

Product Summary

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

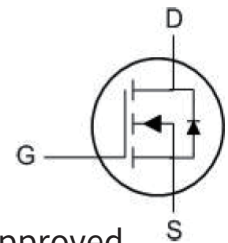
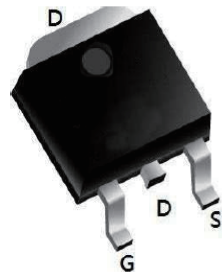
Applications

The 650SJ32 use advanced trench gate 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 650SJ32 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

Product Summary

BVDSS	RDSON	ID
650V	0.35Ω	11A

TO252 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	WMK/WMMWMO/WMP/WMN	WML	Unit
V _{DSS}	Drain-source voltage	650		V
I _D	Continuous drain current ¹⁾ (T _C = 25°C)	11		A
	Continuous drain current ¹⁾ (T _C = 100°C)	6.5		A
I _{DM}	Pulsed drain current ²⁾	32		A
V _{GS}	Gate-source voltage	±30		V
E _{AS}	Avalanche energy, single pulse ³⁾	145		mJ
E _{AR}	Avalanche energy, repetitive ²⁾	0.21		mJ
I _{AR}	Avalanche current, repetitive ²⁾	2		A
P _D	Power dissipation (T _C = 25°C)	85	31	W
	- D rate above 25°C	0.68	0.25	W/°C
T _J , T _{stg}	Operating and storage temperature range	-55 to +150		°C
I _S	Continuous diode forward current	11		A
I _{S,pulse}	Diode pulse current	35		A
dv/dt	MOSFET dv/dt ruggedness	50		V/ns
	Peak diode recovery voltage slope	15		V/ns

Thermal Data

Symbol	Parameter	WMK/WMMWMO/WMP/WMN	WML	Unit
R _{θC}	Thermal resistance, junction-to-case	1.47	4	°C/W
R _{θA}	Thermal resistance, junction-to-ambient	62	80	°C/W

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

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Units
Static characteristics						
BV_{DSS}	Drain-source breakdown voltage	$V_{GS}=0\text{ V}, I_D=0.25\text{ mA}$	650	-	-	V
$V_{GS(th)}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D=0.25\text{ mA}$	2	3	4	V
I_{DSS}	Drain cut-off current	$V_{DS}=700\text{ V}, V_{GS}=0\text{ V}, T_J = 25^\circ\text{C}$	-	-	1	μA
		$V_{DS}=700\text{ V}, V_{GS}=0\text{ V}, T_J = 125^\circ\text{C}$	-	50	-	
I_{GSSF}	Gate leakage current, forward	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$	-	-	100	nA
I_{GSSR}	Gate leakage current, reverse	$V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$	-	-	-100	
$R_{DS(on)}$	Drain-source on-state resistance	$V_{GS}=10\text{ V}, I_D=2\text{ A}$	--	0.35	0.39	Ω
Dynamic characteristics						
C_{iss}	Input capacitance	$V_{DS}=100\text{ V}, V_{GS}=0\text{ V}, f=1\text{ MHz}$	-	710	-	pF
C_{oss}	Output capacitance		-	25	-	
C_{riss}	Reverse transfer capacitance		-	2	-	
$t_{d(on)}$	Turn-on delay time	$V_{DD}=300\text{ V}, I_D=5\text{ A}, R_G=25\Omega,$ $V_{GS}=10\text{ V}$	-	20	-	ns
t_r	Rise time		-	16	-	
$t_{d(off)}$	Turn-off delay time		-	61	-	
t_f	Fall time		-	17	-	
Gate charge characteristics						
Q_{gs}	Gate to source charge	$V_{DD}=480\text{ V}, I_D=5\text{ A}, V_{GS}=0\text{ to }10\text{ V}$	-	3.4	-	nC
Q_{gd}	Gate to drain charge		-	10.1	-	
Q_g	Gate charge total		-	20.3	-	
$V_{plateau}$	Gate plateau voltage		-	4.7	-	V
Reverse diode characteristics						
V_{SD}	Diode forward voltage	$V_{GS}=0\text{ V}, I_F=2\text{ A}$	-	-	1.2	V
t_{rr}	Reverse recovery time	$V_R=50\text{ V}, I_F=5\text{ A}, dI_F/dt=100\text{ A}/\mu\text{s}$	-	213	-	ns
Q_{rr}	Reverse recovery charge		-	2.1	-	μC
I_{rrm}	Peak reverse recovery current		-	20	-	A

