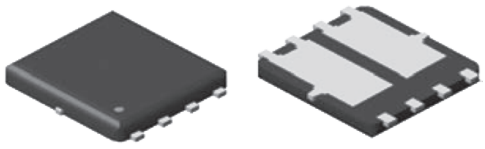
N-Ch and P-Ch MOSFET

2NP10

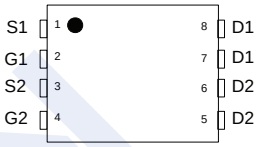
■ Features

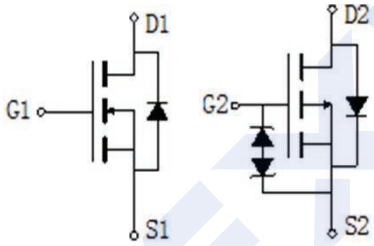
- N-Channel
  - V_{DS} = 40V
  - I_D = 40A
  - $R_{DS(ON)}$ = 12mΩ (Typ.) @ V_{GS}=10V
  - $R_{DS(ON)}$ = 17mΩ (Typ.) @ V_{GS}=4.5V
- P-Channel
  - V_{DS} = -40V
  - I_D = -40A
  - $R_{DS(ON)}$ = 21mΩ (Typ.) @ V_{GS}=-10V
  - $R_{DS(ON)}$ = 30mΩ (Typ.) @ V_{GS}=-4.5V
- Fast Switching Speed
- ESD Protected
- Low gate Charge

PDFN5x6-8A



Top View





■ Absolute Maximum Ratings (T_a = 25℃ Unless otherwise specified)

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V_{DS}	40	-40	V
Gate-Source Voltage		V_{GS}	±20	±20	
Continuous Drain Current (Note 1)	T_C=25℃	I_D	40	-40	A
	T_C=100℃		25	-25	
Pulsed Drain Current (Note 2)		I_{DM}	160	-160	
Single Pulse Avalanche Energy (Note 3)		E_{AS}	42	42	mJ
Maximum Power Dissipation (Note 4)	T_C=25℃	P_D	42	36	W
Thermal Resistance, Junction- to-Ambient (Note 1)		$R_{\theta JA}$	50		℃/W
Thermal Resistance, Junction- to-Case (Note 1)		$R_{\theta JC}$	3	3.5	
Junction Temperature		T_J	150		℃
Storage Temperature Range		T_{stg}	-55 to 150		

Notes 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 E_{AS} data shows Max. rating . The test condition is V_{DD}=25V,V_{GS}=10V,L=0.25mH,I_{AS}=17.8A.

4. The power dissipation is limited by 150℃ junction temperature.

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■ Electrical Characteristics (T_a = 25℃ Unless otherwise specified)

Parameter	Symbol	Test Conditions	Type	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage	V_{DSS}	I_D=250μA, V_{GS}=0V	N-CH	40			V
		I_D=-250μA, V_{GS}=0V	P-CH	-40			
Zero Gate Voltage Drain Current	I_{DSS}	VDS=40V, VGS=0V	N-CH			1	μA
		VDS=40V, VGS=0V, T_J=125°C				30	
		VDS=-40V, VGS=0V	P-CH			-1	
		VDS=-40V, VGS=0V, T_J=125°C				-30	
Gate-Body Leakage Current	I_{GSS}	VDS=0V, VGS=±20V	N-CH			±1	
		VDS=0V, VGS=±20V	P-CH			±10	
On Characteristics (Note 1)							
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS} , I_D=250μA	N-CH	1		2.5	V
		V_{DS}=V_{GS}, I_D=-250μA	P-CH	-1		-2.5	
Static Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=20A	N-CH		12	16	mΩ
		V_{GS}=4.5V, I_D=16A			17	22	
		V_{GS}=-10V, I_D=-20A	P-CH		21	25	
		V_{GS}=-4.5V, I_D=-16A			30	35	
Forward Transconductance	g_{FS}	V_{DS}=5V, I_D=12A	N-CH		8		S
		V_{DS}=-5V, I_D=-8A	P-CH		12.6		
Dynamic Characteristics (Note 2)							
Input Capacitance	C_{iss}	N-Channel: VGS=0V, V_{DS}=20V, f=1MHz P-Channel: VGS=0V, V_{DS}=-20V, f=1MHz	N-CH		880		pF
			P-CH		1900		
Output Capacitance	C_{oss}		N-CH		170		
			P-CH		245		
Reverse Transfer Capacitance	C_{rss}		N-CH		70		
			P-CH		135		
Switching Characteristics (Note 2)							
Total Gate Charge	Q_g	N-Channel: VGS=10V, V_{DS}=32V, I_D=20A P-Channel: VGS=-10V, V_{DS}=-32V, I_D=-20A	N-CH		18		nC
			P-CH		42		
Gate Source Charge	Q_{gs}		N-CH		6		
			P-CH		9		
Gate Drain Charge	Q_{gd}		N-CH		5		
			P-CH		14		
Turn-On DelayTime	$t_{d(on)}$	N-Channel: V_{DD}=20V, I_{DS}=20A V_{GEN}=10V, R_G=4.7Ω P-Channel: V_{DD}=-20V, I_{DS}=20A V_{GEN}=-10V, R_G=4.7Ω	N-CH		6		ns
			P-CH		15		
Turn-On Rise Time	t_r		N-CH		10		
			P-CH		43		
Turn-Off DelayTime	$t_{d(off)}$		N-CH		24		
			P-CH		24		
Turn-Off Fall Time	t_f		N-CH		5		
			P-CH		14		
Drain-Source Diode Characteristics							
Diode Forward Voltage	V_{SD}	I_S=20A,V_{GS}=0V	N-CH			1.2	
		I_S=-20A,V_{GS}=0V	P-CH			1.3	V

