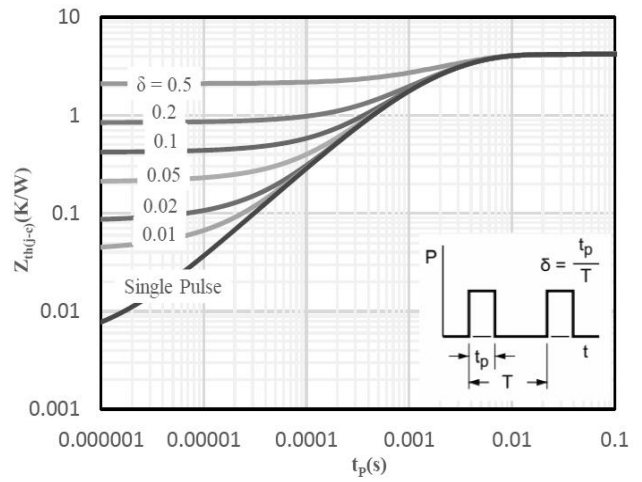


Fig 14 Maximum transient thermal impedance

P Channel Typical Characteristics

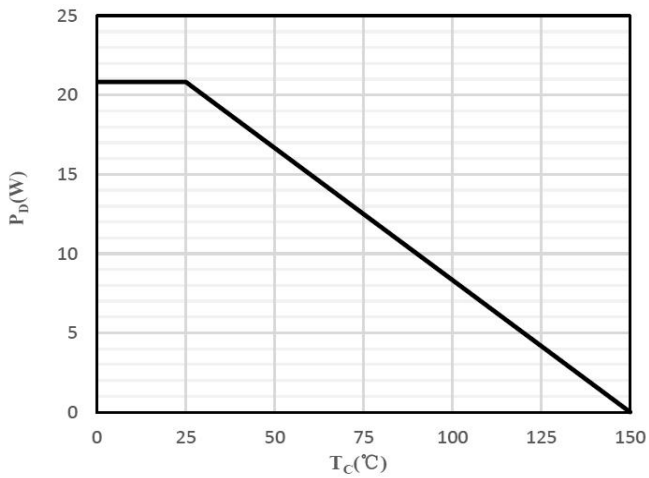


Fig 1 Power Dissipation

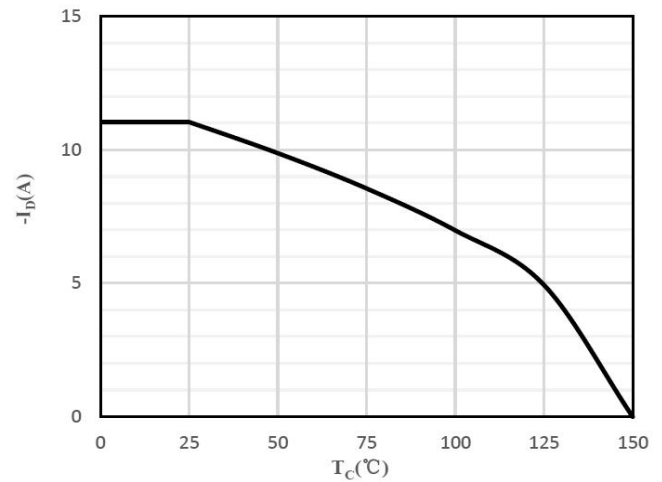


Fig 2 Drain Current

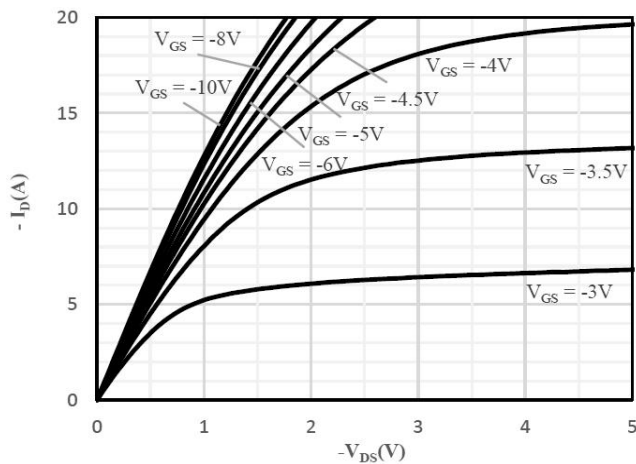


Fig 3 Typical Output Characteristics

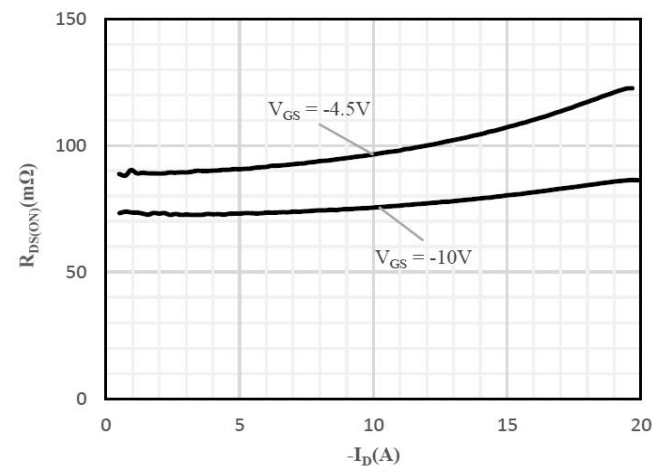


Fig 4 On-Resistance vs. Drain Current and Gate Voltage

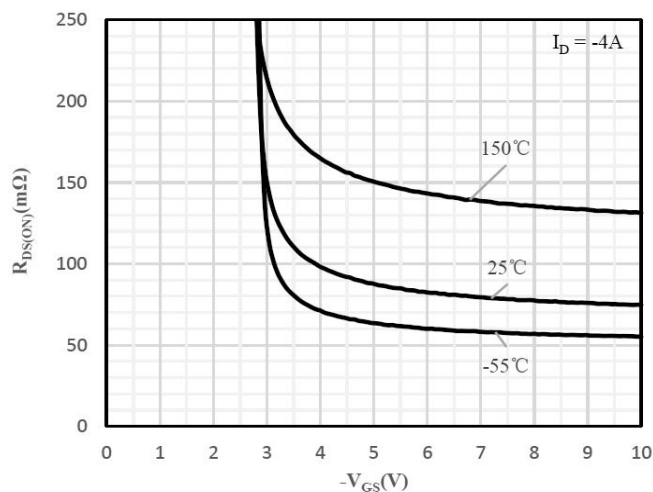