Notes:

- Limited by T_J max. Maximum duty cycle $D=0.5$.
- Repetitive rating: pulse width limited by maximum junction temperature.
- $I_{AS} = 2.0\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\Omega$, starting $T_J = 25^\circ\text{C}$.

Typical Electrical and Thermal Characteristics (Curves)

Figure 1: On-Region Characteristics

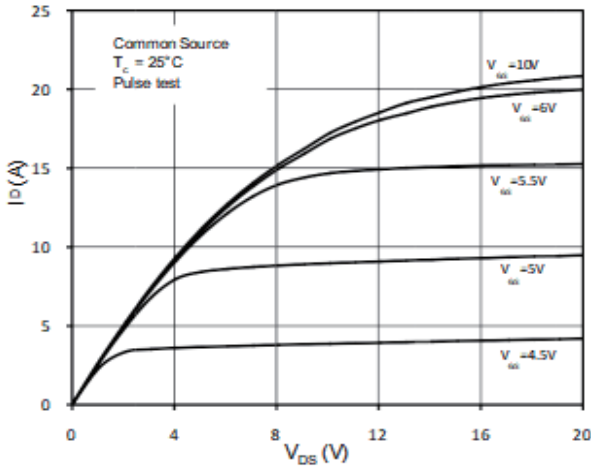


