

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

Product Summary



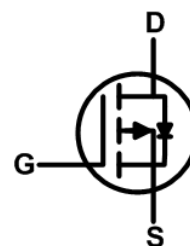
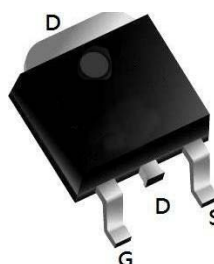
BVDSS	RDSON	ID
-20V	12mΩ	-40A

Description

The XR40P02 is the high cell density trench P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The XR40P02 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

TO252-3L Pin Configuration

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$, unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	-20	V
Gate-Source Voltage		V_{GS}	± 12	V
Continuous Drain Current	$T_A = 25^\circ\text{C}$	I_D	-40	A
	$T_A = 100^\circ\text{C}$		-15.7	
Pulsed Drain Current ¹		I_{DM}	-66	A
Single Pulse Avalanche Energy ²		EAS	28.8	mJ
Total Power Dissipation	$T_A = 25^\circ\text{C}$	P_D	30	W
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction-to-Ambient ³	$R_{\theta JA}$	41.6	$^\circ\text{C/W}$

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

Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics							
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-20	-	-	V
Gate-body Leakage current		I_{GSS}	$V_{DS} = 0V, V_{GS} = \pm 12V$	-	-	± 100	nA
Zero Gate Voltage Drain Current	$T_J = 25^{\circ}C$	I_{DSS}	$V_{DS} = -20V, V_{GS} = 0V$	-	-	-1	μA
	$T_J = 100^{\circ}C$			-	-	-100	
Gate-Threshold Voltage		$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-0.4	-0.65	-1	V
Drain-Source On-Resistance ⁴		$R_{DS(on)}$	$V_{GS} = -4.5V, I_D = -8A$	-	12.0	18	mΩ
			$V_{GS} = -2.5V, I_D = -6A$	-	17	23	
Forward Transconductance ⁴		g_{fs}	$V_{DS} = -4.5V, I_D = -8A$	-	36	-	S
Dynamic Characteristics ⁵							
Input Capacitance		C_{iss}	$V_{DS} = -10V, V_{GS} = 0V, f = 1MHz$	-	1630	-	pF
Output Capacitance		C_{oss}		-	211	-	
Reverse Transfer Capacitance		C_{rss}		-	187	-	
Gate Resistance		R_g	$f = 1MHz$	-	10	-	Ω
Switching Characteristics ⁵							
Total Gate Charge		Q_g	$V_{GS} = -4.5V, V_{DS} = -10V, I_D = -8A$	-	12	-	nC
Gate-Source Charge		Q_{gs}		-	1.8	-	
Gate-Drain Charge		Q_{gd}		-	3.2	-	
Turn-On Delay Time		$t_{d(on)}$	$V_{GS} = -4.5V, V_{DD} = -10V, R_G = 3\Omega, I_D = -8A$	-	17	-	ns
Rise Time		t_r		-	25.5	-	
Turn-Off Delay Time		$t_{d(off)}$		-	32	-	
Fall Time		t_f		-	15	-	
Drain-Source Body Diode Characteristics							
Diode Forward Voltage ⁴		V_{SD}	$I_S = -8A, V_{GS} = 0V$	-	-	-1.2	V
Continuous Source Current	$T_A = 25^{\circ}C$	I_S	-	-	-	-40	A

Notes:

1. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)} = 150^\circ\text{C}$.
2. The EAS data shows Max. rating . The test condition is $V_{DD} = -25V, V_{GS} = -10V, L = 0.1\text{mH}, I_{AS} = -24A$
3. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
5. This value is guaranteed by design hence it is not included in the production test..

