

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

650V Super Junction Power MOSFET

Product Summary



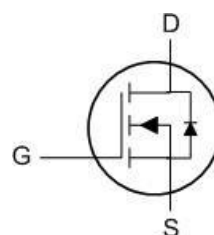
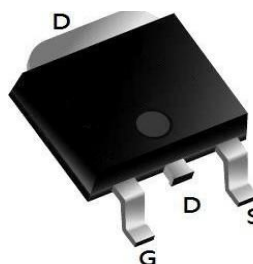
BVDSS	RDS(on)	ID
650V	0.5 Ω	8 A

Description

The XR650SJ520 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 XR650SJ520 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

TO252-3L Pin Configuration



Absolute Maximum Ratings

Parameter	Sym			Unit
Drain-source voltage	V_{DSS}	650		V
Continuous drain current ¹⁾ ($T_C = 25^\circ\text{C}$)	I_D	8		A
($T_C = 100^\circ\text{C}$)		4.8		A
Pulsed drain current ²⁾	I_{DM}	19		A
Gate-source voltage	V_{GS}	±30		V
Avalanche energy, single pulse ³⁾	E_{AS}	45		mJ
Avalanche energy, repetitive ²⁾	E_{AR}	0.15		mJ
Avalanche current, repetitive ²⁾	I_{AR}	1.0		A
Power dissipation ($T_C = 25^\circ\text{C}$)	P_D	57	27	W
- Derate above 25°C		0.46	0.22	W/°C
Operating and storage temperature range	T_j, T_{stg}	-55 to +150		°C
Continuous diode forward current	I_S	8		A
Diode pulse current	$I_{S,pulse}$	19		A

Thermal Characteristics

Parameter	Sym			Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	2.2	4.6	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62	80	°C/W

650V Super Junction Power MOSFET

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0 V, I _D =0.25 mA	650	-	-	V
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =0.25mA	2	3	4	V
Drain cut-off current	I _{DSS}	V _{DS} =650 V, V _{GS} =0V, T _J = 25°C T _J = 125°C	- -	- 30	1 -	μA
Gate leakage current, forward	I _{GSSF}	V _{GS} =20V, V _{DS} =0V	-	-	100	nA
Gate leakage current, reverse	I _{GSSR}	V _{GS} =-20V, V _{DS} =0V	-	-	-100	nA
Drain-source on-state resistance	R _{DS(on)}	V _{GS} =10 V, I _D =1.5A T _J = 25°C	- -	 0.5	 0.6	 Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 100V, V _{GS} = 0V, f = 1 MHz	-	415	-	pF
Output capacitance	C _{OSS}		-	19	-	
Reverse transfer capacitance	C _{rss}		-	0.95	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 300V, I _D = 2A R _G = 25Ω, V _{GS} =10V	-	12	-	ns
Rise time	t _r		-	10	-	
Turn-off delay time	t _{d(off)}		-	62	-	
Fall time	t _f		-	13	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =480V, I _D =2A, V _{GS} =0 to 10V	-	1.7	-	nC
Gate to drain charge	Q _{gd}		-	3.5	-	
Gate charge total	Q _g		-	9.6	-	
Gate plateau voltage	V _{plateau}		-	5.2	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =1.5A	-	-	1.2	V
Reverse recovery time	t _{rr}	V _R =50V, I _F =2A, dI _F /dt=100A/μs	-	105	-	ns
Reverse recovery charge	Q _{rr}		-	0.6	-	μC
Peak reverse recovery current	I _{rrm}		-	11.3	-	A

Notes:

- Limited by $T_{j\max}$. Maximum duty cycle $D=0.5$.
- Repetitive rating: pulse width limited by maximum junction temperature.
- $I_{AS} = 1.0\text{ A}$, $V_{DD} = 50\text{ V}$, $R_G = 25\Omega$, starting $T_j = 25^\circ\text{C}$.

