

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

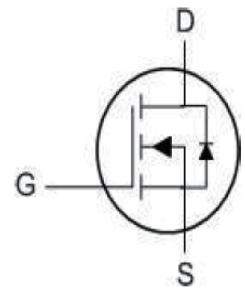
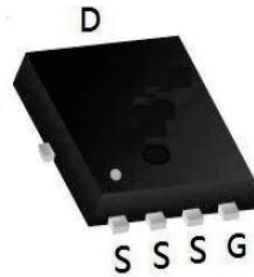
## Product Summary

BVDSS	RDS(on)	ID
60V	12mΩ	40A

## Description

The 40N06D is the high cell density trenched N-ch MOSFETs, which provides excellent RDS(on) and gate charge for most of the synchronous buck converter applications. The 40N06D meets the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

## PDFN3\* 3 Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V <sub>DSS</sub>	Drain-Source Voltage	60	V
V <sub>GSS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Continuous Drain Current	T <sub>C</sub> = 25°C	40
		T <sub>C</sub> = 100°C	23
I <sub>DM</sub>	Pulsed Drain Current <small>note1</small>	100	A
EAS	Single Pulsed Avalanche Energy <small>note2</small>	48	mJ
P <sub>D</sub>	Power Dissipation	T <sub>C</sub> = 25°C	37.7
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	1.6	°C/W
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +175	°C

**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	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=60V, V_{GS}=0V,$	-	-	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	1.6	2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note3</small>	$V_{GS}=10V, I_D=30A$	-	12	17	m $\Omega$
		$V_{GS}=4.5V, I_D=20A$	-	16	25	
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=25V, V_{GS}=0V,$ $f=1.0MHz$	-	2900	-	pF
$C_{oss}$	Output Capacitance		-	140	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	120	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=30V, I_D=30A,$ $V_{GS}=10V$	-	50	-	nC
$Q_{gs}$	Gate-Source Charge		-	6	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	15	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=30V, I_D=30A,$ $R_G=1.8\Omega, V_{GS}=10V$	-	7.4	-	ns
$t_r$	Turn-on Rise Time		-	5.1	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	28.2	-	ns
$t_f$	Turn-off Fall Time		-	5.5	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	40	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	100	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=30A$	-	-	1.2	V
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=30A, dI/dt=100A/\mu s$	-	28	-	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge		-	40	-	nC

**Notes:**

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition :  $T_J=25^\circ\text{C}, V_{DD}=30V, V_G=10V, L=0.5mH, R_G=25\Omega, I_{AS}=16A$
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 0.5\%$

Typical Electrical and Thermal Characteristics (Curves)

