

- ★ Super Low Gate Charge
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Excellent CdV/dt effect decline
- ★ Advanced trench gate super junction technology

700V Super Junction Power MOSFET

Product Summary



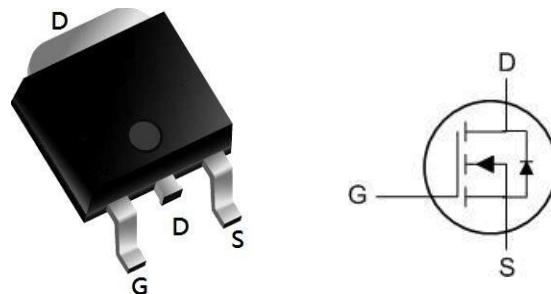
BVDSS	RDS(ON)	ID
700V	320mΩ	12A

Description

The XR70R320 use super junction technology and design to provide excellent RDS(ON) with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

The XR70R320 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

TO252-3L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	700	V
V_{GS}	Gate-Source Voltage	± 30	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	12	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	7	A
I_{DM}	Pulsed Drain Current ²	52	A
EAS	Single Pulse Avalanche Energy ³	90	mJ
I_{AS}	Avalanche Current	---	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation ⁴	26	W
T_{STG}	Storage Temperature Range	-55 to 150	°C
T_J	Operating Junction Temperature Range	-55 to 150	°C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	56	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	4.9	°C/W

700V Super Junction Power MOSFET

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$, $I_D=250\mu\text{A}$	700	---	---	V
$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	---	---	$\text{V}/^\circ\text{C}$
$R_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance ²	$V_{\text{GS}}=10\text{V}$, $I_D=3\text{A}$	---	320	369	$\text{m}\Omega$
		$V_{\text{GS}}=4.5\text{V}$, $I_D=3\text{A}$	---	---	---	
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{GS}}=V_{\text{DS}}$, $I_D=250\mu\text{A}$	3	---	4	V
$\Delta V_{\text{GS}(\text{th})}$	$V_{\text{GS}(\text{th})}$ Temperature Coefficient		---	---	---	$\text{mV}/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{\text{DS}}=700\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=25^\circ\text{C}$	---	---	1	uA
		$V_{\text{DS}}=700\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=100^\circ\text{C}$	---	10	---	
I_{GSS}	Gate-Source Leakage Current	$V_{\text{GS}}=\pm 30\text{V}$, $V_{\text{DS}}=0\text{V}$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{\text{DS}}=20\text{V}$, $I_D=6\text{A}$	---	10	---	S
R_g	Gate Resistance	$V_{\text{DS}}=0\text{V}$, $V_{\text{GS}}=0\text{V}$, $f=1\text{MHz}$	---	9.3	---	Ω
Q_g	Total Gate Charge	$V_{\text{DS}}=480\text{V}$, $V_{\text{GS}}=10\text{V}$, $I_D=6\text{A}$	---	26	---	nC
Q_{gs}	Gate-Source Charge		---	3.7	---	
Q_{gd}	Gate-Drain Charge		---	13.8	---	
$T_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{GS}}=10\text{V}$, $V_{\text{DS}}=400\text{V}$, $R_G=10\Omega$, $I_D=6\text{A}$	---	20	---	ns
T_r	Rise Time		---	26	---	
$T_{\text{d(off)}}$	Turn-Off Delay Time		---	105	---	
T_f	Fall Time		---	32	---	
C_{iss}	Input Capacitance	$V_{\text{DS}}=100\text{V}$, $V_{\text{GS}}=0\text{V}$, $f=1\text{MHz}$	---	753	---	pF
C_{oss}	Output Capacitance		---	40	---	
C_{rss}	Reverse Transfer Capacitance		---	1.4	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_s	Continuous Source Current ^{1,4}	$V_G=V_D=0\text{V}$, Force Current	---	---	12	A
V_{SD}	Diode Forward Voltage ²	$V_{\text{GS}}=0\text{V}$, $I_s=16\text{A}$, $T_J=25^\circ\text{C}$	---	---	1	V
t_{rr}	Reverse Recovery Time	$I_F=10\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$, $T_J=25^\circ\text{C}$	---	210	---	nS
			---	2.05	---	nC

Note :

The data is tested by a surface mounted on a 1 inch² FR-4 board with 2oz copper.

The data is tested by a pulsed pulse width < 300us, duty cycle < 2%.

