

N-Ch 20V Fast Switching MOSFETs

- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

Product Summary



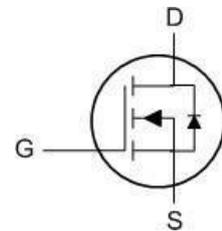
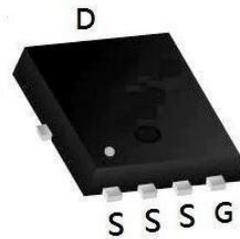
BVDSS	RDS(on)	ID
20V	4.0 mΩ	60A

Description

The XR60N02D is the high cell density trenched N-ch MOSFETs, which provide excellent RDS(on) and gate charge for most of the synchronous buck converter applications.

The XR60N02D meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

PDFN3333-8L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	20	V
V <sub>GS</sub>	Gate-Source Voltage	±12	V
I <sub>D</sub> @T <sub>C</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	60	A
I <sub>D</sub> @T <sub>C</sub> =100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	33	A
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>	220	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	46	mJ
I <sub>AS</sub>	Avalanche Current	25	A
P <sub>D</sub> @T <sub>C</sub> =25°C	Total Power Dissipation <sup>4</sup>	15	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sup>1</sup>	---	4.5	°C/W

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=20V, V_{GS}=0V,$	-	-	1.0	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	0.4	0.7	1.1	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note3</small>	$V_{GS}=4.5V, I_D=30A$	-	4.0	5	m $\Omega$
		$V_{GS}=2.5V, I_D=20A$	-	6.0	9	
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=10V, V_{GS}=0V,$ $f = 1.0MHz$	-	2500	-	pF
$C_{oss}$	Output Capacitance		-	407	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	386	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=10V, I_D=30A,$ $V_{GS}=4.5V$	-	32	-	nC
$Q_{gs}$	Gate-Source Charge		-	3	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	11	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=10V,$ $I_D=30A, R_{GEN}=3\Omega,$ $V_{GS}=4.5V$	-	17	-	ns
$t_r$	Turn-on Rise Time		-	49	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	74	-	ns
$t_f$	Turn-off Fall Time		-	26	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	75	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	300	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0V, I_S=30A$	-	-	1.2	V

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition:  $T_J=25^\circ\text{C}$ ,  $V_{DD}=10V$ ,  $V_G=4.5V$ ,  $L=0.5mH$ ,  $R_G=25\Omega$ ,  $I_{AS}=15A$

3. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 0.5\%$

Typical Performance Characteristics

Figure 1: Output Characteristics

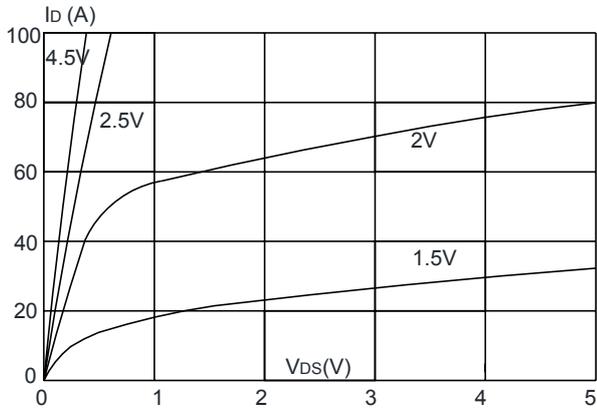


Figure 2: Typical Transfer Characteristics

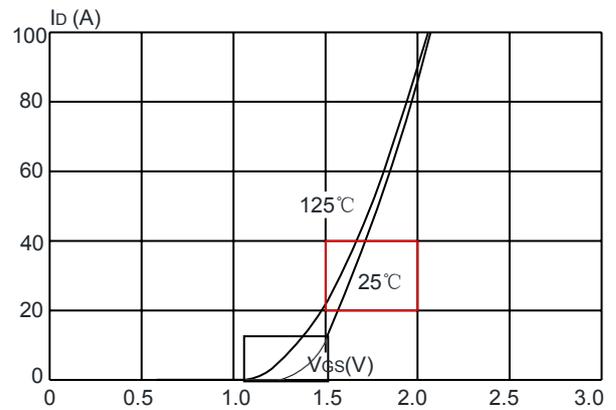


Figure 3: On-resistance vs. Drain Current

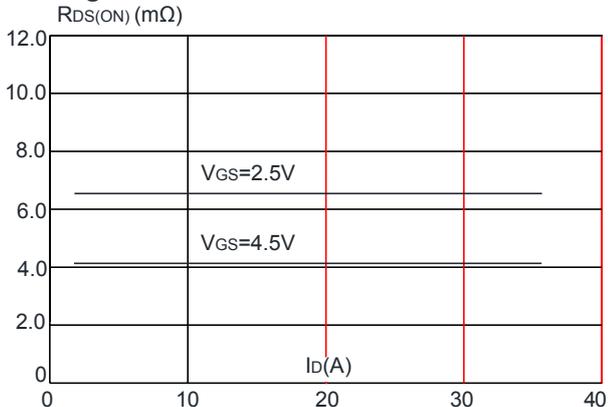


Figure 4: Body Diode Characteristics

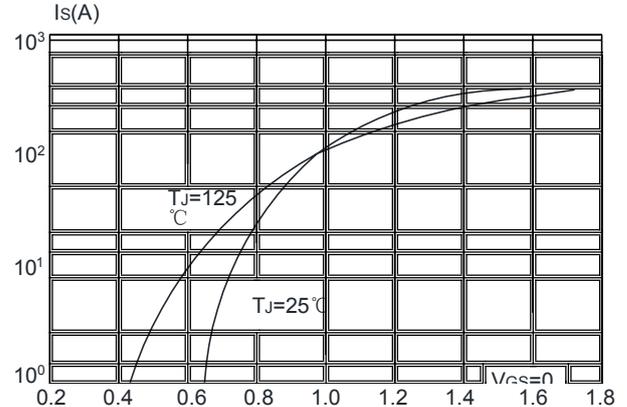


Figure 5: Gate Charge Characteristics

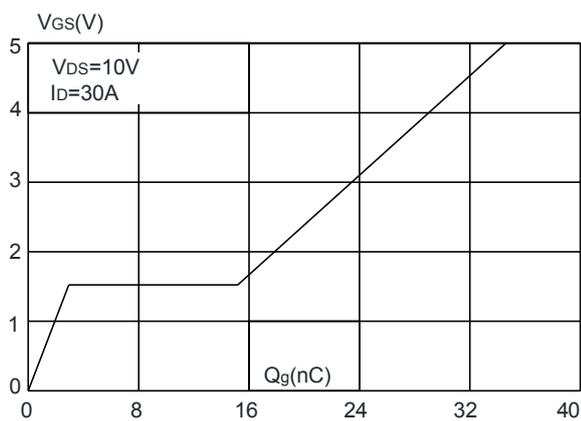
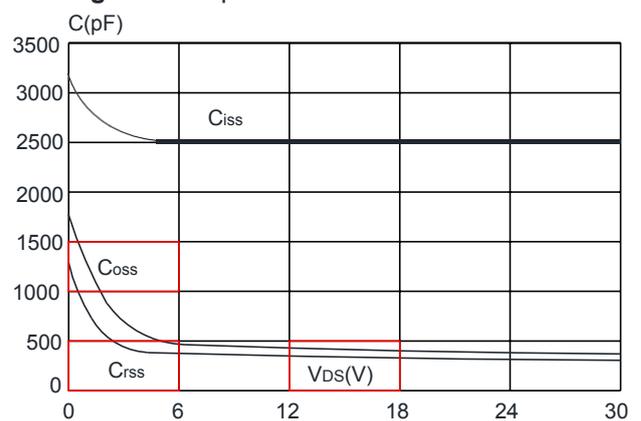
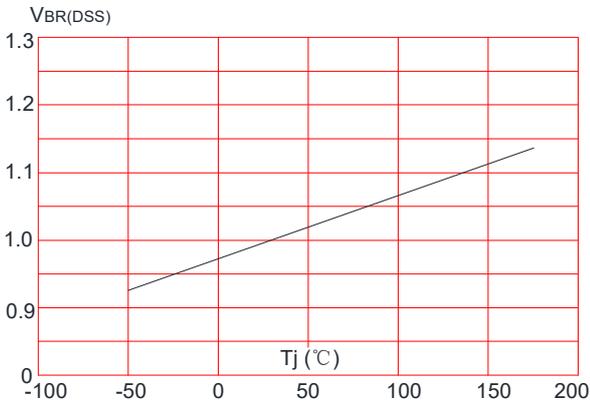