Typical Characteristics

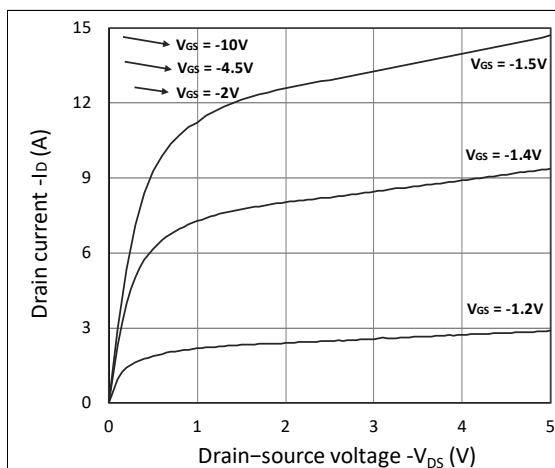


Figure 1. Output Characteristics

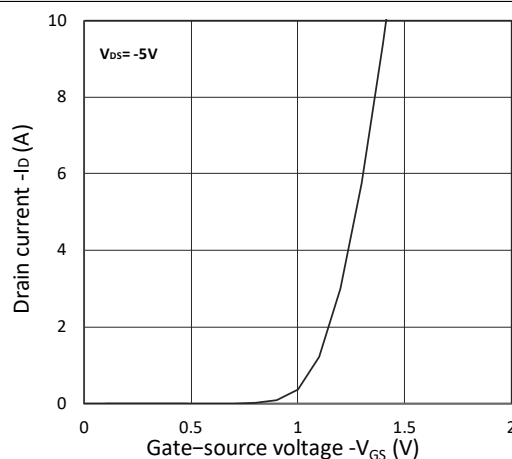


Figure 2. Transfer Characteristics

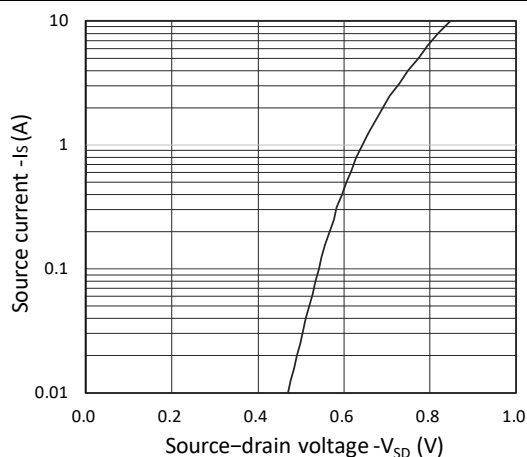


Figure 3. Forward Characteristics of Reverse

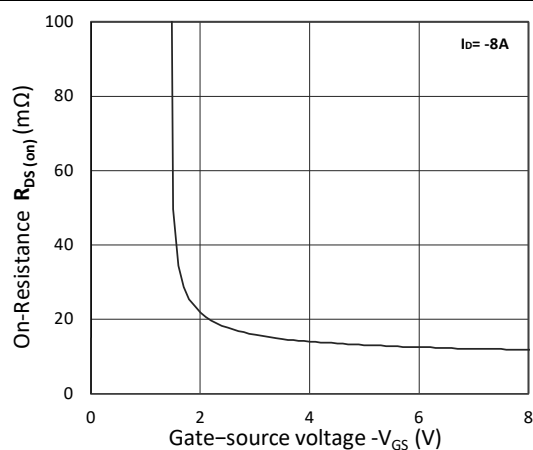


Figure 4. $R_{DS(on)}$ vs. V_{GS}

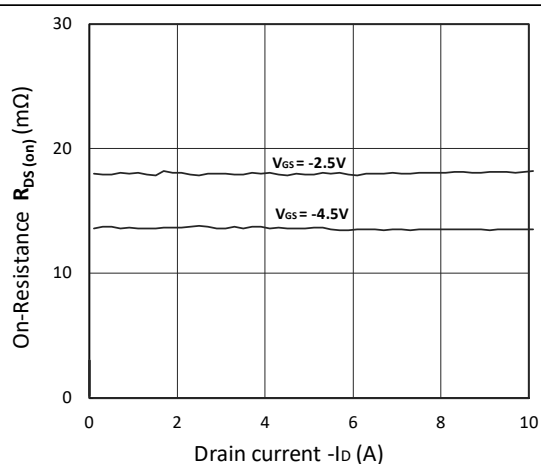


Figure 5. $R_{DS(on)}$ vs. I_D