The EAS data shows Max. rating. The test condition is VRAMG > 0, VDD=200V, VGS=10V, L=50mH

The power dissipation is limited by 50°C junction temperature.

The data is theoretically the same as I_D and I_{DM} in real applications. It should be limited by total power dissipation.

700V Super Junction Power MOSFET

Typical Performance Characteristics

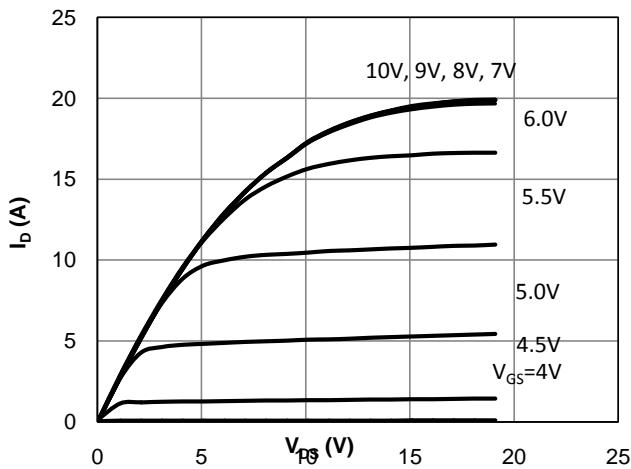
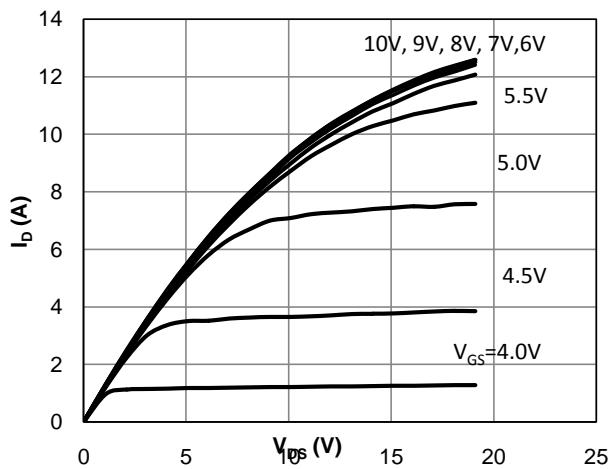
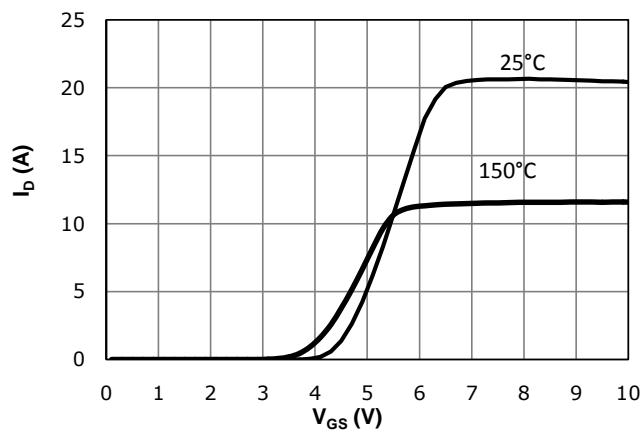
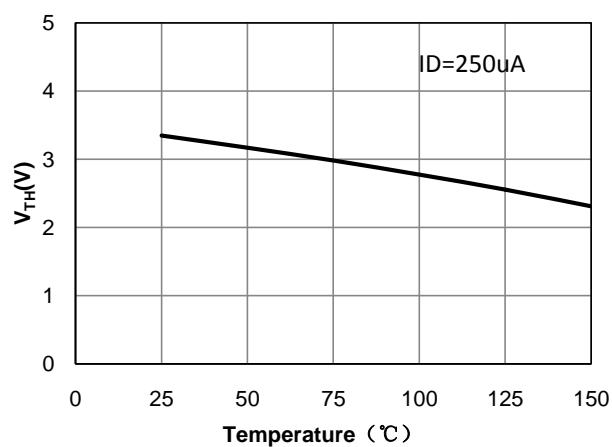
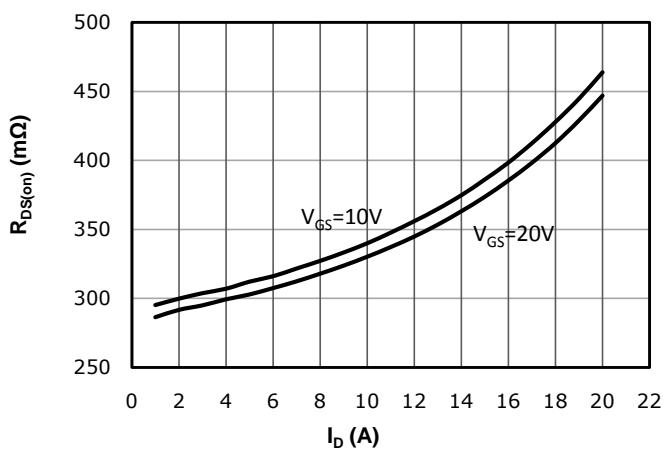
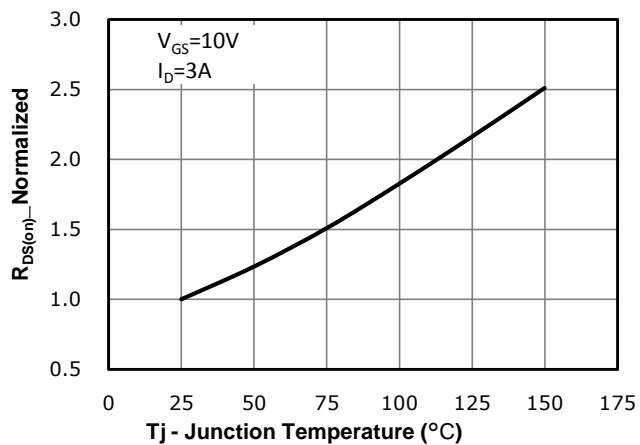
Fig 1. Output Characteristics ($T_j=25^\circ\text{C}$)Fig 2. Output Characteristics ($T_j=150^\circ\text{C}$)

