

N-Ch 500V Fast Switching MOSFETs

- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Excellent CdV/dt effect decline
- ★ Advanced VD MOSFETS

Product Summary



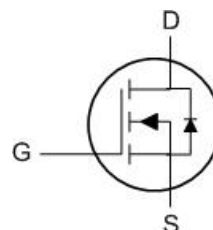
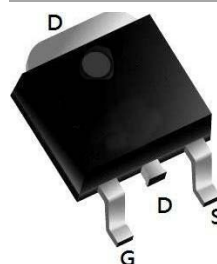
BVDSS	RDSON	ID
500V	2.2Ω	4A

Description

The XR4N50FR is the Advanced VD N-ch MOSFETS, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The XR4N50FR meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

TO252-3L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V _{DSS}	Drain-Source Voltage	500	V
I _D	Drain Current - Continuous (TC= 25°C) - Continuous (TC= 100°C)	4	A
		1.8	A
I _{DM}	Drain Current - Pulsed (Note 1)	12	A
V _{GSS}	Gate-Source Voltage	± 30	V
E _{AS}	Single Pulsed Avalanche Energy (Note 2)	67	mJ
I _{AR}	Avalanche Current (Note 1)	5	A
E _{AR}	Repetitive Avalanche Energy (Note 1)	115	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5	V/ns
P _D	Power Dissipation (TC = 25°C) - Derate above 25°C	100	W
		0.2	W/°C
T _j , T _{stg}	Operating and Storage Temperature Range	-55 to +150	°C
T _L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	°C

Thermal Characteristics

Symbol	Parameter	Value	Units
R _{θJC}	Thermal Resistance, Junction-to-Case	1.25	°C/W
R _{θJS}	Thermal Resistance, Case-to-Sink Typ.	--	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	110	°C/W

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V(\text{BR})_{\text{DSS}}$	Drain-Source Breakdown Voltage	$V_{\text{GS}} = 0\text{V}$, $I_{\text{D}} = 250\mu\text{A}$	500	550	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 500\text{V}$, $V_{\text{GS}} = 0\text{V}$, $T_J = 25^{\circ}\text{C}$	--	--	1	μA
I_{GSS}	Gate-Source Leakage	$V_{\text{GS}} = \pm 30\text{V}$	--	--	± 100	nA
$V_{\text{GS}}(\text{th})$	Gate-Source Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\mu\text{A}$	2.0	3.0	4.0	V
$R_{\text{DS}}(\text{on})$	Drain-Source On-Resistance (Note3)	$V_{\text{GS}} = 10\text{V}$, $I_{\text{D}} = 1.5\text{A}$	--	2.2	2.6	Ω
C_{iss}	Input Capacitance	$V_{\text{GS}} = 0\text{V}$, $V_{\text{DS}} = 25\text{V}$, $f = 1.0\text{MHz}$	--	218	--	pF
C_{oss}	Output Capacitance		--	28	--	
C_{rss}	Reverse Transfer Capacitance		--	4	--	
Q_{g}	Total Gate Charge	$V_{\text{DD}} = 480\text{V}$, $I_{\text{D}} = 1\text{A}$, $V_{\text{GS}} = 10\text{V}$	--	4.8	--	nC
Q_{gs}	Gate-Source Charge		--	0.7	--	
Q_{gd}	Gate-Drain Charge		--	2.7	--	
$t_{\text{d}}(\text{on})$	Turn-on Delay Time	$V_{\text{DD}} = 250\text{V}$, $I_{\text{D}} = 3\text{A}$, $R_{\text{G}} = 25\Omega$	--	7.8	--	ns
t_{r}	Turn-on Rise Time		--	33	--	
$t_{\text{d}}(\text{off})$	Turn-off Delay Time		--	13	--	
t_{f}	Turn-off Fall Time		--	59	--	
I_{S}	Continuous Body Diode Current	$T_C = 25^{\circ}\text{C}$	--	--	3	A
I_{SM}	Pulsed Diode Forward Current		--	--	12	A
V_{SD}	Body Diode Voltage	$T_J = 25^{\circ}\text{C}$, $I_{\text{SD}} = 3\text{A}$, $V_{\text{GS}} = 0\text{V}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$V_{\text{GS}} = 0\text{V}$, $I_{\text{S}} = 3\text{A}$, $dI_{\text{F}}/dt = 100\text{A}/\mu\text{s}$	--	62	--	ns
Q_{rr}	Reverse Recovery Charge		--	0.28	--	μC