Fig 5 On-Resistance vs. Gate-Source Voltage

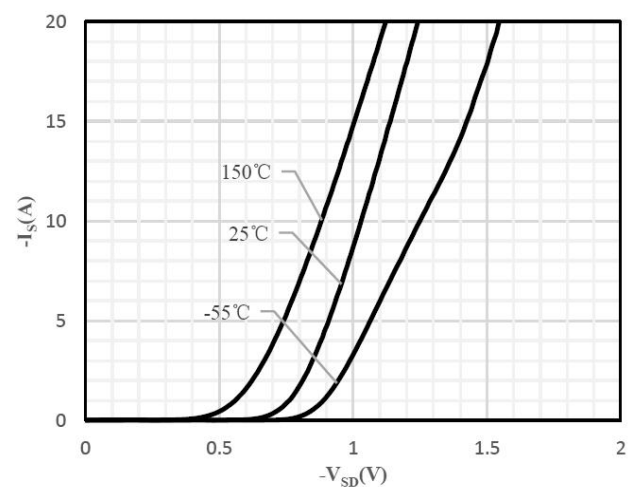


Fig 6 Body-Diode Characteristics

P- Channel Typical Characteristics

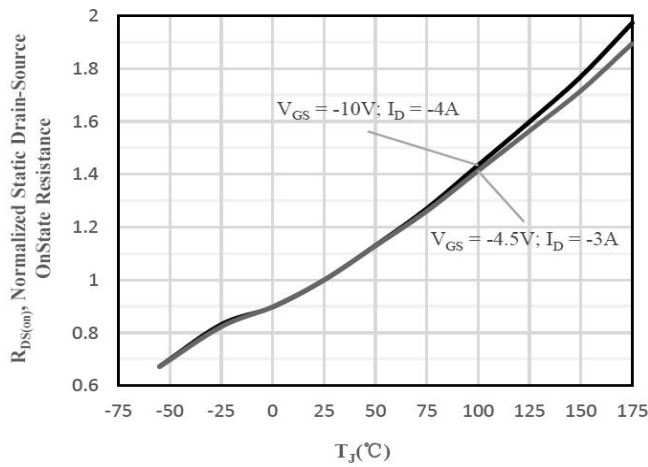


Fig 7 Normalized On-Resistance vs. Junction Temperature

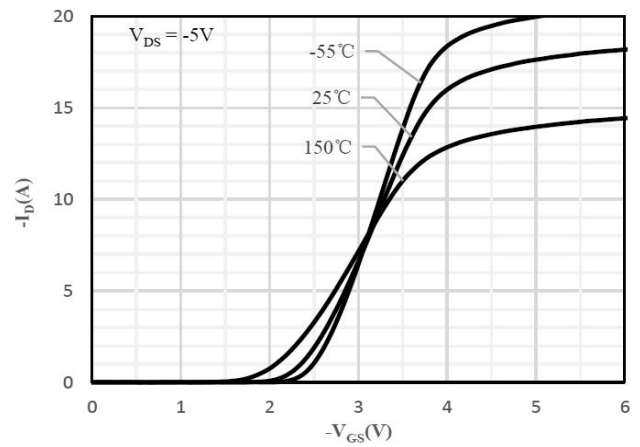


Fig 8 Transfer Characteristics

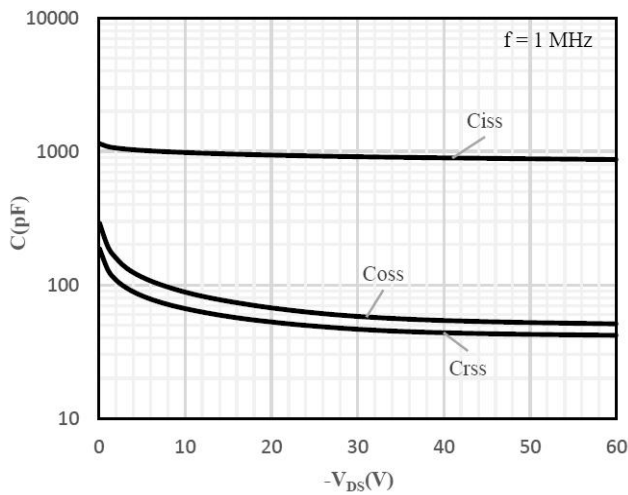


Fig 9 Capacitance Characteristics

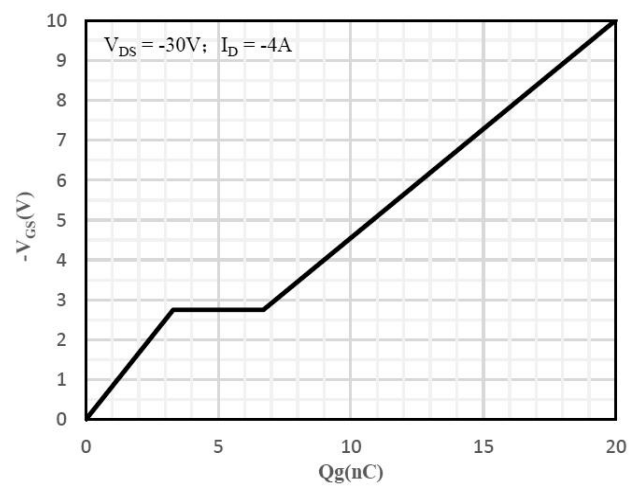