Notes 1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

2. Guaranteed by design, not subject to production

■ Marking

Marking	NP10 KA****

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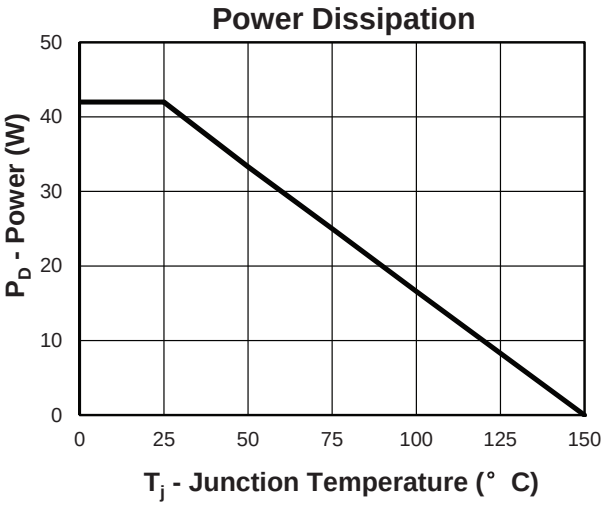
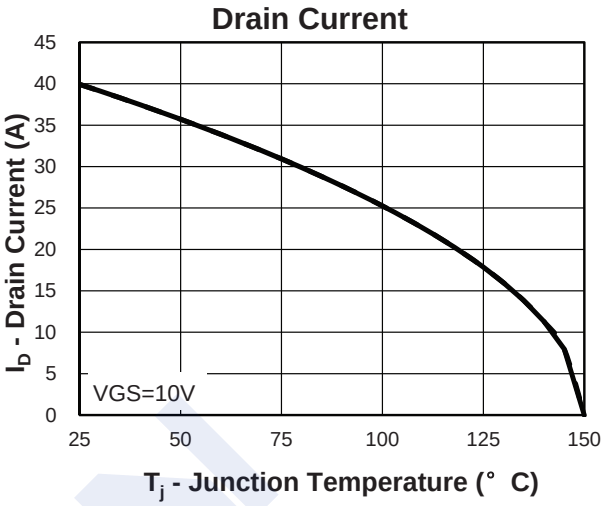
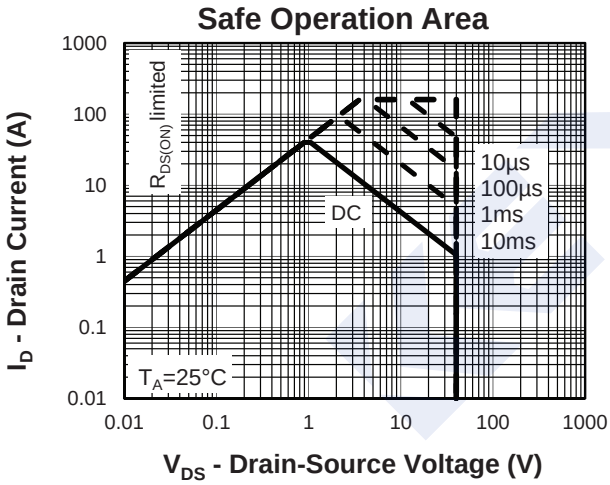
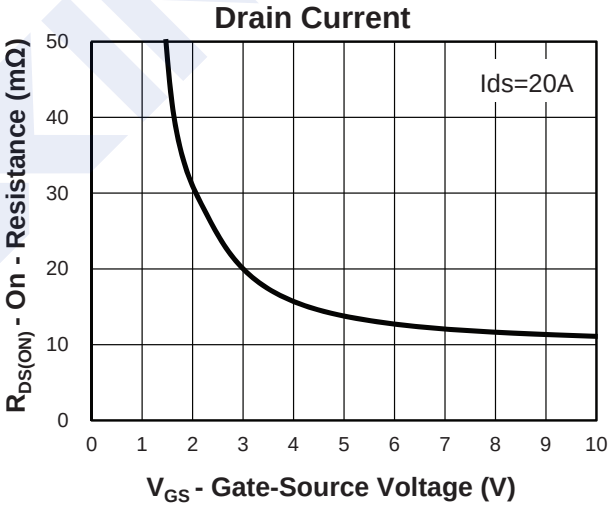
■ Typical Characterisitics (T_J = 25℃ unless othewise specified)

