Product Specification

QN4606

30V Complementary MOSFET

FEATURES

- N-Channel: 30V, 9A

  $R_{DS(ON)}$ < 21mΩ @ V_{GS} = 10V

  $R_{DS(ON)}$ < 33mΩ @ V_{GS} = 4.5V
- P-Channel: -30V, -7A

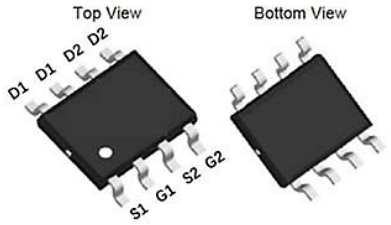
  $R_{DS(ON)}$ < 35mΩ @ V_{GS} = -10V

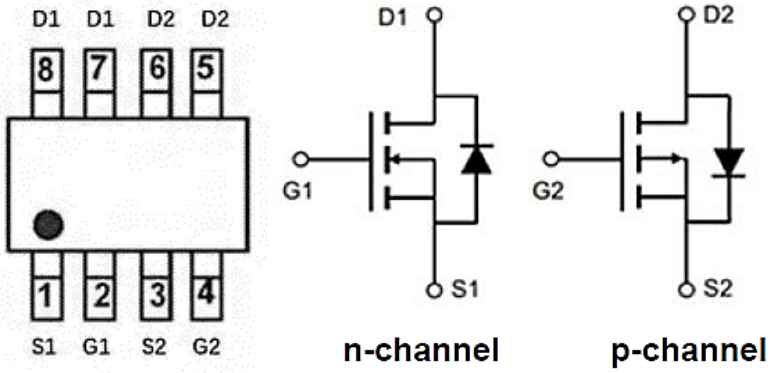
  $R_{DS(ON)}$ < 54mΩ @ V_{GS} = -4.5V
- Excellent Gate Charge x $R_{DS(ON)}$ Product(FOM)
- Very Low On-resistance $R_{DS(ON)}$
- Fast Switching Speed

Applications

- Battery Protection
- Load Switch
- Power Management

Pin Description





NO.	Symbol	Description
1	S1	SOURCE 1
2	G1	GATE 1
3	S2	SOURCE 2
4	G2	GATE 2
5	D2	DRAIN 2
6	D2	DRAIN 2
7	D1	DRAIN 1
8	D1	DRAIN 1

Absolute Maximum Ratings

(@ T_C = 25℃ unless otherwise specified)

Symbol	Parameter		Max. N-Channel	Max. P-Channel	Units
V_{DSS}	Drain-Source Voltage		30	-30	V
V_{GSS}	Gate-Source Voltage		±20	±20	V
I_D	Continuous Drain Current	T_A = 25℃	9	-7	A
		T_A = 100℃	6	-4.6	A
I_{DM}	Pulsed Drain Current note1		36	-28	A
E_{AS}	Single Pulsed Avalanche Energy note2		12	30	mJ
P_D	Power Dissipation	T_A = 25℃	2.7	2.5	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		46.3	50	℃/W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150		℃

N-Channel Electrical Characteristics

(T_J = 25℃ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250uA	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V	-	-	1	uA
I_{GSS}	Gate to Body Leakage Current	V_{DS}=0V, V_{GS}=±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250uA	1.0	1.5	2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance(2)	V_{GS}=10V, I_D=5A	-	16	21	mΩ
		V_{GS}=4.5V, I_D=3A	-	24	33	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=15V, V_{GS}=0V, f=1.0MHz	-	490	-	pF
C_{oss}	Output Capacitance		-	79	-	pF
C_{rss}	Reverse Transfer Capacitance		-	61	-	pF
Q_g	Total Gate Charge	V_{DS}=15V, I_D=5A, V_{GS}=10V	-	5.2	-	nC
Q_{gs}	Gate-Source Charge		-	0.9	-	nC
Q_{gd}	Gate-Drain(“Miller”) Charge		-	1.3	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DS}=15V, I_D=3A, V_{GS}=10V, R_{REN} =3Ω	-	4.5	-	ns
t_r	Turn-on Rise Time		-	2.5	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	14.5	-	ns
t_f	Turn-off Fall Time		-	3.5	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	9	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	36	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S=9A	-	0.8	1.2	V

