

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

### Product Summary



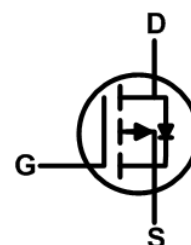
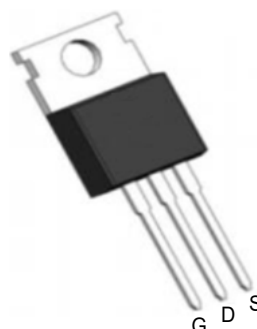
BVDSS	RDSON	ID
-100V	31mΩ	-40A

### Description

The XR40P10T is the high cell density trenched P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The XR40P10T meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

### TO220AB Pin Configuration



### Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	-100	V
Continuous drain current $T_C = 25^\circ\text{C}$ (Silicon limit) $T_C =$ $25^\circ\text{C}$ (Package limit) $T_C =$ $100^\circ\text{C}$ (Silicon limit)	$I_D$	-40 -120 -25	A
Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ )	$I_{D \text{ pulse}}$	-152	A
Avalanche energy, single pulse ( $L=0.5\text{mH}$ , $R_g=25\Omega$ )	$E_{AS}$	110	mJ
Gate-Source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{tot}$	111	W
Operating junction and storage temperature	$T_j, T_{stg}$	-55...+150	$^\circ\text{C}$
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	$T_{sold}$	260	$^\circ\text{C}$

### Thermal Resistance

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case.	$R_{thJC}$	1.13	°C/W
Thermal resistance, junction – ambient(min. footprint)	$R_{thJA}^*$	84	

### Electrical Characteristic (at $T_j = 25^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	$BV_{DSS}$	-100	-	-	V	$V_{GS}=0V, I_D=-250\mu A$
Gate threshold voltage	$V_{GS(th)}$	-1.5	-2.0	-2.5	V	$V_{DS}=V_{GS}, I_D=-250\mu A$
Zero gate voltage drain current	$I_{DSS}$	- -	-0.05 -5	-1 -20	$\mu A$	$V_{DS}=-100V, V_{GS}=0V$ $T_j=25^{\circ}C$ $T_j=150^{\circ}C$
Gate-source leakage current	$I_{GSS}$	-	-10	$\pm 100$	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	- - -	31 61 37	37 73 48	m $\Omega$	$V_{GS}=-10V, I_D=-22A$ $T_j=25^{\circ}C$ $T_j=150^{\circ}C$ $V_{GS}=-4.5V, I_D=-10A$
Transconductance	$g_{fs}$	-	60	-	S	$V_{DS}=-5V, I_D=-22A$

### Dynamic Characteristic

Input Capacitance	$C_{iss}$	-	5612	-	pF	$V_{GS}=0V, V_{DS}=-50V,$ $f=1\text{MHz}$
Output Capacitance	$C_{oss}$	-	180	-		
Reverse Transfer Capacitance	$C_{rss}$	-	80	-		
Gate Total Charge	$Q_G$	-	102	-	nC	$V_{GS}=-10V, V_{DS}=-50V,$ $I_D=-22A, f=1\text{MHz}$
Gate-Source charge	$Q_{gs}$	-	25	-		
Gate-Drain charge	$Q_{gd}$	-	19	-		
Turn-on delay time	$t_{d(on)}$	-	15	-	ns	$V_{GS}=-10V, V_{DD}=-50V,$ $R_{G\_ext}=2.7\Omega, I_D=-22A$
Rise time	$t_r$	-	38	-		
Turn-off delay time	$t_{d(off)}$	-	86	-		
Fall time	$t_f$	-	68	-		
Gate resistance	$R_G$	-	4.3	- $\Omega$		$V_{GS}=0V, V_{DS}=0V,$ $f=1\text{MHz}$

**Body Diode Characteristic**

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$	-	-0.9	-1.3	V	$V_{GS}=0V, I_{SD}=-22A$
Body Diode Forward Current	$I_S$			-40	A	$T_C = 25^{\circ}C$
Body Diode Reverse Recovery Time	$t_{rr}$	-	36	-	ns	$I_{SD}=-22A, dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	62	-	nC	

\*The value of  $R_{thJA}$  is measured by placing the device in a still air box which is one cubic foot.