650V Super Junction Power MOSFET

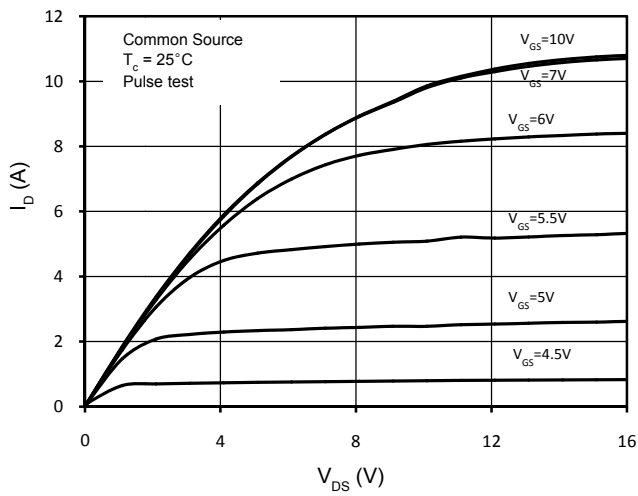


Figure 1. On-Region Characteristics

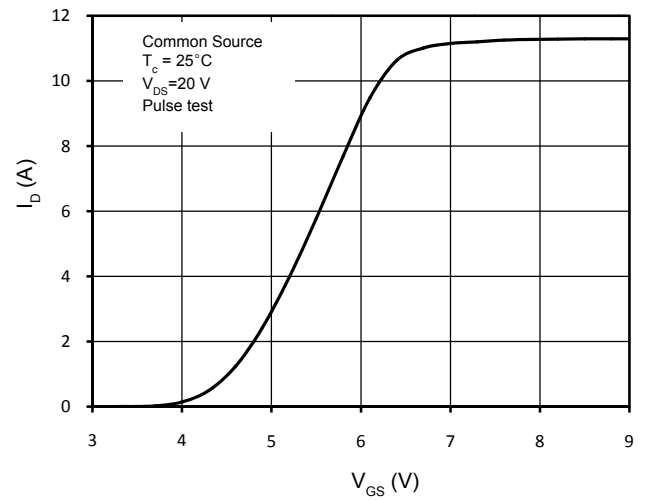


Figure 2. Transfer Characteristics

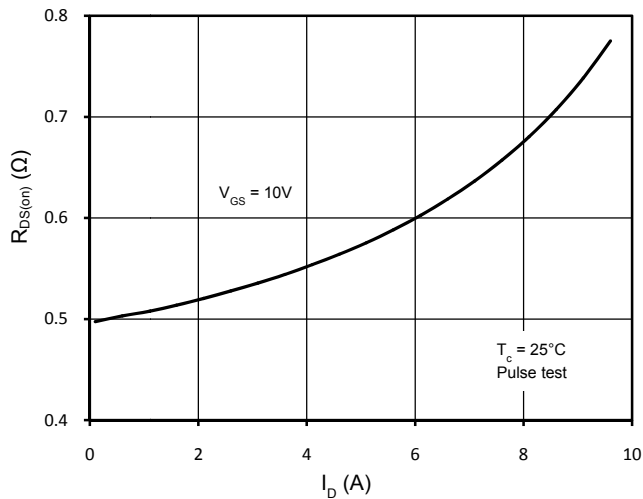


Figure 3. Static Drain-Source On Resistance

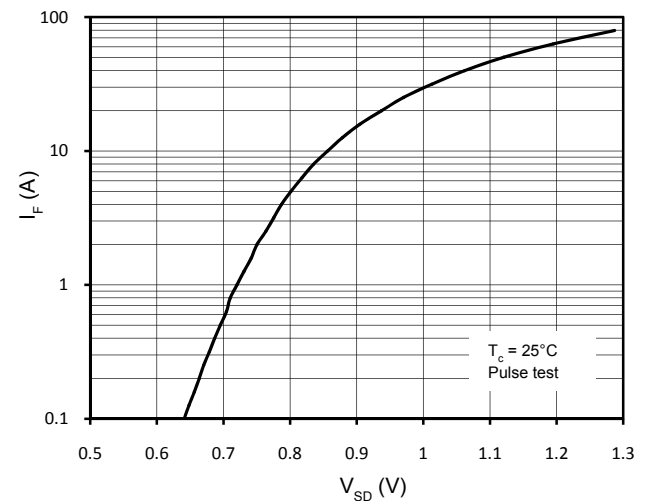


