Product Specification

QNM40NP2444

40V Complementary MOSFET

FEATURES

- N-Channel: 40V, 10A

  $R_{DS(ON)} < 35m\Omega$ @ $V_{GS} = 10V$

  $R_{DS(ON)} < 40m\Omega$ @ $V_{GS} = 4.5V$
- P-Channel: -40V, -10A

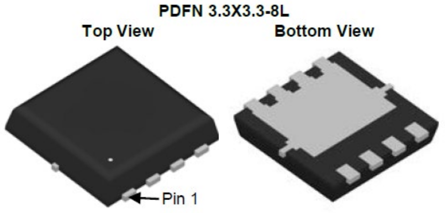
  $R_{DS(ON)} < 44m\Omega$ @ $V_{GS} = -10V$

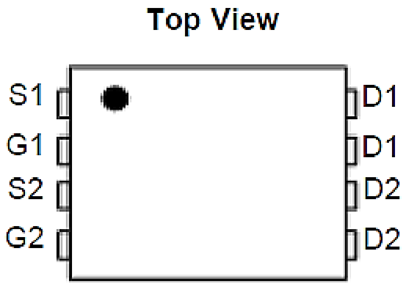
  $R_{DS(ON)} < 52m\Omega$ @ $V_{GS} = -4.5V$
- Excellent Gate Charge x $R_{DS(ON)}$ Product(FOM)
- Very Low On-resistance $R_{DS(ON)}$
- Fast Switching Speed

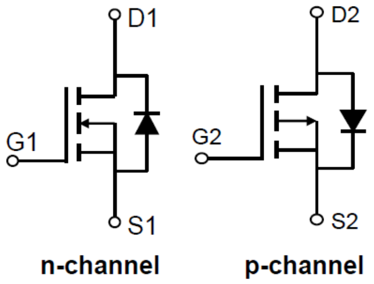
Applications

- Battery Protection
- Load Switch
- Power Managemen

Pin Description







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

Absolute Maximum Ratings

(@ T_A = 25℃ unless otherwise specified)

Symbol	Parameter		Max. N-Channel	Max. P-Channel	Units
V_{DSS}	Drain-Source Voltage		40	-40	V
V_{GSS}	Gate-Source Voltage		±20	±20	V
I_D	Continuous Drain Current	T_A = 25℃	10	-10	A
		T_A = 100℃	6.5	-6.5	A
I_{DM}	Pulsed Drain Current note1		40	-40	A
E_{AS}	Single Pulsed Avalanche Energy note2		19	27.5	mJ
P_D	Power Dissipation	T_A = 25℃	3.4	7.5	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		36.8	16.7	℃/W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150		℃

N-Channel Electrical Characteristics

(T_A = 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=250μA	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=40V, V_{GS}=0V	-	-	1.0	μA
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}=VGS, I_D=250μA	1.0	1.5	2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance note3	V_{GS}=10V, I_D=10A	-	28	35	mΩ
		V_{GS}=4.5V, I_D=5A	-	37	40	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=20V, V_{GS}=0V, f=1.0MHz	-	580	-	pF
C_{oss}	Output Capacitance		-	36.2	-	pF
C_{rss}	Reverse Transfer Capacitance		-	32.5	-	pF
Q_g	Total Gate Charge	V_{DS}=20V, I_D=5A, V_{GS}=10V	-	11	-	nC
Q_{gs}	Gate-Source Charge		-	1.9	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	2.2	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DS}=20V, I_D= 5A, R_L=2.5Ω, R_{REN} =3Ω	-	11	-	ns
t_r	Turn-on Rise Time		-	13	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	36	-	ns
t_f	Turn-off Fall Time		-	9	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	10	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	40	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S= 10A	-	-	1.2	V
trr	Body Diode Reverse Recovery Time	T_J=25℃, I_F=10A,dI/dt=100A/μs	-	19	-	ns
Qrr	Body Diode Reverse Recovery		-	11	-	nC

Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition :
T_J=25℃,V_{DD}=30V,V_G=10V,L=0.5mH,Rg=25Ω,I_{AS}=8.7A
T_J=25℃,V_{DD}=-30V,V_G= -10V,L=0.5mH,Rg=25Ω,I_{AS}= -10.5A
3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

P-Channel Electrical Characteristics

(T_A = 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= -250μA	-40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}= -40V, V_{GS}=0V	-	-	-1	μA
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}=VGS, I_D= -250μA	-1.0	-1.6	-2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance note3	V_{GS}= -10V, I_D= -8A	-	34	44	mΩ
		V_{GS}= -4.5V, I_D= -5A	-	39	52	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}= -20V, V_{GS}=0V, f=1.0MHz	-	1134	-	pF
C_{oss}	Output Capacitance		-	85	-	pF
C_{rss}	Reverse Transfer Capacitance		-	68	-	pF
Q_g	Total Gate Charge	V_{DS}= -20V, I_D= -5A, V_{GS}= -10V	-	20	-	nC
Q_{gs}	Gate-Source Charge		-	3.5	-	nC
Q_{gd}	Gate-Drain(“Miller”) Charge		-	4.2	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}= -20V, I_D= -5A, V_{GS}= -10V, R_{GEN}=2.5Ω	-	8	-	ns
t_r	Turn-on Rise Time		-	15	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	23	-	ns
t_f	Turn-off Fall Time		-	9	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-10	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-40	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S= -10A	-	-	-1.2	V
trr	Reverse Recovery Time	T_J=25℃, I_F=10A,dI/dt=100A/μs	-	29	-	ns
Qrr	Reverse Recovery Charge		-	20	-	nC