### Typical Performance Characteristics

Fig 1: Output Characteristics

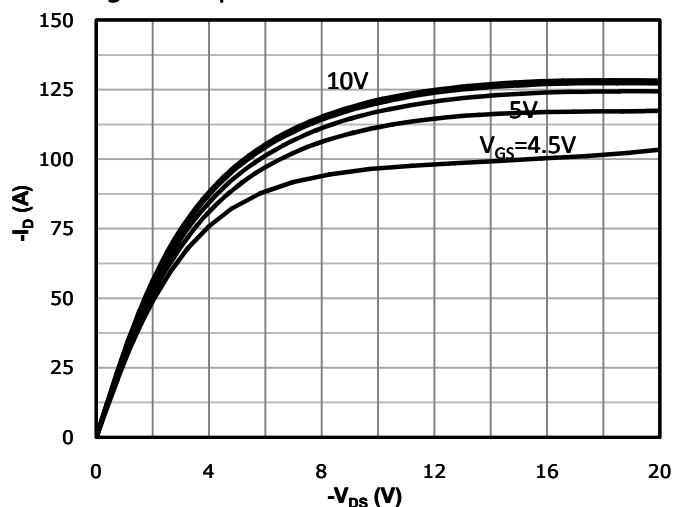


Fig 2: Transfer Characteristics

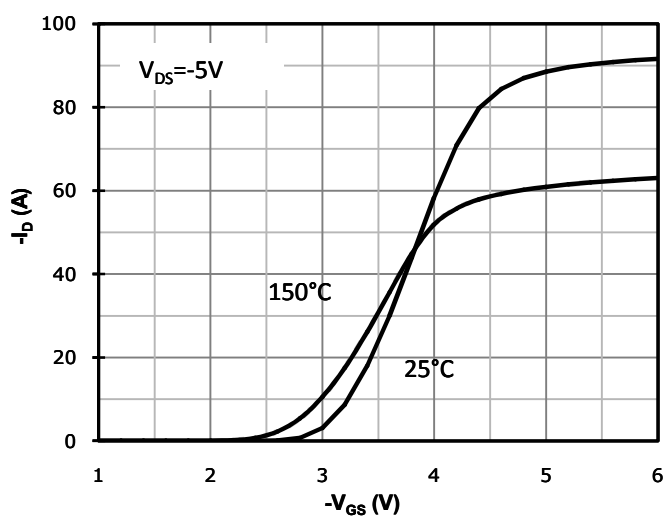


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

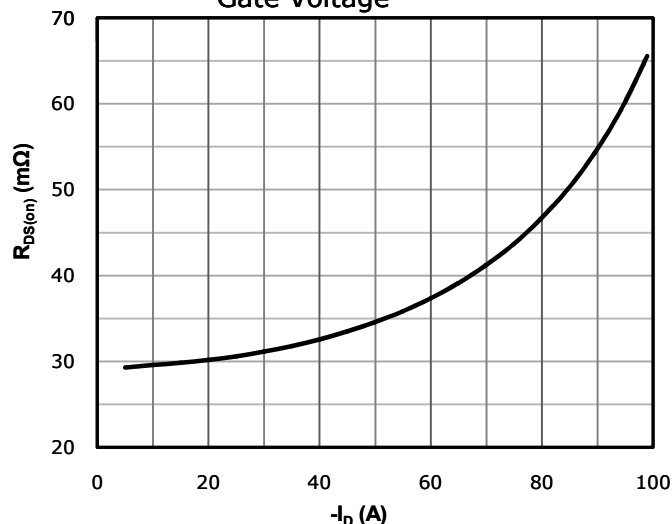