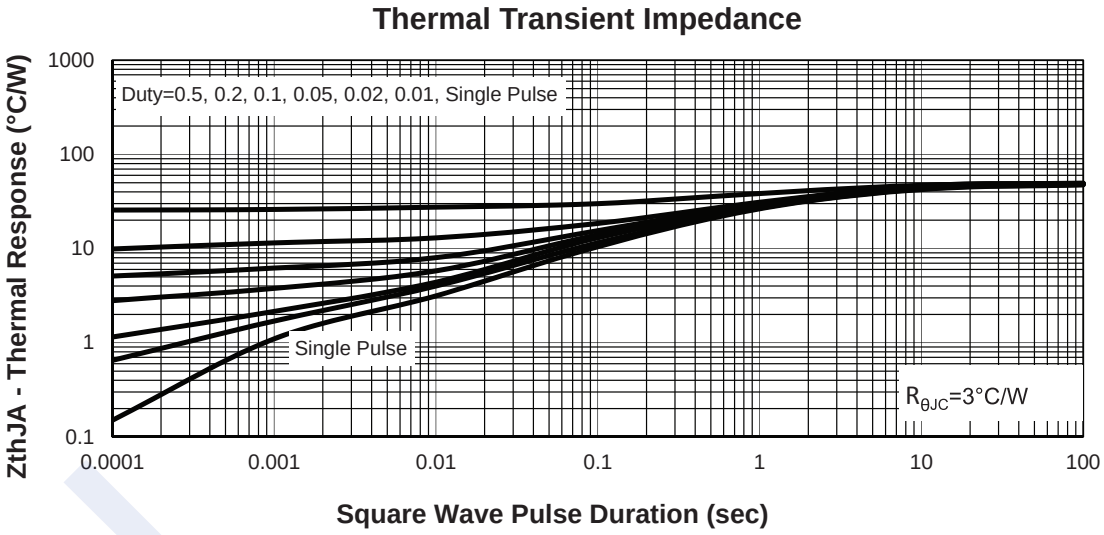
N-Channel Typical Characteristics











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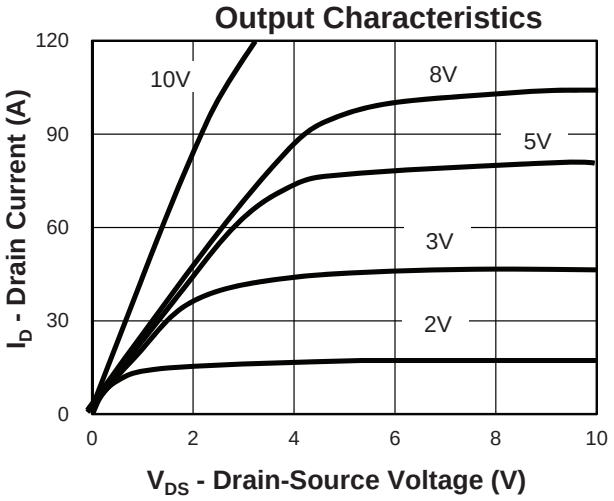
