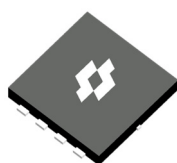
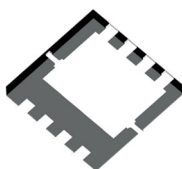


Product Summary

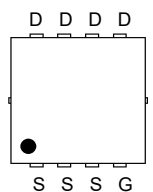
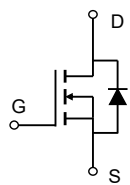
V_{DS}	$R_{DS(ON)_TYP}$	I_{D_MAX}
40 V	9.0 m Ω @ $V_{GS} = 10V$	35 A
	11.6 m Ω @ $V_{GS} = 4.5V$	

PDFN3333-8L


Top View



Bottom View


 PIN Configuration
(Top View)


Schematic Diagram

Features

- Low On-Resistance
- Excellent FoM (figure of merit)
- 100% ΔV_{DS} & UIS & Rg tested


Applications

- Load switching
- Motor driver
- High frequency switching, synchronous rectification

Mechanical Data

- Green molding compound
- Moisture sensitivity: level 1 per J-STD-020
- UL flammability classification rating 94V-0

Ordering Information

Orderable Part Number	Package Type	Device Marking	Form	Quantity (pcs)
SMN4013ALR	PDFN3333-8L	N4013AL	13" Tape&Reel	5,000

Maximum Ratings (@ $T_C = 25^\circ\text{C}$, unless otherwise specified.)

Parameter	Symbol	Value	Unit
Drain - Source Voltage	V_{DS}	40	V
Gate - Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($V_{GS} = 10V$) ⁽¹⁾	I_D	35	A
		22	A
Pulsed Drain Current ⁽²⁾	I_{DM}	107	A
Single Pulse Avalanche Energy ⁽³⁾	E_{AS}	53	mJ
Single Pulse Avalanche Current ($L = 0.1mH$)	I_{AS}	17	A
Power Dissipation	P_D	29	W
		11.6	W
Junction & Storage Temperature Range	T_J, T_{STG}	-55 ~ +150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient ⁽⁴⁾	$R_{\theta JA}$	55	68	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case ⁽⁵⁾	$R_{\theta JC}$	3.3	4.3	$^\circ\text{C/W}$

Electrical Characteristics (@ $T_J = 25^\circ\text{C}$, unless otherwise specified.)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Off Characteristics ⁽⁶⁾						
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	-	-	1.0	μA
		T _J = 125°C	-	-	100	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} = ±20V, V _{DS} = 0V	-	-	±100	nA
On Characteristics ⁽⁶⁾						
Gate Threshold Voltage	V _{GS(th)}	V _{GS} = V _{DS} , I _D = 250μA	1.0	1.5	2.0	V
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} = 10V, I _D = 20A	-	9.0	13.0	mΩ
		V _{GS} = 4.5V, I _D = 15A	-	11.6	20	mΩ
Forward Transconductance	g _{fs}	V _{DS} = 5.0V, I _D = 20A	-	24	-	S
Diodes Forward Voltage	V _{SD}	I _S = 2.0A, V _{GS} = 0V	-	0.7	1.2	V
Dynamic Characteristics ⁽⁷⁾						
Input Capacitance	C _{iss}	V _{DS} = 20V, V _{GS} = 0V, f = 1MHz	-	1143	-	pF
Output Capacitance	C _{oss}		-	112	-	pF
Reverse Transfer Capacitance	C _{rss}		-	92	-	pF
Gate Resistance	R _g	V _{GS} = 0V, V _{DS} = 0V, f = 1MHz	-	1.8	-	Ω
Switching Characteristics ⁽⁷⁾						
Turn-On DelayTime	t _{d(on)}	V _{GS} = 10V, V _{DS} = 20V I _D = 20A, R _{GEN} = 3.0Ω	-	6.4	-	ns
Rise Time	t _r		-	14	-	ns
Turn-Off DelayTime	t _{d(off)}		-	23	-	ns
Fall Time	t _f		-	8.2	-	ns
Gate Charge Characteristics ⁽⁷⁾						
Total Gate Charge (V _{GS} = 10V)	Q _g	V _{DS} = 20V, I _D = 20A V _{GS} = 10V	-	23	-	nC
Total Gate Charge (V _{GS} = 4.5V)	Q _g		-	11	-	nC
Gate-Source Charge	Q _{gs}		-	2.9	-	nC
Gate-Drain Charge	Q _{gd}		-	4.4	-	nC
Gate Plateau Voltage	V _{plateau}		-	2.9	-	V
Drain-Source Diode Characteristics ⁽⁷⁾						
Body Diode Reverse Recovery Time	t _{rr}	I _F = 20A, dI/dt = 100A/μs, T _J = 25°C	-	12	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	4.0	-	nC
Diode Forward Current	I _S	T _C = 25°C	-	-	35	A