Fig 3: Transfer Characteristics

Fig 4: V_{TH} Vs T_j Temperature CharacteristicsFig 5: $R_{DS(on)}$ Vs I_D Characteristics ($T_c=25^\circ\text{C}$)Fig 6: $R_{DS(on)}$ vs. Temperature

700V Super Junction Power MOSFET

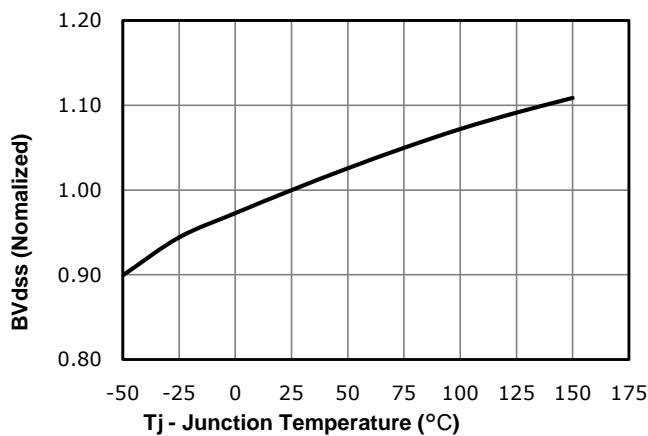
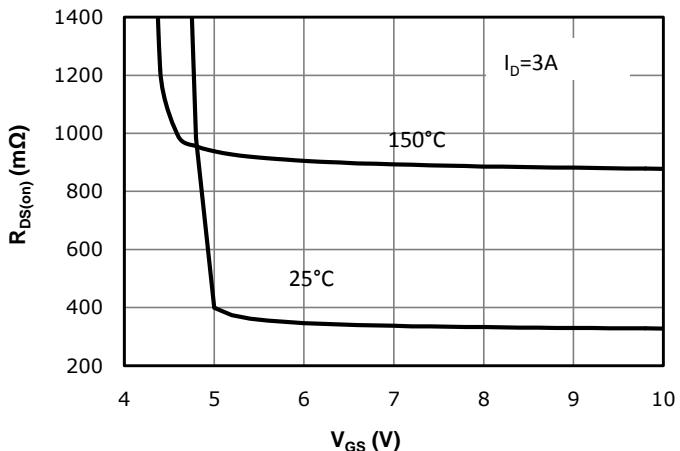
Fig 7: BV_{DSS} vs. TemperatureFig 8: R_{d(on)} vs Gate Voltage