Typical Performance Characteristics-N

Figure1: Output Characteristics

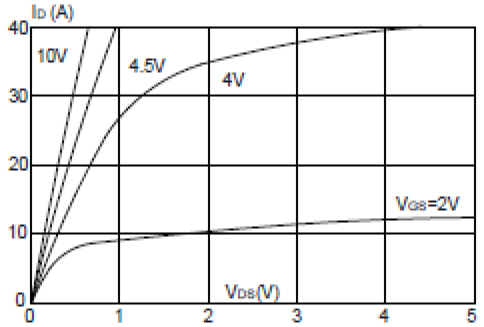


Figure 2: Typical Transfer Characteristics

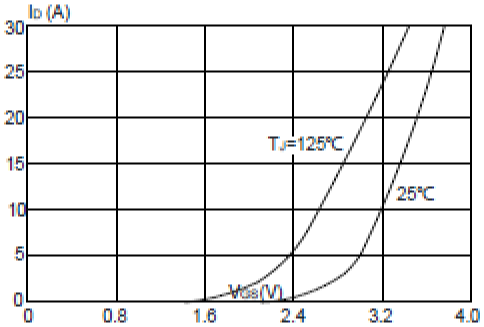


Figure 3: On-resistance vs. Drain Current

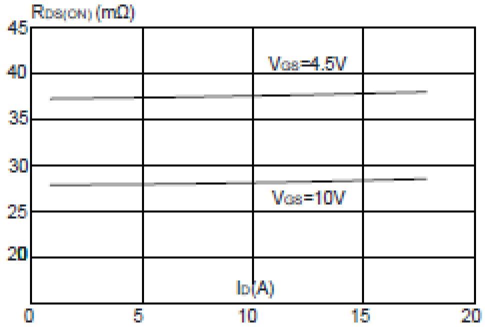


Figure 4: Body Diode Characteristics

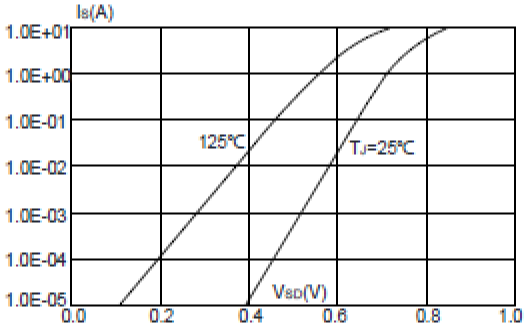


Figure 5: Gate Charge Characteristics

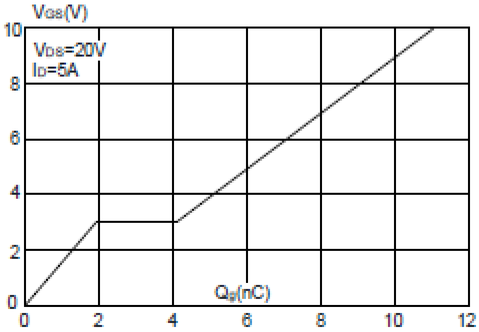


Figure 6: Capacitance Characteristics

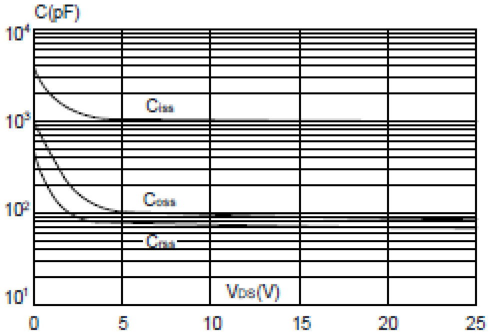


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

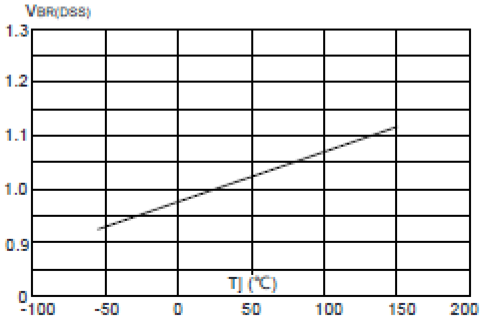


Figure 8: Normalized on Resistance vs. Junction Temperature

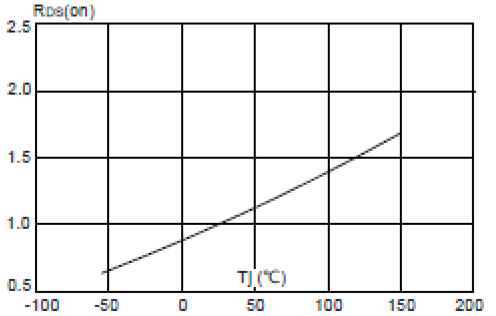


Figure 9: Maximum Safe Operating Area

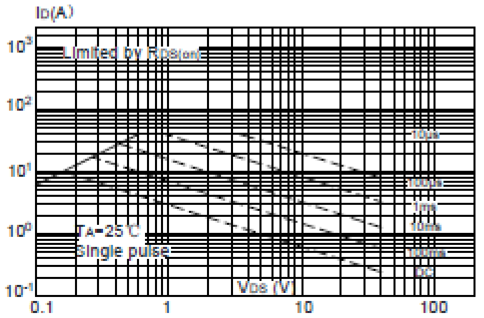


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

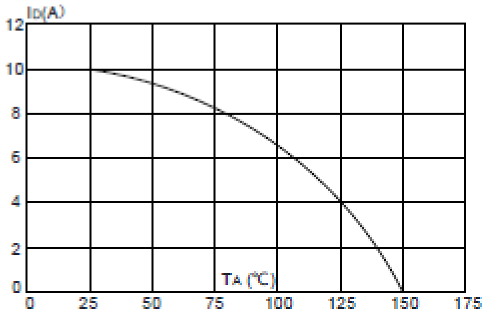
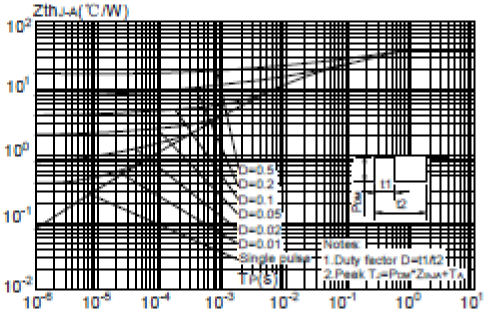


