

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
40V	20mΩ@10V	14A
	26mΩ@4.5V	
-40V	46mΩ@-10V	-14A
	75mΩ@-4.5V	

Feature

- Trench Technology Power MOSFET
- Low $R_{DS(ON)}$
- Low Gate Charge
- Low Gate Resistance

Application

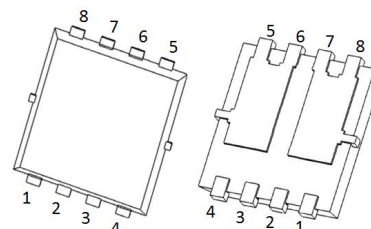
- PWM Applications
- Loas Switch
- Power Management

MARKING:

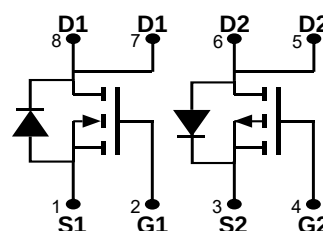


M400NP04L = Device Code
 XX = Data Code
 Solid Dot = Green Device Indicator

PDFN3.3X3.3-8L



Schematic diagram



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter		Symbol	NMOS	PMOS	Unit
Drain-Source Voltage		V_{DS}	40	-40	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current ¹	$T_C = 25^\circ\text{C}$	I_D	14	-14	A
	$T_C = 100^\circ\text{C}$		8.9	-8.9	
Pulsed Drain Current ²		I_{DM}	56	-56	A
Single Pulsed Avalanche Current ³		I_{AS}	10	-11	A
Single Pulsed Avalanche Energy ³		E_{AS}	28	35	mJ
Power Dissipation ⁵	$T_C = 25^\circ\text{C}$	P_D	2	3.2	W
Thermal Resistance from Junction to Case		$R_{\theta JC}$	8.8	8.8	$^\circ\text{C/W}$
Junction Temperature		T_J	150	150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55~ +150	-55~ +150	$^\circ\text{C}$

MOSFET ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
NMOS:

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = 250μA	40			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 40V, V _{GS} = 0V			1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} = ±20V, V _{DS} = 0V			±100	nA
On Characteristics ³						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250μA	1.3	1.6	3.0	V
Drain-Source On-Resistance	R _{DS(on)}	V _{GS} = 10V, I _D = 6.0A		20	36	mΩ
		V _{GS} = 4.5V, I _D = 6.0A		26	56	
Dynamic Characteristics						
Input Capacitance	C _{iSS}	V _{DS} = 20V, V _{GS} = 0V, f = 1MHz		767		pF
Output Capacitance	C _{oSS}			60		
Reverse Transfer Capacitance	C _{rSS}			46		
Gate Resistance	R _g	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz		2.3		Ω
Switching Characteristics						
Total Gate Charge	Q _g	V _{DS} = 20V, V _{GS} = 10V, I _D = 6A		15.3		pC
Gate-Source Charge	Q _{gs}			2.5		
Gate-Drain Charge	Q _{gd}			3.5		
Turn-On Delay Time	t _{d(on)}	V _{DD} = 20V, V _{GS} = 10V, R _L = 2.5Ω R _G = 3Ω		5		ns
Turn-On Rise Time	t _r			3		
Turn-Off Delay Time	t _{d(off)}			15		
Turn-Off Fall Time	t _f			2		
Source-Drain Diode Characteristics						
Diode Forward Voltage ³	V _{SD}	V _{GS} = 0V, I _S = 1.0A			1.2	V

PMOS:

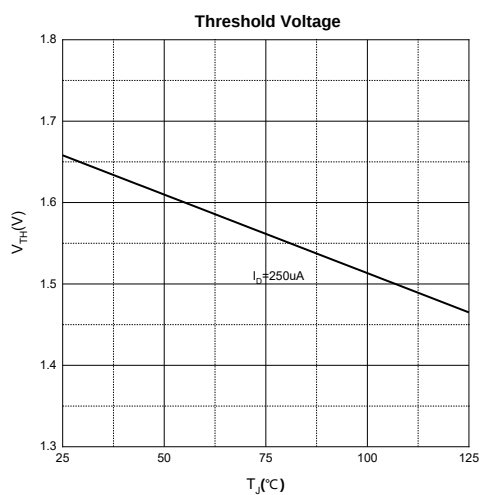
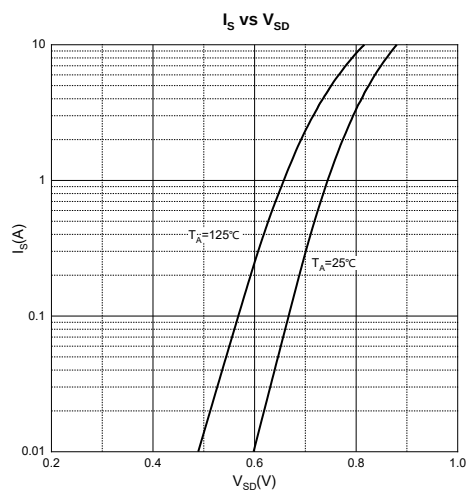
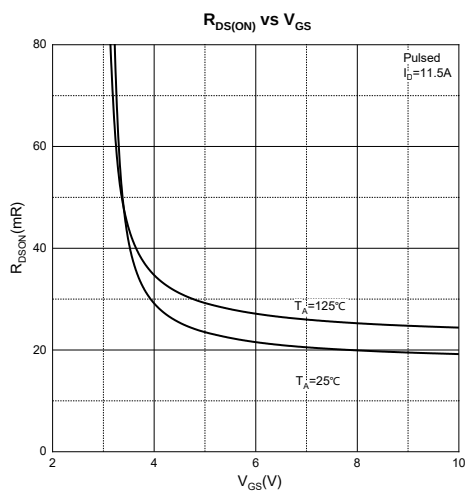
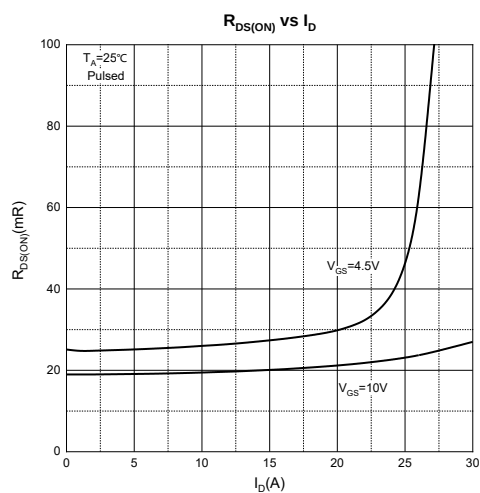
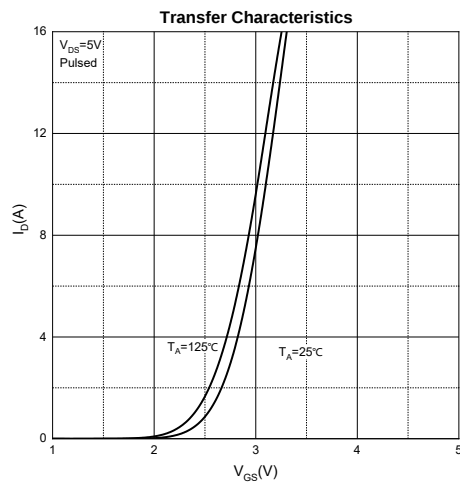
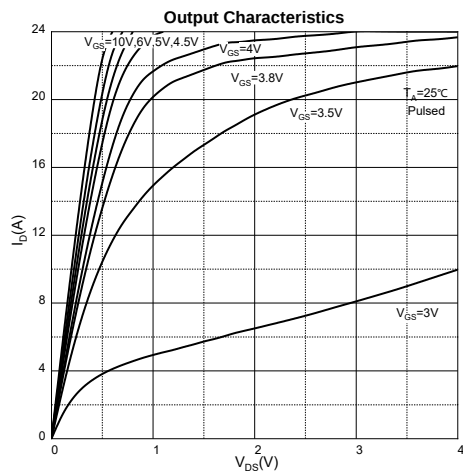
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-40			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -40V, V_{GS} = 0V$			-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 100	nA
On Characteristics ³						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1.3	-2.1	-3.0	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = -10V, I_D = -5.0A$		46	60	m Ω
		$V_{GS} = -4.5V, I_D = -5.0A$		75	98	
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS} = -20V, V_{GS} = 0V, f = 1MHz$		677		pF
Output Capacitance	C_{oss}			70		
Reverse Transfer Capacitance	C_{rss}			53		
Gate Resistance	R_g	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$		25		Ω
Switching Characteristics						
Total Gate Charge	Q_g	$V_{DS} = -20V, V_{GS} = -10V, I_D = -5A$		13		pC
Gate-Source Charge	Q_{gs}			2.5		
Gate-Drain Charge	Q_{gd}			3		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -20V, V_{GS} = -10V, R_L = 2.3\Omega$ $R_G = 6\Omega$		8		ns
Turn-On Rise Time	t_r			6		
Turn-Off Delay Time	$t_{d(off)}$			20		
Turn-Off Fall Time	t_f			7		
Source-Drain Diode Characteristics						
Diode Forward Voltage ³	V_{SD}	$V_{GS} = 0V, I_S = -1.0A$			-1.2	V