Fig 9: Body-diode Forward Characteristics

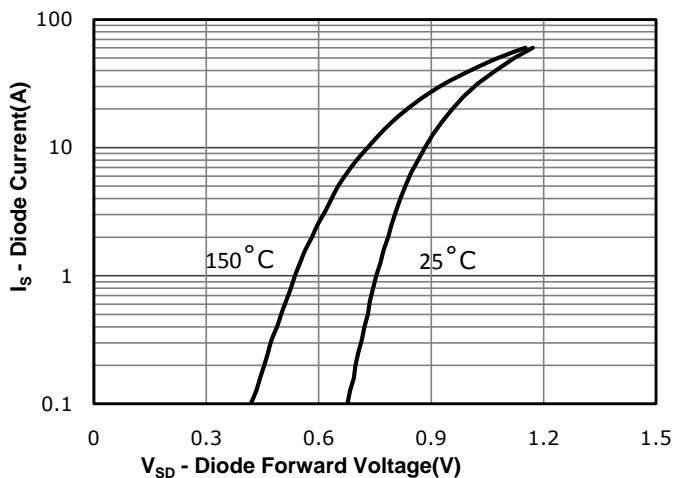


Fig 10: Gate Charge Characteristics

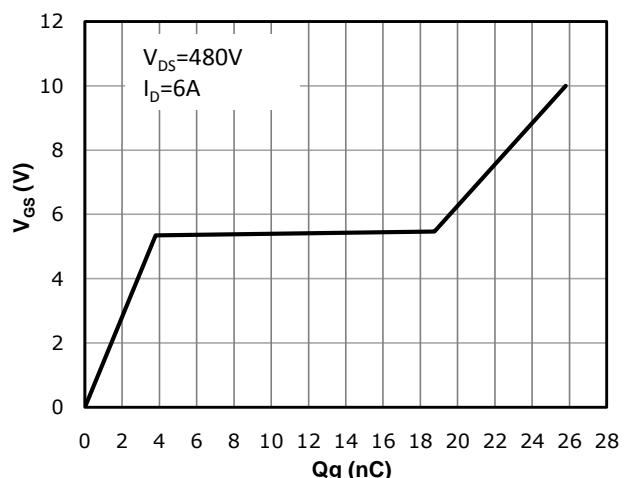


Fig 11: Capacitance Characteristics

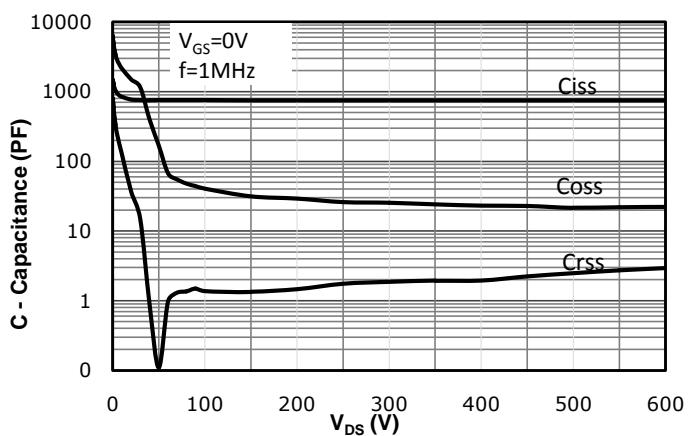
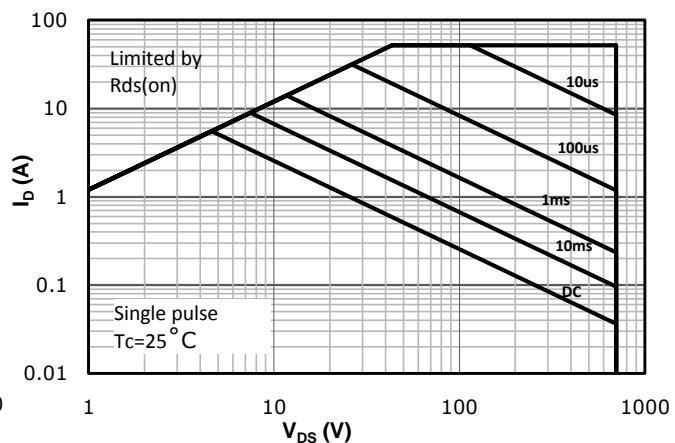
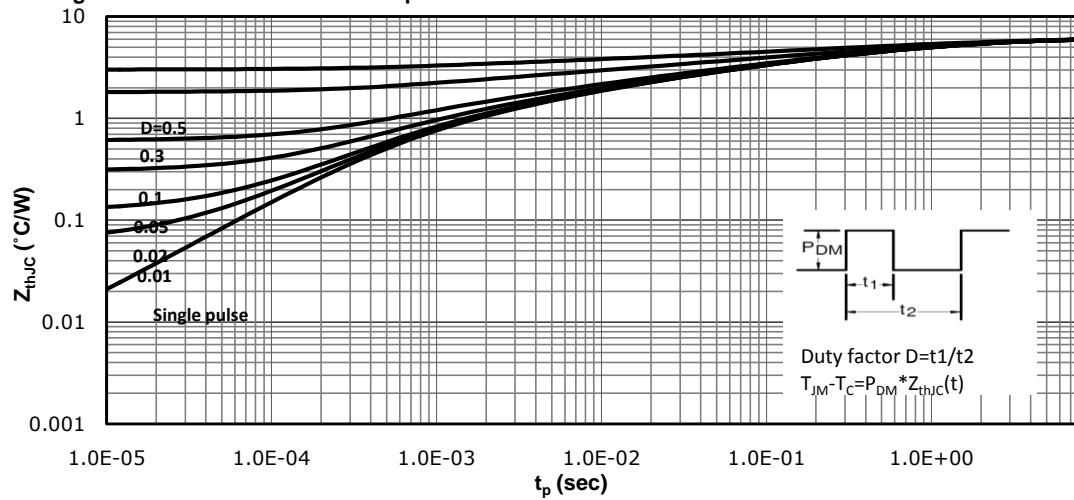