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



Test Circuit-N

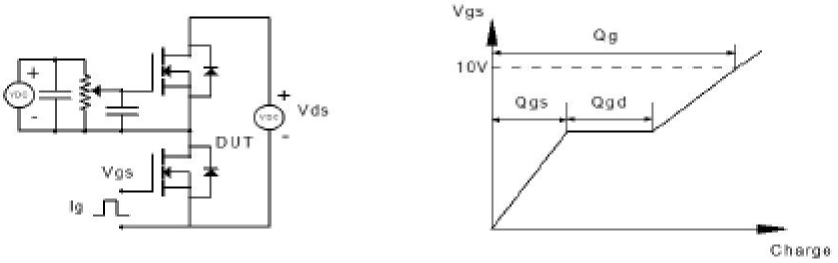


Figure 1: Gate Charge Test Circuit & Waveform

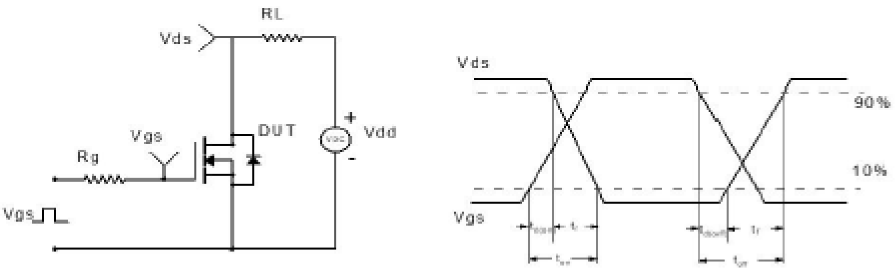


Figure 2: Resistive Switching Test Circuit & Waveform

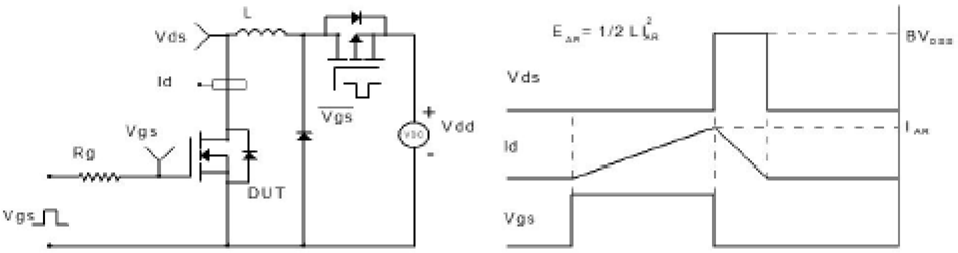


Figure 3: Unclamped Inductive Switching Test Circuit& Waveform

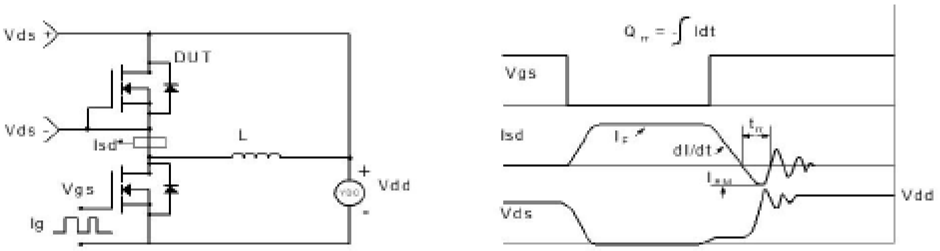


Figure 4: Diode Recovery Test Circuit & Waveform

Typical Performance Characteristics -P

Figure1: Output Characteristics