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

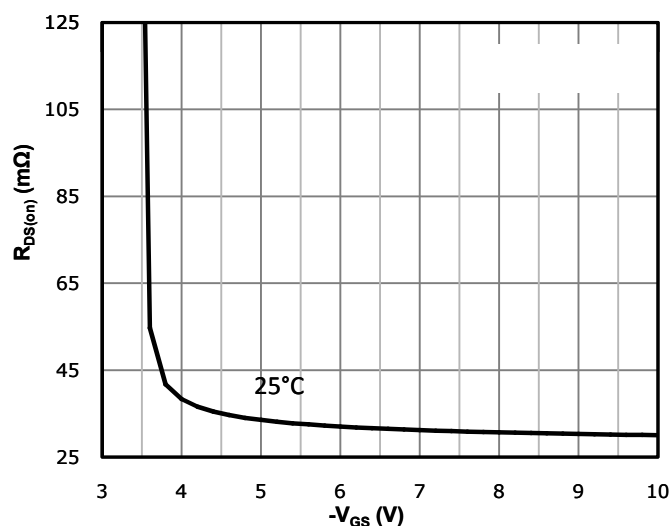


Fig 5:  $R_{DS(on)}$  vs. Temperature

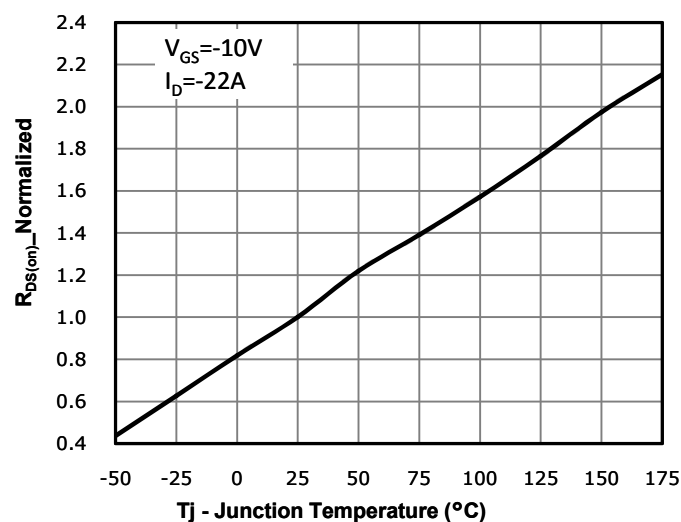


Fig 6: Capacitance Characteristics

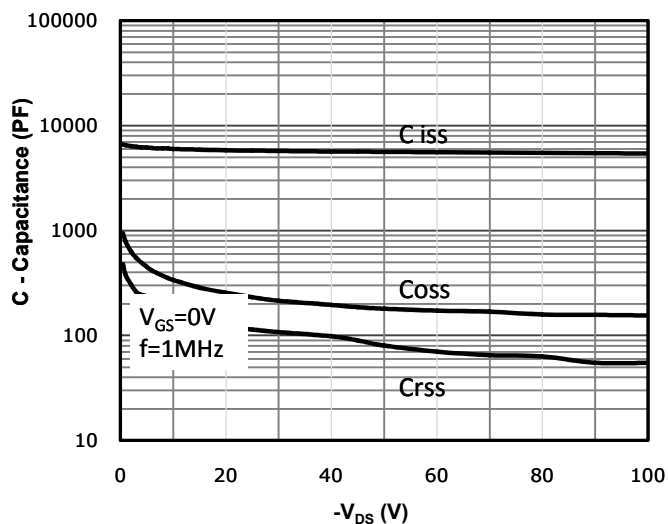


Fig 7: Gate Charge Characteristics

