

- ★ 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

650V Super Junction Power MOSFET

Product Summary



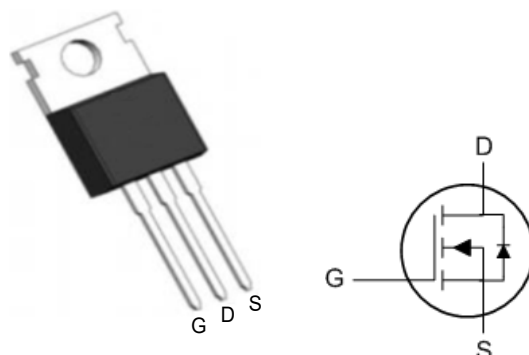
BVDSS	RDS(on)	ID
650V	360 mΩ	11A

Description

The XR65R380T 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 XR65R380T 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
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	11	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	7	A
I_{DM}	Pulsed Drain Current ²	44	A
EAS	Single Pulse Avalanche Energy ³	120	mJ
I_{AS}	Avalanche Current	11	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation ⁴	29	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	78	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	4.3	$^\circ C/W$

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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	650	---	---	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 =5.5A	---	360	450	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	3.5	---	4.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	---	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =650V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =650V, V _{GS} =0V, T _J =100°C	---	---	100	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±30V, V _{DS} =0V	---	---	±80	nA
g _{fs}	Forward Transconductance	V _{DS} =20V, I _D =5.5A	---	12	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	2	---	Ω
Q _g	Total Gate Charge	V _{DS} =480V, V _{GS} =10V, I _D =5.5A	---	22	---	nC
Q _{gs}	Gate-Source Charge		---	5.3	---	
Q _{gd}	Gate-Drain Charge		---	8.8	---	
T _{d(on)}	Turn-On Delay Time	V _{GS} =10V, V _{DD} =400V, R _G =25Ω, I _D =5.5A	---	20	---	ns
T _r	Rise Time		---	15	---	
T _{d(off)}	Turn-Off Delay Time		---	74	---	
T _f	Fall Time		---	43	---	
C _{iss}	Input Capacitance	V _{DS} =100V, V _{GS} =0V, f=1MHz	---	790	---	pF
C _{oss}	Output Capacitance		---	32	---	
C _{rss}	Reverse Transfer Capacitance		---	2	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,4}	V _G =V _D =0V, Force Current	---	---	11	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =5.5A, T _J =25°C	---	---	1.2	V
t _{rr}	Reverse Recovery Time	I _F =5.5A, di/dt=100A/μs,	---	218	---	nS
Q _{rr}	Reverse Recovery Charge	T _J =25°C	---	2.35	---	nC

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The EAS data shows Max. rating . The test condition is T_J = 25°C, 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_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Performance Characteristics

Fig 1. Output Characteristics (Tj=25°C)

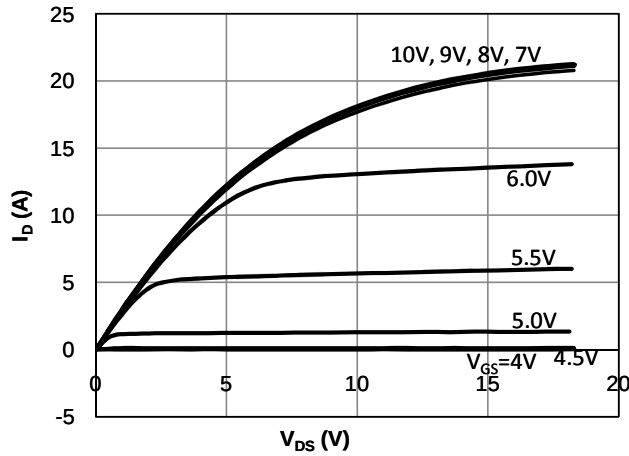


Fig 2. Output Characteristics (Tj=150°C)