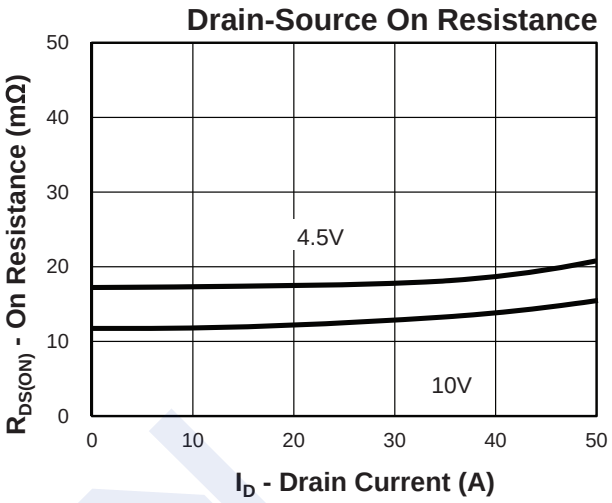
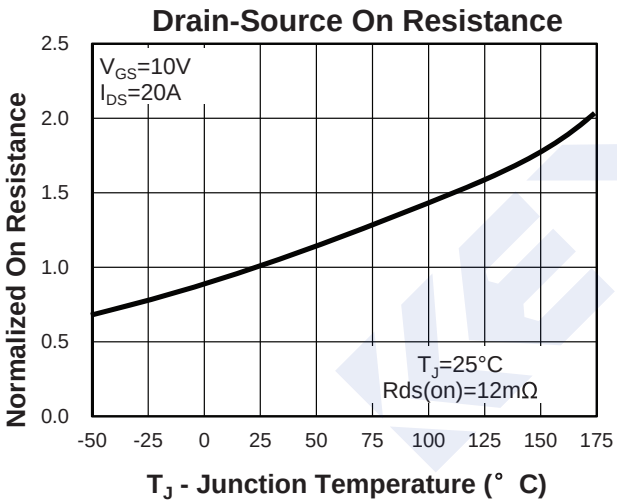
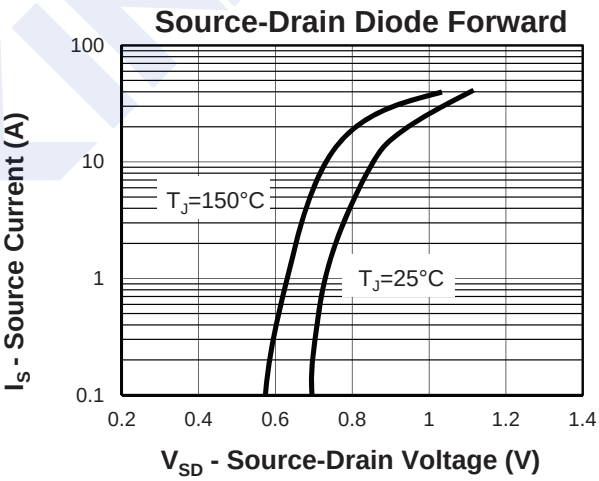
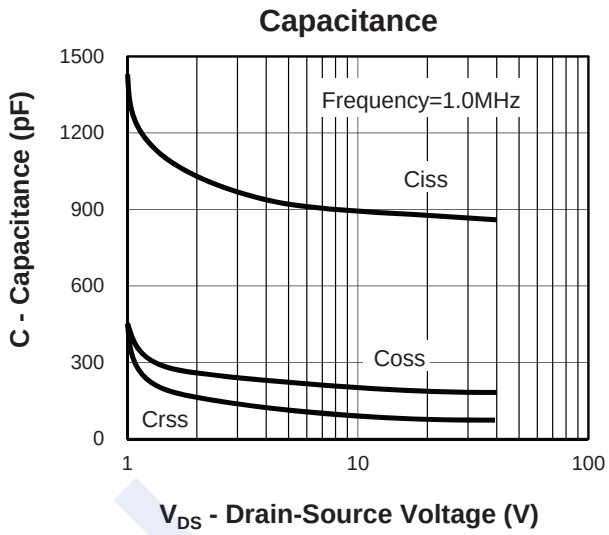
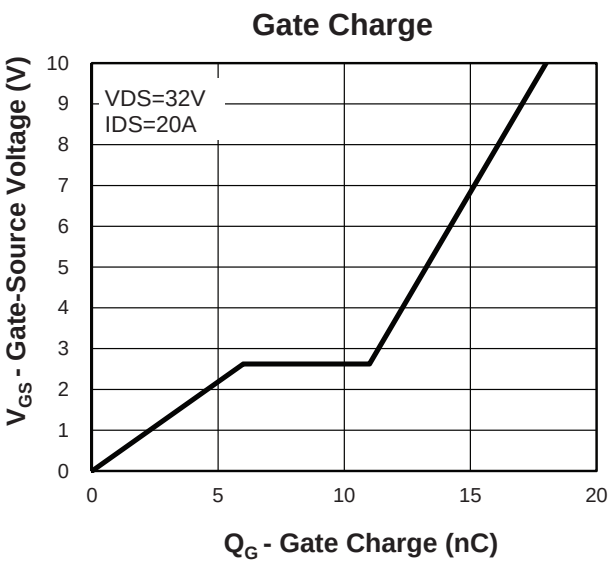

