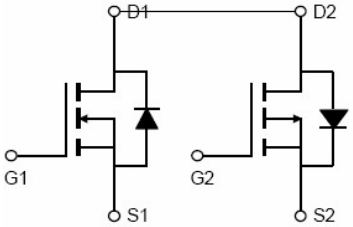
AP3908KD

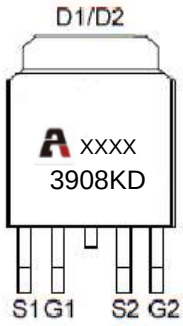
N and P-Channel Enhancement Mosfet

DATA SHEET

Feature

- **N-Channel**
  V_{DD}=30V,I_D=20A
  $R_{DS(ON)}$ <13mΩ @V_{GS}=10V
  $R_{DS(ON)}$ <19mΩ @V_{GS}=4.5V
- **P-Channel**
  V_{DD}=-30V,I_D=-20A
  $R_{DS(ON)}$ <23mΩ @V_{GS}=-10V
  $R_{DS(ON)}$ <34mΩ @V_{GS}=-4.5V
- Lead free product is acquired
- High power and current handing capability
- Surface mount package





Marking and pin assignment

Application

- PWM applications
- Load Switch
- Power management

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
3908KD	AP3908KD	TO-252-4	13 inch	-	2500

ABSOLUTE MAXIMUM RATINGS (T_a=25℃ unless otherwise noted)

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V_{DS}	30	-30	V
Gate-Source Voltage	V_{GS}	±20	±20	V
Continuous Drain Current (T_a =25℃)	I_D	20	-20	A
Continuous Drain Current (T_a =100℃)	I_D	14.1	-14	A
Pulsed Drain Current (1)	I_{DM}	80	-60	A
Power Dissipation	P_D	21		W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	6.25		℃/W
Junction Temperature	T_J	150		℃
Storage Temperature	T_{STG}	-55~ +150		℃

N-CH ELECTRICAL CHARACTERISTICS(T_a=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =250μA	30			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =30V, V_{GS} = 0V			1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V			±100	nA
Gate threshold voltage(2)	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250μA	1	1.5	2.5	V
Drain-source on-resistance(2)	$R_{DS(on)}$	V_{GS} =10V, I_D =10A		9.5	13	mΩ
		V_{GS} =4.5V, I_D =6A		15	19	
Forward tranconductance(2)	g_{FS}	V_{DS} =10V, I_D =10A		10		S
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =15V, V_{GS} =0V, f =1MHz		900		pF
Output Capacitance	C_{oss}			140		
Reverse Transfer Capacitance	C_{rss}			120		
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DD}=15V, I_D=10A V_{GS}=10V, R_G=3Ω		6		ns
Turn-on rise time	t_r			5		
Turn-off delay time	$t_{d(off)}$			25		
Turn-off fall time	t_f			7		
Total Gate Charge	Qg	VDS=15V, ID=20A, VGS=10V		19		nC
Gate-Source Charge	Qgs			6.3		
Gate-Drain Charge	Qgd			4.5		
Source-Drain Diode characteristics						
Diode Forward voltage(2)	V_{DS}	V_{GS} =0V, I_S=10A			1.2	V
Diode Forward current(3)	I_S		-	-	20	A