Figure 4. Body-Diode Forward Characteristics

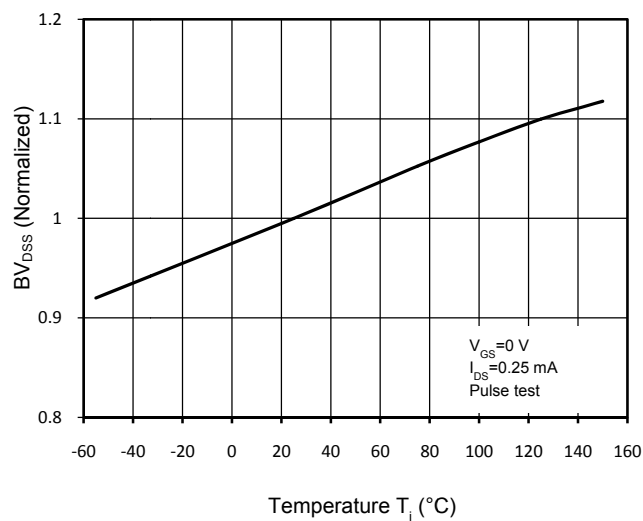


Figure 5. Normalized BV_{DS} vs. Temperature

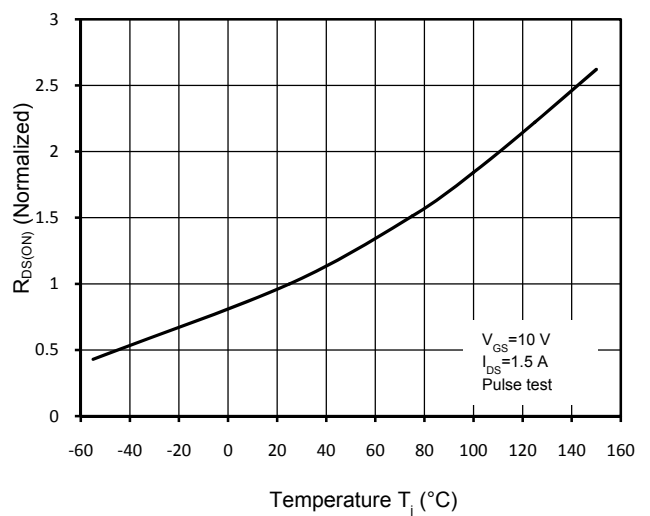


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

650V Super Junction Power MOSFET