Output Characteristics
10V
8V
5V
3V
2V
I_D - Drain Current (A)
V_{DS} - Drain-Source Voltage (V)


Drain-Source On Resistance
4.5V
10V
$R_{DS(ON)}$ - On Resistance (mΩ)
I_D - Drain Current (A)


Drain-Source On Resistance
V_{GS}=10V
I_{DS}=20A
T_J=25°C
Rds(on)=12mΩ
Normalized On Resistance
T_J - Junction Temperature (° C)


Source-Drain Diode Forward
T_J=150°C
T_J=25°C
I_S - Source Current (A)
V_{SD} - Source-Drain Voltage (V)


Capacitance
Frequency=1.0MHz
Ciss
Coss
Crss
C - Capacitance (pF)
V_{DS} - Drain-Source Voltage (V)


Gate Charge
VDS=32V
IDS=20A
V_{GS} - Gate-Source Voltage (V)
Q_G - Gate Charge (nC)

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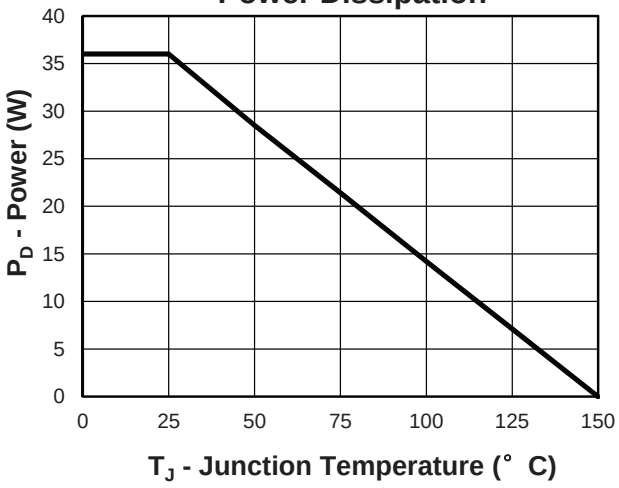
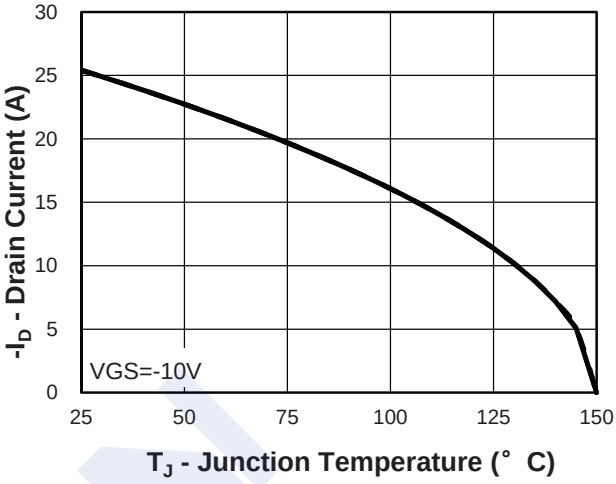
P-Channel Typical Characteristics

