

650V Super Junction Power MOSFET

- ★ Super_Junction technology
- ★ Much lower $R_{on} \cdot A$ performance for On-state efficiency
- ★ Better efficiency due to very low FOM
- ★ Qualified for industrial grade applications according to JEDEC

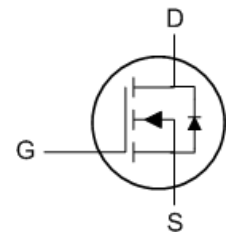
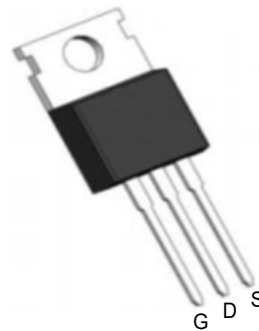
Product Summary


BVDSS	R _{DS(on)}	I _D
650V	0.11 Ω	24A

Description

The XR65R110T use super junction technology and design to provide excellent R_{DS(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 XR65R110T meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

TO220AB Pin Configuration

Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V _{DS}	Drain-Source Voltage	650	V
V _{GS}	Gate-Source Voltage	±30	V
I _D @T _C =25°C	Continuous Drain Current, V _{GS} @ 10V ^{1,6}	24	A
I _D @T _C =100°C	Continuous Drain Current, V _{GS} @ 10V ^{1,6}	12	A
I _{DM}	Pulsed Drain Current ²	96	A
EAS	Single Pulse Avalanche Energy ³	300	mJ
I _{AS}	Avalanche Current	---	A
P _D @T _C =25°C	Total Power Dissipation ⁴	89	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 _{θJA}	Thermal Resistance Junction-Ambient ¹	---	67	°C/W
R _{θJC}	Thermal Resistance Junction-Case ¹	---	1.4	°C/W

Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	∞	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =1mA	---	---	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =16A	---	1.1	1.4	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	3.2	3.5	1.6	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	---	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =100V, V _{GS} =0V, T _J =25°C	---	---	5	uA
		V _{DS} =100V, V _{GS} =0V, T _J =150°C	---	220	---	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±10V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =60V, I _D =16A	---	16.5	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	10	---	Ω
Q _g	Total Gate Charge	V _{DS} =100V, V _{GS} =10V, I _D =16A	---	46	---	nC
Q _{gs}	Gate-Source Charge		---	14	---	
Q _{gd}	Gate-Drain Charge		---	24	---	
T _{d(on)}	Turn-On Delay Time	V _{GS} =10V, V _{DD} =100V, R _G =7Ω, I _D =16A	---	60	---	ns
T _r	Rise Time		---	61	---	
T _{d(off)}	Turn-Off Delay Time		---	140	---	
T _f	Fall Time		---	31	---	
C _{iss}	Input Capacitance	V _{DS} =100V, V _{GS} =0V, f=1MHz	---	1595	---	pF
C _{oss}	Output Capacitance		---	90	---	
C _{rss}	Reverse Transfer Capacitance		---	1.5	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,4}	V _G =V _D =0V, Force Current	---	---	24	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =16A, T _J =25°C	0.7	0.86	1.1	V
t _{rr}	Reverse Recovery Time	I _F =16, di/dt=100A/μs, T _J =25°C	---	120	---	ns
Q _{rr}	Reverse Recovery Charge		---	0.63	---	

Note :

1 The data is tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.

2 The data is tested by pulsed pulse width ≤ 300us duty cycle ≤ 2%

3 The EAS data shows Max. rating at the test condition as V_{RM} > 0, V_{DD}=200V, V_{GS}=10V, L=60mH

4 The power dissipation is limited by 150°C junction temperature

5 The data is theoretically the same as I_{DM} and I_{DM(A)} in real applications it should be limited by total power dissipation.