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. E_{AS} condition : T_J=25℃, V_{DD}=15V, V_G=10V, L=0.5mH, R_g=25Ω, I_{AS}=7A

3. Pulse Test: Pulse Width≤300us, Duty Cycle≤0.5%

P-Channel Electrical Characteristics

(T_J=25℃ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D= -250uA	-30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}= -30V, V_{GS}=0V,	-	-	-1	uA
I_{GSS}	Gate to Body Leakage Current	V_{DS}=0V, V_{GS}= ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=-250uA	-1.0	-1.5	-2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance(3)	V_{GS}= -10V, I_D=-7A	-	27	35	mΩ
		V_{GS}=-4.5V, I_D=-4A	-	38	54	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}= -15V, V_{GS}=0V, f=1.0MHz	-	982	-	pF
C_{oss}	Output Capacitance		-	135	-	pF
C_{rss}	Reverse Transfer Capacitance		-	109	-	pF
Q_g	Total Gate Charge	V_{DS}= -15V, I_D= -4A, V_{GS}= -10V	-	10	-	nC
Q_{gs}	Gate-Source Charge		-	2	-	nC
Q_{gd}	Gate-Drain(“Miller”) Charge		-	2.7	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}= -15V, I_D= -7A, V_{GS}= -10V, R_{GEN}=2.5Ω	-	11	-	ns
t_r	Turn-on Rise Time		-	19	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	45	-	ns
t_f	Turn-off Fall Time		-	26	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-7	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-28	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S= -7A	-	-0.8	-1.2	V

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. E_{AS} condition : T_J=25℃, V_{DD}= -15V, V_G= -10V, L=0.5mH, R_g=25Ω, I_{AS}= -11A