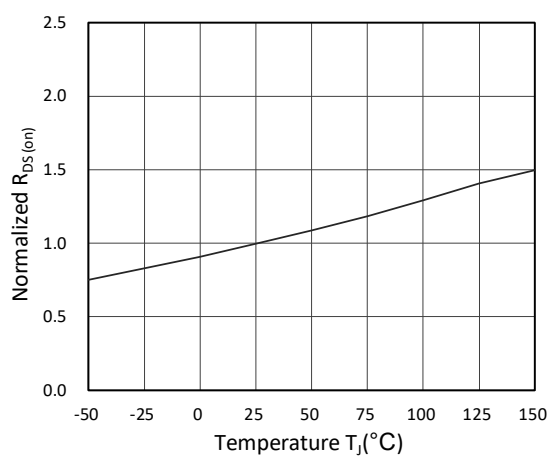


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

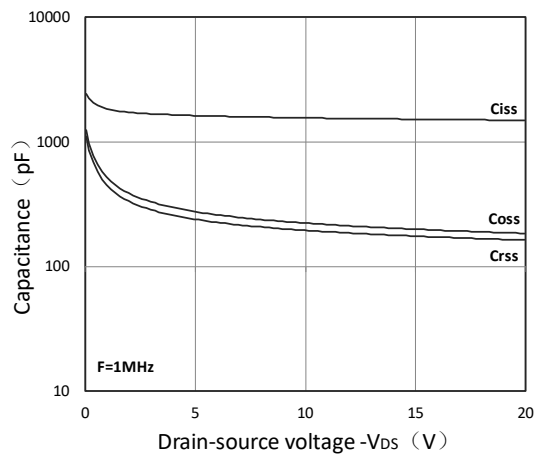


Figure 7. Capacitance Characteristics

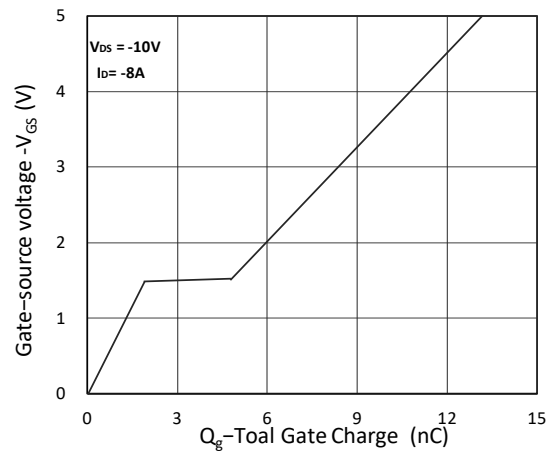


Figure 8. Gate Charge Characteristics

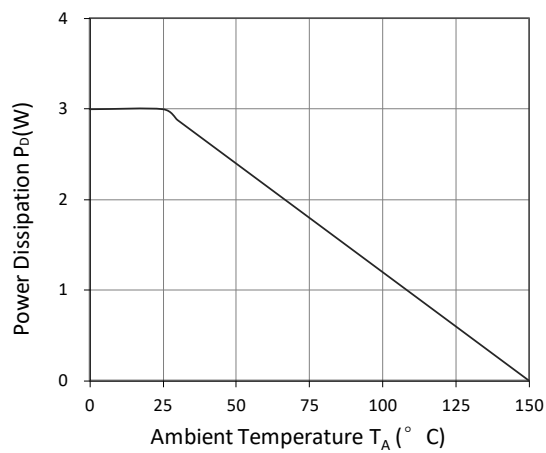


Figure 9. Power Dissipation

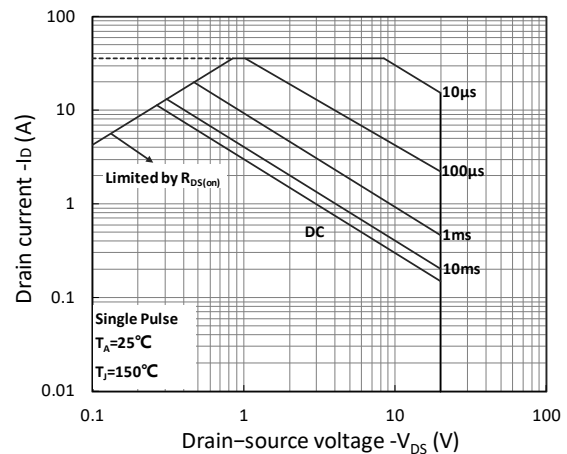


Figure 10. Safe Operating Area