Figure 2: Transfer Characteristics

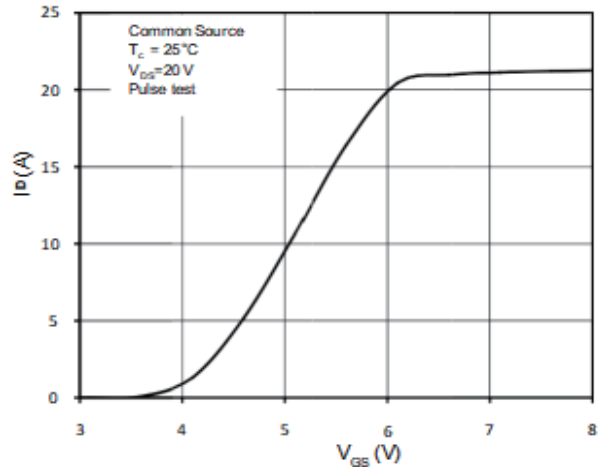


Figure 3: Static Drain-Source On Resistance

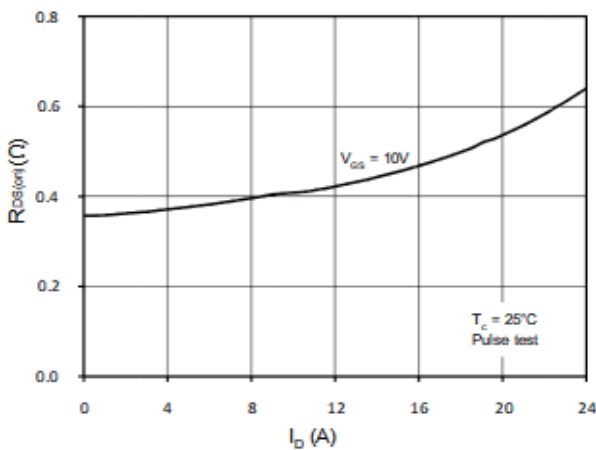


Figure 4: Body Diode Characteristics

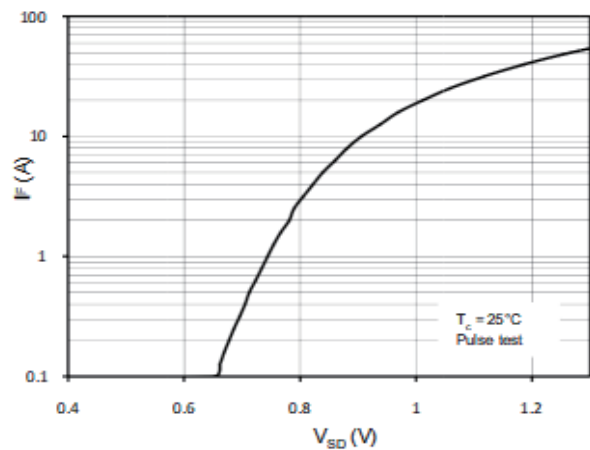


Figure 5: Normalized BVDSS vs. Temperature

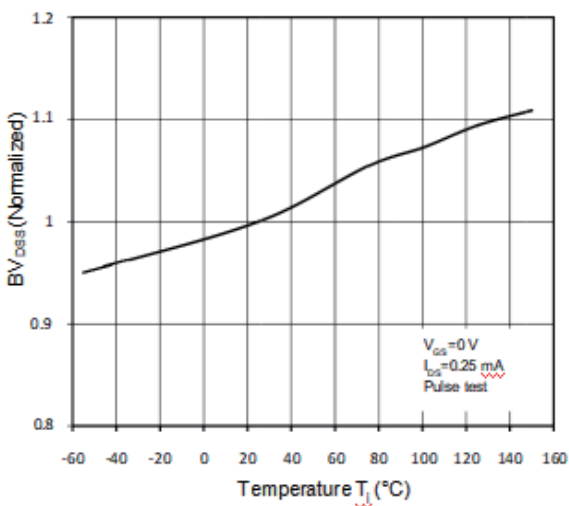
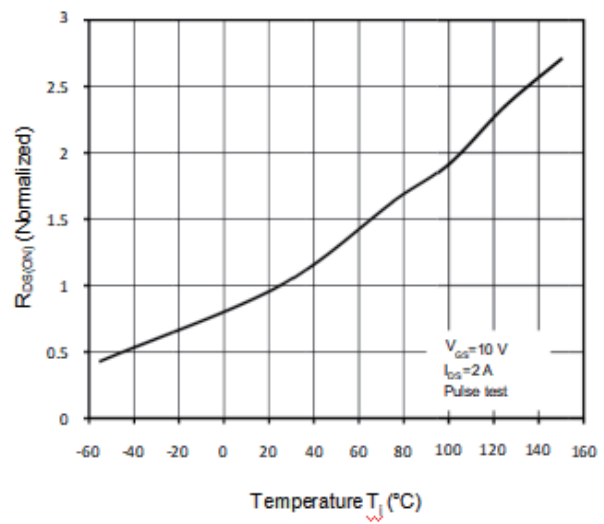


