

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

## Product Summary

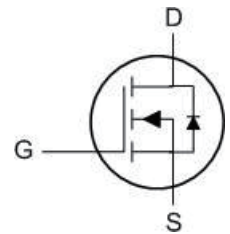
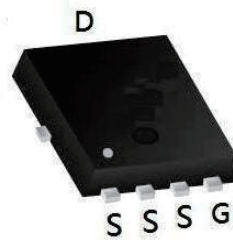
BVDSS	RDS(on)	ID
30V	15mΩ	20A

## Description

The 20N03D 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 20N03D meet the RoHS and Green Product, requirement 100% EAS guaranteed with full function reliability approved.

## PDFN3\*3 Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		10s	Steady State	
$V_{DS}$	Drain-Source Voltage	30		V
$V_{GS}$	Gate-Source Voltage	±20		V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS}@ 10V^1$	20		A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS}@ 10V^1$	8		A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	38		A
$E_{AS}$	Single Pulse Avalanche Energy <sup>3</sup>	28		mJ
$I_{AS}$	Avalanche Current	13.8		A
$P_D@T_C=25^\circ C$	Total Power Dissipation <sup>4</sup>	5.5		W
$T_{STG}$	Storage Temperature Range	-55 to 175		°C
$T_J$	Operating Junction Temperature Range	-55 to 175		°C

## Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	36	°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	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=30V, V_{GS}=0V,$	-	-	1	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.5	2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note3</small>	$V_{GS}=10V, I_D=5A$	-	15	20	m $\Omega$
		$V_{GS}=4.5V, I_D=3A$	-	21	29	m $\Omega$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=15V, V_{GS}=0V,$ $f=1.0MHz$	-	490	-	pF
$C_{oss}$	Output Capacitance		-	79	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	61	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=15V, I_D=5.8A, V_{GS}=10V$	-	10	-	nC
$Q_{gs}$	Gate-Source Charge		-	1.7	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	2.5	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=15V, I_D=3A, V_{GS}=10V,$ $R_{REN}=3\Omega$	-	6	-	ns
$t_r$	Turn-on Rise Time		-	15	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	17	-	ns
$t_f$	Turn-off Fall Time		-	17	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	9	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	36	A
$V_{SD}$	Drain to Source Diode Forward	$V_{GS}=0V, I_S=9A$	-	-	1.2	V
$t_{rr}$	Body Diode Reverse Recovery	$I_F=5A, dI/dt=100A/\mu s$	-	7	-	ns
$Q_{rr}$	Body Diode Reverse Recovery		-	2	-	nC

## Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition:  $T_J=25^\circ\text{C}, V_{DD}=10V, V_G=4.5V, R_G=25\Omega, L=0.5mH, I_{AS}=6A$
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 0.5\%$