Note :

- 1、The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2、The EAS data shows Max. rating . $I_{\text{AS}} = 2.4\text{A}$, $V_{\text{DD}} = 50\text{V}$, $R_{\text{G}} = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$
- 3、The test condition is Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
- 4、The power dissipation is limited by 150°C junction temperature
- 5、The data is theoretically the same as I_{D} and I_{DM} , in real applications , should be limited by total power dissipation.

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Typical Characteristics

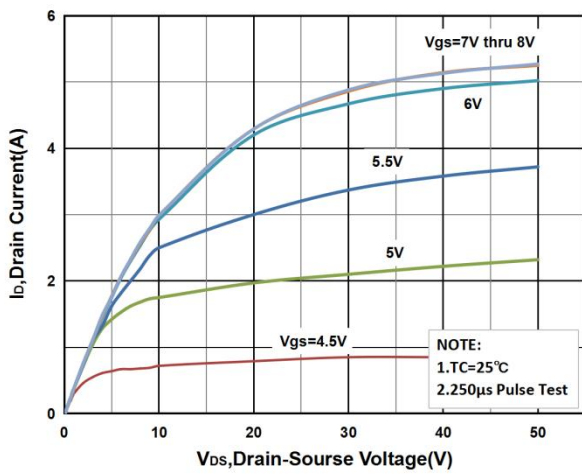


Fig1 Typical Output Characteristics, $T_c = 25^\circ\text{C}$

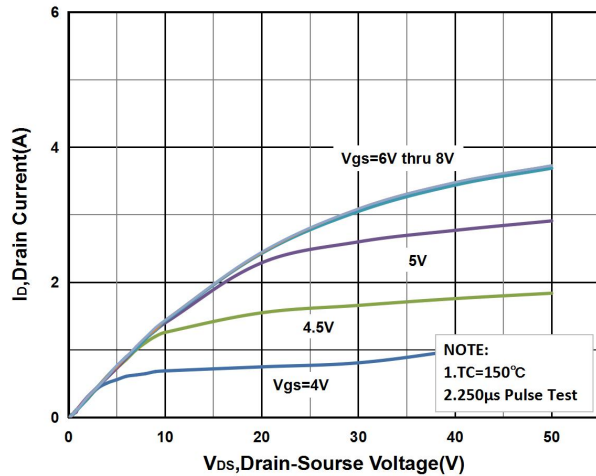


Fig2 Typical Output Characteristics, $T_c = 150^\circ\text{C}$

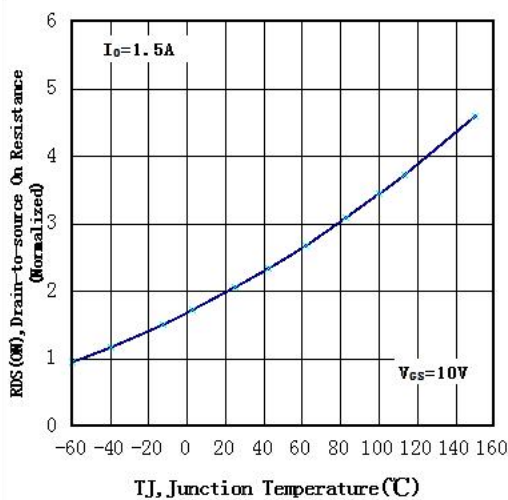


Fig3 On-Resistance Vs. Temperature

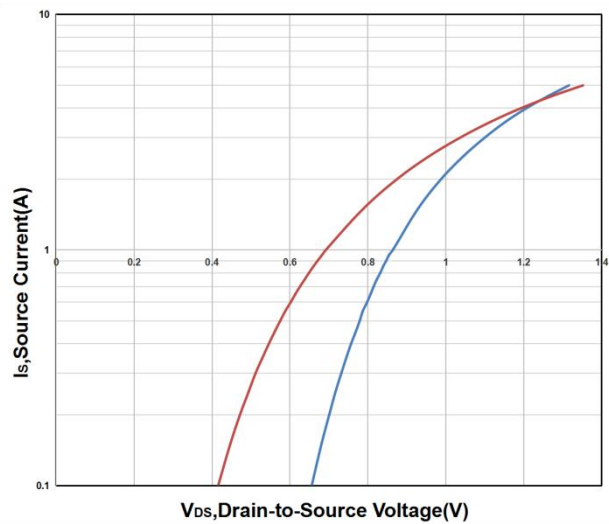


Fig4 Typical Source-Drain Diode Forward Voltage

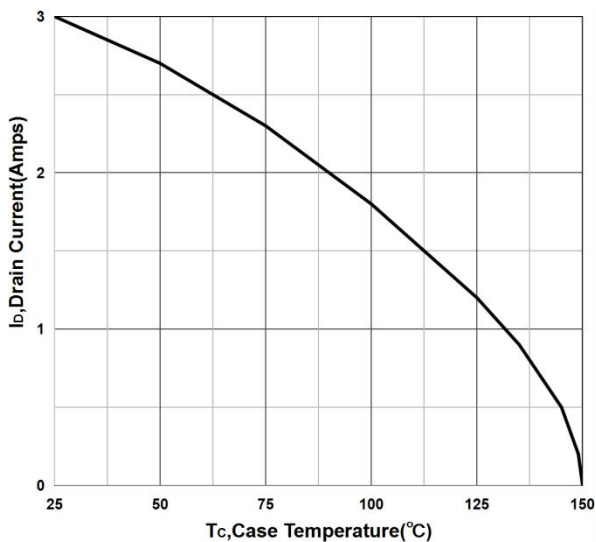


Fig5 Maximum Drain Current Vs. Case Temperature

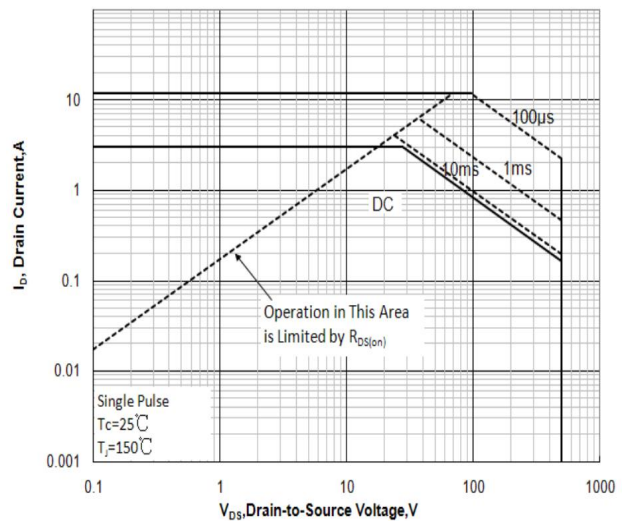


Fig6 Maximum Safe Operating Area

Typical Characteristics (Continued)