3. Pulse Test: Pulse Width≤300us, Duty Cycle≤0.5%

Typical Performance Characteristics-N

Figure1: Output Characteristics

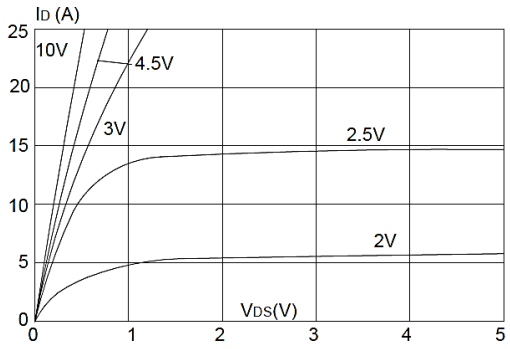


Figure 2: Typical Transfer Characteristics

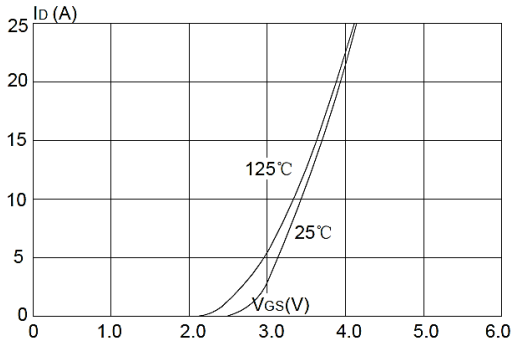


Figure 3: On-resistance vs. Drain Current

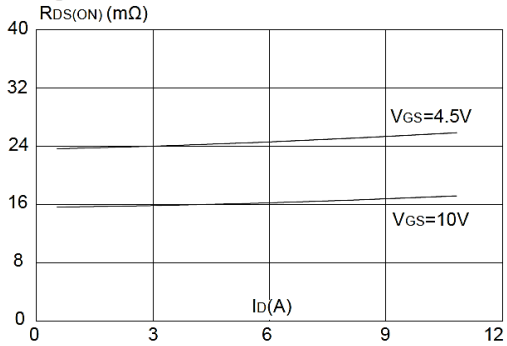


Figure 4: Body Diode Characteristics

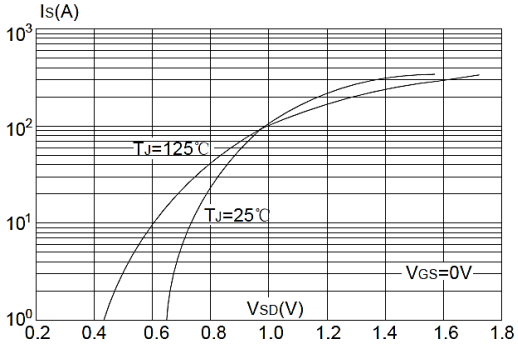


Figure 5: Gate Charge Characteristics

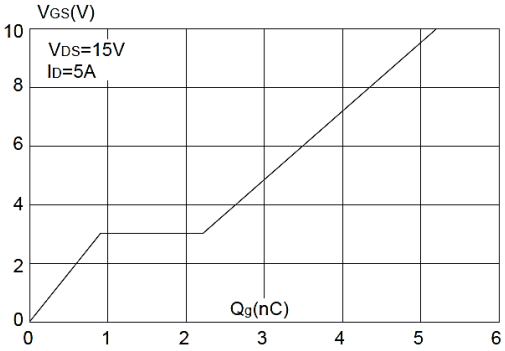