Typical Performance Characteristics

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

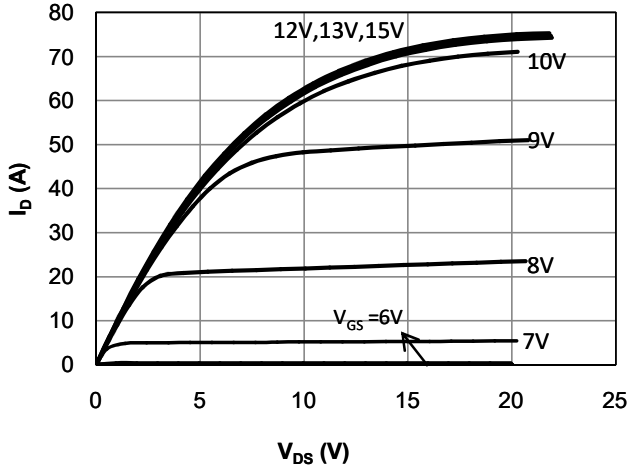


Fig 2. Output Characteristics ($T_j=150^\circ\text{C}$)

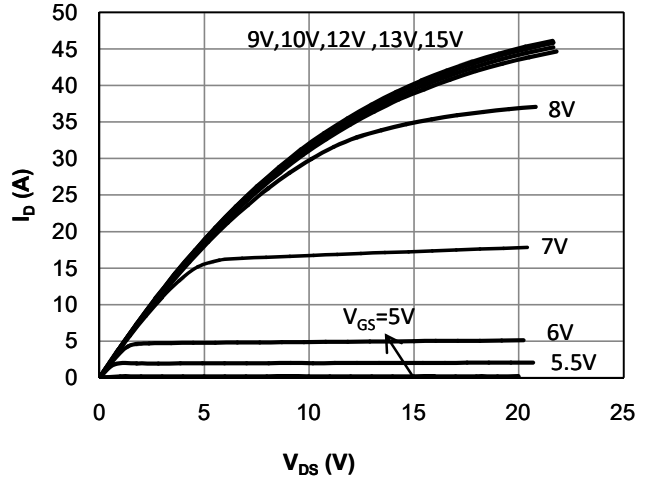


Fig 3: Transfer Characteristics

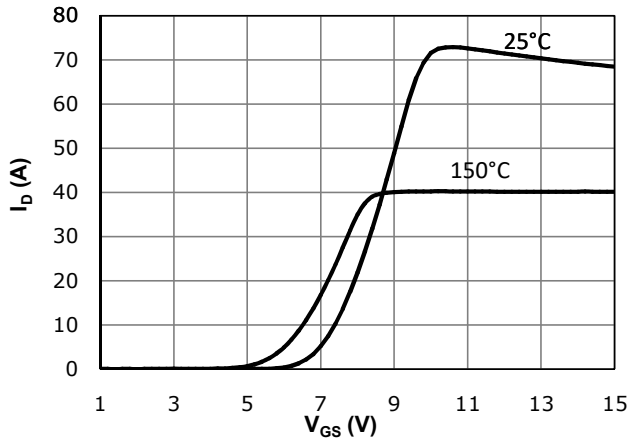


Fig 4: V_{TH} vs. T_j Temperature Characteristics

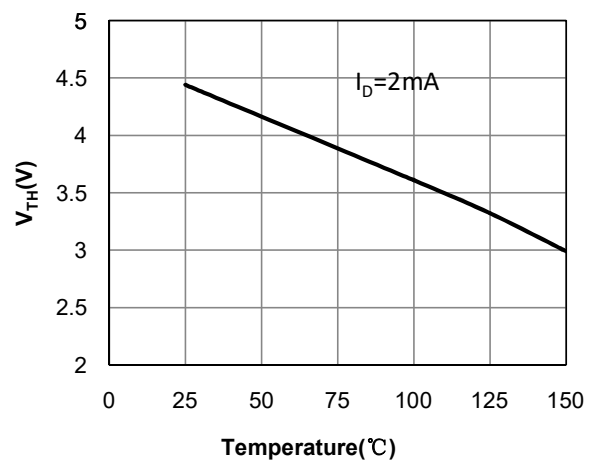


Fig 5: $R_{DS(on)}$ vs. I_{DS} Characteristics ($T_j=25^\circ\text{C}$)