Fig 12: Safe Operating Area



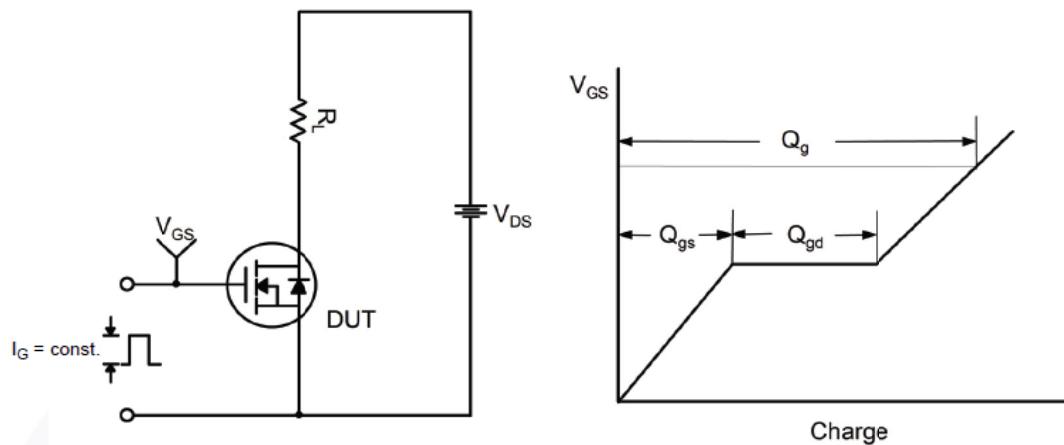
700V Super Junction Power MOSFET

Fig 13: Max. Transient Thermal Impedance

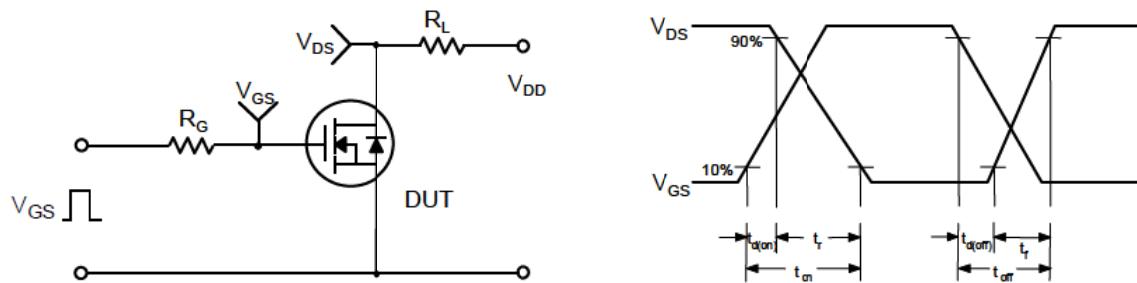


700V Super Junction Power MOSFET

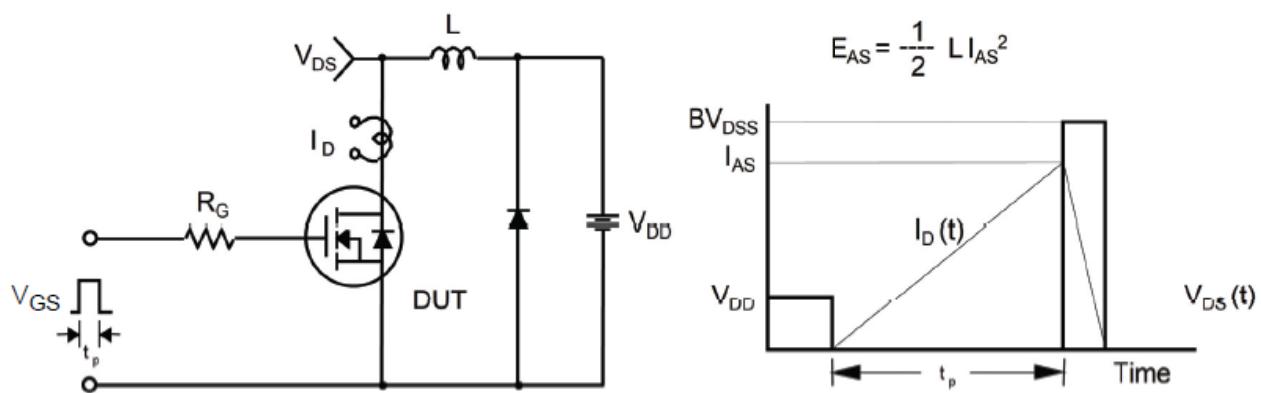