Figure 6: Capacitance Characteristics

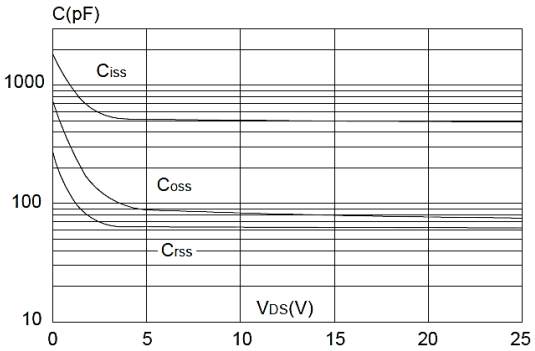


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

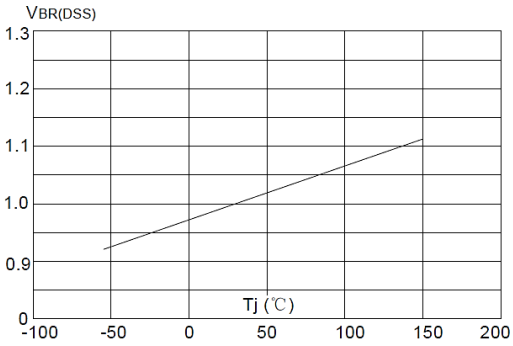


Figure 8: Normalized on Resistance vs. Junction Temperature

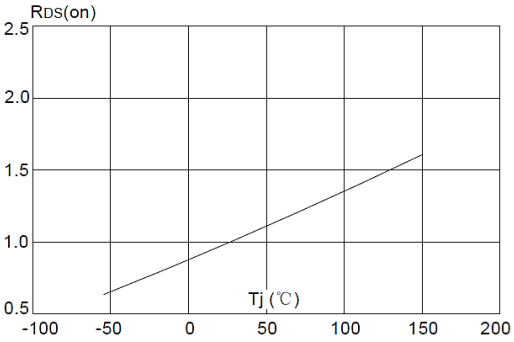


Figure 9: Maximum Safe Operating Area

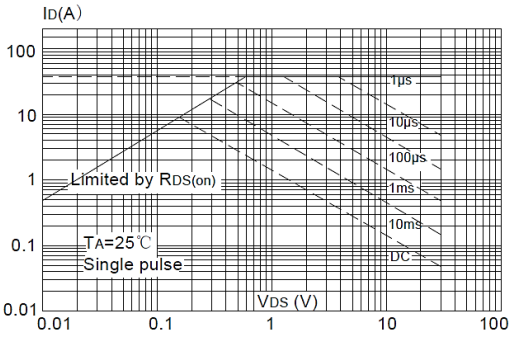


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

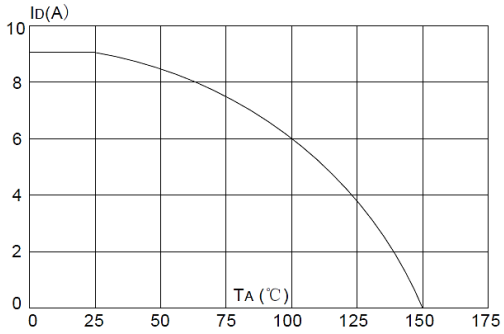
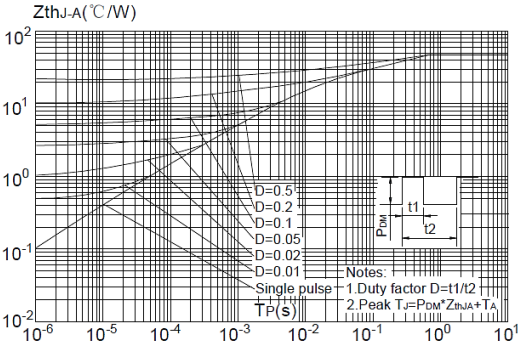