Figure 6: Normalized RDS(on) vs. Temperature



Typical Performance Characteristics

Figure 7: Threshold Voltage vs. Temperature

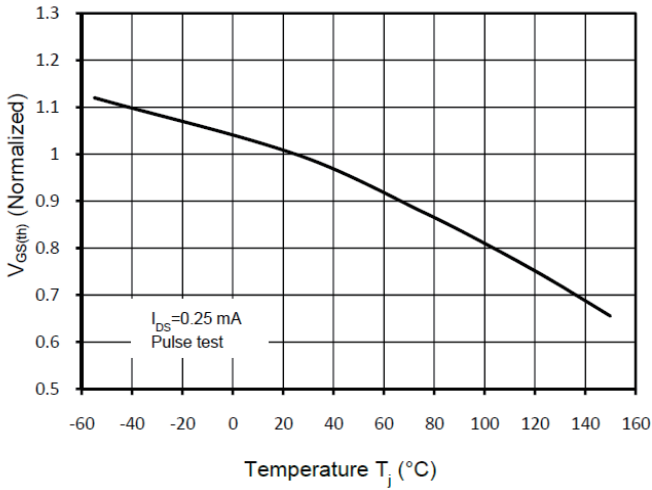


Figure 8: Capacitance Characteristics

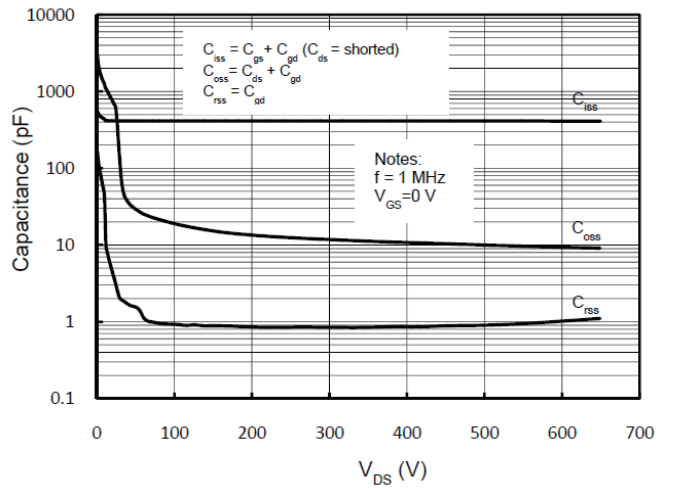


Figure 9: Power Dissipation

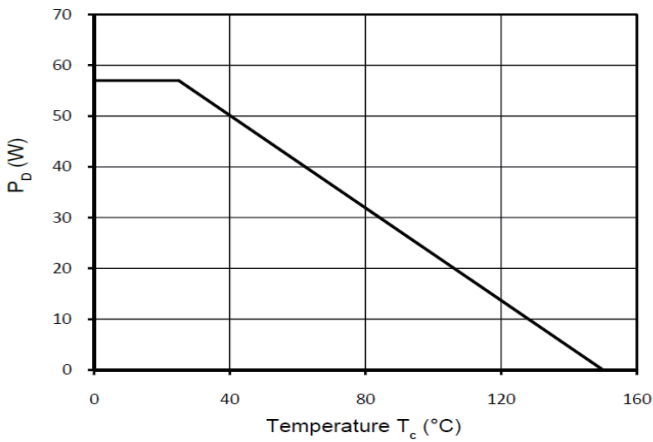


Figure 10: Power Dissipation (TO-220F)