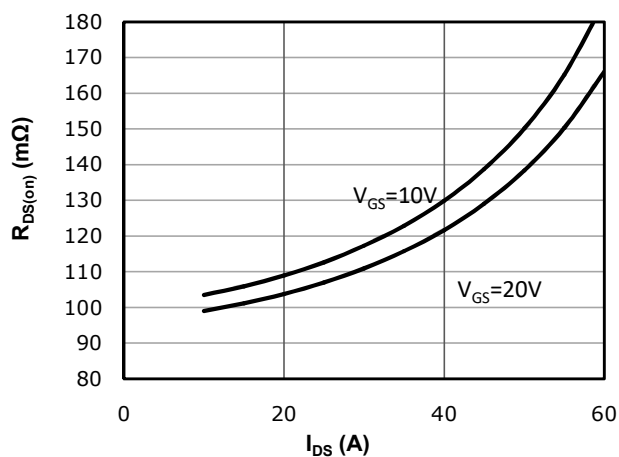


Fig 6: $R_{DS(on)}$ vs. Temperature

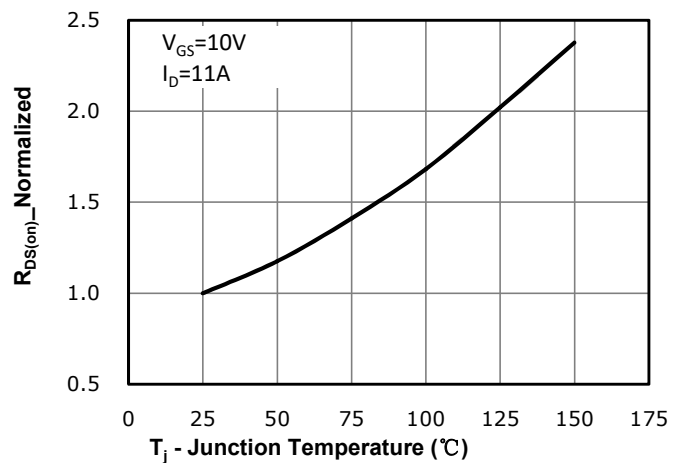


Fig 7: BV_{DSS} vs. Temperature

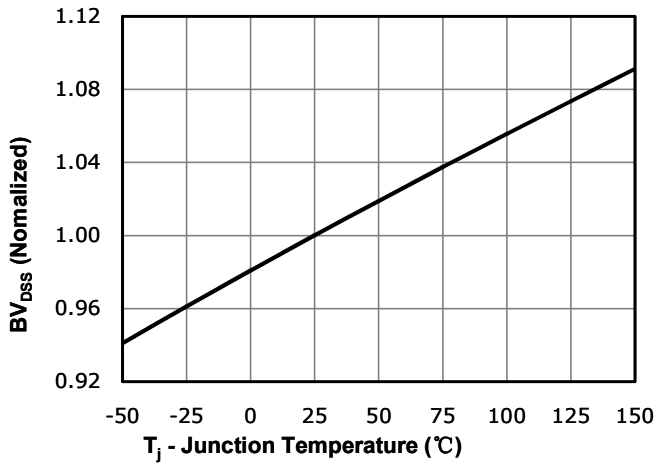


Fig 8: $R_{DS(on)}$ vs. Gate Voltage

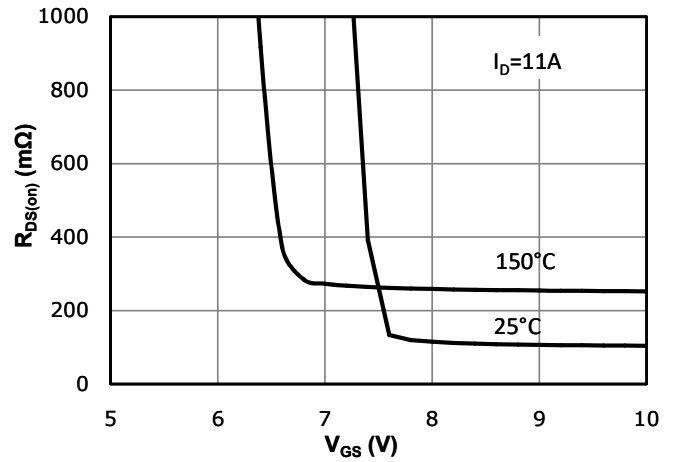