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



Test Circuit-N

Figure1:Gate Charge Test Circuit & Waveform

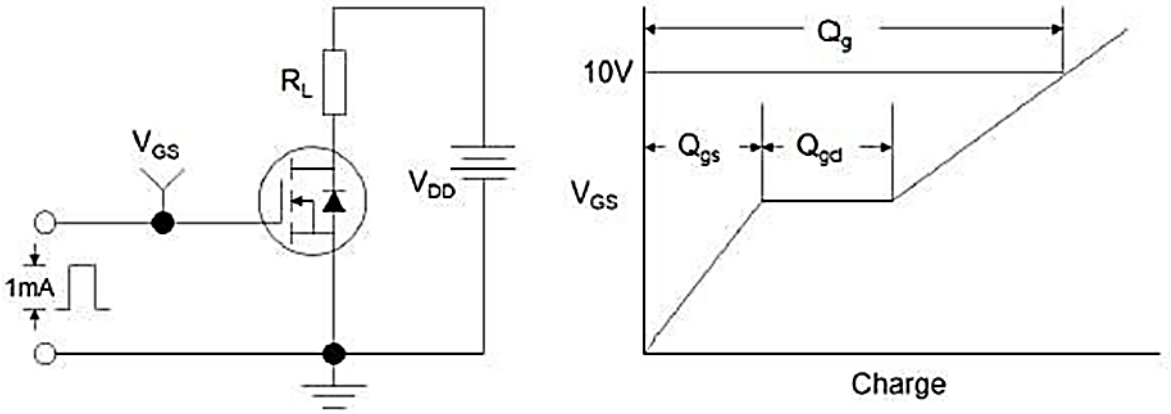


Figure 2: Resistive Switching Test Circuit & Waveforms

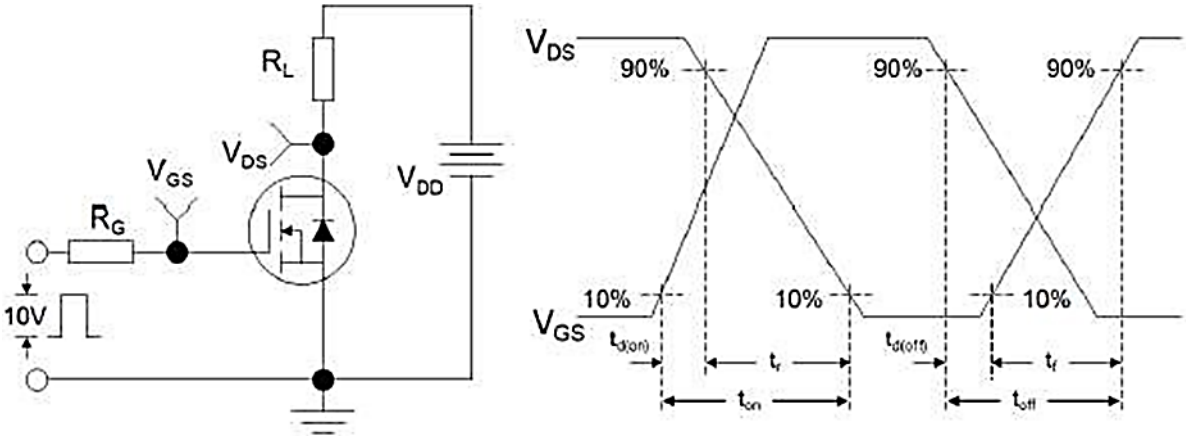
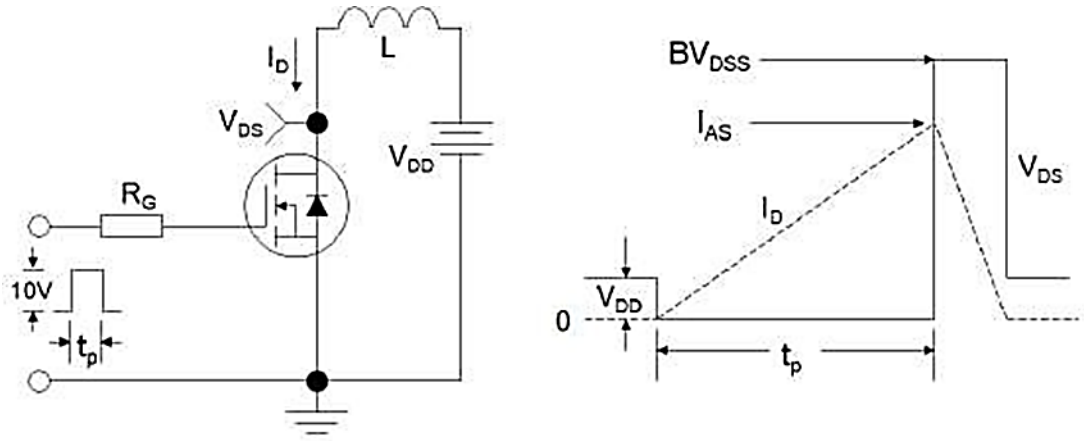