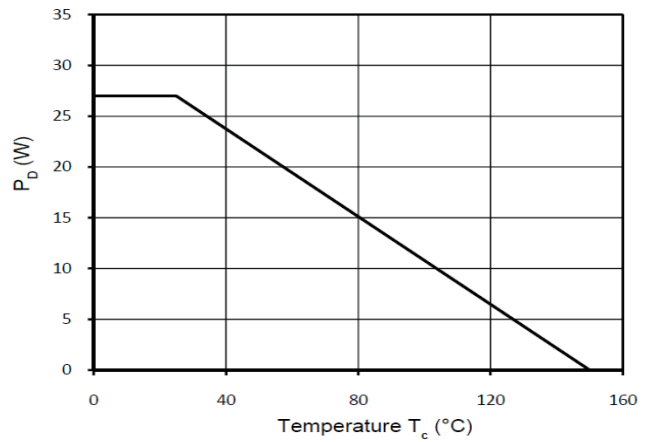


Figure 11: Maximum Safe Operating Area

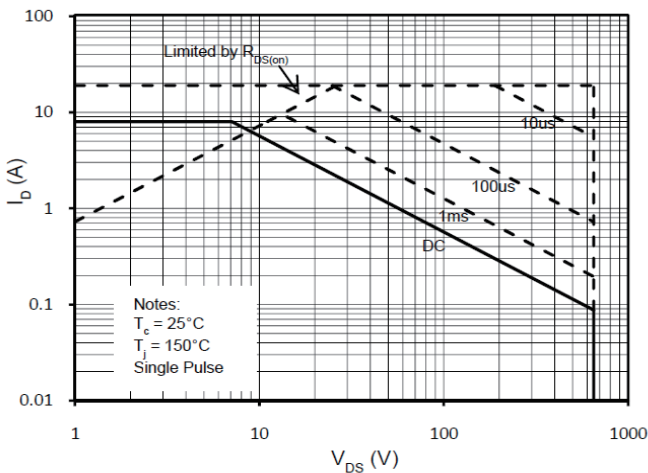
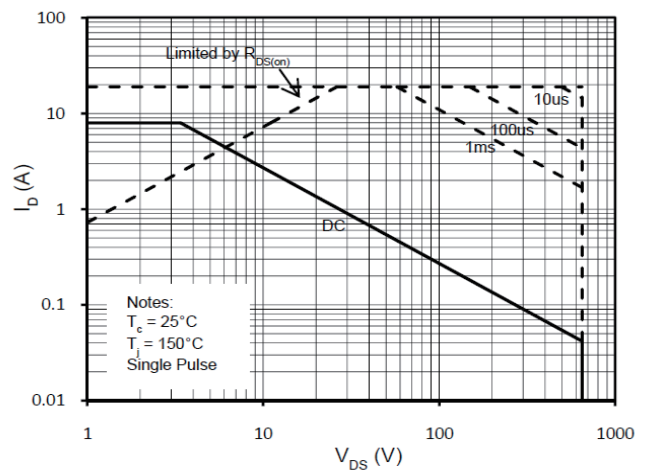