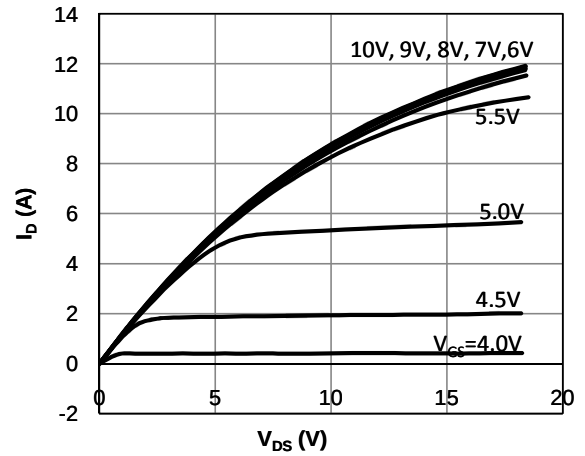


Fig 3: Transfer Characteristics

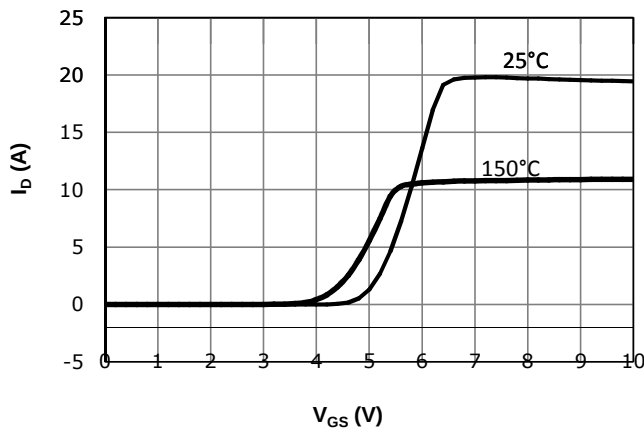


Fig 4: Vth Vs Tj Temperature Characteristics

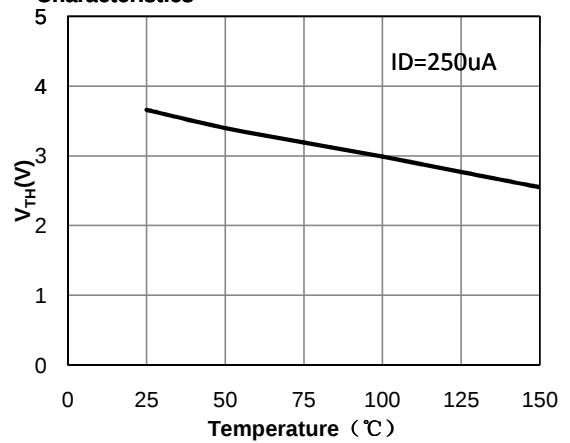


Fig 5: Rds(on) Vs Ids Characteristics (Tc=25°C)

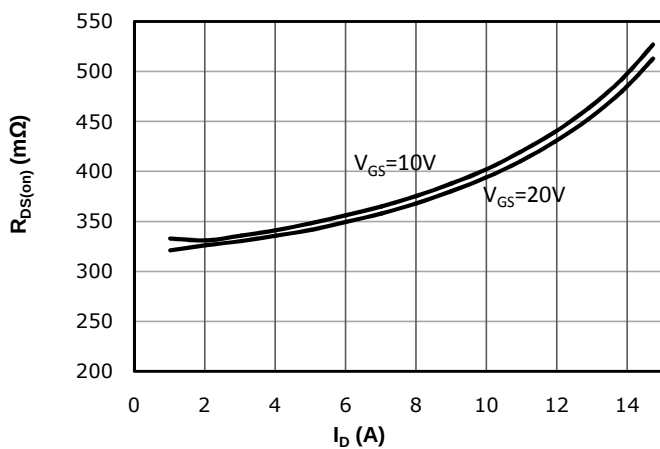
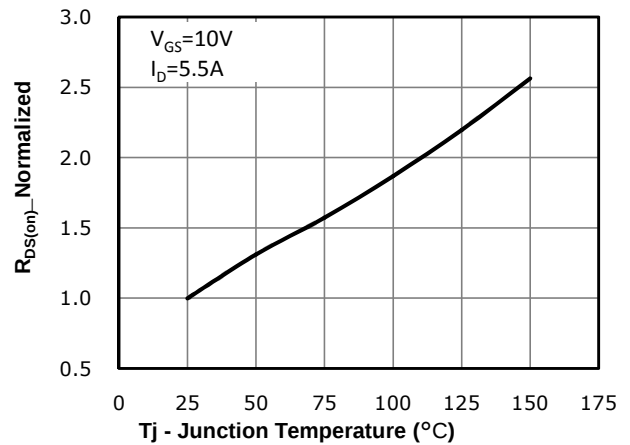


Fig 6: Rds(on) vs. Temperature



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Fig 7: BVDSS vs. Temperature