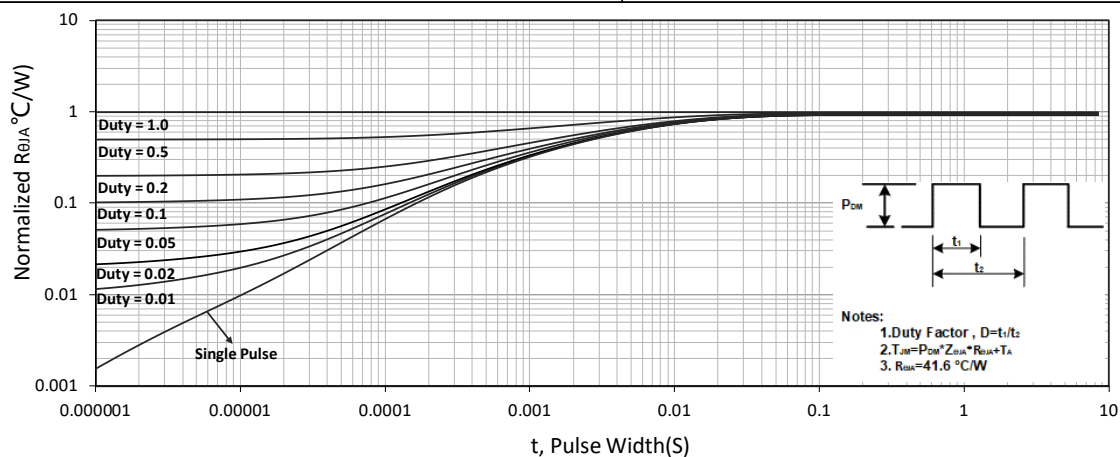
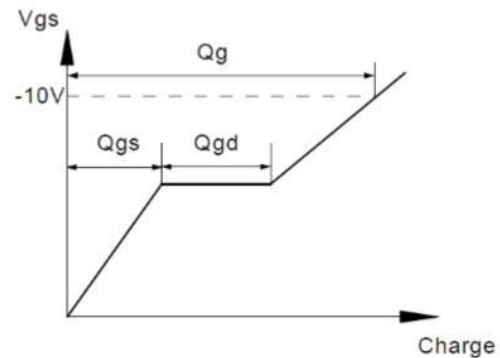
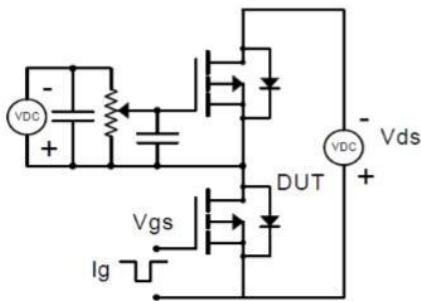


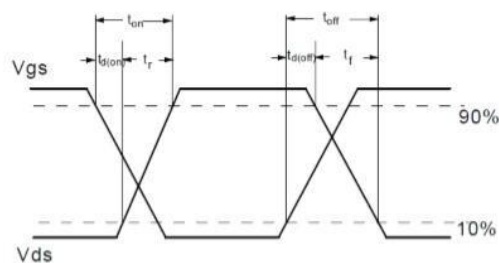
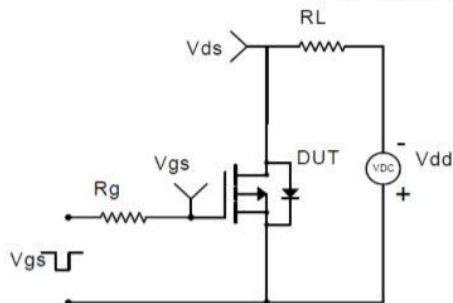
Figure 11. Normalized Maximum Transient Thermal Impedance

Test Circuit

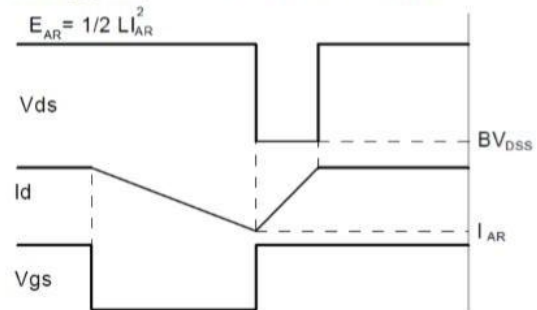
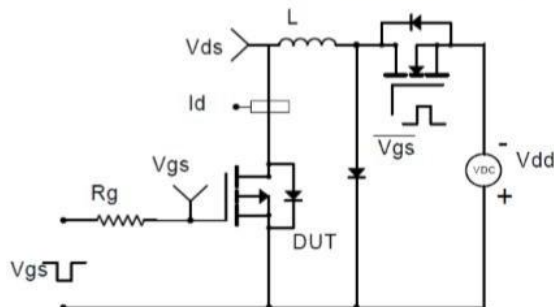
Gate Charge Test Circuit & Waveform