Fig 9: Body-diode Forward Characteristics

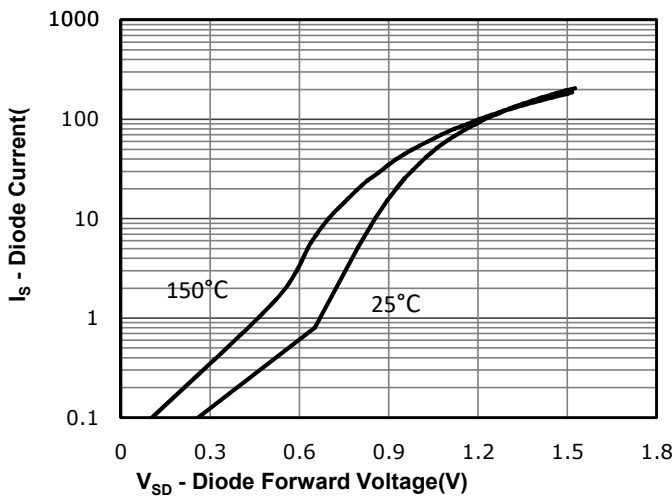


Fig 10: Gate Charge Characteristics

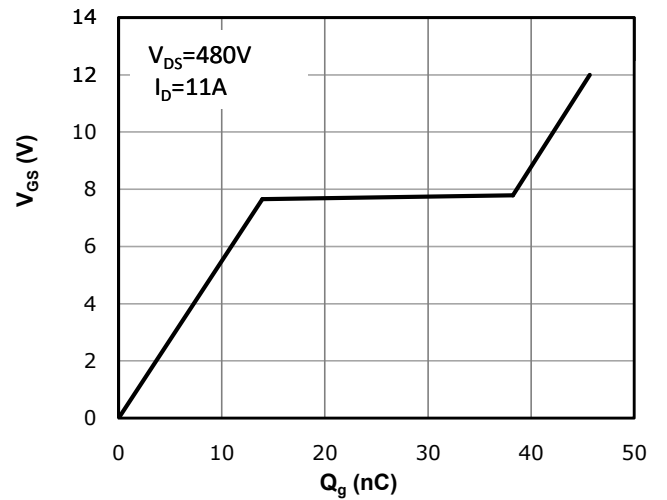


Fig 11: Capacitance Characteristics

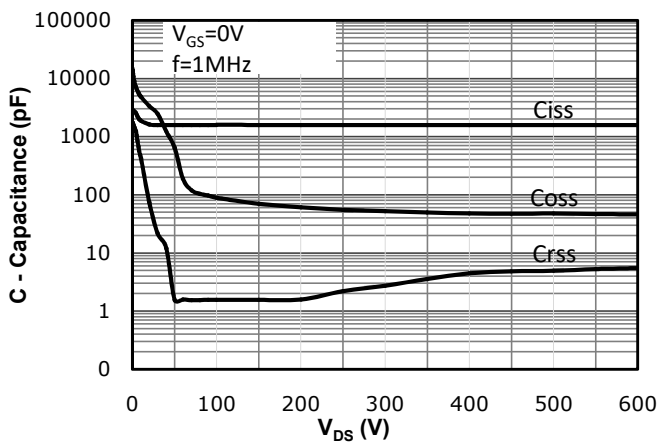


Fig 12: Safe Operating Area