Typical Performance Characteristics

Figure1: Output Characteristics

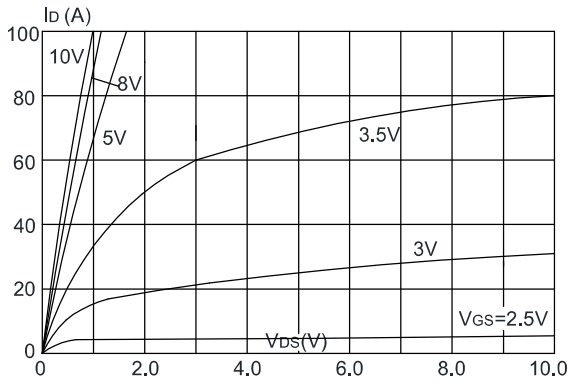


Figure 2: Typical Transfer Characteristics

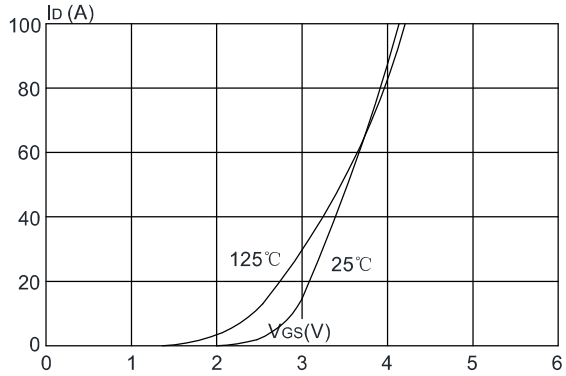


Figure 3: On-resistance vs. Drain Current

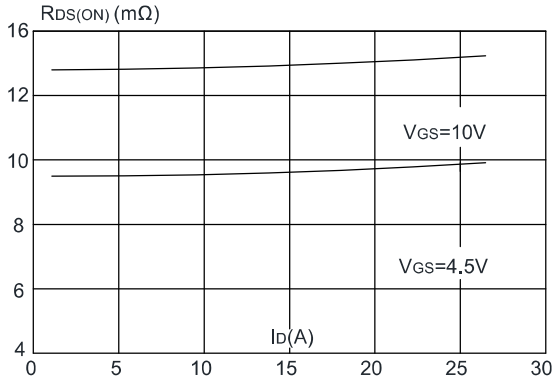


Figure 4: Body Diode Characteristics

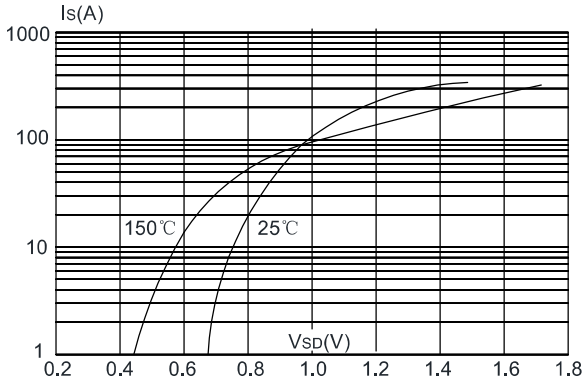


Figure 5: Gate Charge Characteristics

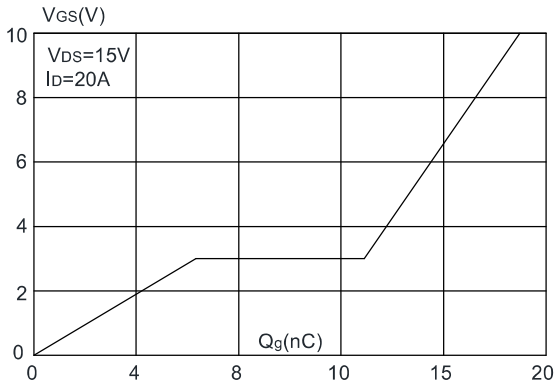


Figure 6: Capacitance Characteristics