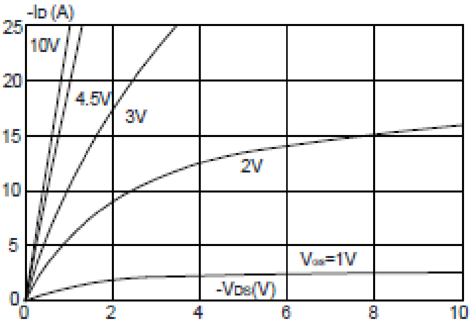


Figure 2: Typical Transfer Characteristics

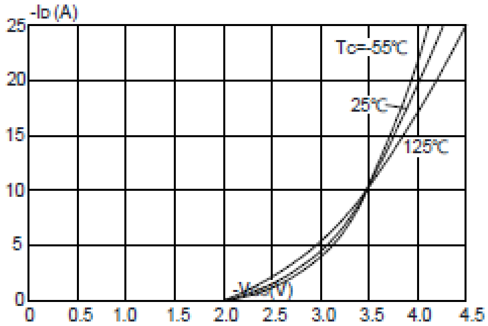


Figure 3: On-resistance vs. Drain Current

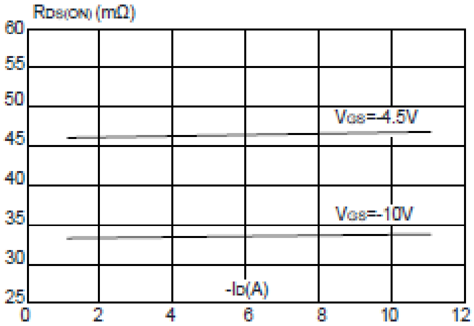


Figure 4: Body Diode Characteristics

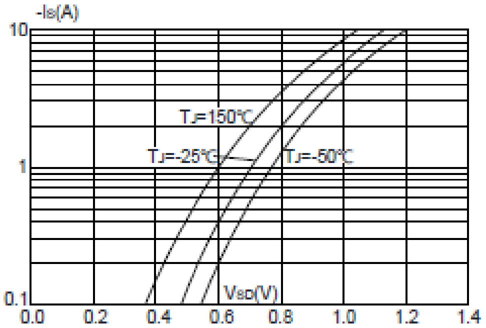


Figure 5: Gate Charge Characteristics

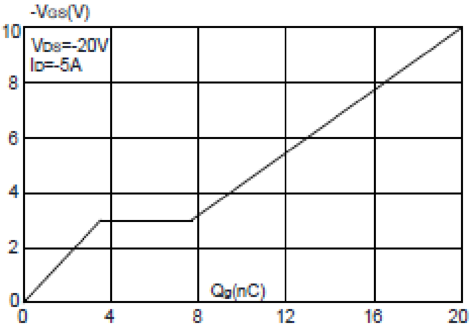


Figure 6: Capacitance Characteristics

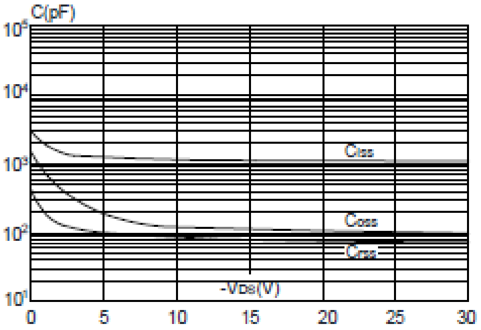


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