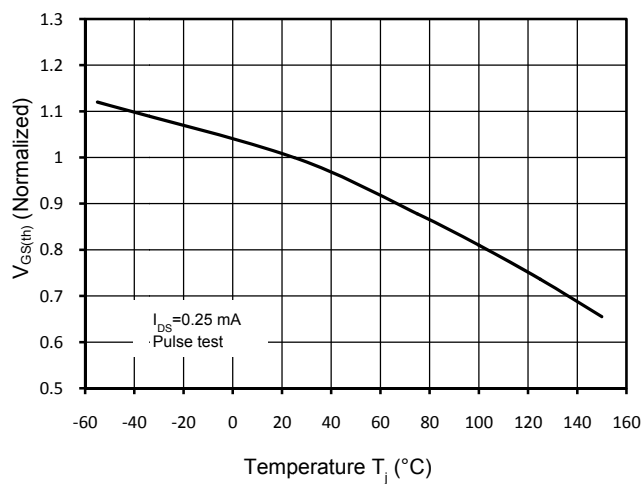


Figure 7. Threshold Voltage vs. Temperature

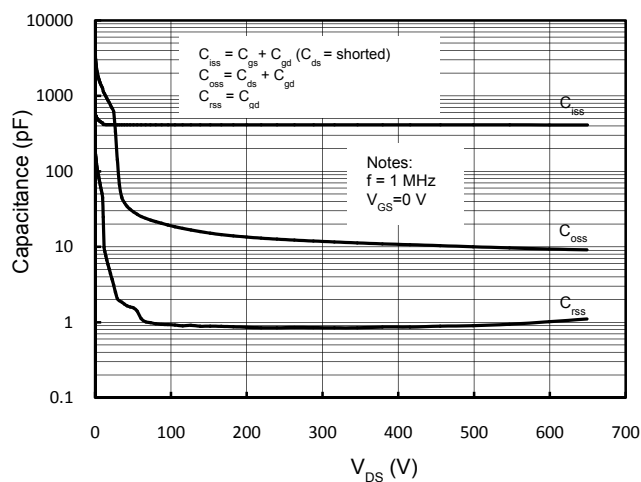


Figure 8. Capacitance Characteristics

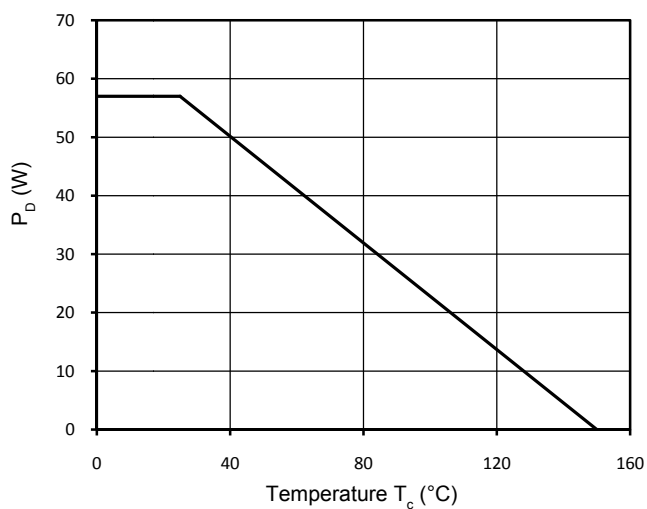


Figure 9. Power Dissipation

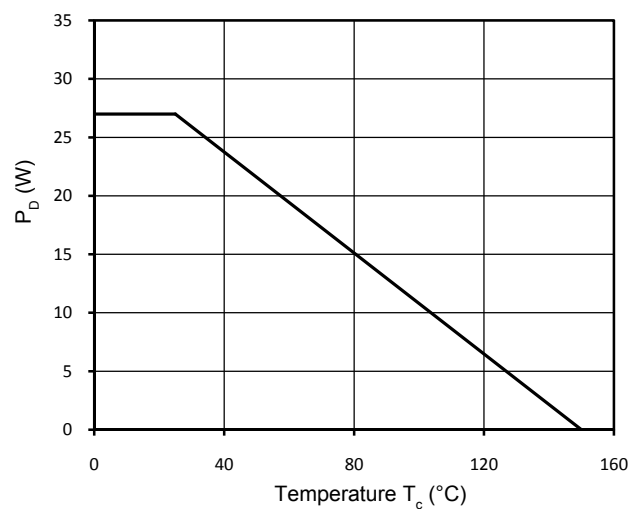


Figure 10. Power Dissipation (TO-220F)