Figure 1: Output Characteristics

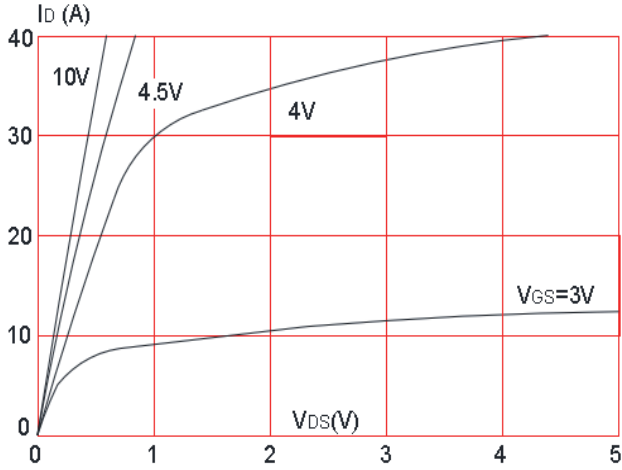


Figure 2: Typical Transfer Characteristics

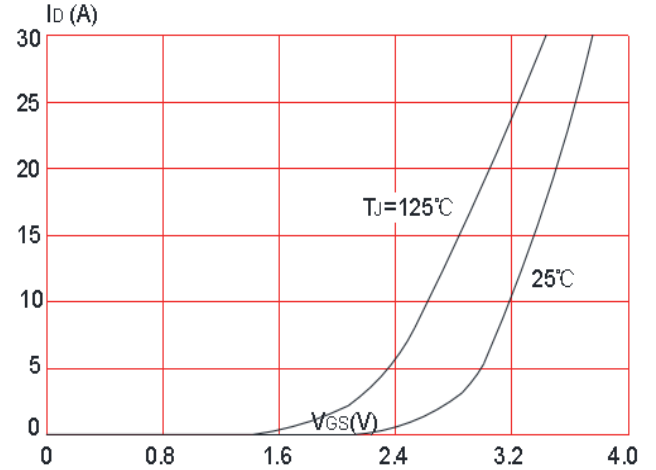


Figure 3: On-resistance vs. Drain Current

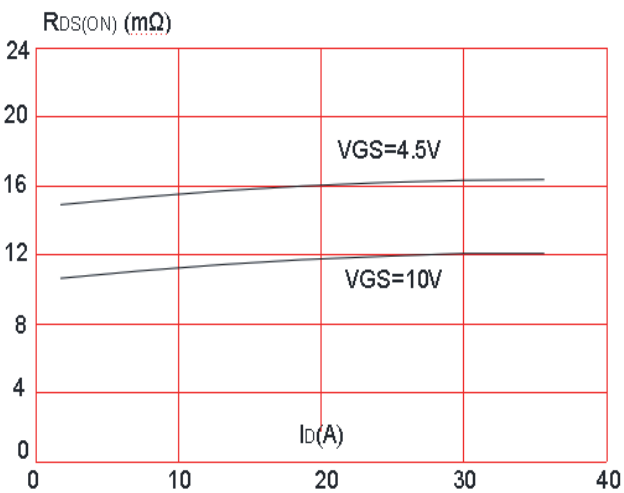


Figure 4: Body Diode Characteristics

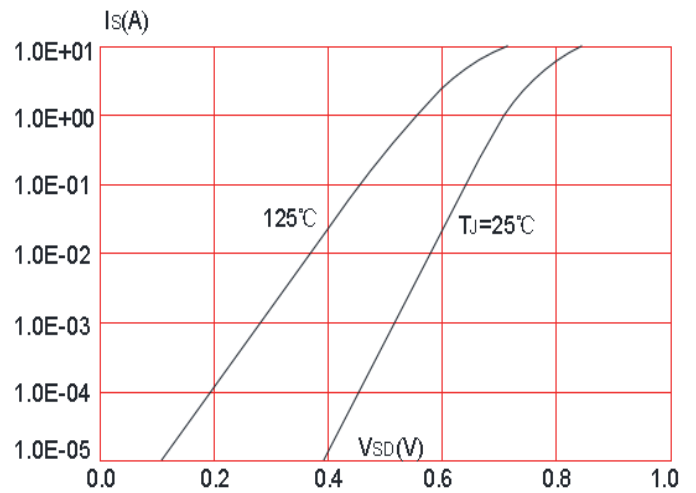


Figure 5: Gate Charge Characteristics

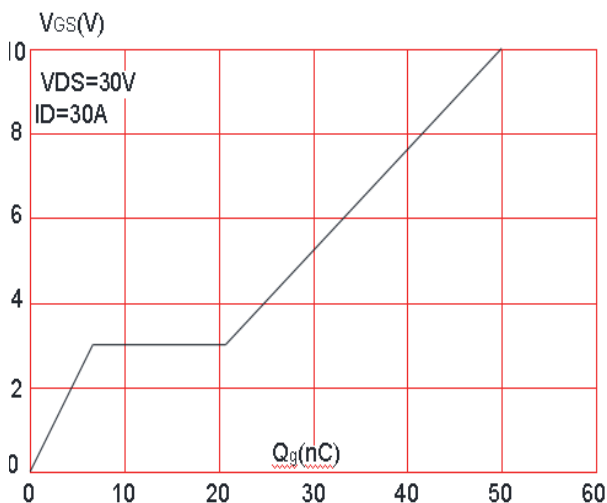
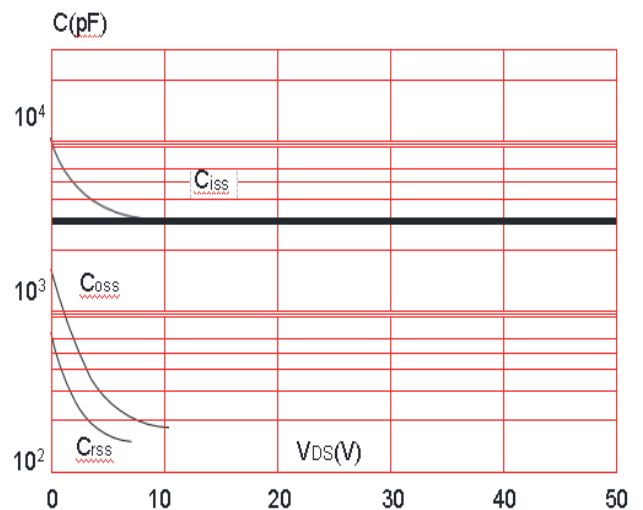