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms



Typical Performance Characteristics-P

Figure1: Output Characteristics

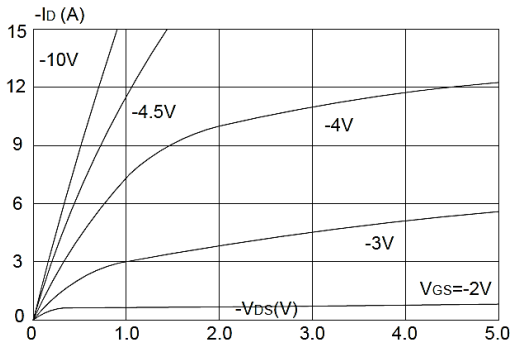


Figure 2: Typical Transfer Characteristics

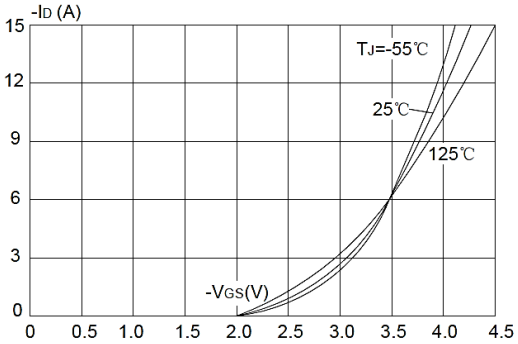


Figure 3: On-resistance vs. Drain Current

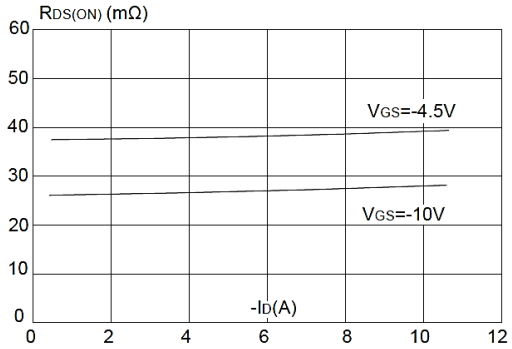


Figure 4: Body Diode Characteristics

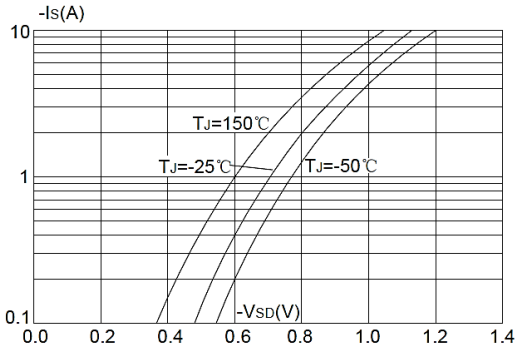


Figure 5: Gate Charge Characteristics

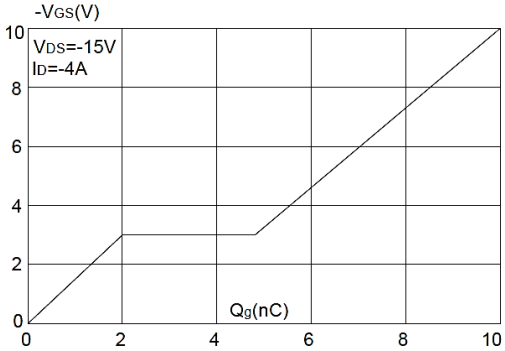