Notes:

1. This current is chip limited, which is calculated based on R_{thjc} .
2. This current is calculated on single pulse with 10 μs Pulse.
3. Defined by design, not subject to production test, E_{AS} condition: $T_J=25^\circ\text{C}$, $V_{DD}=-15V$, $V_{GS}=-10V$, $L=1.0\text{mH}$.
4. Device mounted on FR-4 substrate PC board with 2oz copper in 1inch square cooling area.
5. Thermal resistance from junction to the exposed drain pad.
6. Short duration pulse test used to minimize self-heating effect.
7. Defined by design, not subject to production.

Typical Electrical and Thermal Characteristics

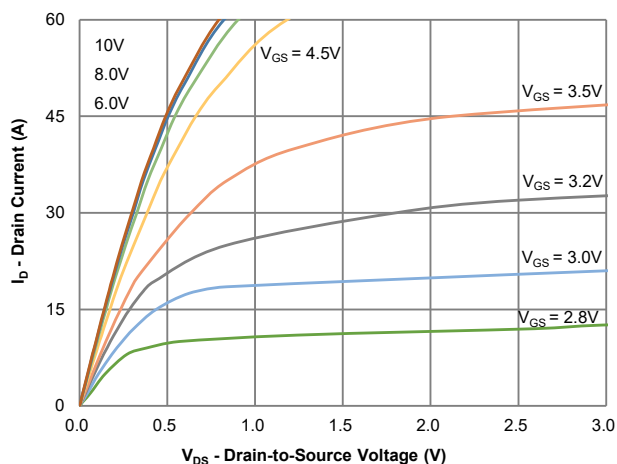


Figure 1: Output Characteristics

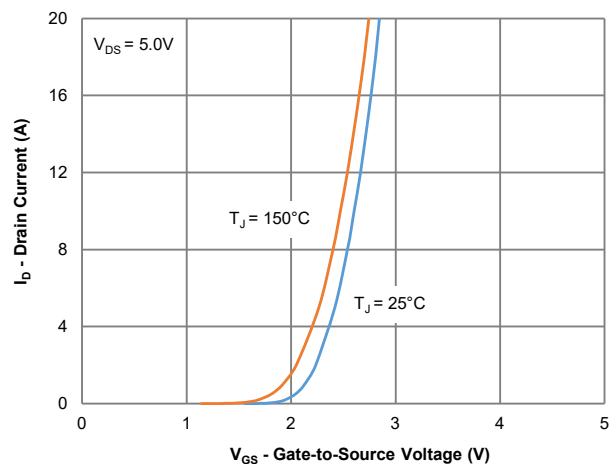


Figure 2: Transfer Characteristics

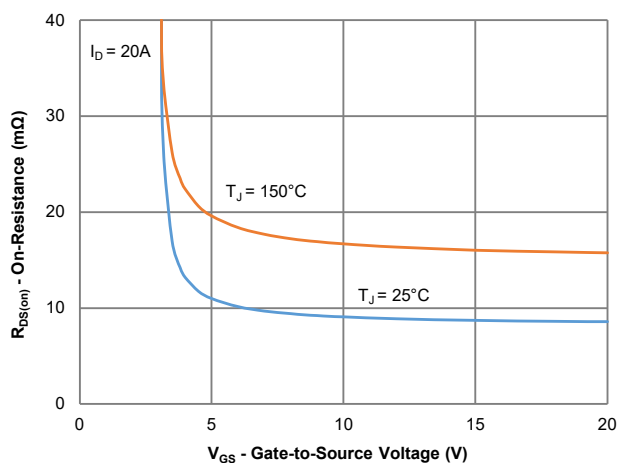


Figure 3: On-Resistance vs. Gate-Source Voltage

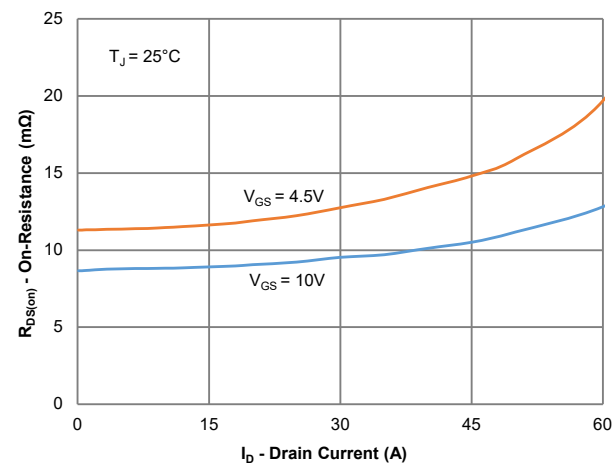


Figure 4: On-Resistance vs. Drain Current and Gate Voltage