Notes :

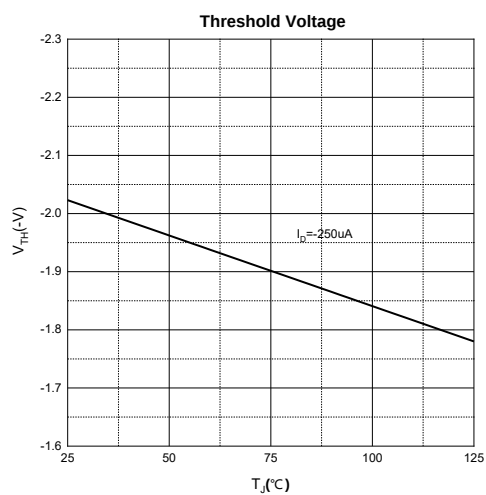
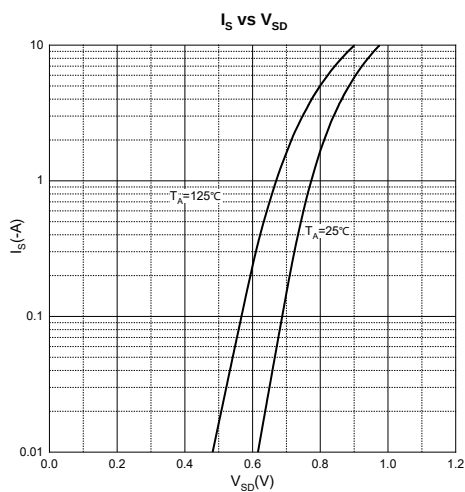
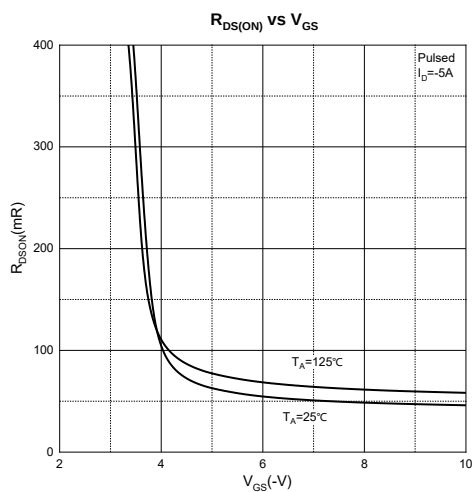
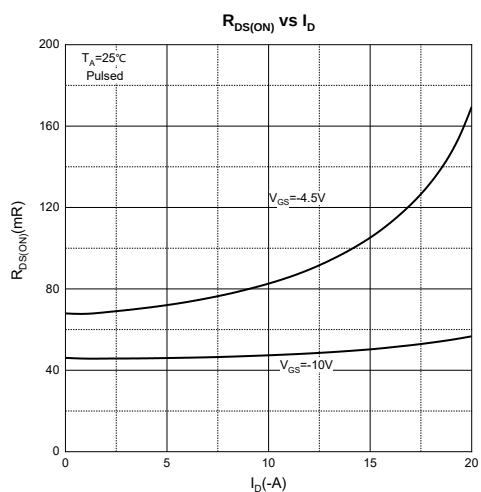
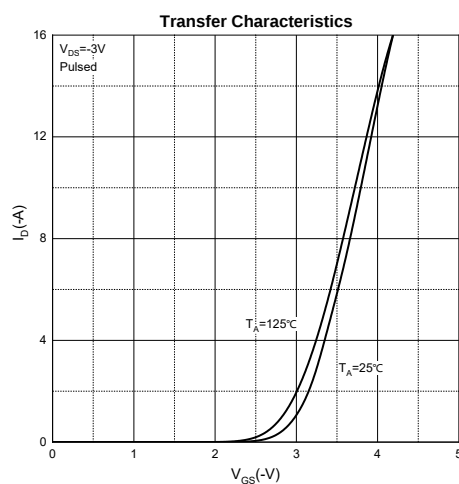
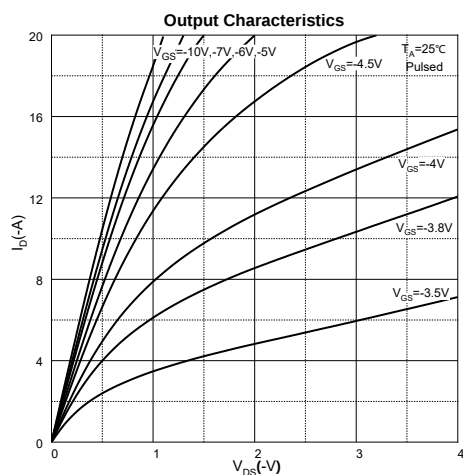
- 1.The maximum current rating is limited by package. And device mounted on a large heatsink.
- 2.Pulse Test : Pulse Width $\leq 10\mu s$, duty cycle $\leq 1\%$.
- 3.EAS condition: $V_{DD} = 20V, V_{GS} = 10V, L = 0.5mH, R_G = 25\Omega$ Starting $T_J = 25^\circ C$.
- 4.Pulse Test : Pulse Width $\leq 300\mu s$, duty cycle $\leq 2\%$.
- 5.The power dissipation P_D is limited by $T_{J(MAX)} = 40^\circ C$. And device mounted on a large heatsink.
- 6.Device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ C$.