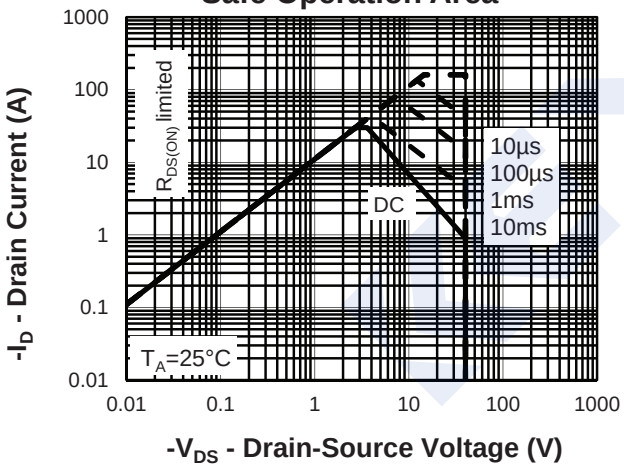
Power Dissipation



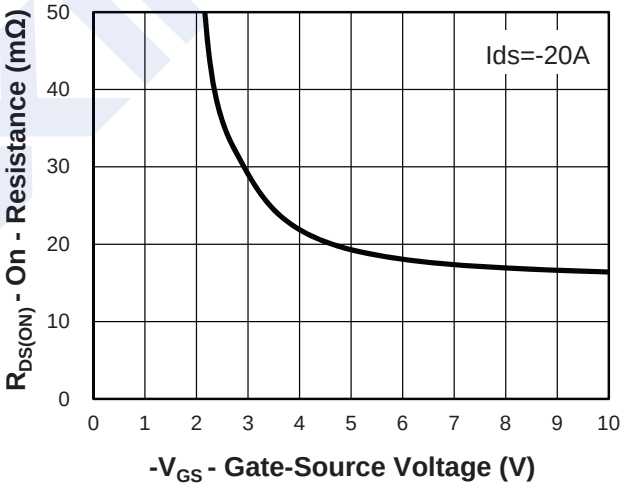
Drain Current



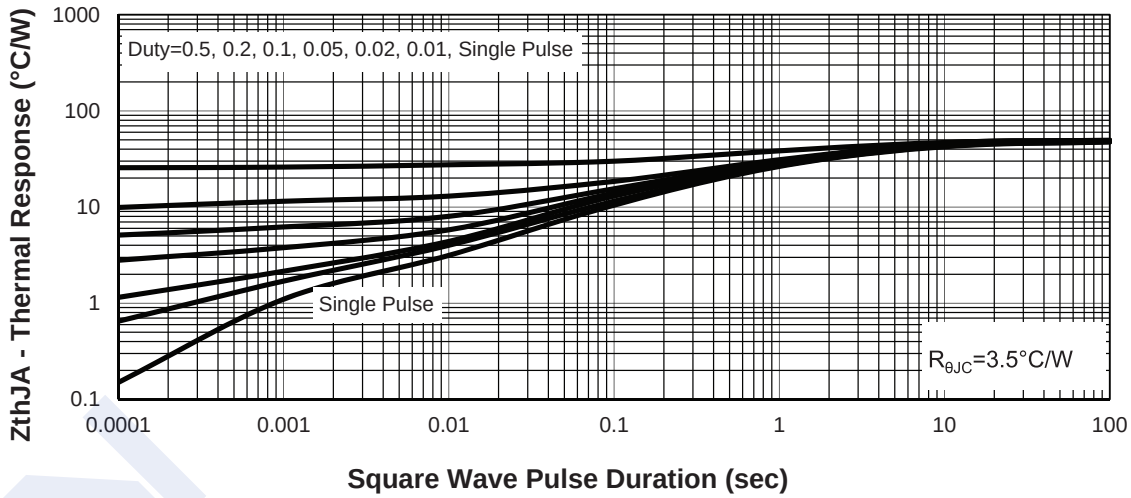
Safe Operation Area



Drain Current



Thermal Transient Impedance