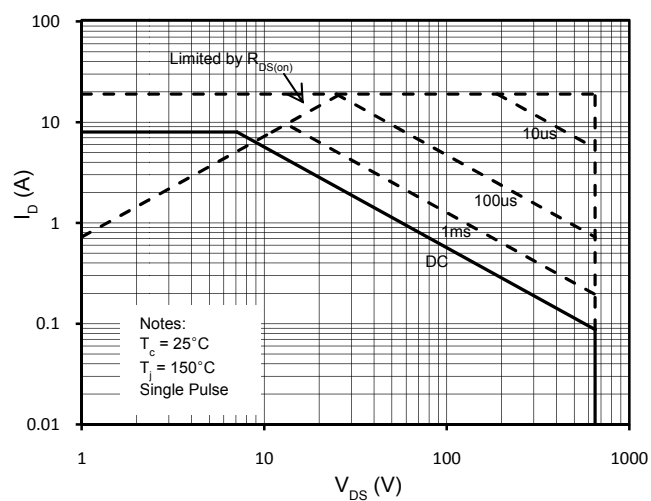


Figure 11. Maximum Safe Operating Area

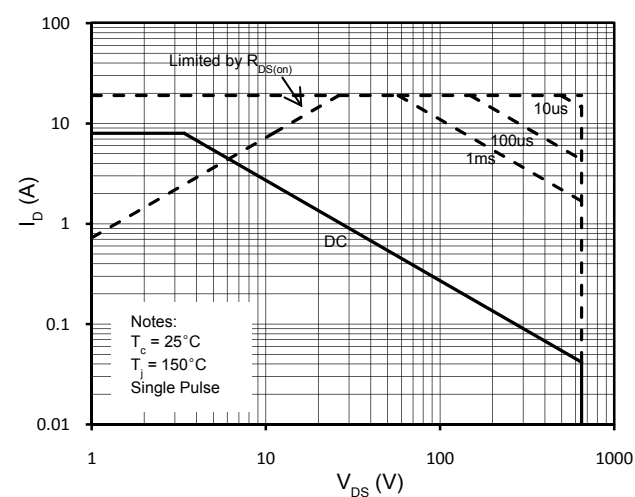


Figure 12. Maximum Safe Operating Area (TO-252)

650V Super Junction Power MOSFET

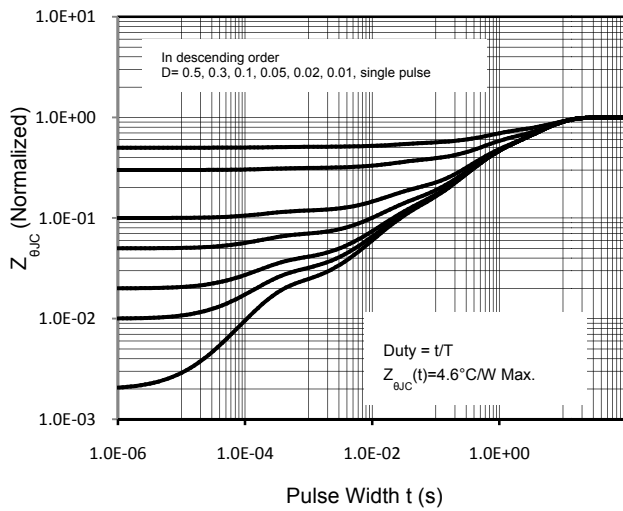


Figure 13. Transient Thermal Response Curve (TO-220F)