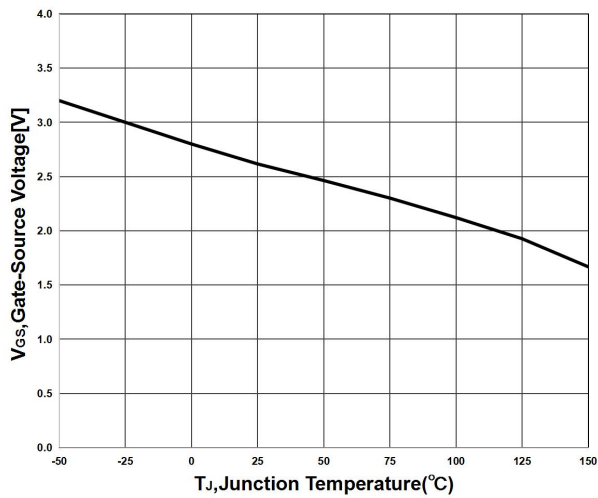


Fig7 Gate Threshold Voltage Variation vs. Temperature

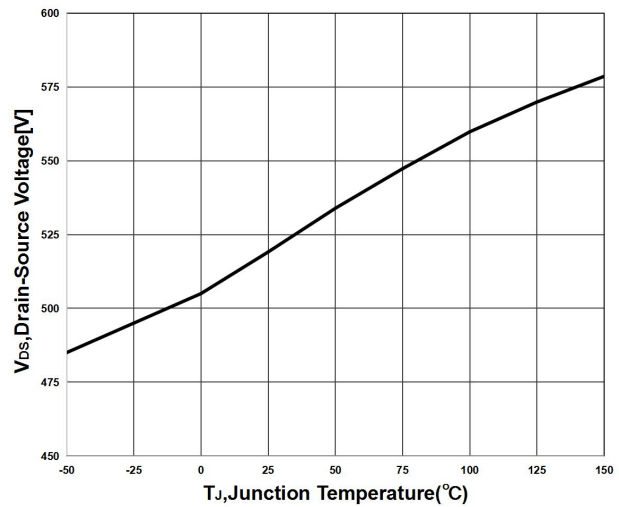


Fig8 Breakdown Voltage Variation vs. Temperature

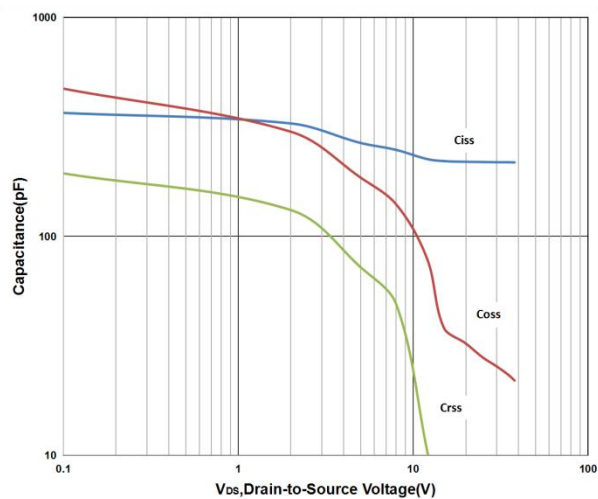