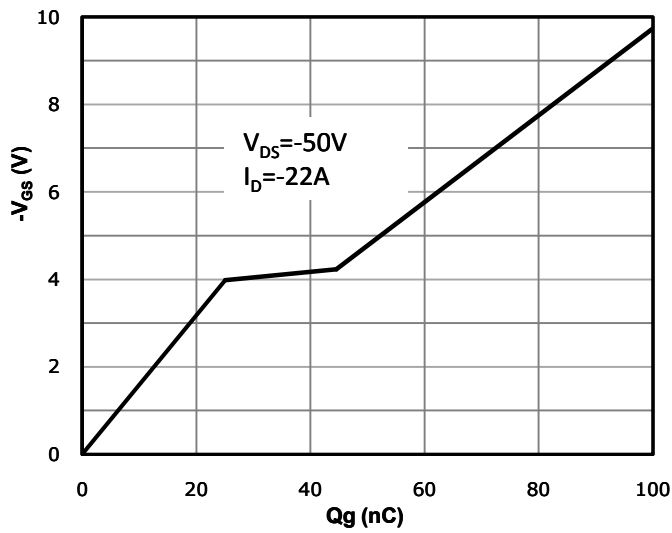


Fig 8: Body-diode Forward Characteristics

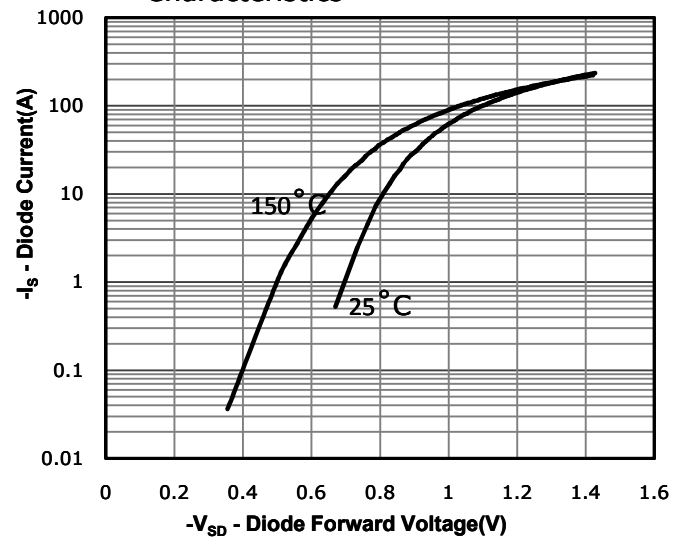


Fig 9: Power Dissipation

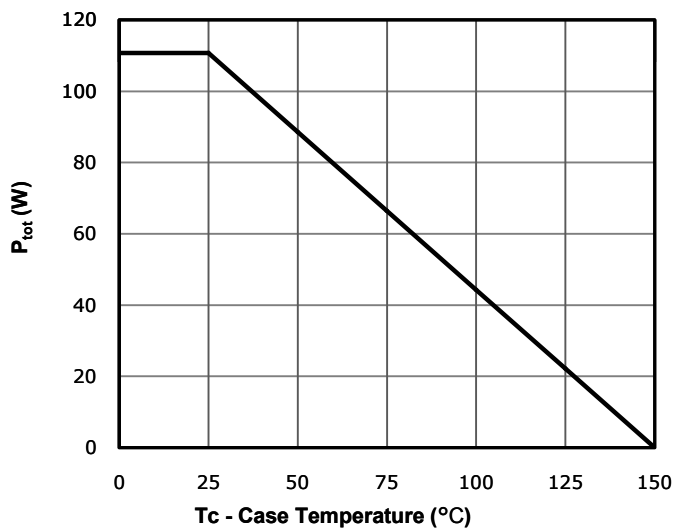


Fig 10: Drain Current Derating

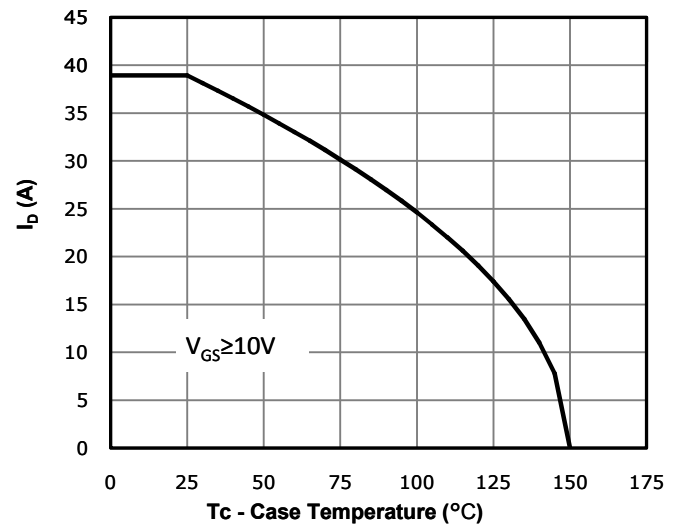


Fig 11: Safe Operating Area