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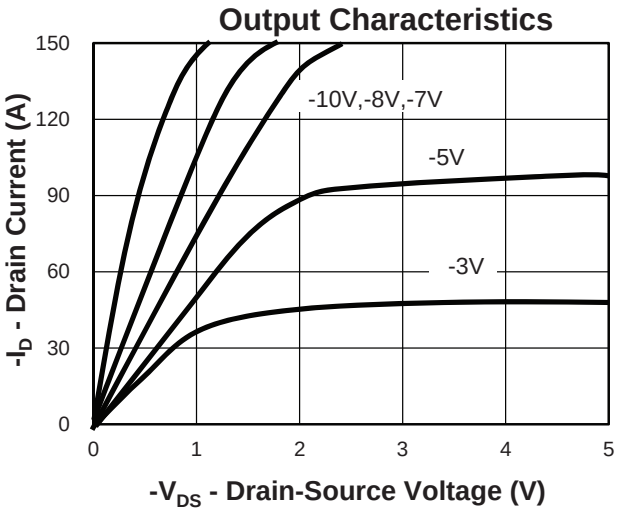
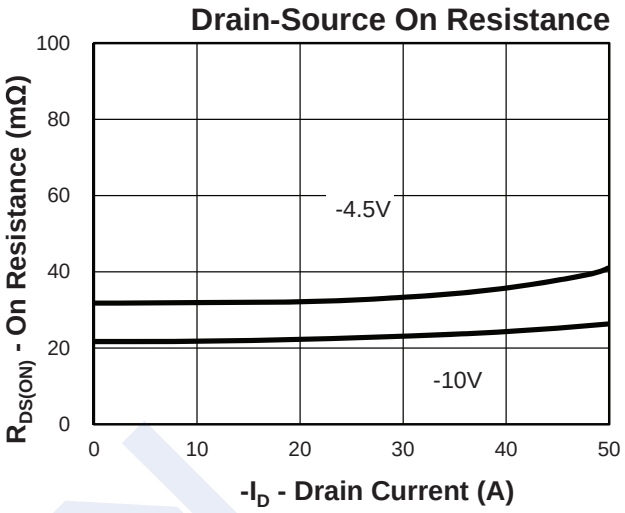
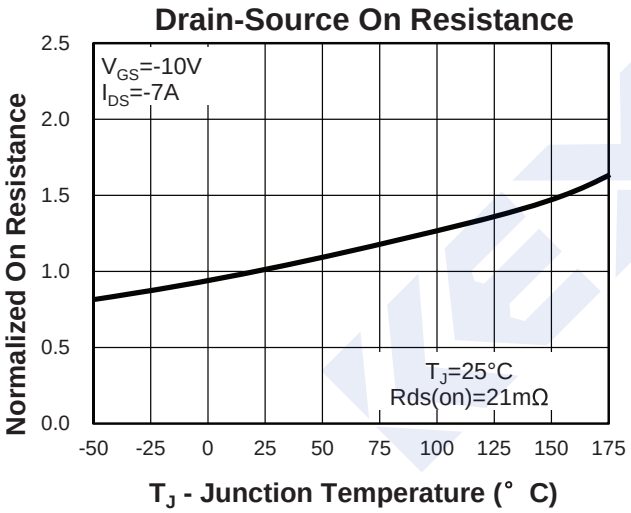
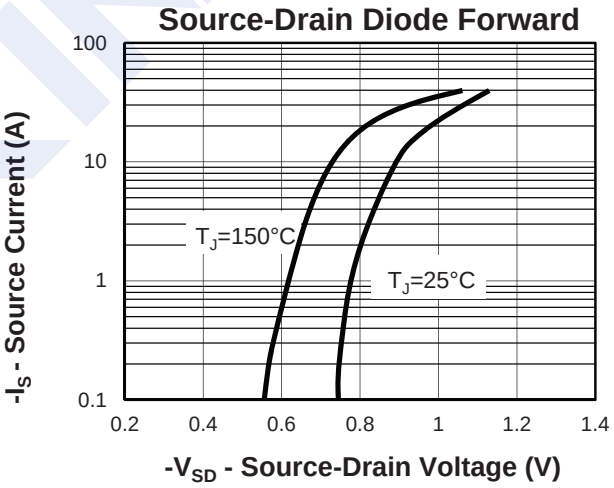
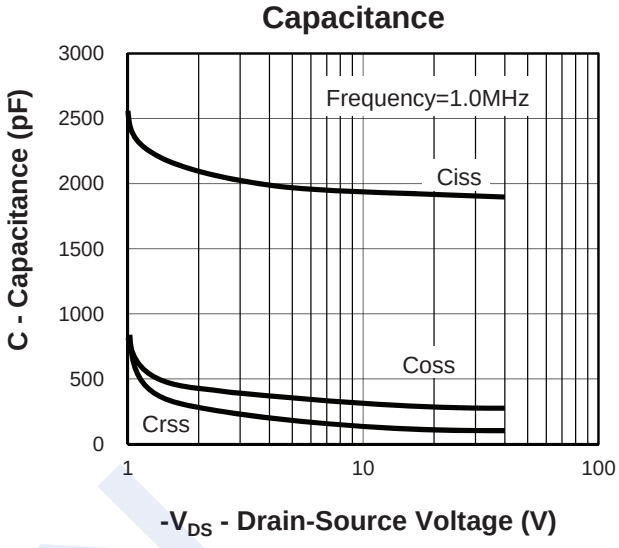
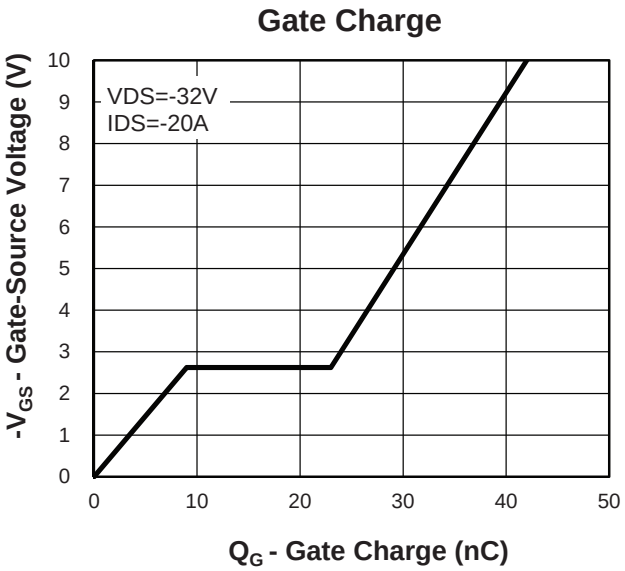