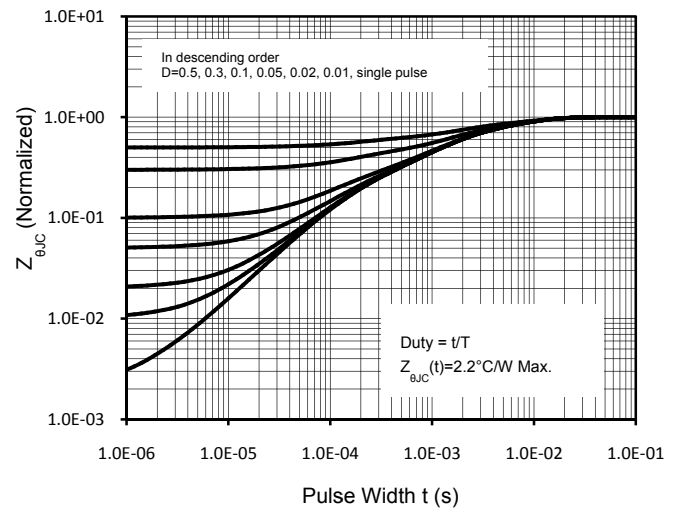


Figure 14. Transient Thermal Response Curve

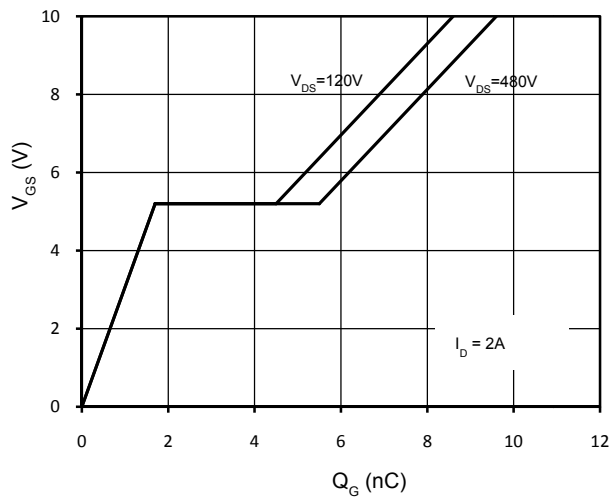
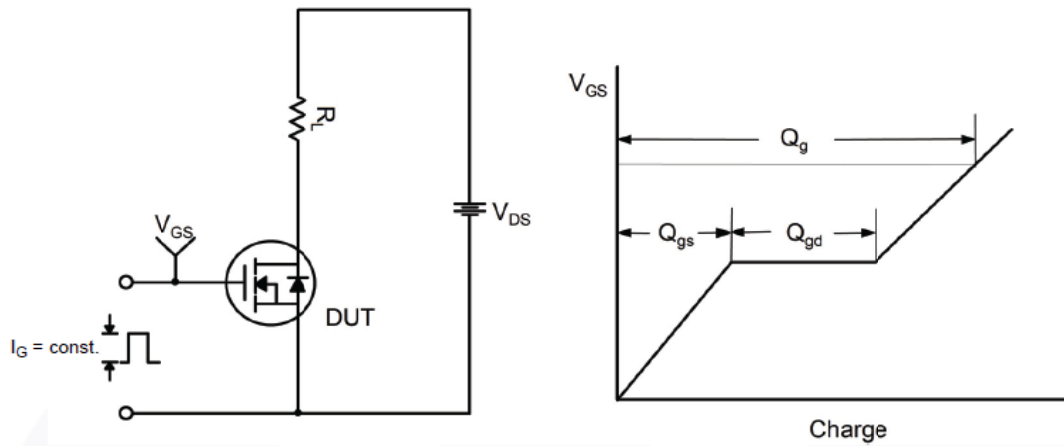
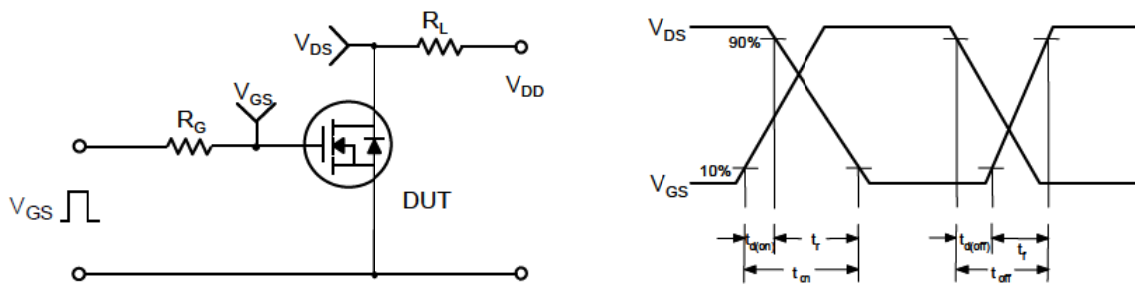