Typical Performance Characteristics

Figure 1: Output Characteristics

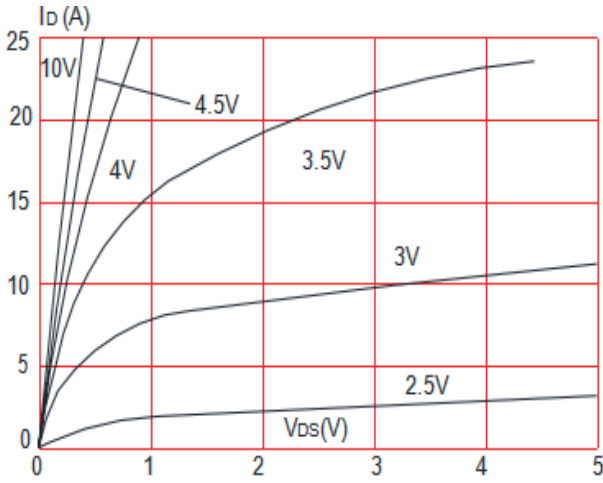


Figure 2: Typical Transfer Characteristics

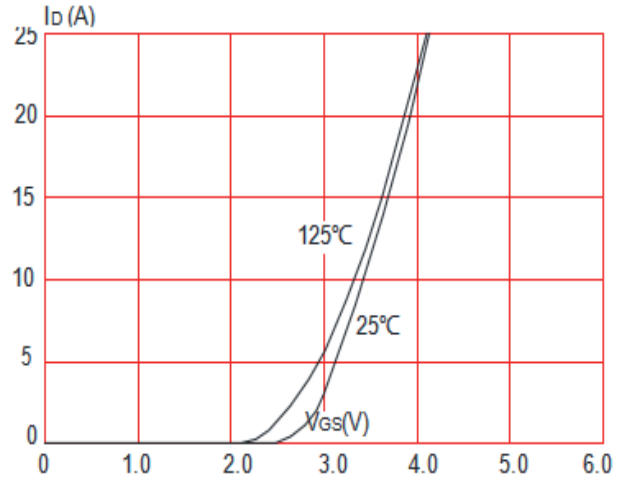


Figure 3: On-resistance vs. Drain Current

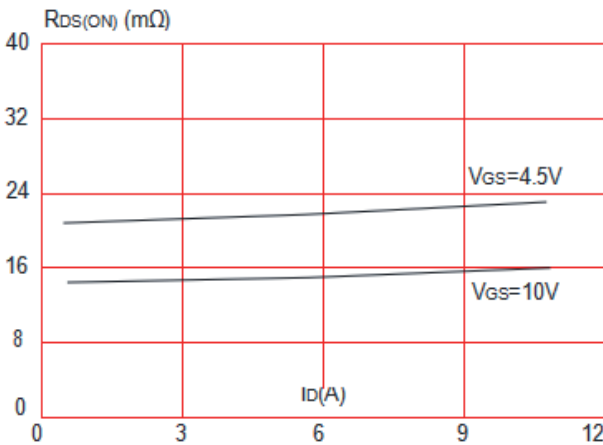


Figure 4: Body Diode Characteristics

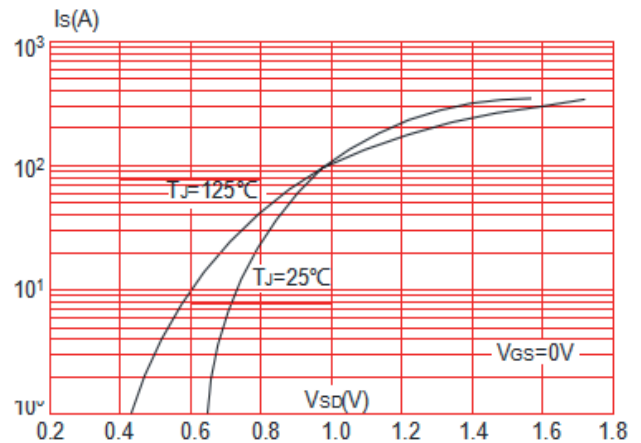


Figure 5: Gate Charge Characteristics

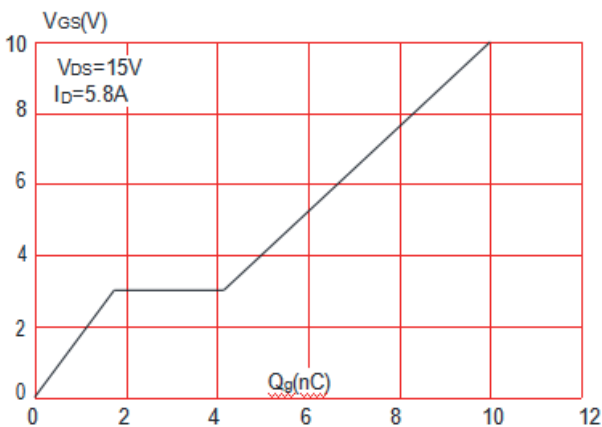
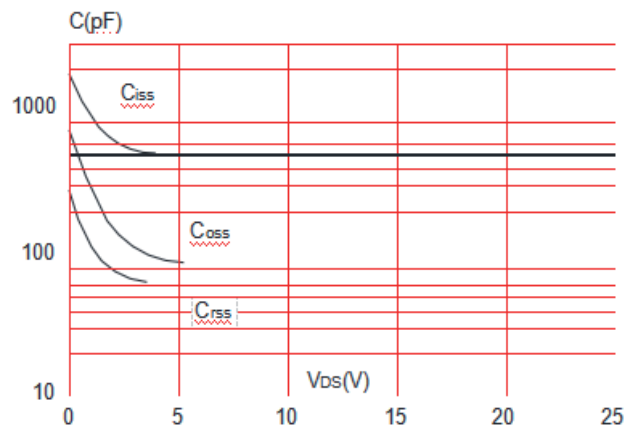