Fig9 Capacitance Characteristics

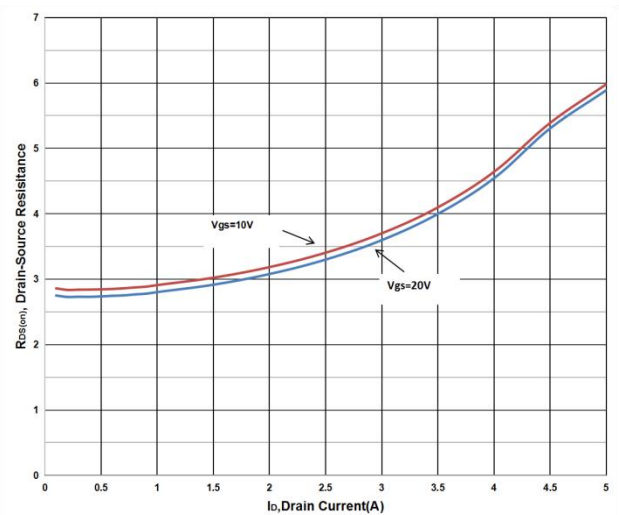


Fig10 On-Resistance Variation VS. Drain Current and Gate Voltage

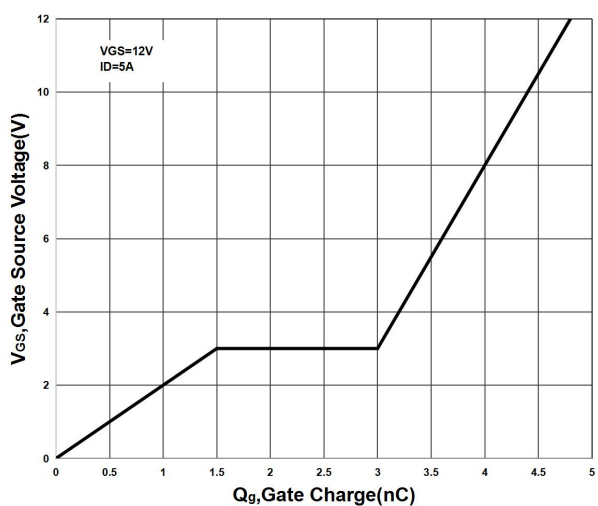
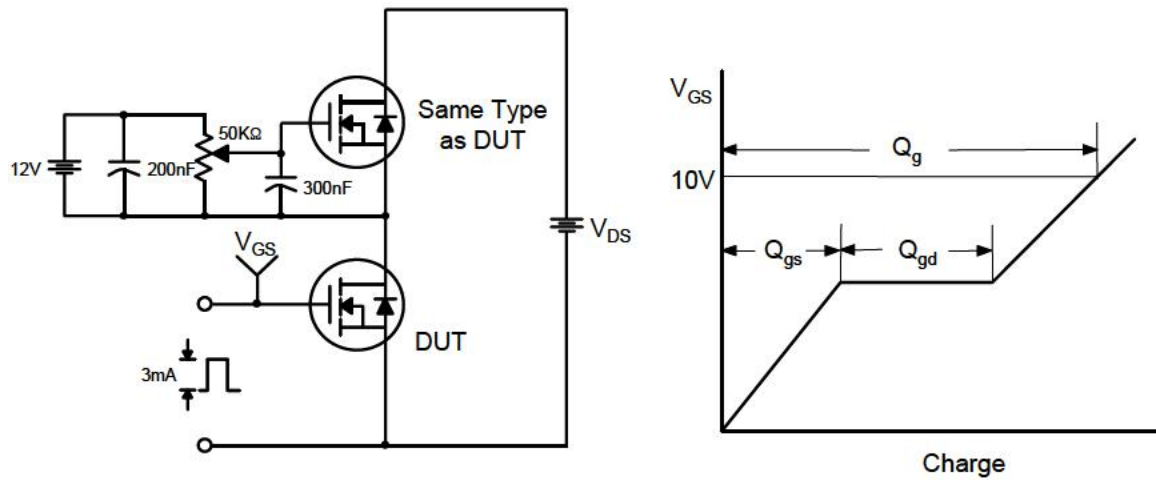
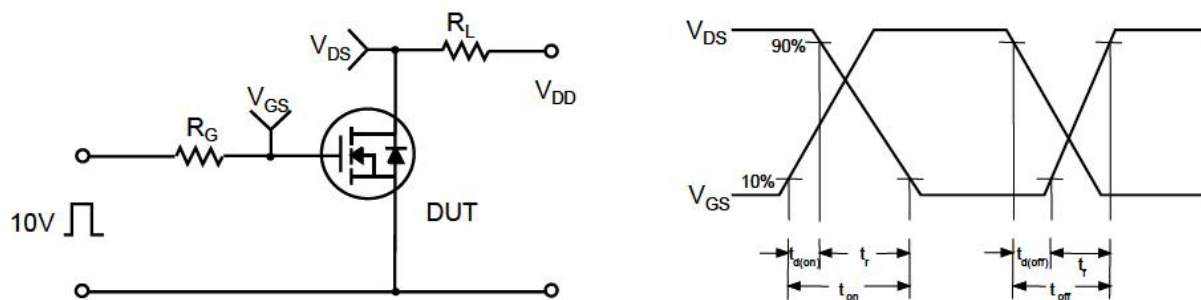