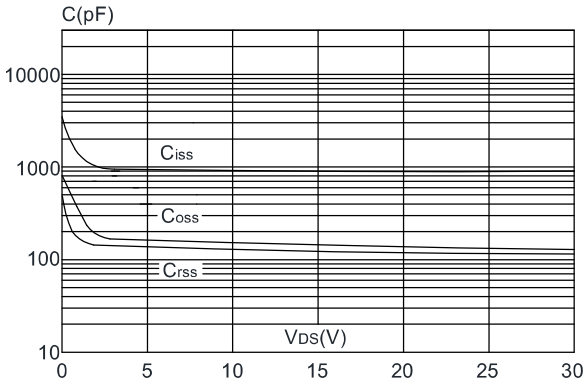


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

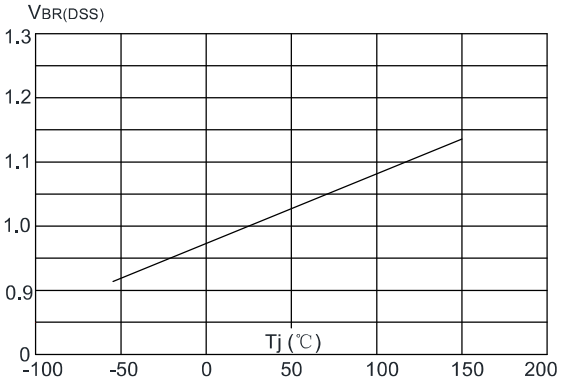


Figure 8: Normalized on Resistance vs. Junction Temperature

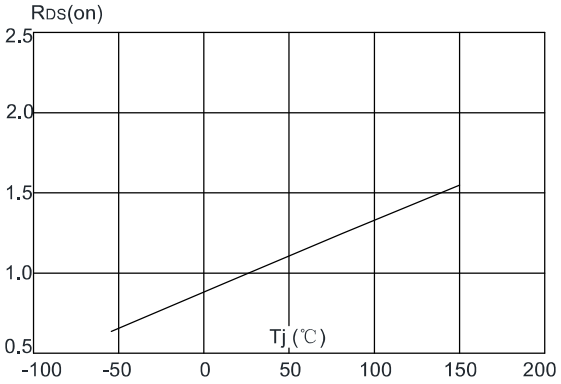


Figure 9: Maximum Safe Operating Area

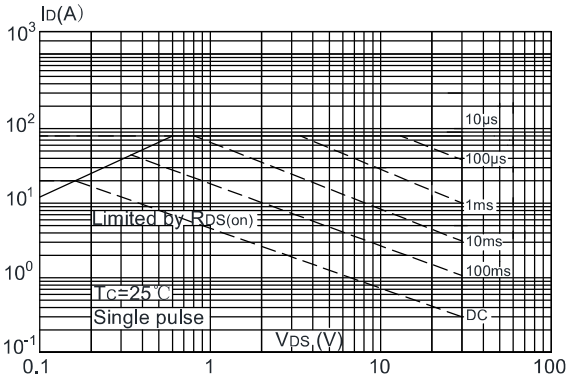


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

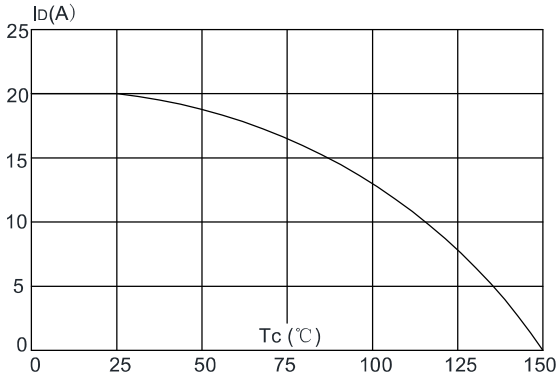
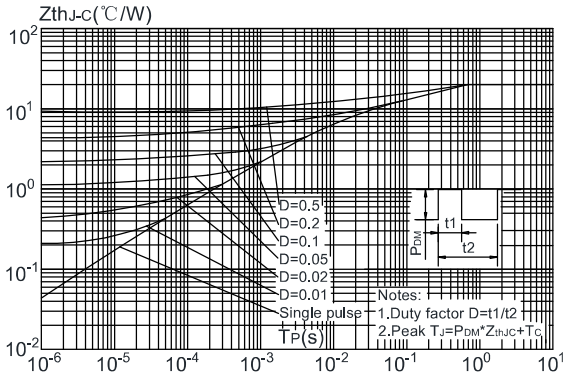