Fig 10 Gate-Charge Characteristics

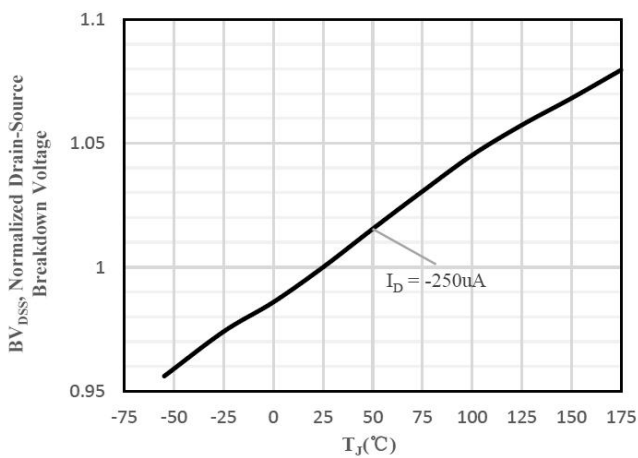


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

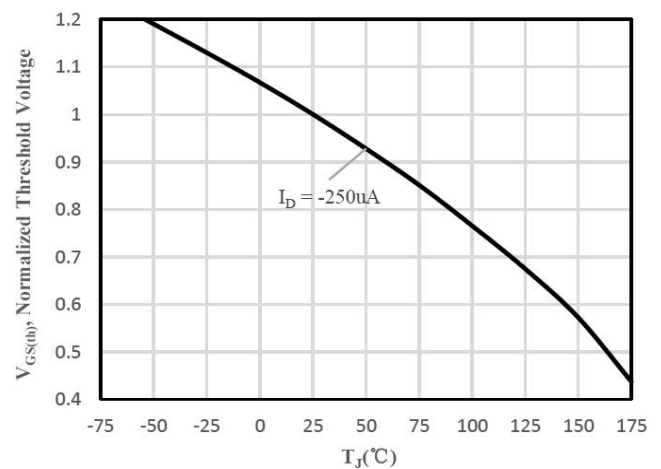


Fig 12 Normalized $V_{GS(th)}$ vs. Junction Temperature

P- Channel Typical Characteristics

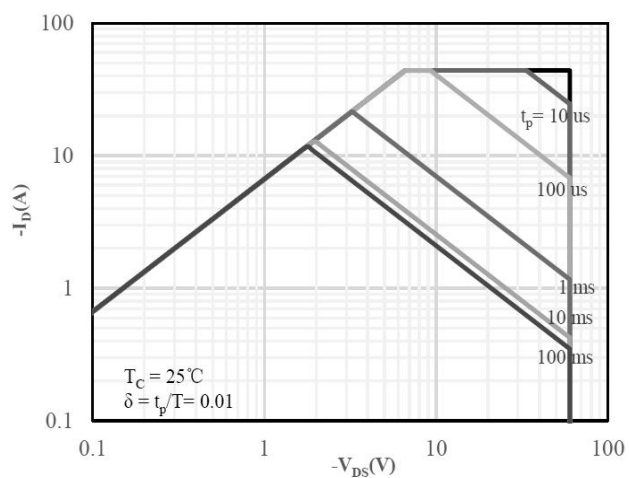


Fig 13 Safe Operating Area

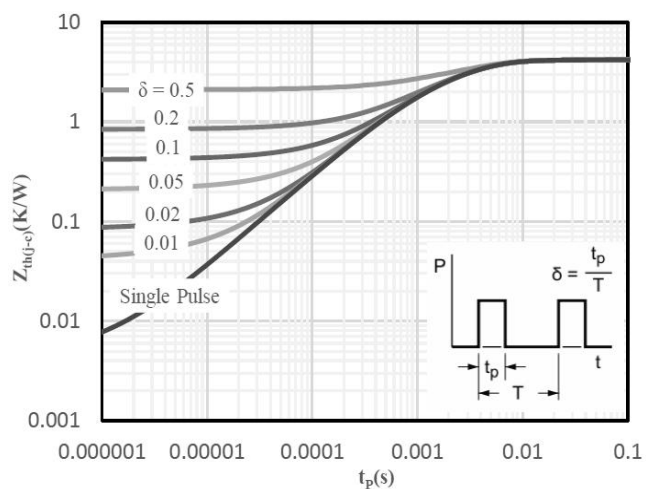
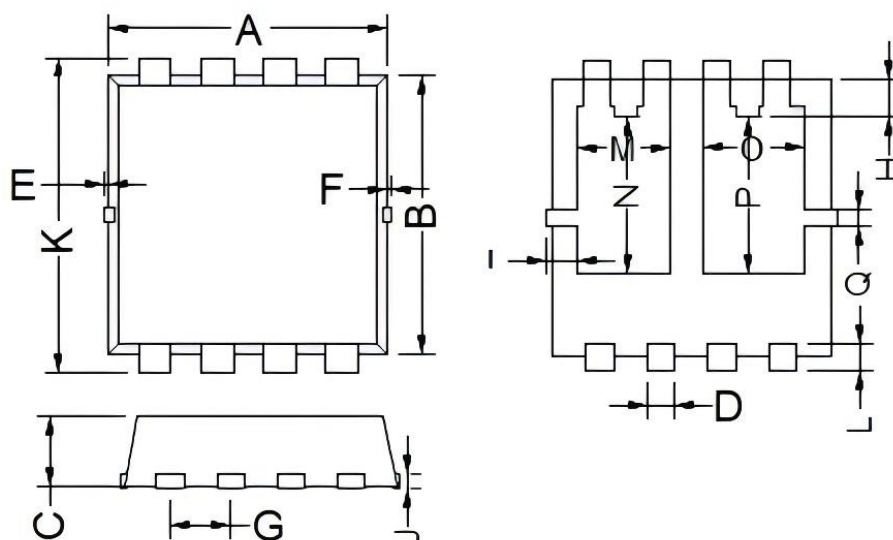


Fig 14 Maximum transient thermal impedance

PDFN3*3-8L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.900	3.100	0.114	0.122
B	2.900	3.100	0.114	0.122
C	0.550	0.750	0.022	0.030
D	0.200	0.400	0.008	0.016
E	0.000	0.200	0.000	0.008
F	0.000	0.200	0.000	0.008
G	0.550	0.750	0.022	0.030
H	0.200	0.400	0.008	0.016
I	0.200	0.400	0.008	0.016
J	0.100	0.200	0.004	0.008
K	3.150	3.450	0.124	0.136
L	0.250	0.450	0.010	0.018
M/O	0.900	1.200	0.035	0.047
N/P	1.650	1.850	0.065	0.073
Q	0.100	0.300	0.004	0.012