Figure 11: Maximum Safe Operating Area





Typical Performance Characteristics

Figure 13: Transient Thermal Response $Z_{\theta JC}$

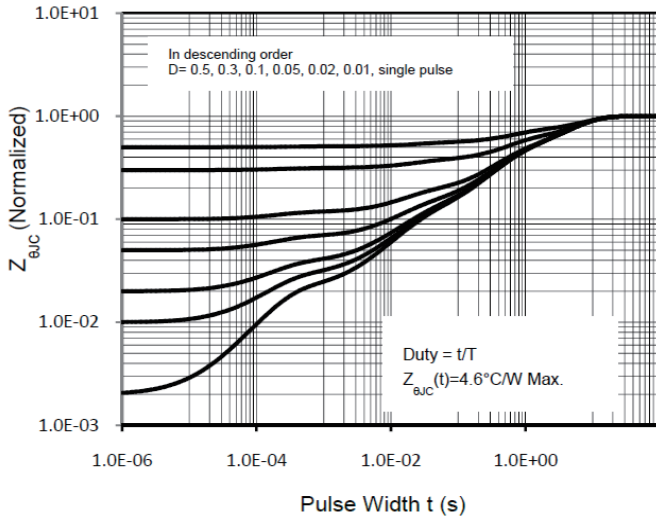


Figure 14: Transient Thermal Response $Z_{\theta JC}$

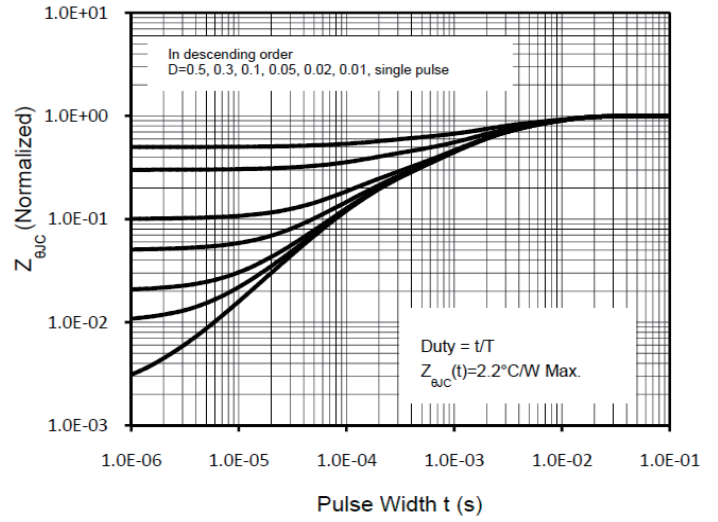
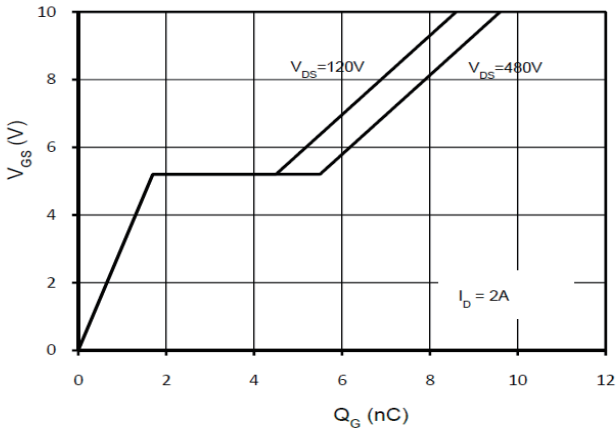
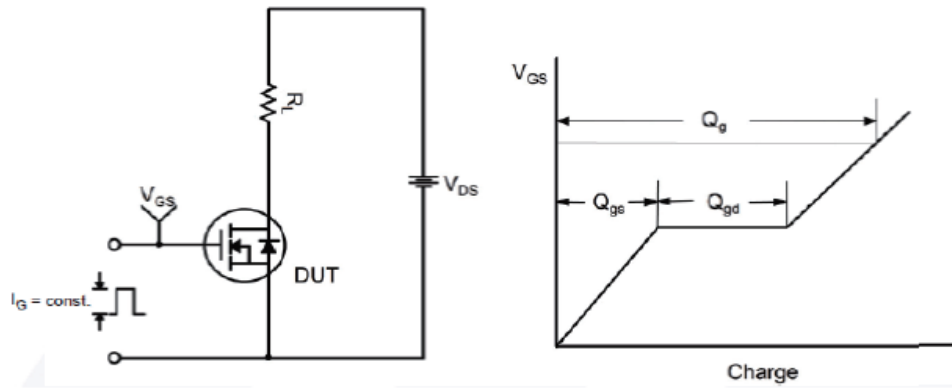