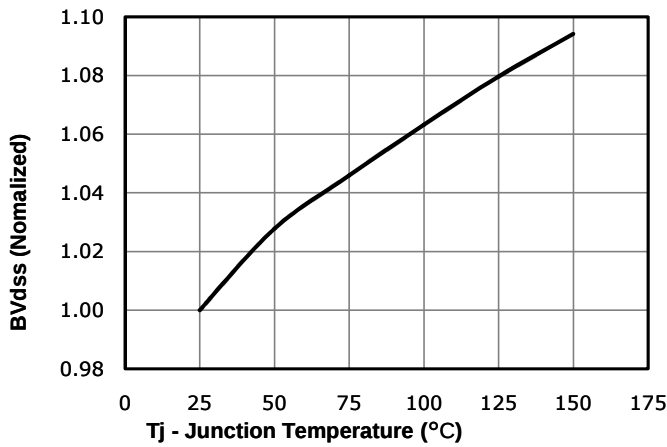


Fig 8: Rds(on) vs Gate Voltage

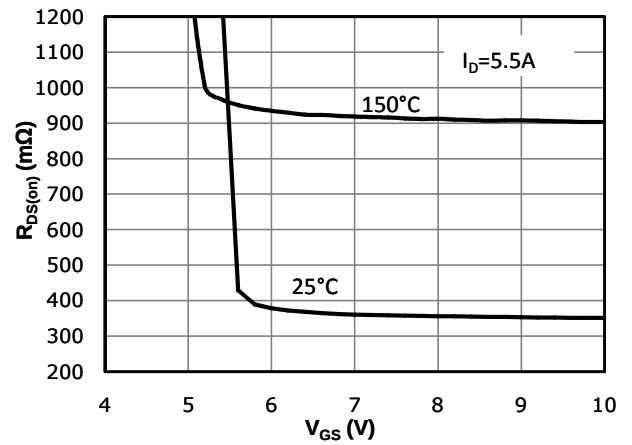


Fig 9: Body-diode Forward Characteristics

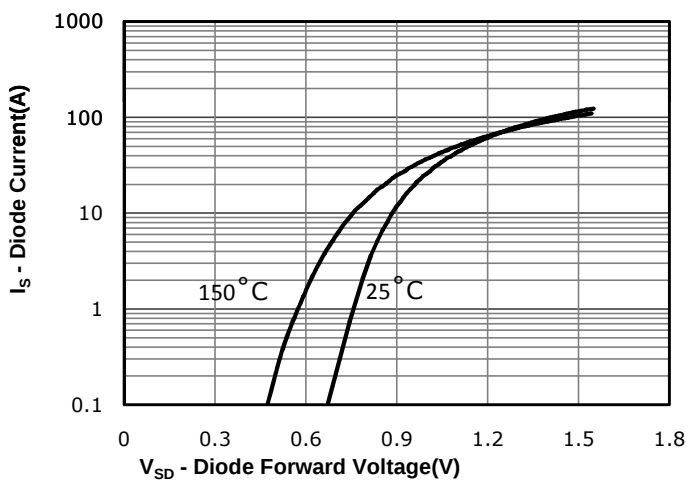


Fig 10: Gate Charge Characteristics

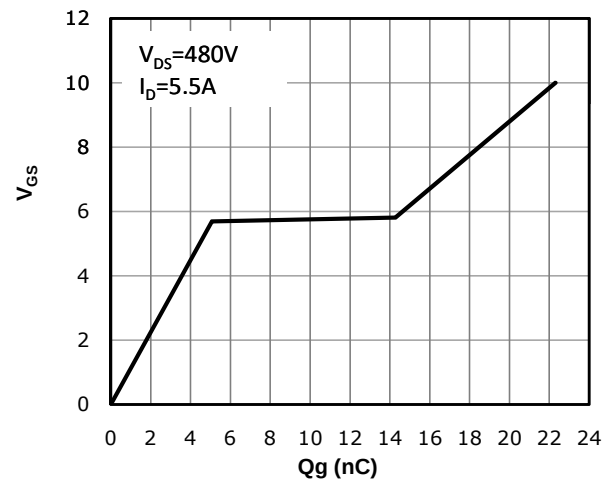


Fig 11: Capacitance Characteristics

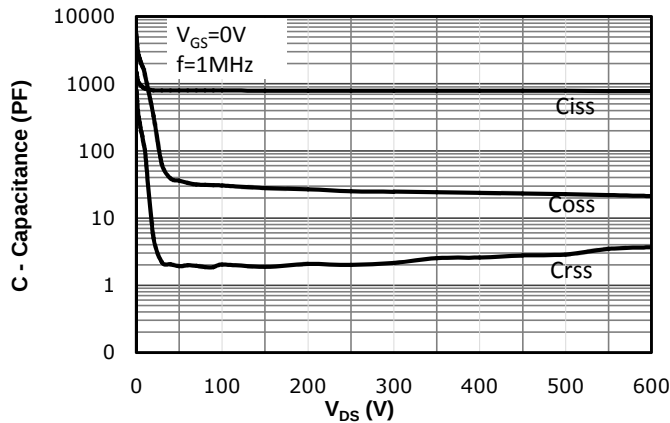