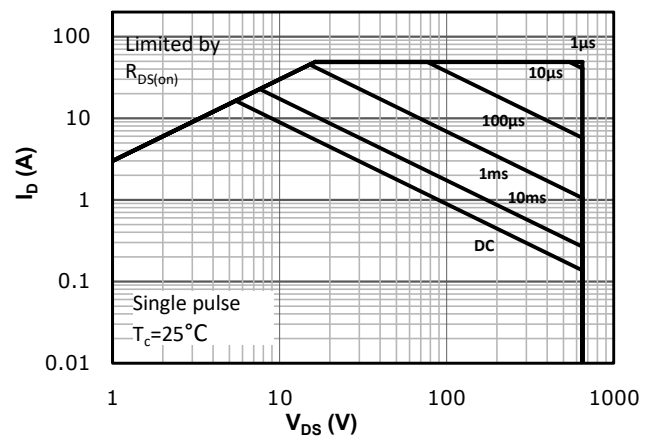
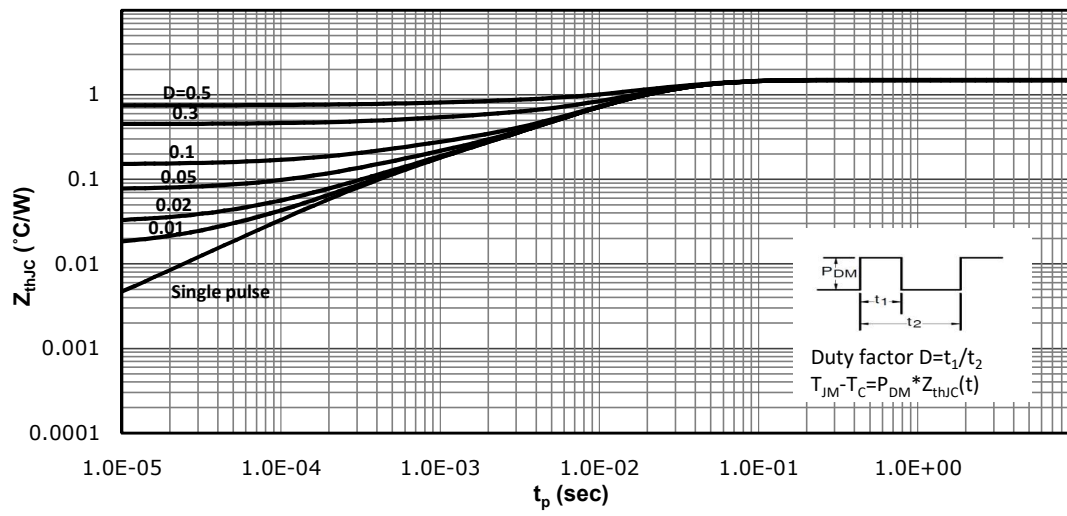
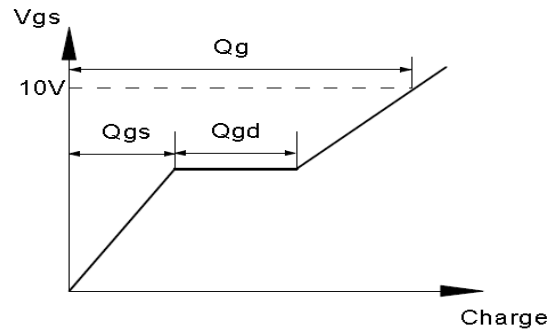
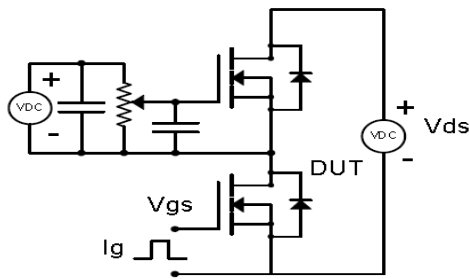


Fig 13: Max. Transient Thermal Impedance

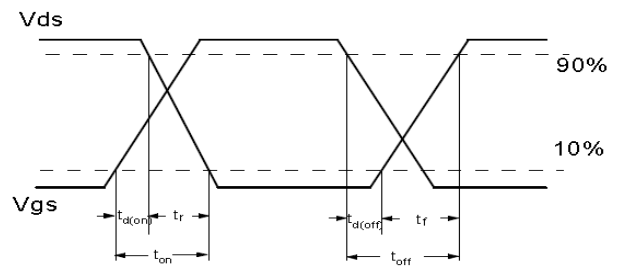
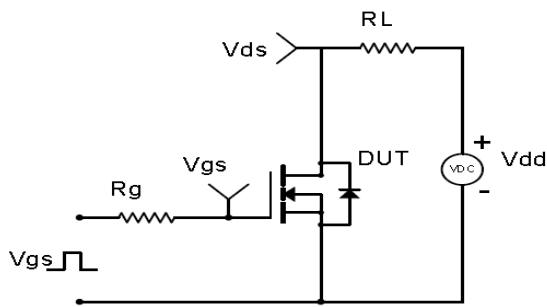