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



Test Circuit

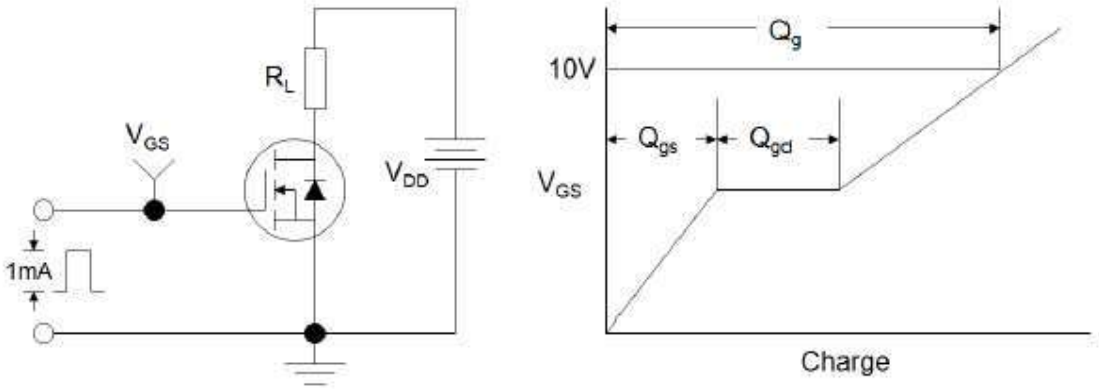


Figure1:Gate Charge Test Circuit & Waveform

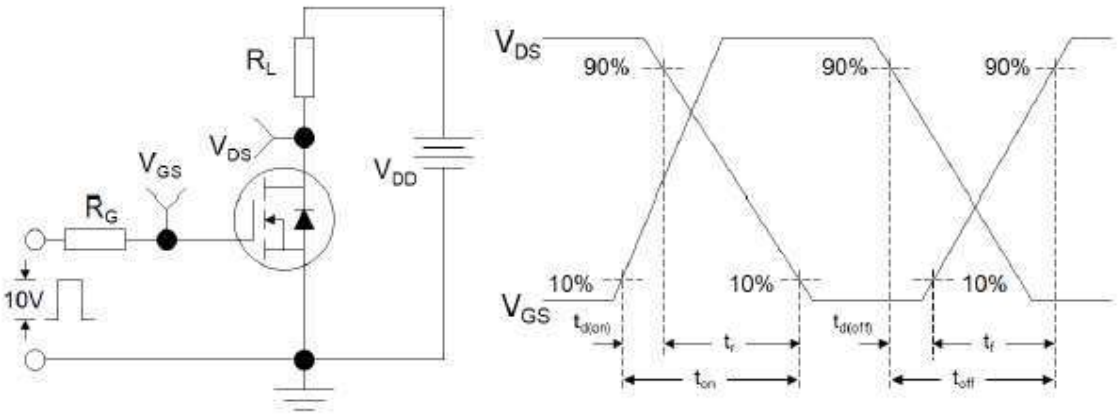


Figure 2: Resistive Switching Test Circuit & Waveforms

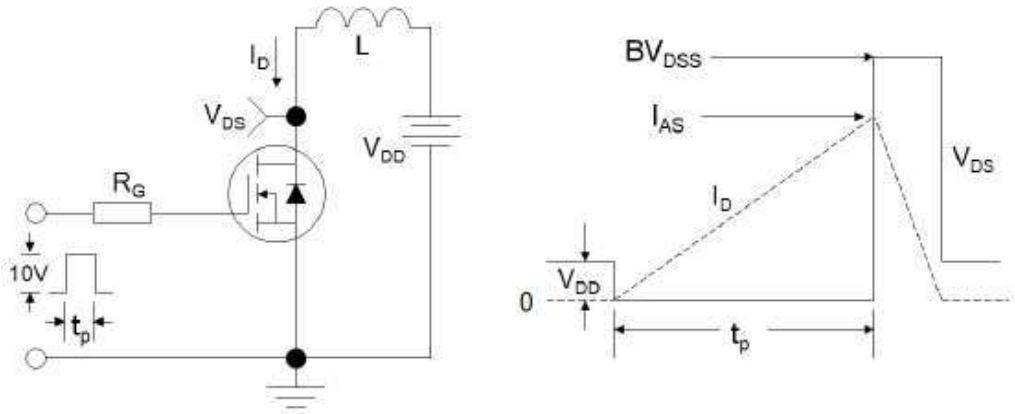


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

P-CH ELECTRICAL CHARACTERISTICS(T_a=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =-250μA	-30			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =-30V, V_{GS} = 0V			1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V			±100	nA
Gate threshold voltage(2)	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =-250μA	-1	-1.5	-2.5	V
Drain-source on-resistance(2)	$R_{DS(on)}$	V_{GS} =-10V, I_D =-10A		16	23	mΩ
		V_{GS} =-4.5V, I_D =-5A		25	34	
Forward tranconductance(2)	g_{FS}	V_{DS} =-10V, I_D =-10A		20		S
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =-15V, V_{GS} =0V, f =1MHz		1550		pF
Output Capacitance	C_{oss}			327		
Reverse Transfer Capacitance	C_{rss}			278		
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DD}=-15V, I_D=-6A V_{GS}=-10V, R_G=2.5Ω		14		ns
Turn-on rise time	t_r			20		
Turn-off delay time	$t_{d(off)}$			95		
Turn-off fall time	t_f			65		
Total Gate Charge	Qg	VDS=-15V, ID=-10A, VGS=-10V		30		nC
Gate-Source Charge	Qgs			5.3		
Gate-Drain Charge	Qgd			7.6		
Source-Drain Diode characteristics						
Diode Forward voltage(2)	V_{DS}	V_{GS} =0V, I_S=-10A			1.2	V
Diode Forward current(3)	I_S		-	-	-20	A

Notes:

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. Pulse Test: pulse width≤300μs, duty cycle≤2%
3. Surface Mounted on FR4 Board,t≤10 sec

Figure1: Output Characteristics

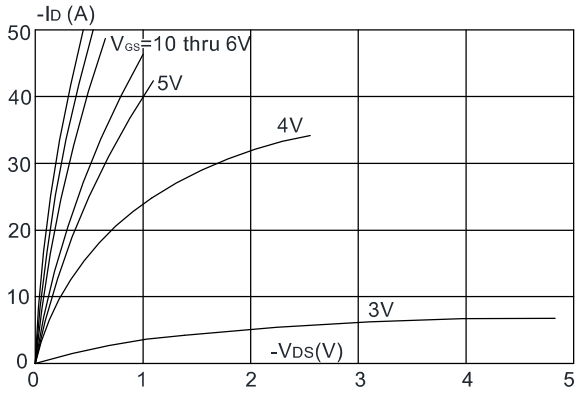


Figure 2: Typical Transfer Characteristics

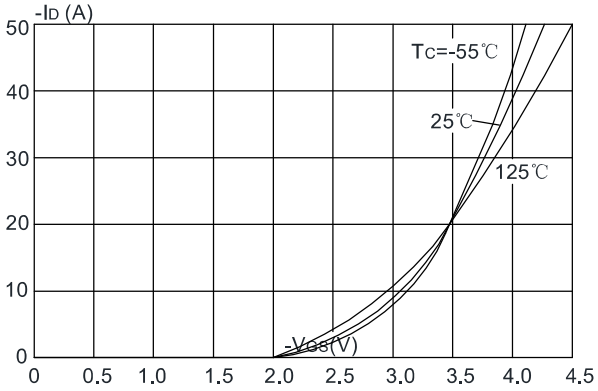


Figure 3: On-resistance vs. Drain Current

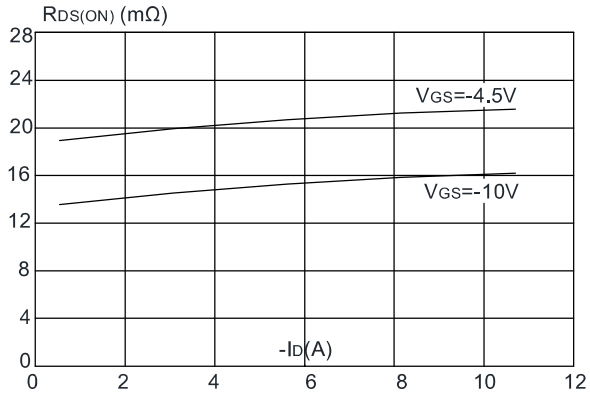


Figure 4: Body Diode Characteristics

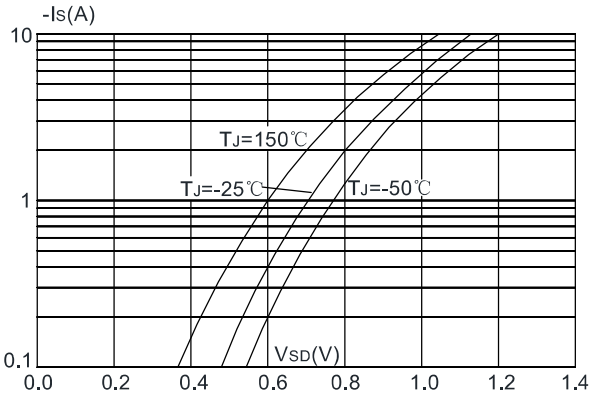