Figure 6: Capacitance Characteristics



Typical Performance Characteristics

Figure 7: Normalized Breakdown Voltage

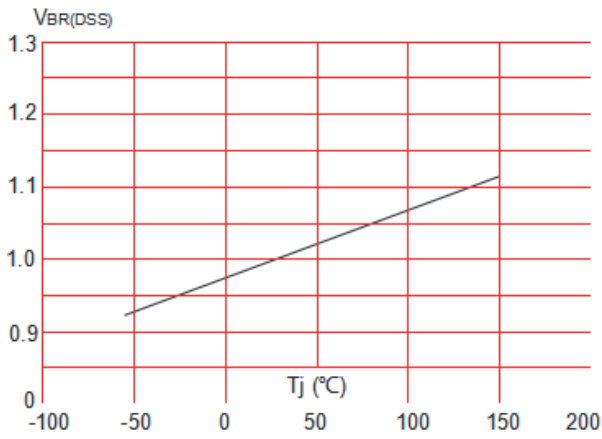


Figure 8: Normalized on Resistance vs. Junction Temperature

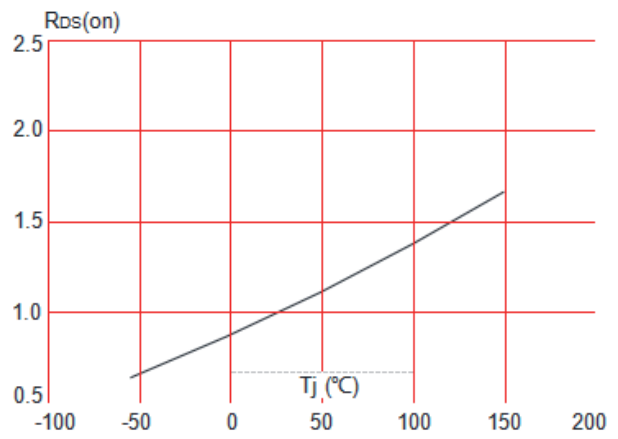


Figure 9: Maximum Safe Operating Area

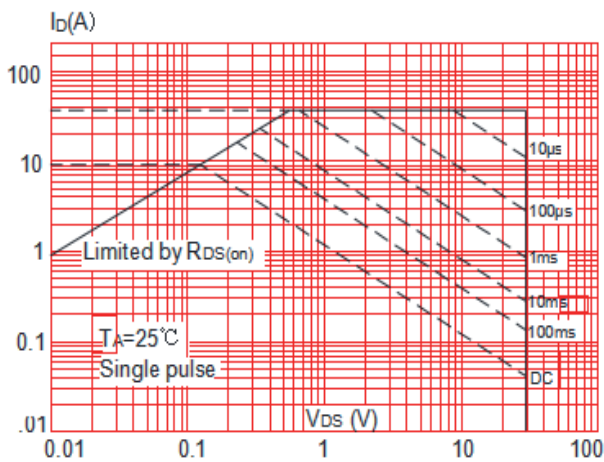


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

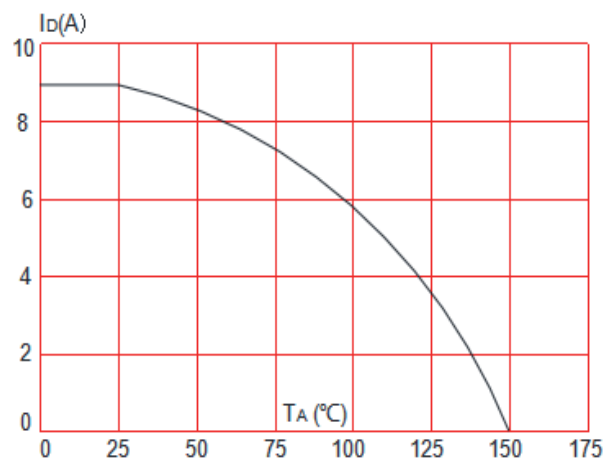
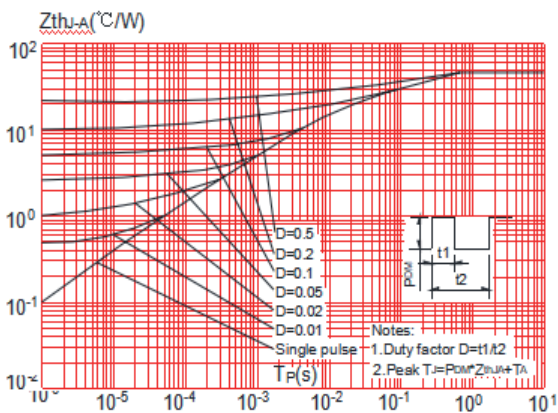