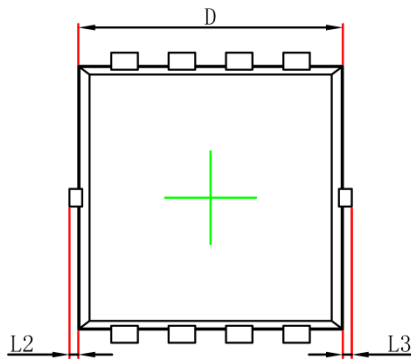
Typical Characteristics

NMOS:

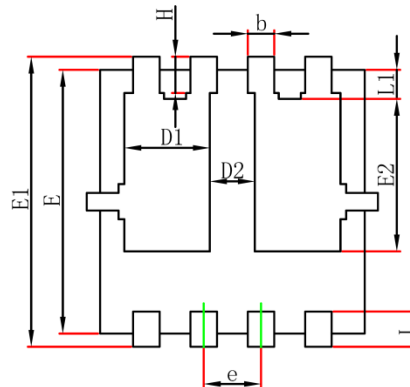


PMOS:

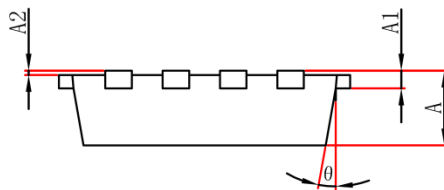


PDFN3.3X3.3-8L Package Information


Top View
[顶视图]



Bottom View
[背视图]



Side View
[侧视图]

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.900	0.028	0.035
A1	0.152REF		0.006REF	
A2	0.000	0.050	0.000	0.002
D	2.900	3.200	0.114	0.126
D1	0.935	1.135	0.037	0.045
D2	0.280	0.480	0.011	0.019
E	2.900	3.200	0.114	0.126
E1	3.150	3.450	0.124	0.136
E2	1.535	1.935	0.060	0.076
b	0.200	0.400	0.008	0.016
e	0.550	0.750	0.022	0.030
L	0.300	0.500	0.012	0.020
L1	0.180	0.480	0.007	0.019
L2	0.000	0.100	0.000	0.004
L3	0.000	0.100	0.000	0.004
H	0.315	0.515	0.012	0.020
θ	0°	12°	0°	12°

Attention:

- GreenPower Electronics reserves the right to improve product design function and reliability without notice.
- Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.
- GreenPower Electronics products belong to consumer electronics or other civilian electronic products.