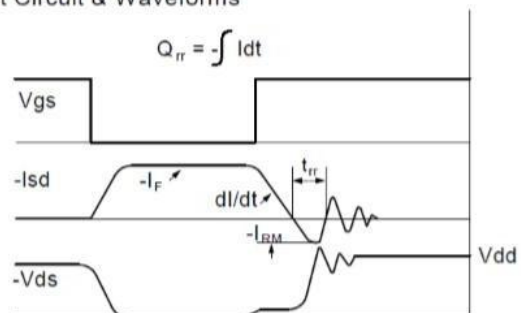
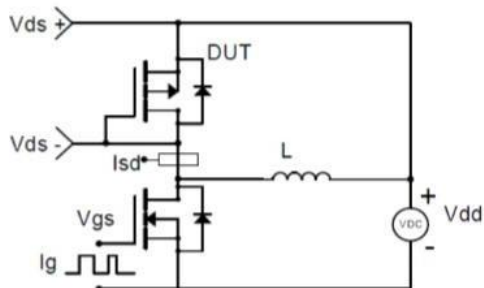
Resistive Switching Test Circuit & Waveforms



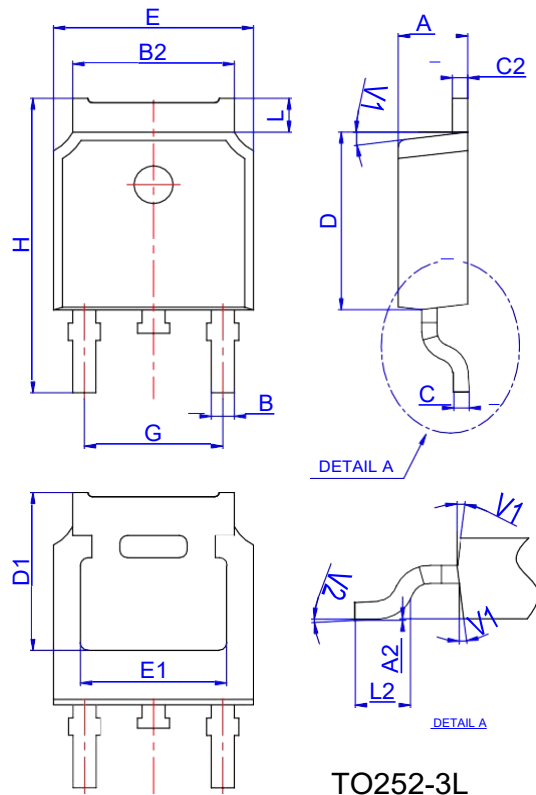
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

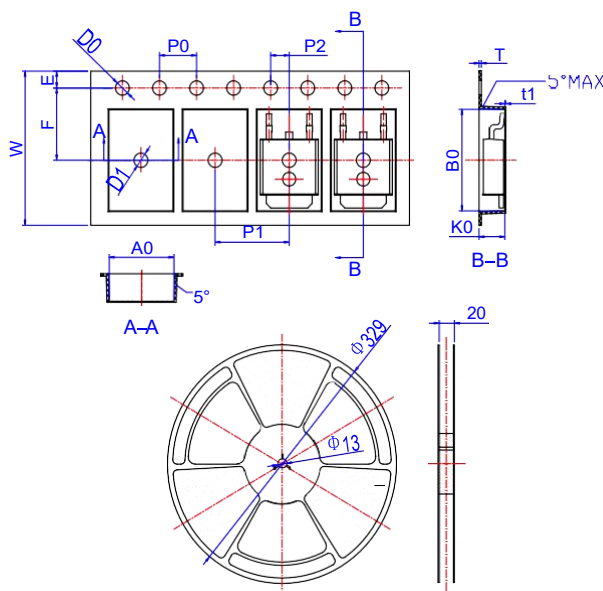


Package Mechanical Data TO252-3L



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-TO252-3L



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