Fig11 Gate Charge VS Gate to Source Voltage

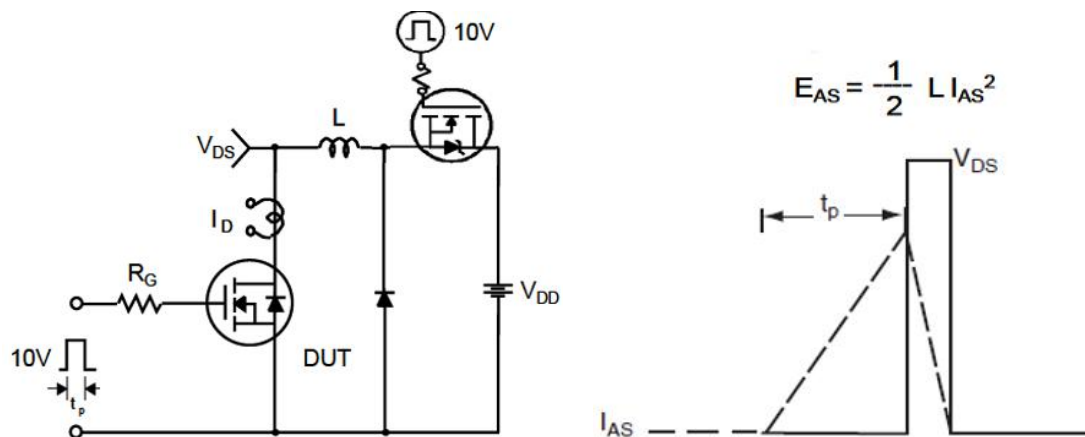
Gate Charge Test Circuit & Waveform



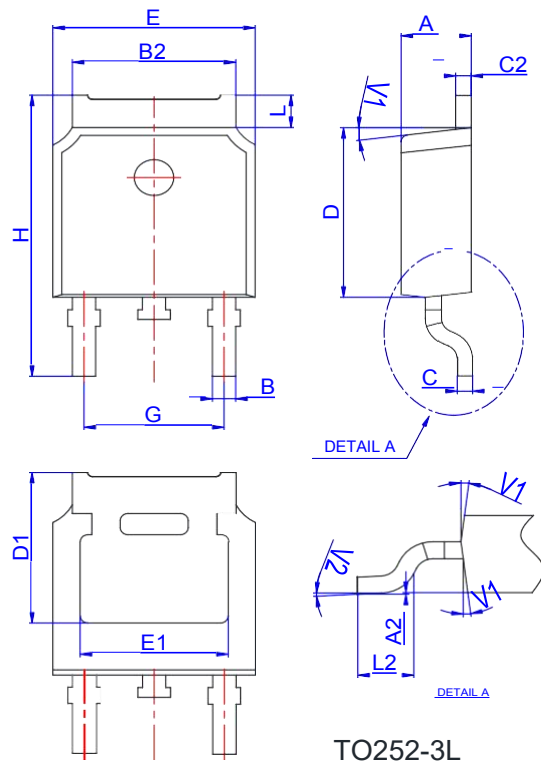
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

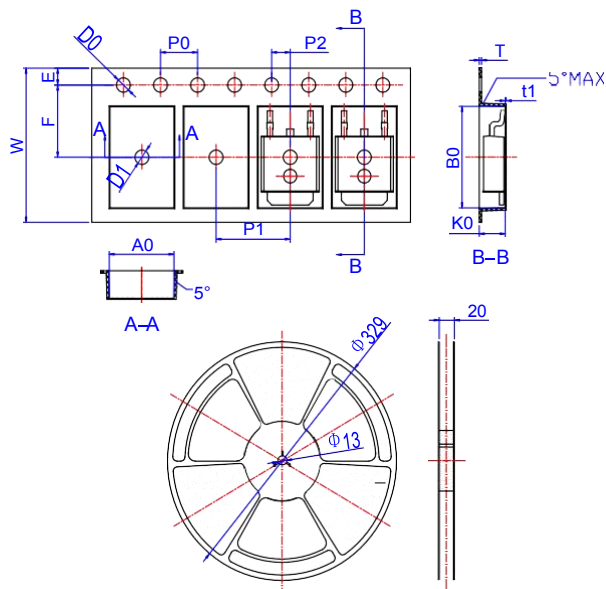


Package Mechanical Data-TO252-3L



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