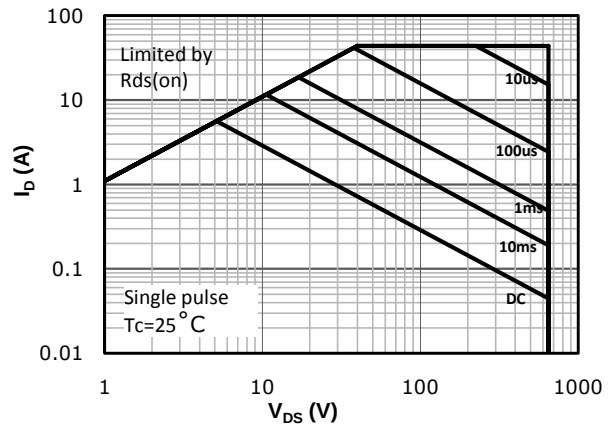
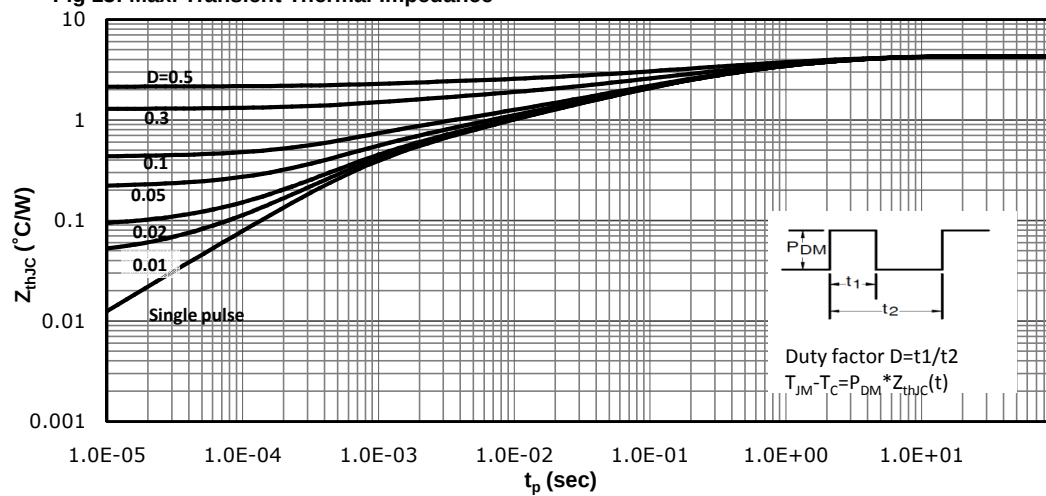


Fig 12: Safe Operating Area



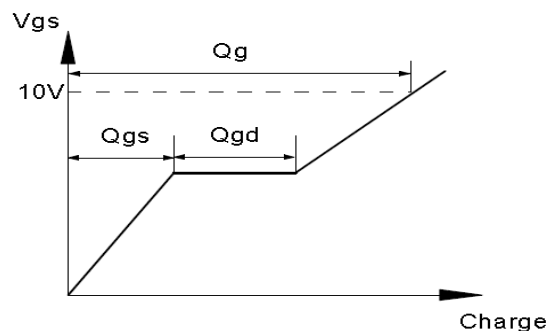
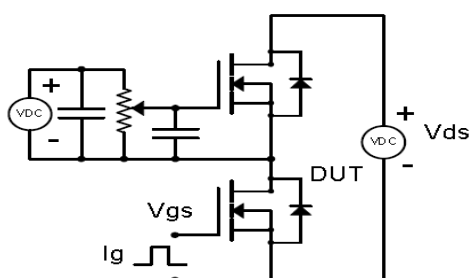
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Fig 13: Max. Transient Thermal Impedance

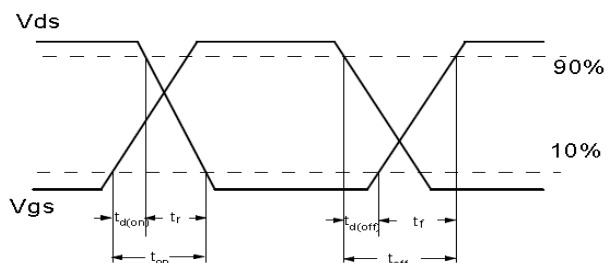
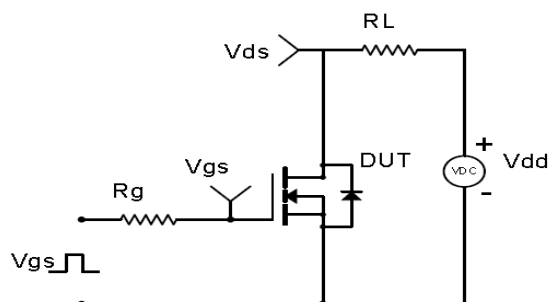