Figure 6: Capacitance Characteristics

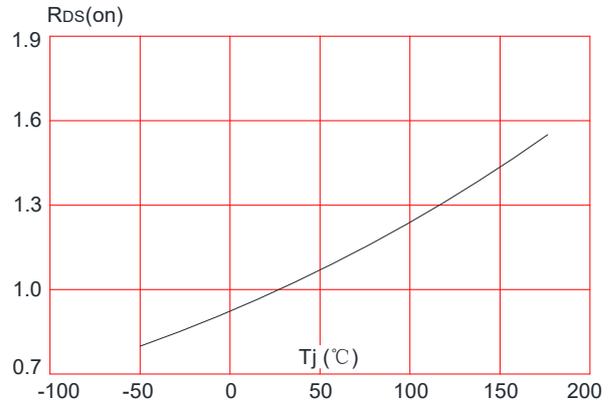


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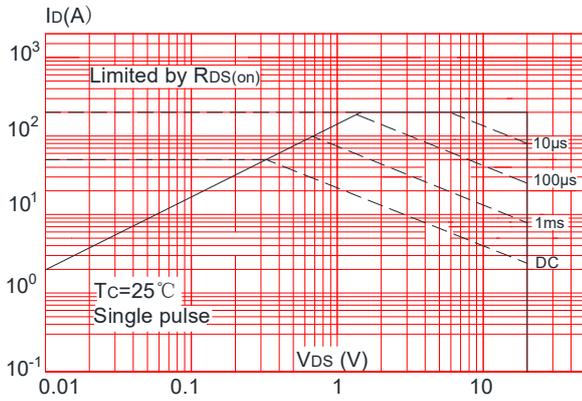
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



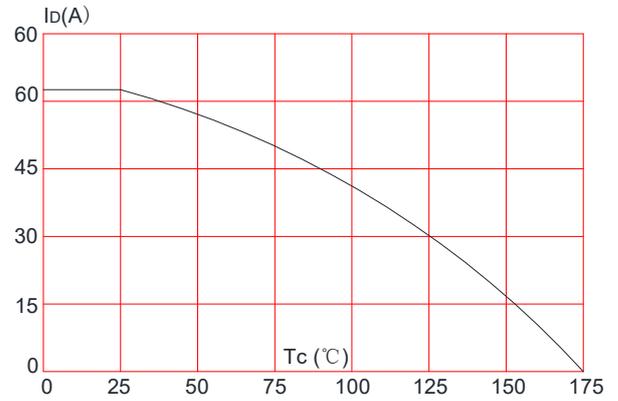
**Figure 8:** Normalized on Resistance vs. Junction Temperature



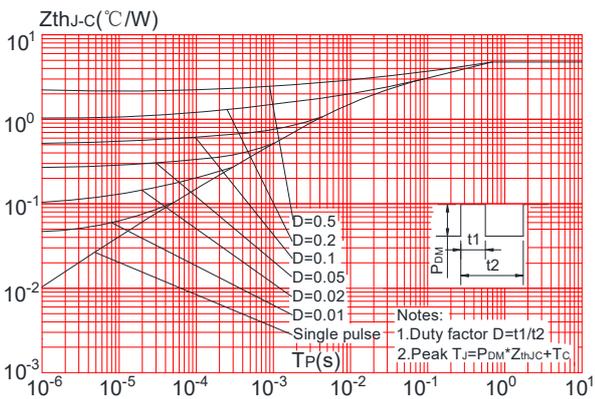
**Figure 9:** Maximum Safe Operating Area