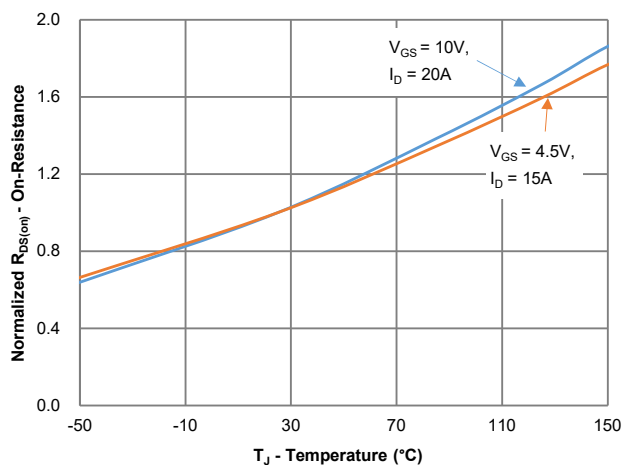


Figure 5: On-Resistance vs. Junction Temperature

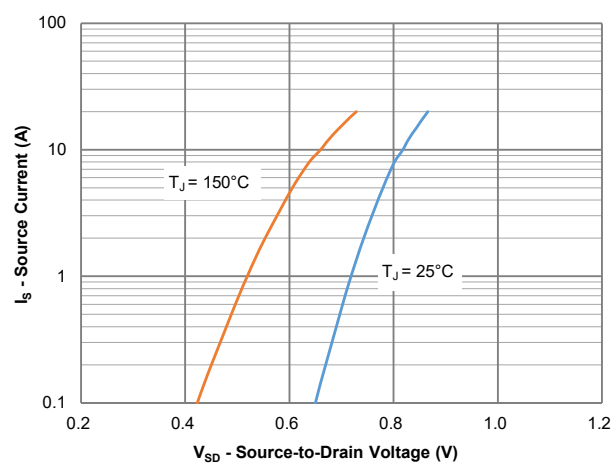
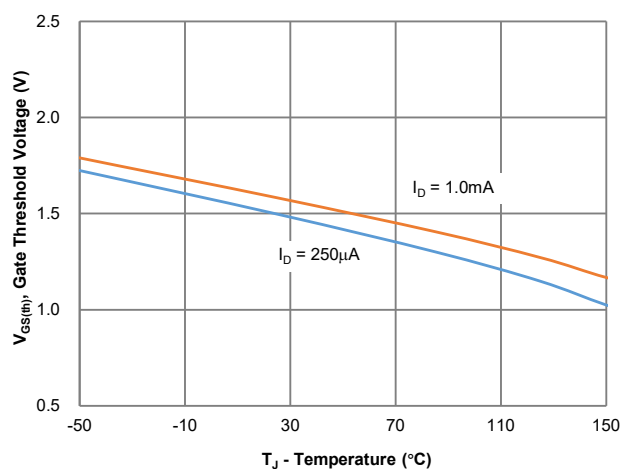
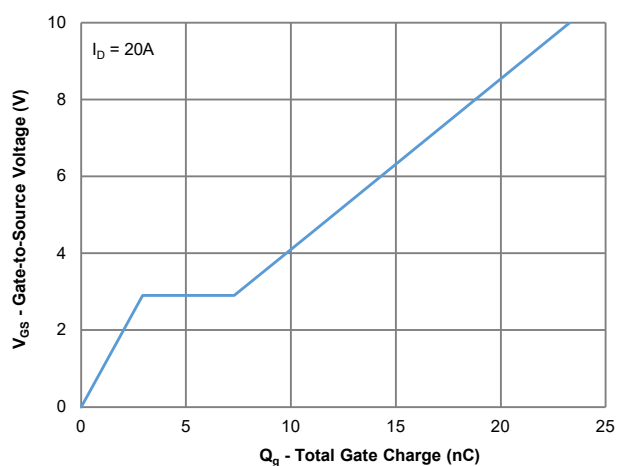
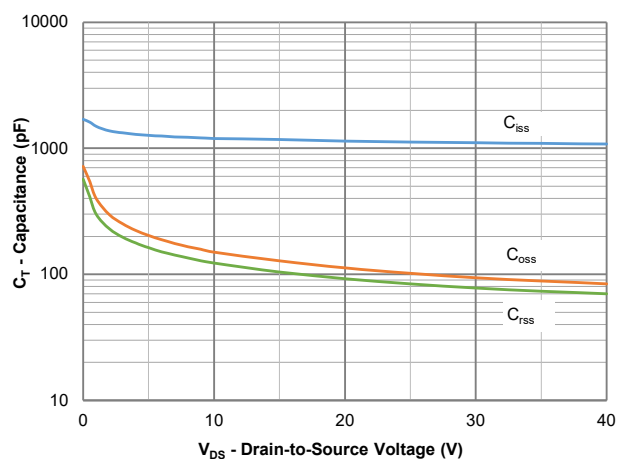
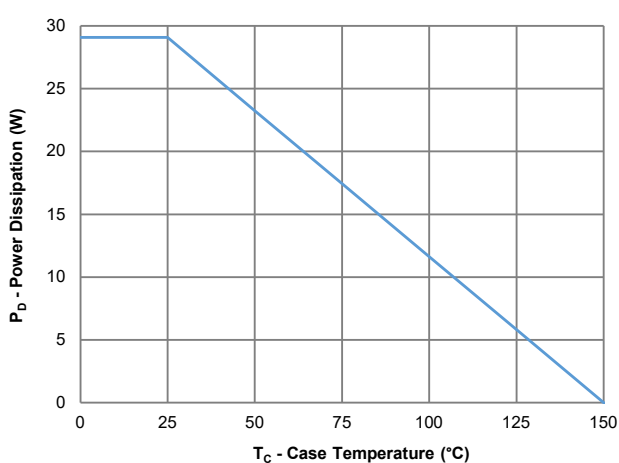
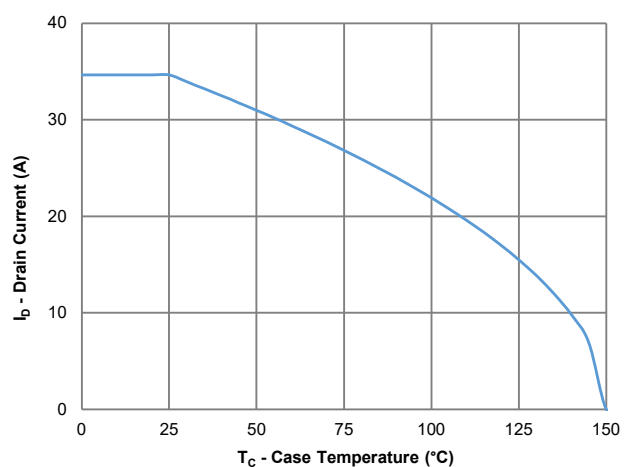
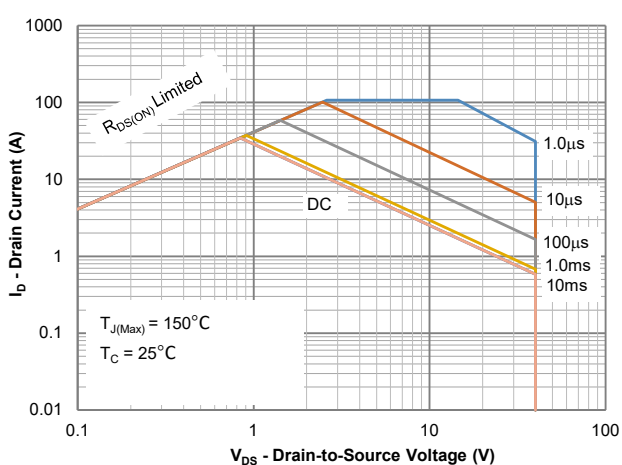
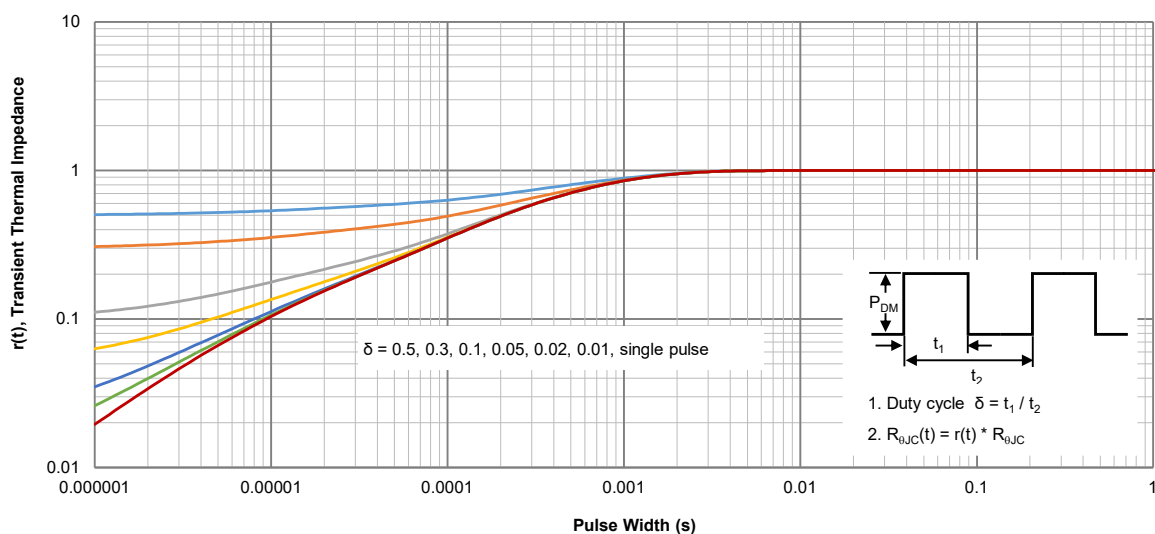
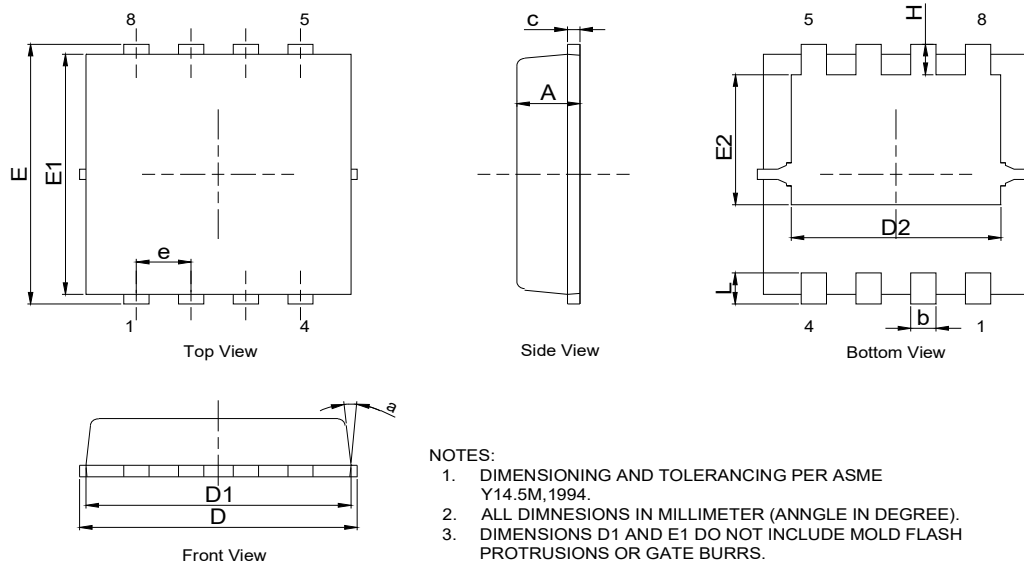