Figure 11: Maximum Effective Transient Thermal Impedance



Test Circuit

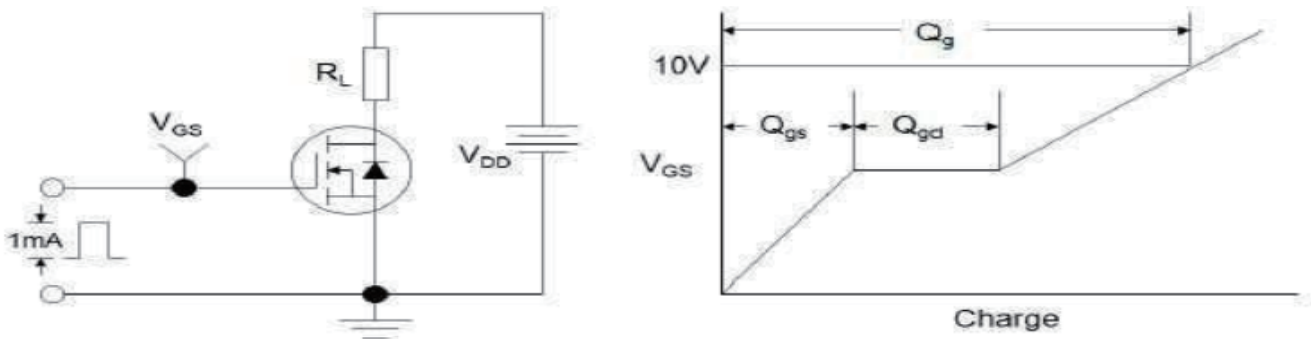


Figure 1: Gate Charge Test Circuit & Waveform

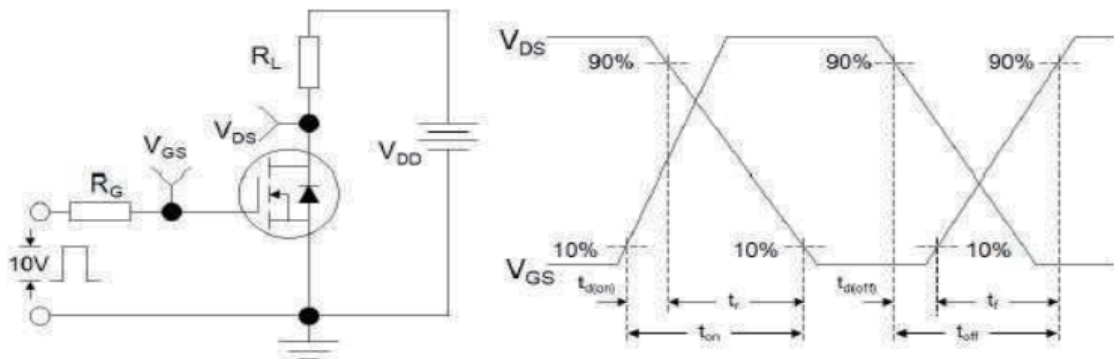


Figure 2: Resistive Switching Test Circuit & Waveforms

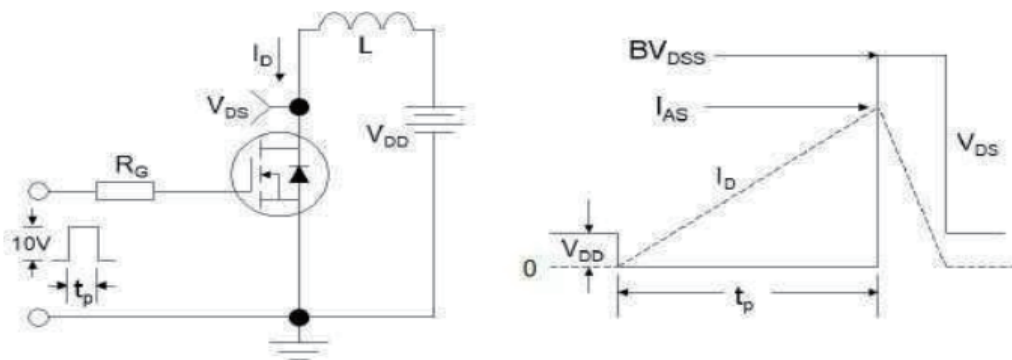
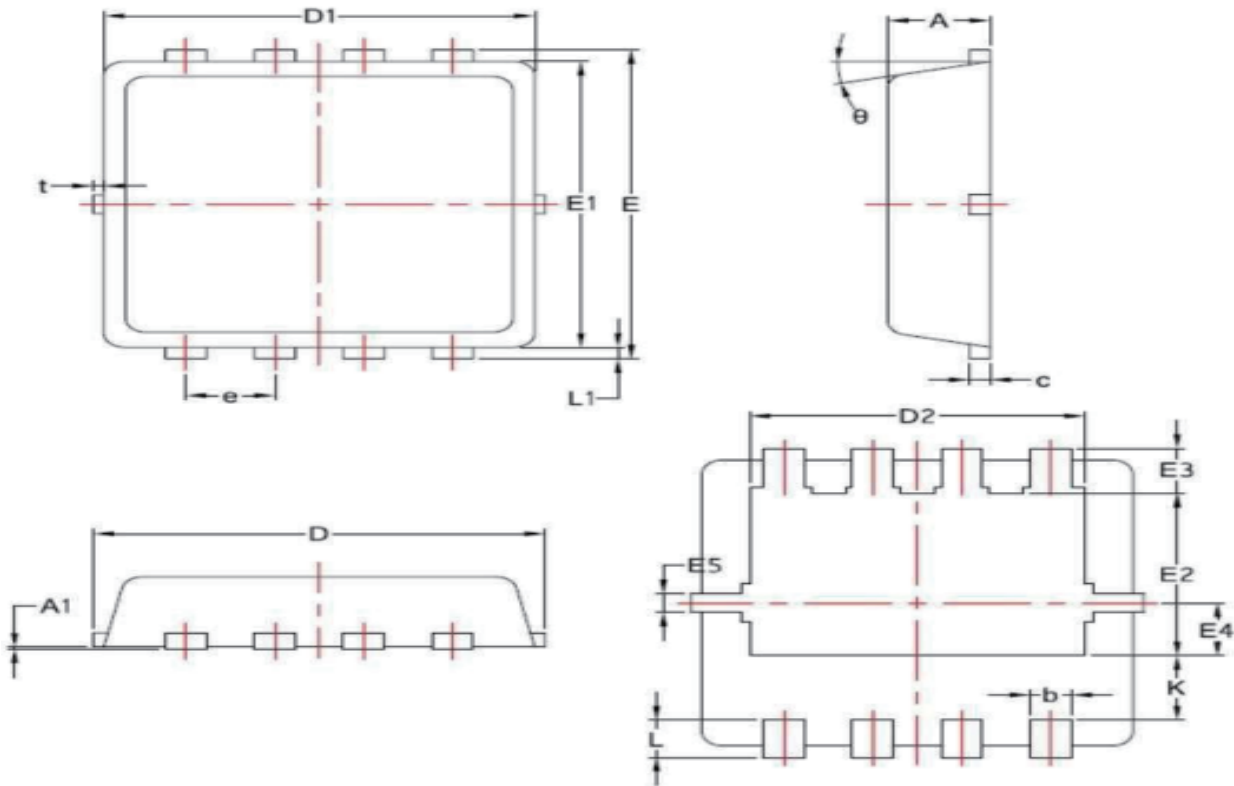


Figure 3: Unclamped Inductive Switching Test Circuit & Waveforms



Symbol	COMMON		
	MM		
	MIN	MON	MAX
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.20	0.30	0.40
c	0.10	0.152	0.25
D	3.15	3.30	3.45
D1	3.00	3.15	3.25
D2	2.29	2.45	2.65
E	3.15	3.30	3.45
E1	2.90	3.05	3.20
E2	1.54	1.74	1.94
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.59	0.69	0.89
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
t	0	0.075	0.13
θ	10°	12°	14°