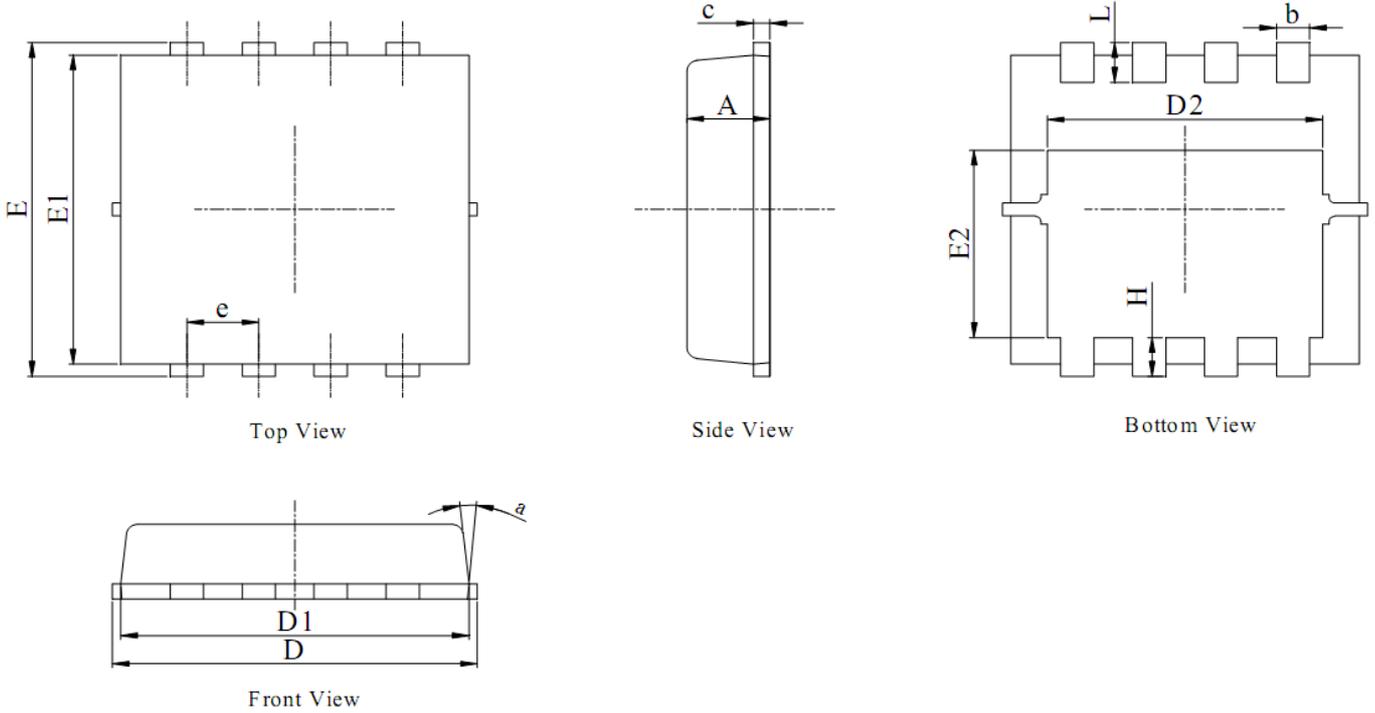
**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case



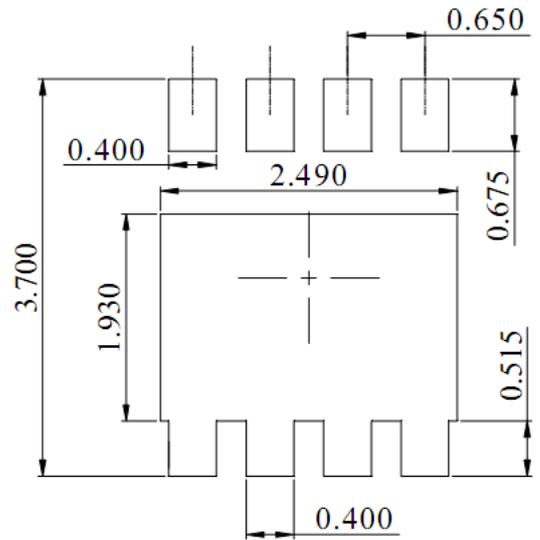
Package Mechanical Data-PDFN3333-8L-Single



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. ALL DIMENSIONS IN MILLIMETER (ANGLE IN DEGREE).
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.20	0.25
D	3.00	3.15	3.25
D1	2.95	3.05	3.15
D2	2.39	2.49	2.59
E	3.20	3.30	3.40
E1	2.95	3.05	3.15
E2	1.70	1.80	1.90
e	0.65 BSC		
H	0.30	0.40	0.50
L	0.25	0.40	0.50
a	---	---	15°



DIMENSIONS: MILLIMETERS