Figure 5: Gate Charge Characteristics

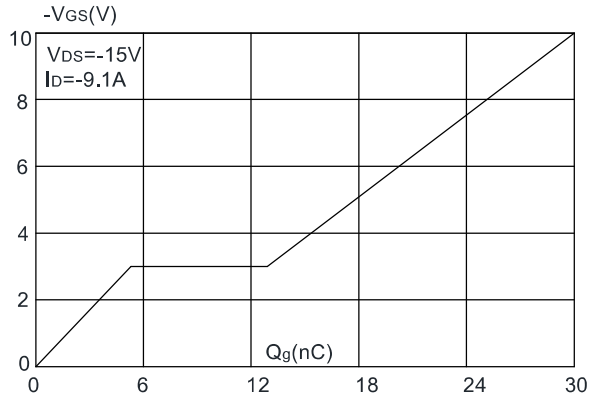


Figure 6: Capacitance Characteristics

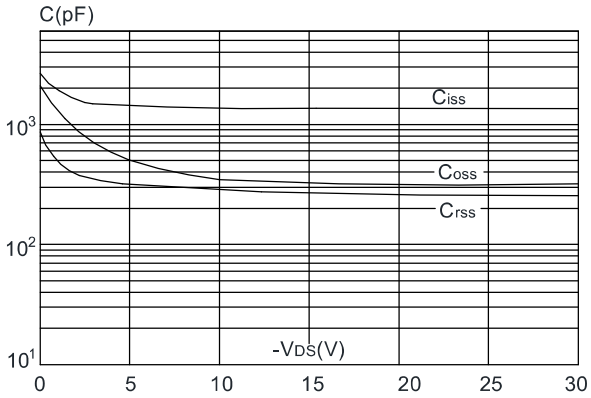


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

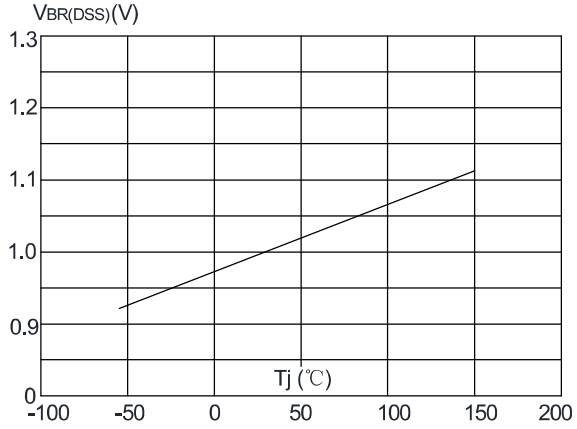


Figure 8: Normalized on Resistance vs. Junction Temperature

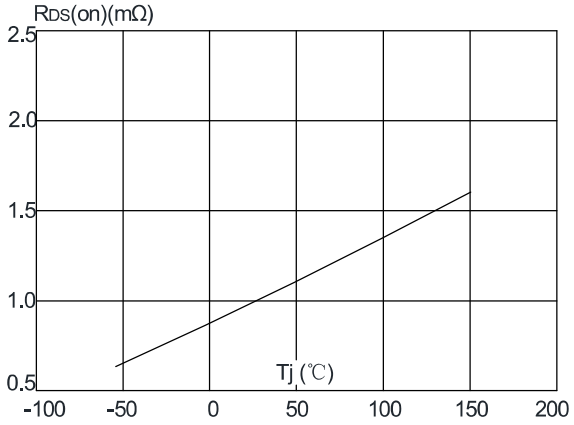


Figure 9: Maximum Safe Operating Area

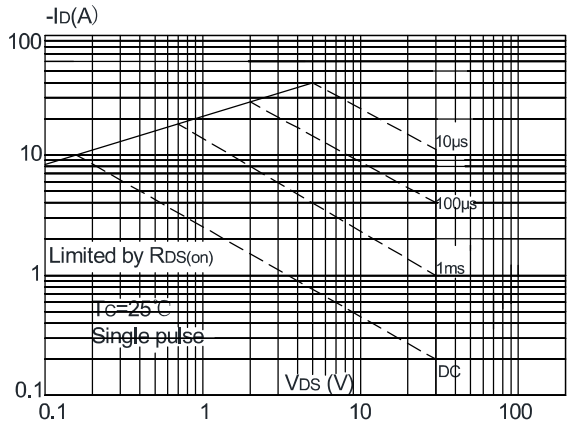


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