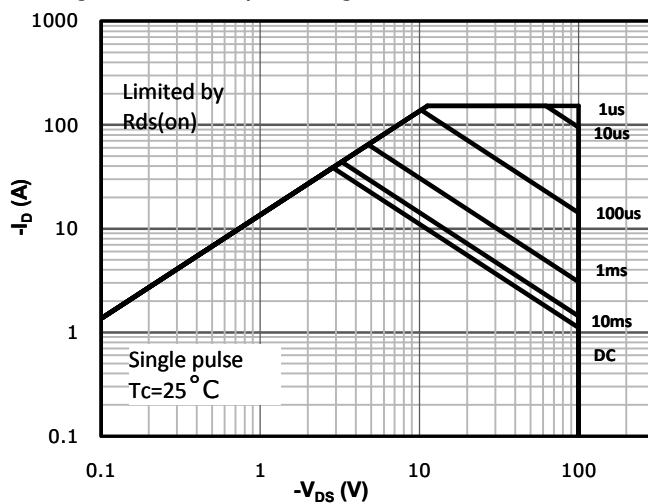
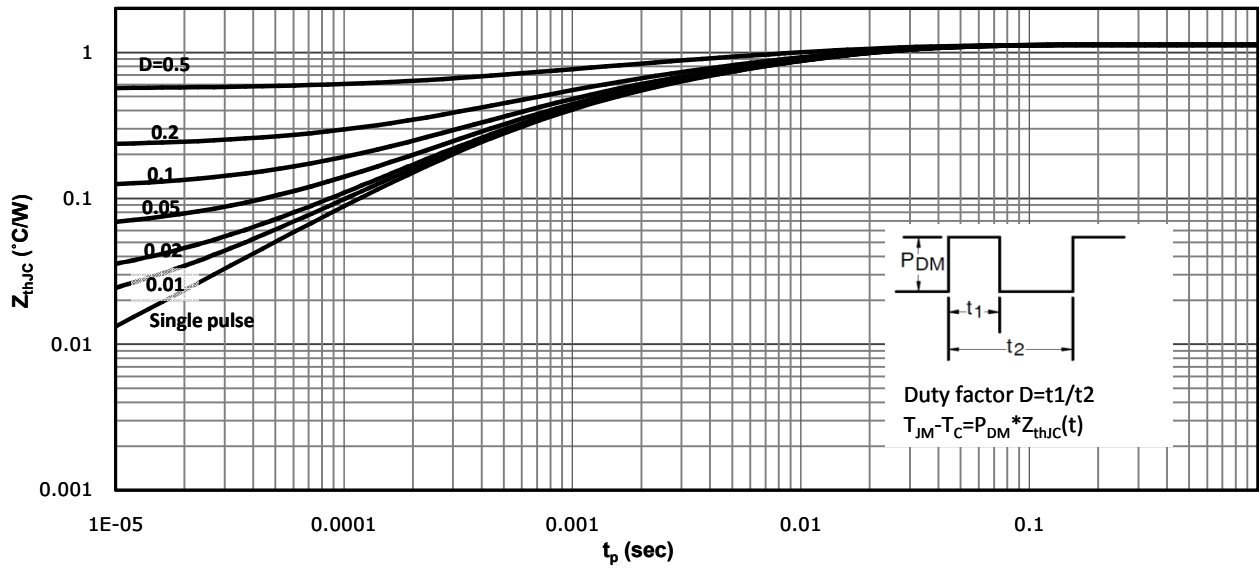
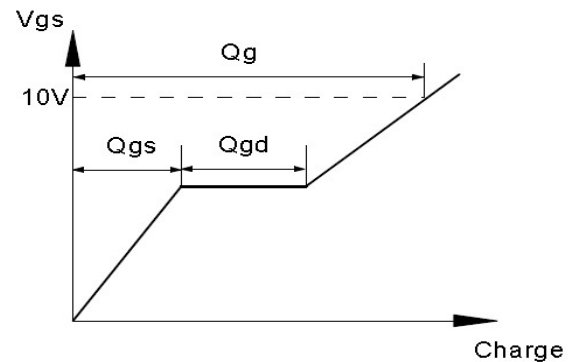
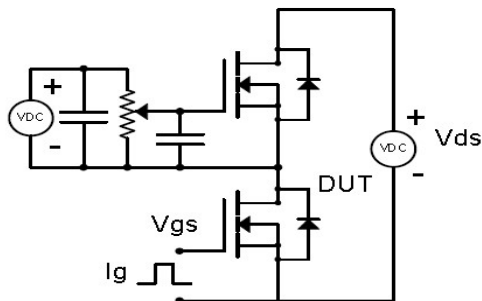


Fig 12: Max. Transient Thermal Impedance

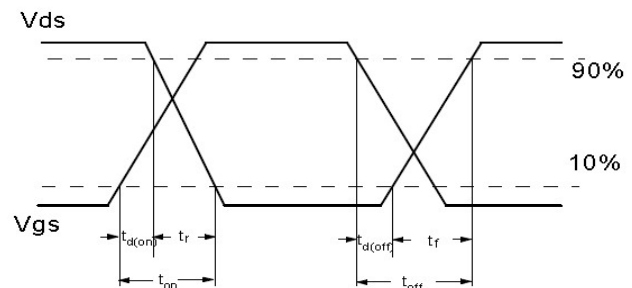
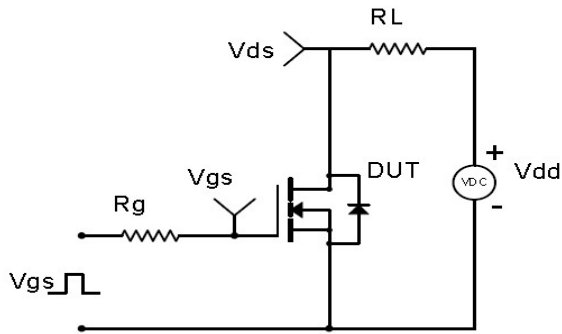