Figure 6: Capacitance Characteristics



Typical Performance Characteristics

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

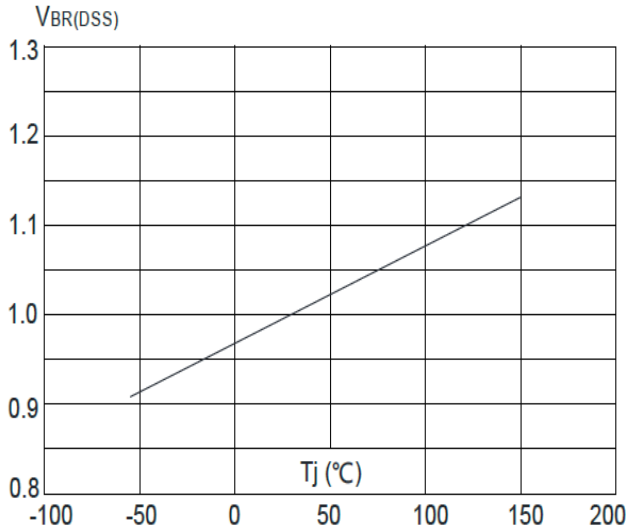


Figure 8: Normalized on Resistance vs. Junction Temperature

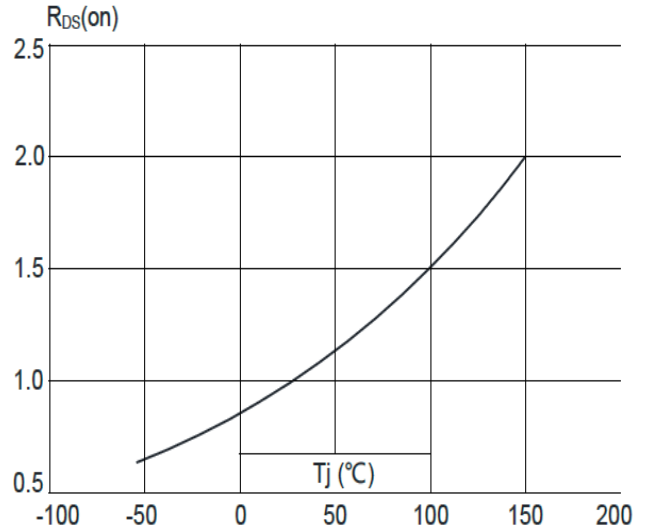


Figure 9: Maximum Safe Operating Area

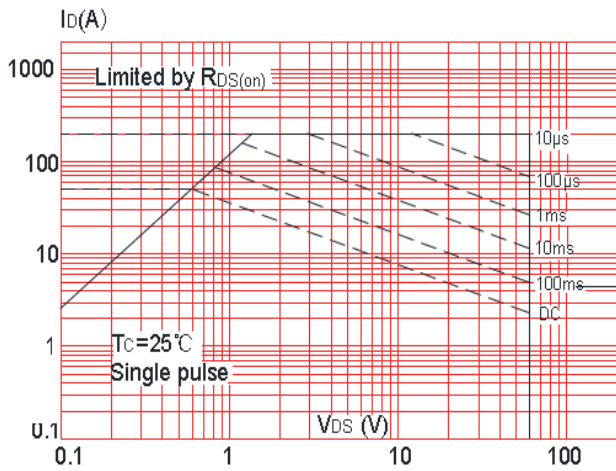


Figure 11: Maximum Continuous Drain Current vs. Ambient Temperature

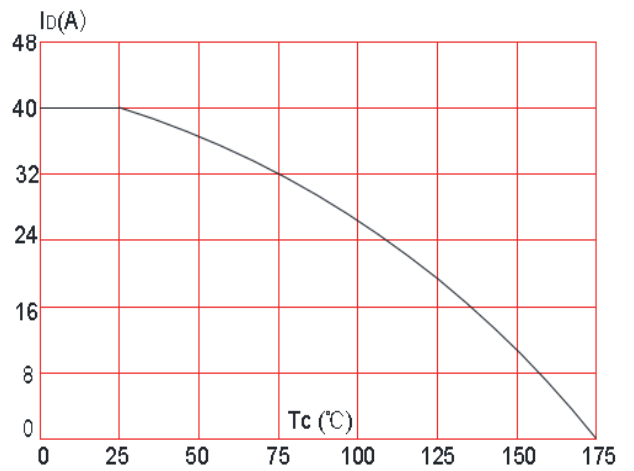
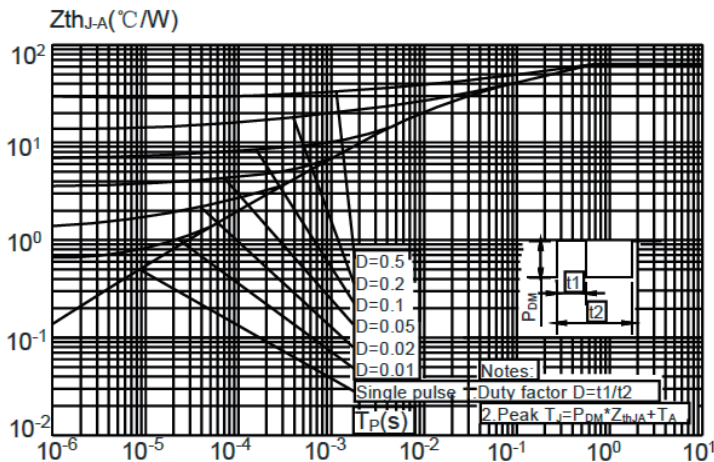
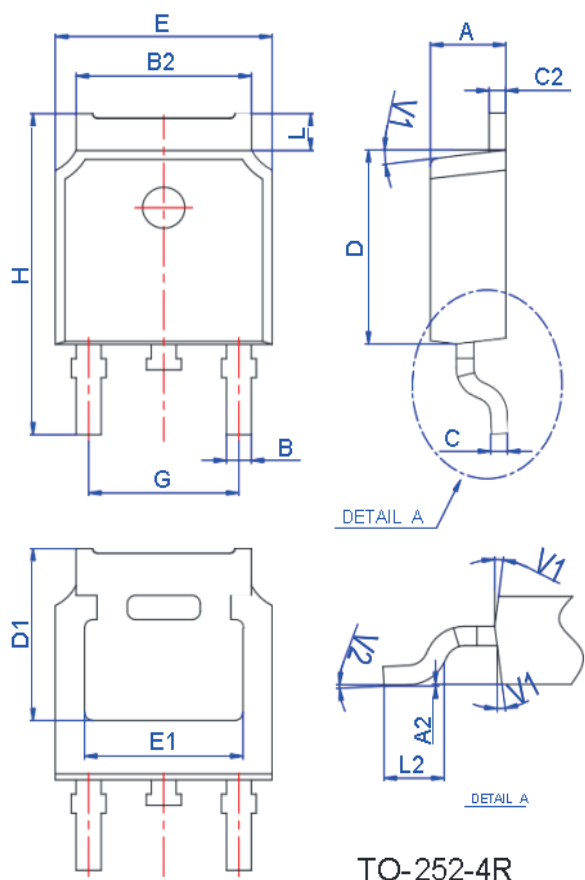


Figure 10: Maximum Effective Transient Thermal Impedance vs. Junction Temperature

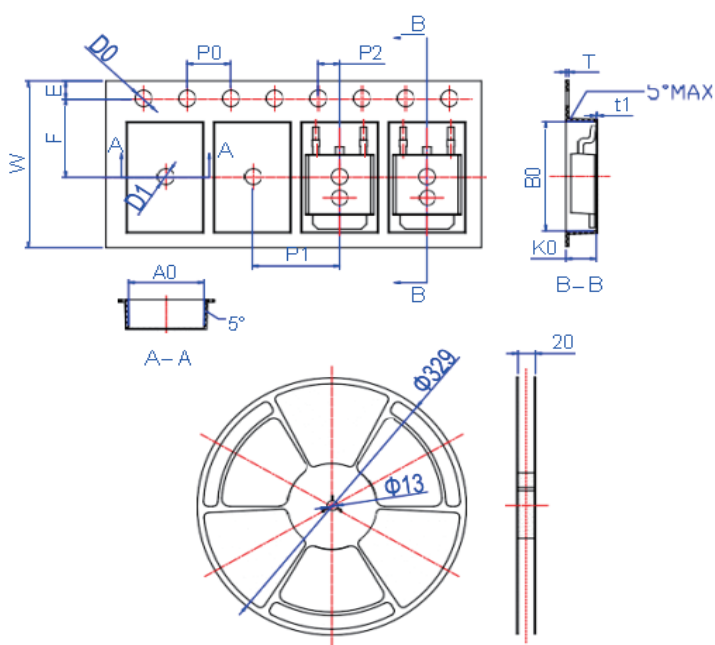


## Package Mechanical Data-TO-252-4R



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

## Reel Specification-TO-252-4R



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
W	15.90	16.00	16.10	0.626	0.630	0.634
E	1.65	1.75	1.85	0.065	0.069	0.073
F	7.40	7.50	7.60	0.291	0.295	0.299
D0	1.40	1.50	1.60	0.055	0.059	0.063
D1	1.40	1.50	1.60	0.055	0.059	0.063
P0	3.90	4.00	4.10	0.154	0.157	0.161
P1	7.90	8.00	8.10	0.311	0.315	0.319
P2	1.90	2.00	2.10	0.075	0.079	0.083
A0	6.85	6.90	7.00	0.270	0.271	0.276
B0	10.45	10.50	10.60	0.411	0.413	0.417
K0	2.68	2.78	2.88	0.105	0.109	0.113
T	0.24		0.27	0.009		0.011
t1	0.10			0.004		
10P0	39.80	40.00	40.20	1.567	1.575	1.583

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