Output Characteristics
-ID - Drain Current (A)
-VDS - Drain-Source Voltage (V)
-10V,-8V,-7V
-5V
-3V
150
120
90
60
30
0
0
1
2
3
4
5


Drain-Source On Resistance
RDS(ON) - On Resistance (mΩ)
-ID - Drain Current (A)
-4.5V
-10V
100
80
60
40
20
0
0
10
20
30
40
50


Drain-Source On Resistance
Normalized On Resistance
TJ - Junction Temperature (° C)
VGS=-10V
IDS=-7A
TJ=25°C
Rds(on)=21mΩ
2.5
2.0
1.5
1.0
0.5
0.0
-50
-25
0
25
50
75
100
125
150
175


Source-Drain Diode Forward
-IS - Source Current (A)
-VSD - Source-Drain Voltage (V)
TJ=150°C
TJ=25°C
100
10
1
0.1
0.2
0.4
0.6
0.8
1
1.2
1.4


Capacitance
C - Capacitance (pF)
-VDS - Drain-Source Voltage (V)
Frequency=1.0MHz
Ciss
Coss
Crss
3000
2500
2000
1500
1000
500
0
1
10
100


Gate Charge
-VGS - Gate-Source Voltage (V)
QG - Gate Charge (nC)
VDS=-32V
IDS=-20A
10
9
8
7
6
5
4
3
2
1
0
0
10
20
30
40
50

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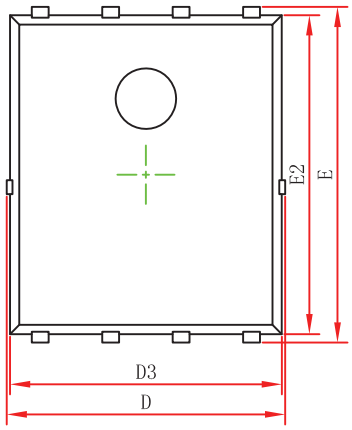
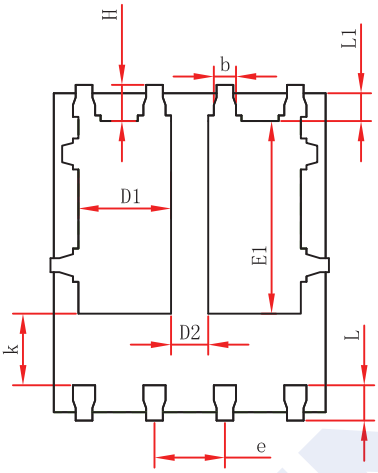
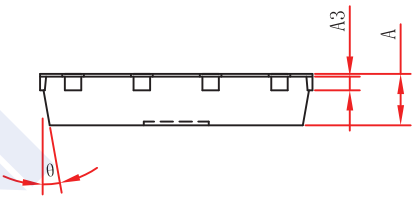
■ PDFN5x6-8A Package Outline Dimensions



Top View



Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254 REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	1.470	1.870	0.058	0.074
D2	0.470	0.870	0.019	0.034
E1	3.375	3.575	0.133	0.141
D3	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	10°	12°	10°	12°