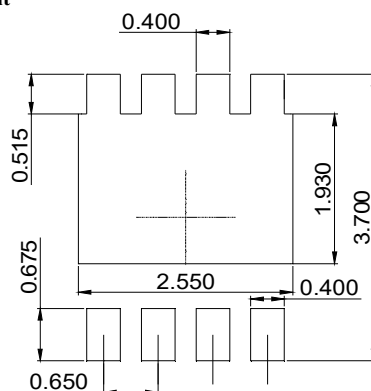
Figure 6: Source-Drain Diode Forward Voltage

Typical Electrical and Thermal Characteristics

Figure 7: Gate Threshold Variation vs. Junction Temperature

Figure 8: Gate Charge Characteristics

Figure 9: Capacitance Characteristics

Figure 10: Power Derating

Figure 11: Current Derating

Figure 12: Safe Operating Area

Typical Electrical and Thermal Characteristics

Figure 13: Normalized Maximum Transient Thermal Impedance

PDFN3333-8L Package Outline
Package Outline


DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	0.70	0.80	0.90
b	0.20	0.30	0.40
c	0.10	0.15	0.25
D	3.10	3.30	3.40
D1	3.00	3.15	3.25
D2	2.35	--	2.69
E	3.20	3.35	3.45
E1	2.85	3.10	3.20
E2	1.48	--	1.98
e	0.65 BSC		
H	0.25	--	0.60
L	0.25	0.40	0.50
a	---	---	15°

Recommended Soldering Footprint


DIMENSIONS: MILLIMETERS