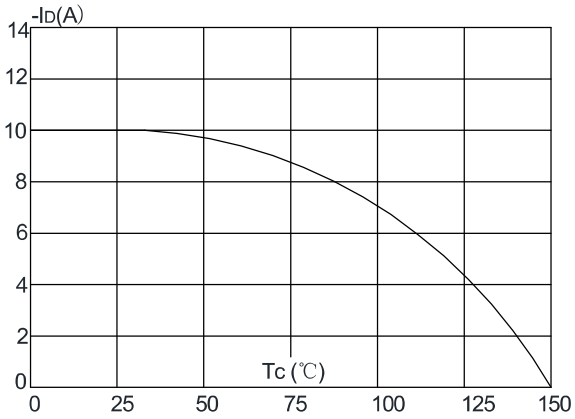
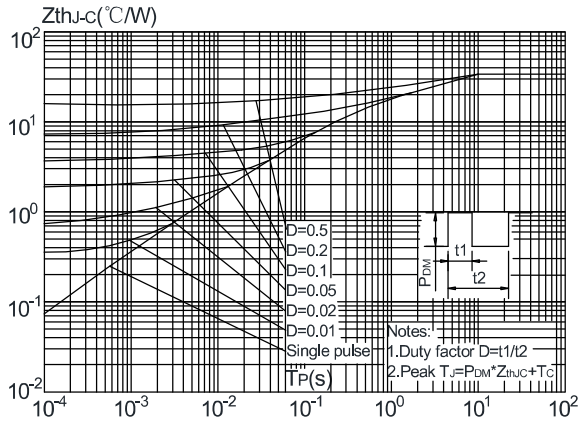
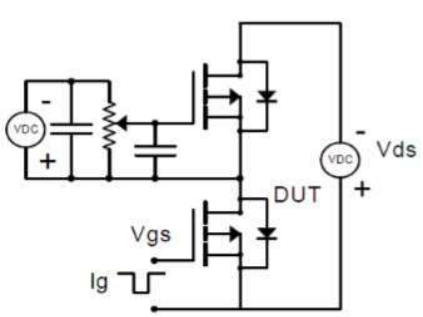
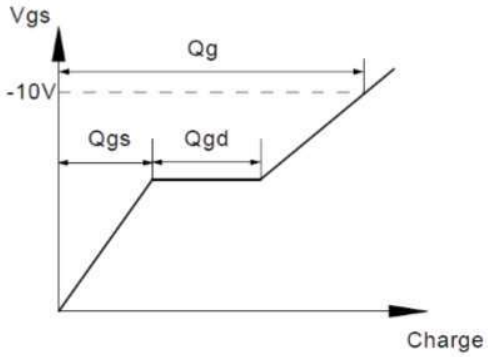


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

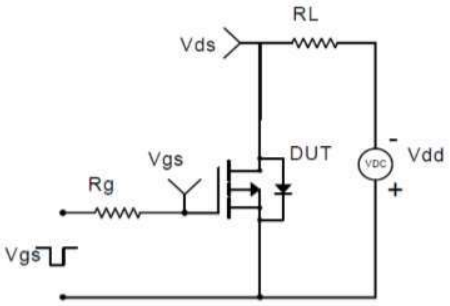


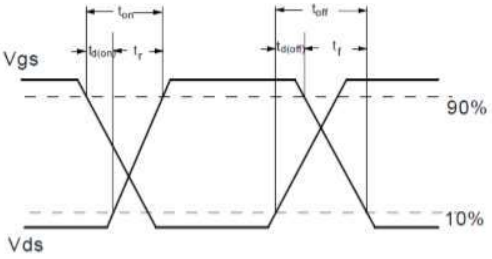
Gate Charge Test Circuit & Waveform



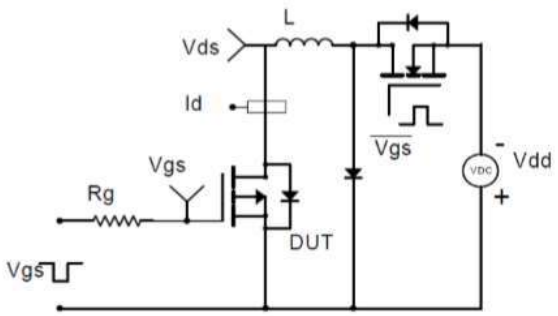


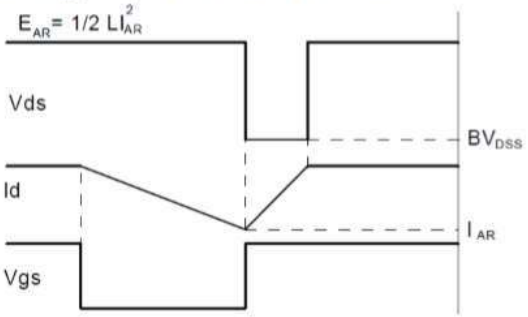
Resistive Switching Test Circuit & Waveforms