Figure 15: Gate Charge Characteristics

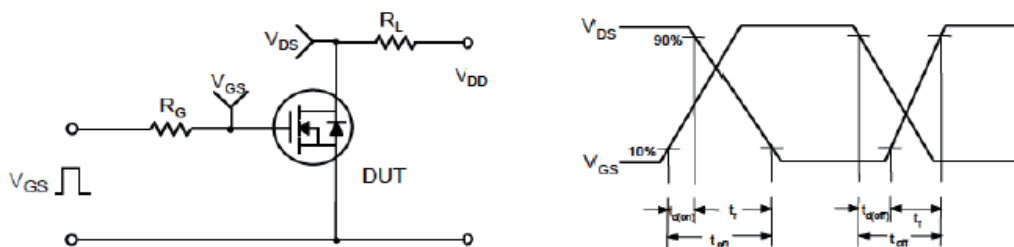


Test circuit

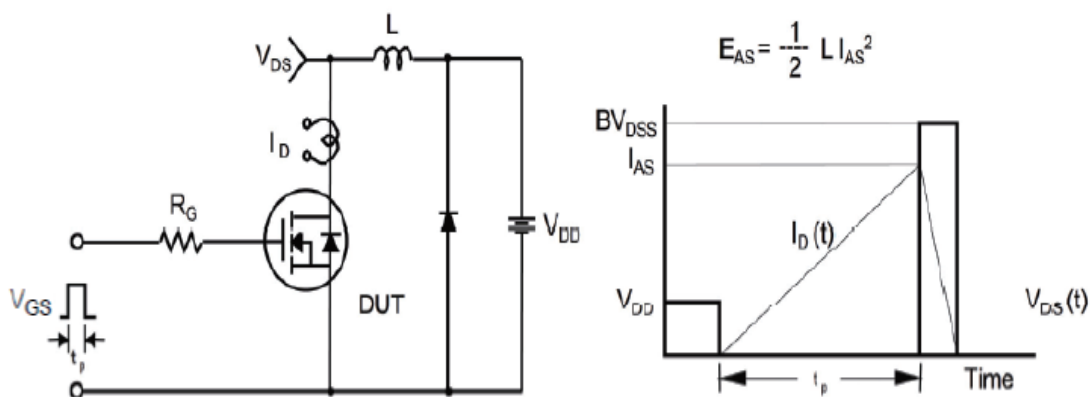
Gate Charge Test Circuit & Waveform



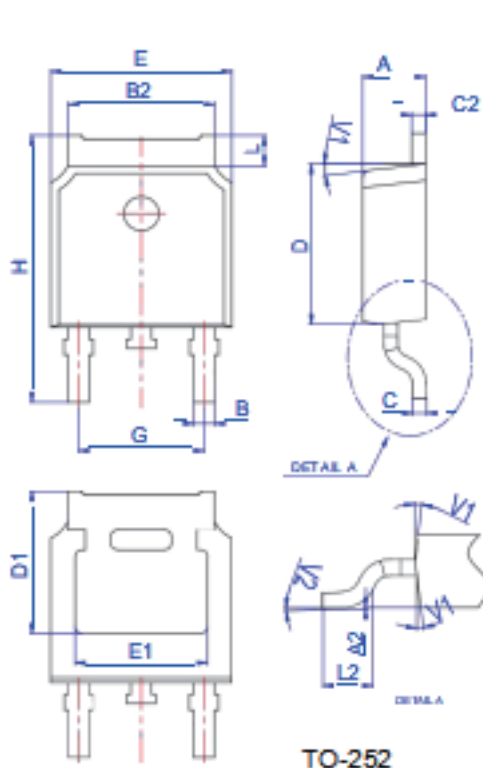
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

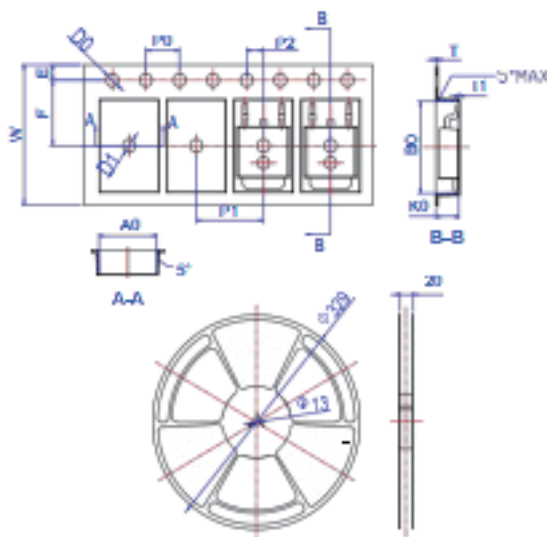


Package Mechanical Data-TO-252



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
I1	0.10			0.004		
10P0	39.80	40.00	40.20	1.567	1.575	1.583