Figure 6: Capacitance Characteristics

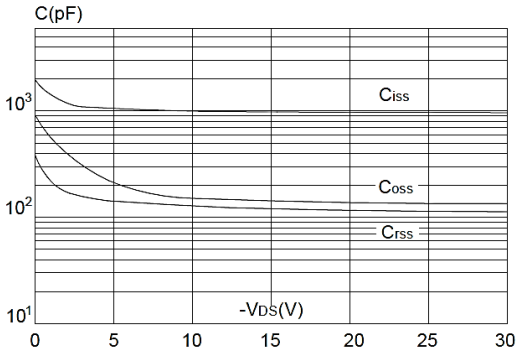


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

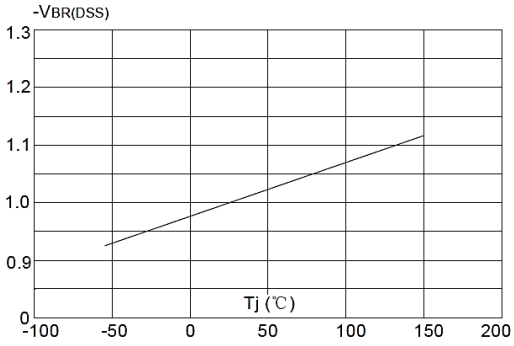


Figure 8: Normalized on Resistance vs. Junction Temperature

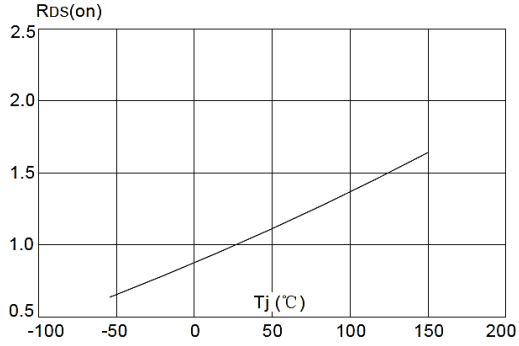


Figure 9: Maximum Safe Operating Area

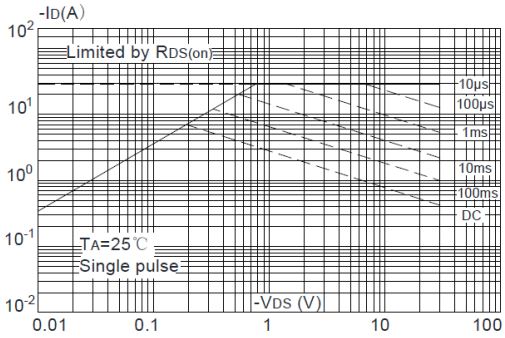


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

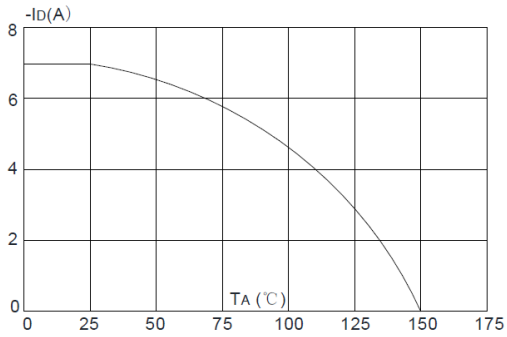
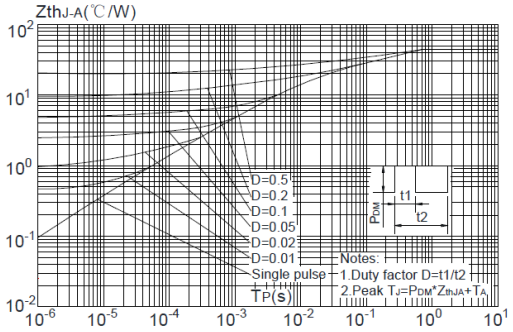
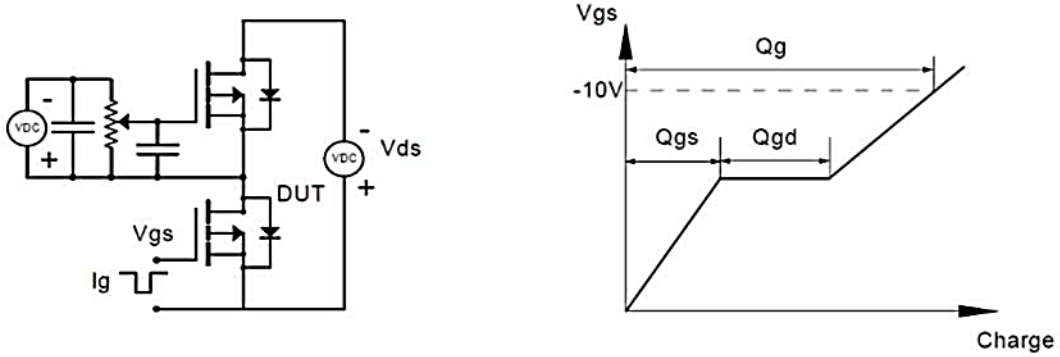