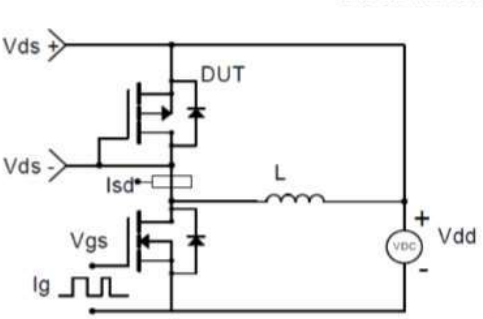


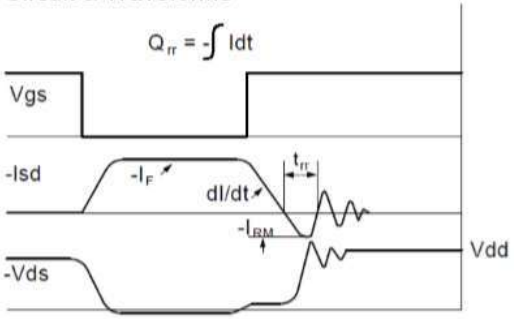
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



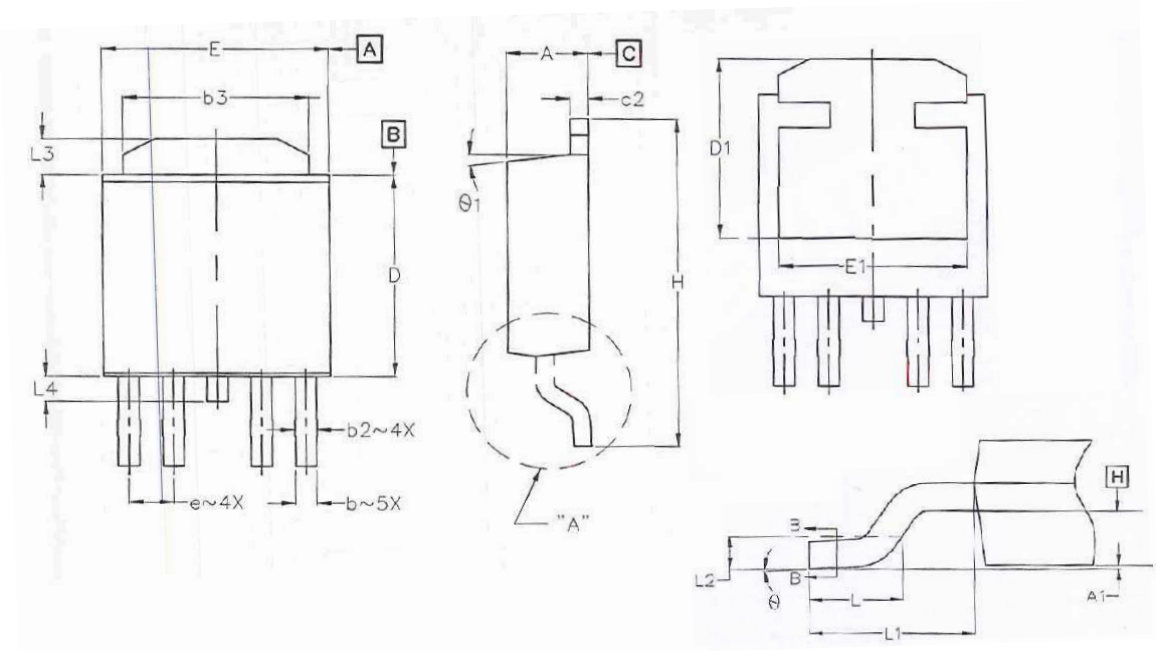


Diode Recovery Test Circuit & Waveforms





TO-252-4 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.184	2.387	0.086	0.094
A1	-	0.127	-	0.094
b	0.508	0.711	0.020	0.028
b1	0.508	0.660	0.020	0.026
b2	0.610	0.787	0.024	0.031
b3	4.953	5.461	0.195	0.215
c	0.460	0.610	0.018	0.024
c1	0.410	0.559	0.016	0.022
C2	0.460	12.950	0.498	0.510
D	4.980	5.180	0.196	0.204
D1	2.650	2.950	0.104	0.116
E	7.900	8.100	0.311	0.319
E1	0.000	0.300	0.000	0.012
e	12.900	13.400	0.508	0.528
H	2.850	3.250	0.112	0.128
L	1.397	1.778	0.055	0.070
L1	2.743	BSC	0.108	BSC
L2	0.508	BSC	0.020	BSC
L3	0.889	1.270	0.035	0.050
L4	-	1.015	-	0.040
θ	0°	10°	0°	10°
θ1	0°	15°	0°	15°