Test Circuit & Waveform

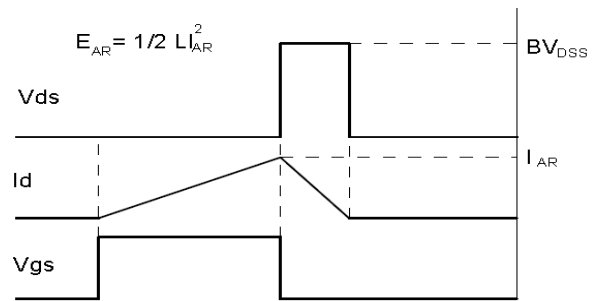
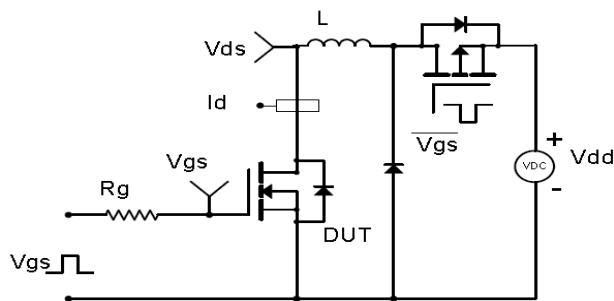
Gate Charge Test Circuit & Waveform



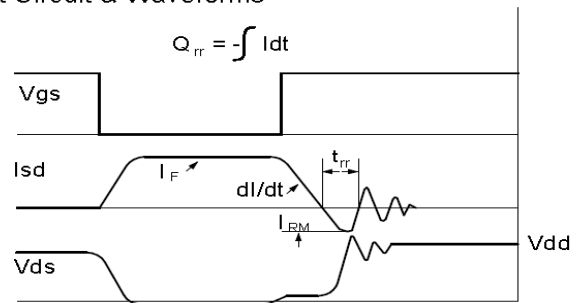
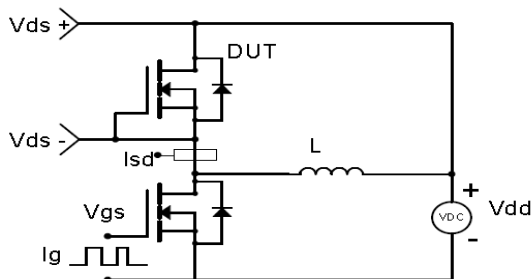
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

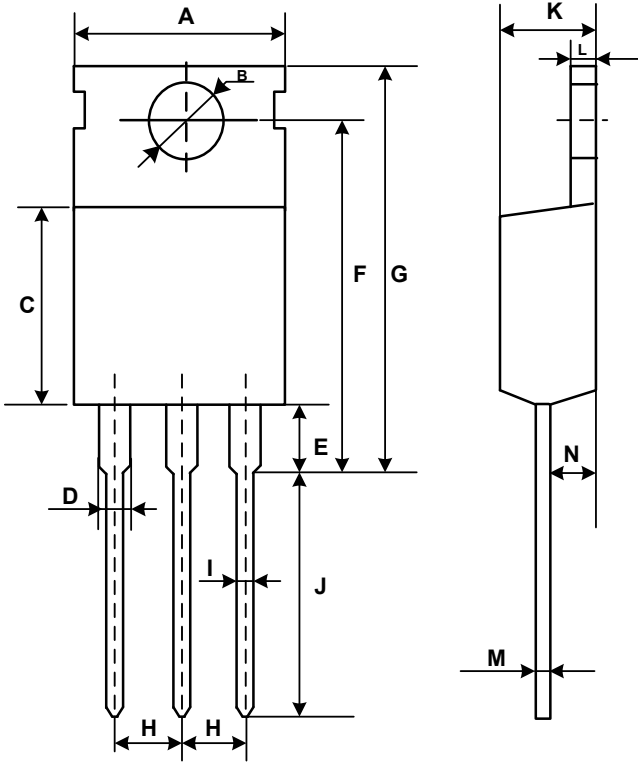


Diode Recovery Test Circuit & Waveforms



Mechanical Dimensions for TO-220

COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	9.70	10.30
B	3.40	3.80
C	8.80	9.40
D	1.17	1.47
E	2.60	3.50
F	15.10	16.70
G	19.55MAX	
H	2.54REF	
I	0.70	0.95
J	9.35	11.00
K	4.30	4.77
L	1.20	1.45
M	0.40	0.65
N	2.20	2.60