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

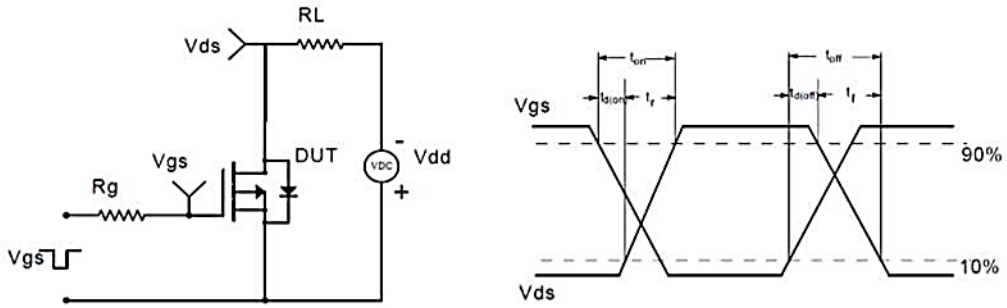


Test Circuit-P

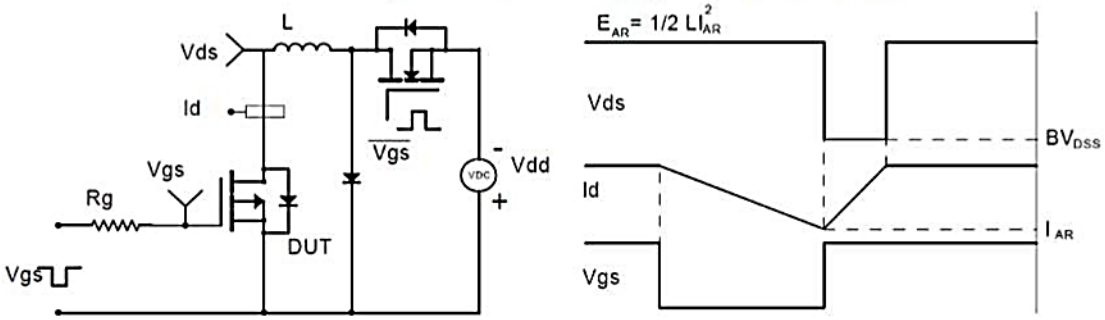
Gate Charge Test Circuit & Waveform



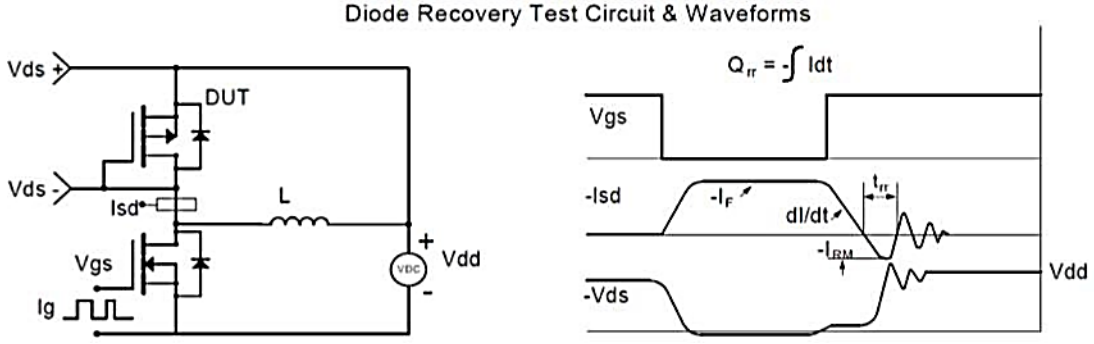
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

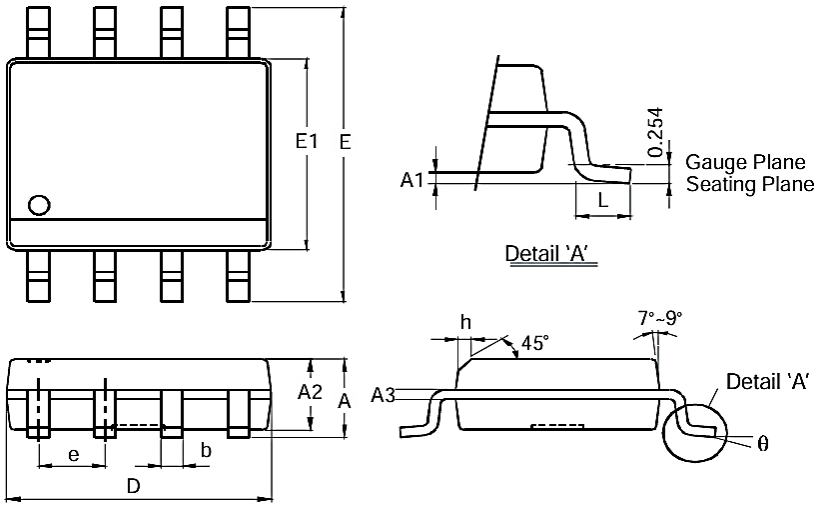


Diode Recovery Test Circuit & Waveforms



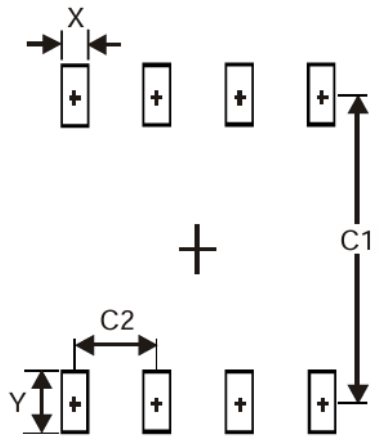
Package Mechanical Data

SOP-8



Dim	Min(mm)	Max(mm)
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°

suggested Pad Layout



Dimensions	Value(mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

Ordering information

Order Code	Package	Channel	V_{DS}(V)	I_D(A)	$R_{DS(ON)}$(mΩ)	
QN4606	SOP-8	N-Channel	30	9	V_{GS}=10V	< 21
					V_{GS}=4.5V	< 33
		P-Channel	-30	-7	V_{GS}=-10V	< 35
					V_{GS}=-4.5V	< 54