Figure 15. Gate Charge Characteristics

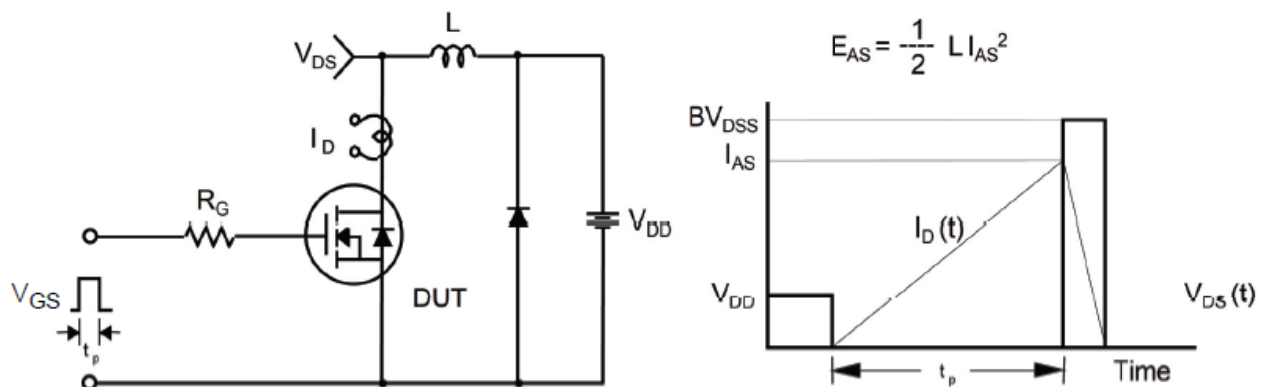
Gate Charge Test Circuit & Waveform



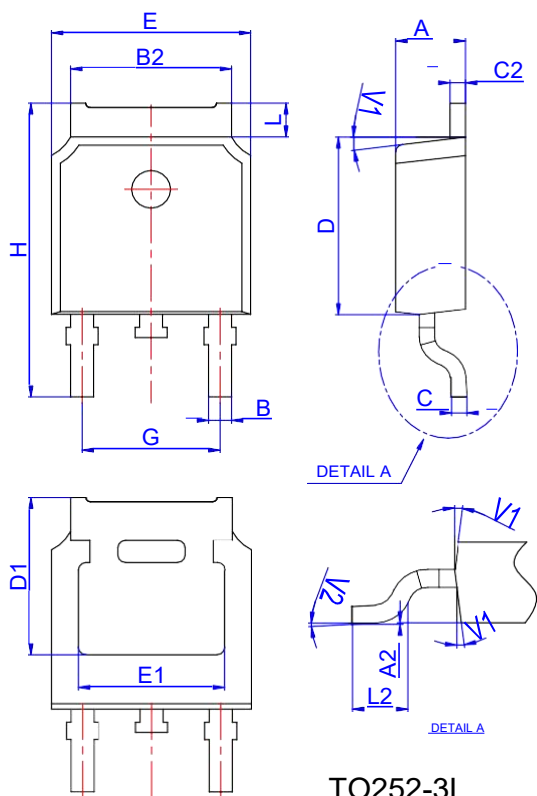
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



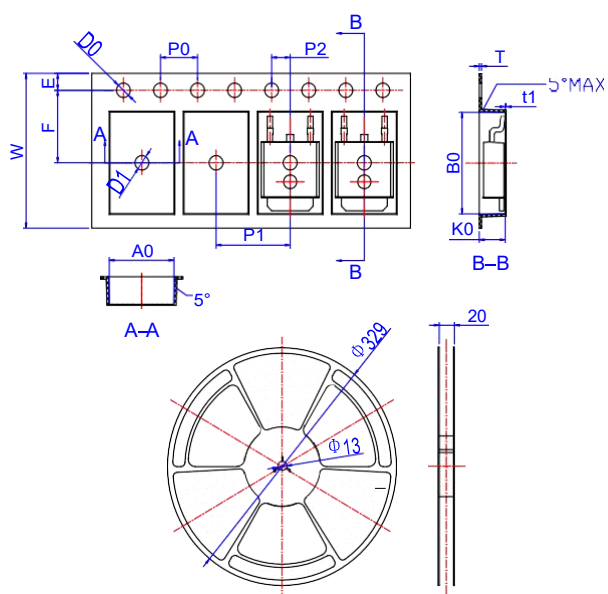
Package Mechanical Data-TO252-3L



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