Test Circuit & Waveform

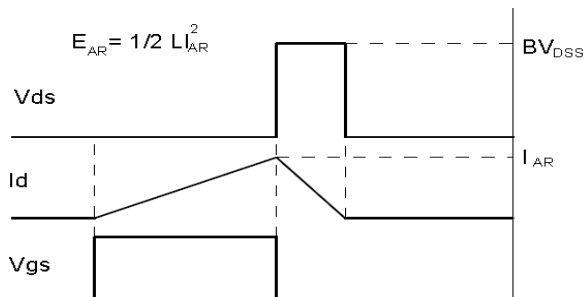
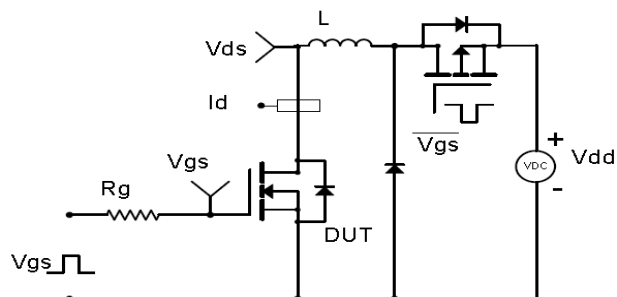
Gate Charge Test Circuit & Waveform



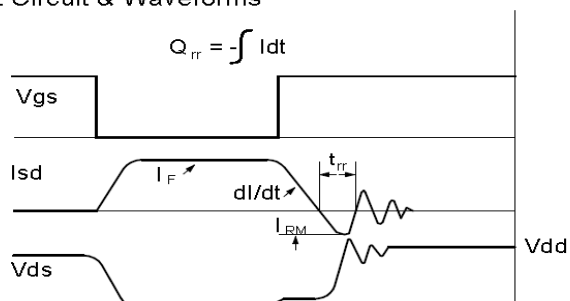
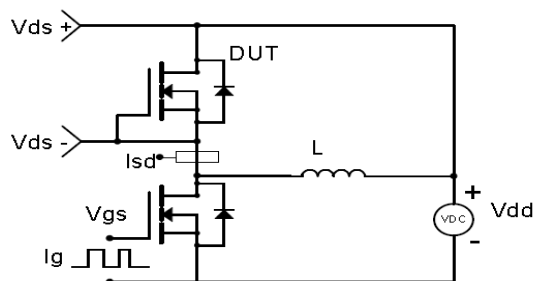
Resistive Switching Test Circuit & Waveforms



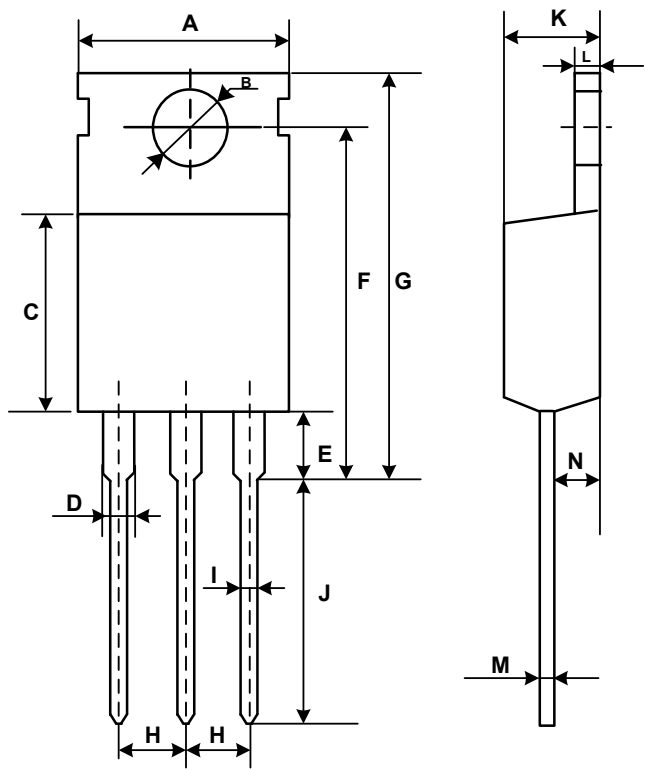
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



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