### Test Circuit & Waveform

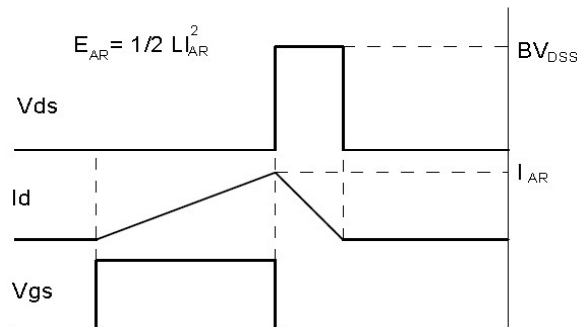
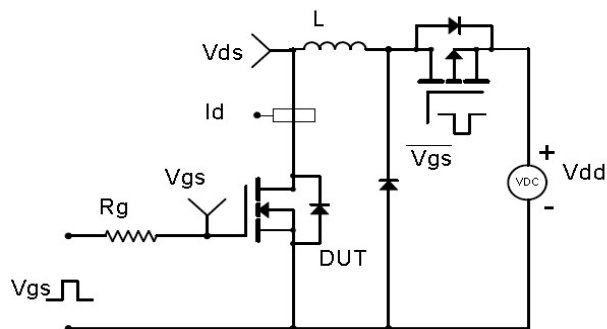
Gate Charge Test Circuit & Waveform



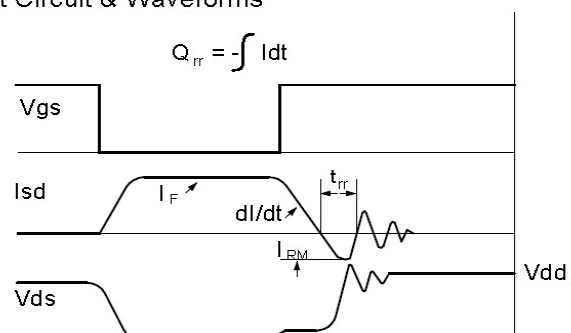
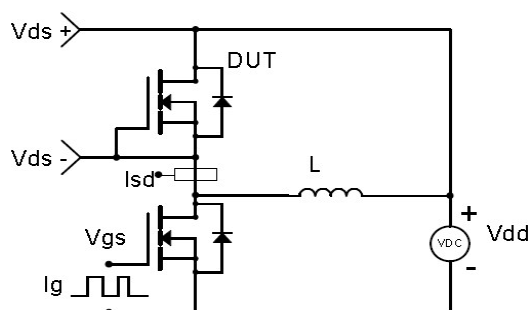
Resistive Switching Test Circuit & Waveforms



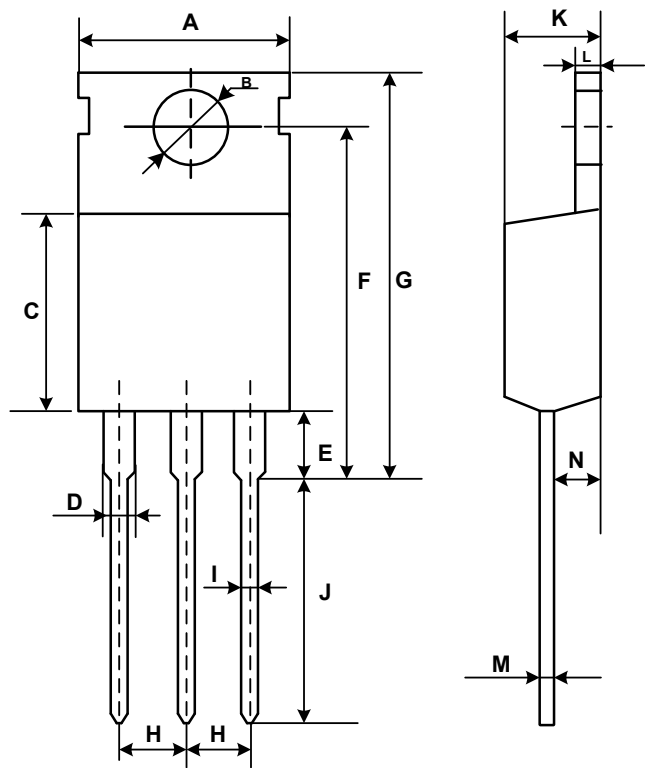
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



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