Gate Charge Test Circuit & Waveform



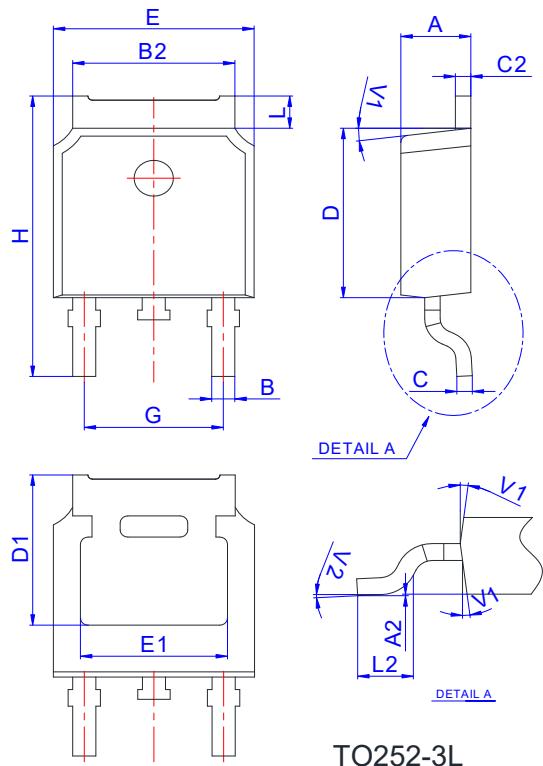
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

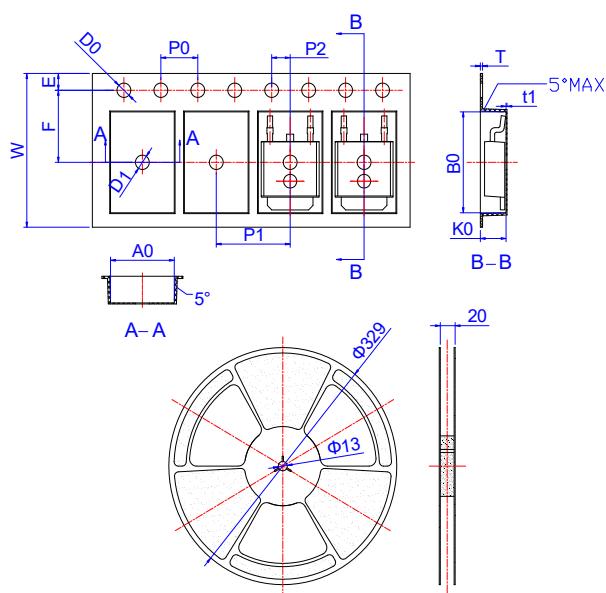


Package Mechanical Data-TO252-3L



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