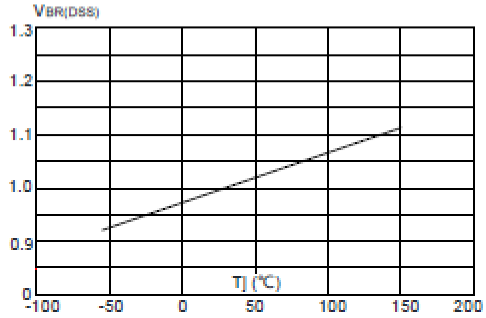


Figure 8: Normalized on Resistance vs. Junction Temperature

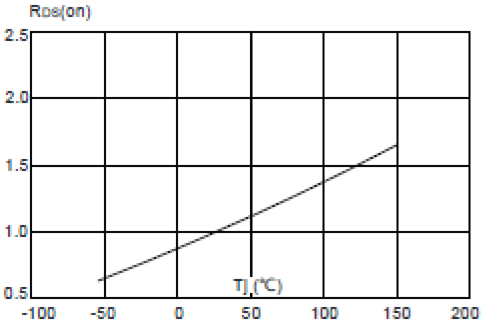


Figure 9: Maximum Safe Operating Area

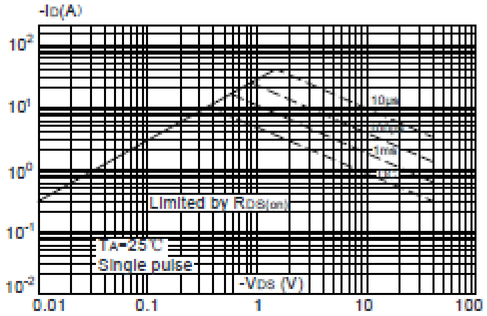


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

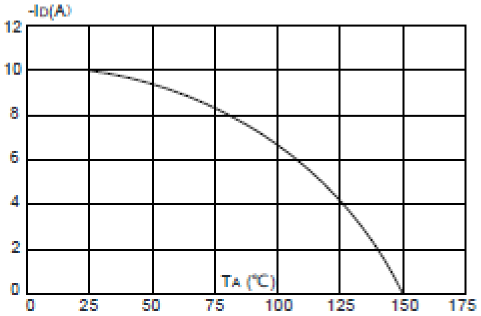
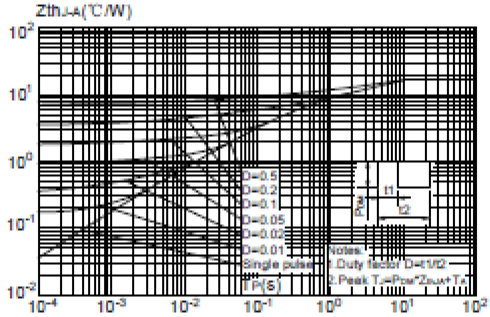
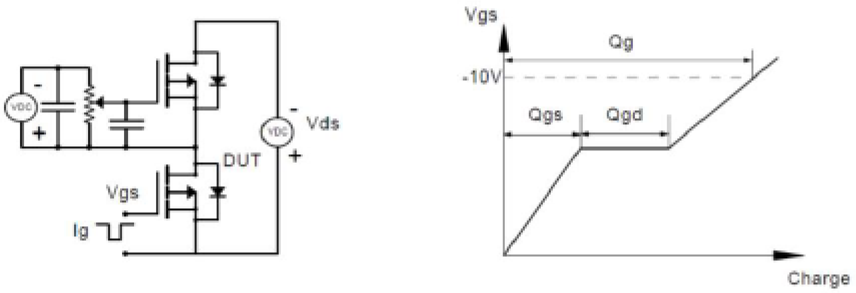


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

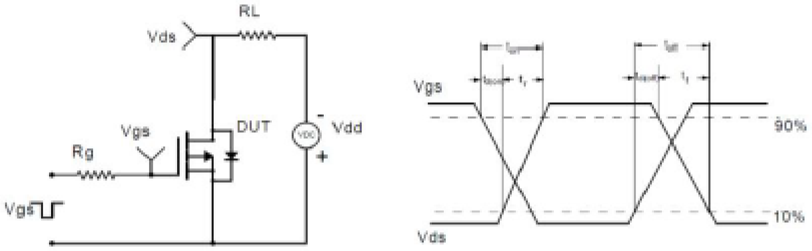


Test Circuit-P

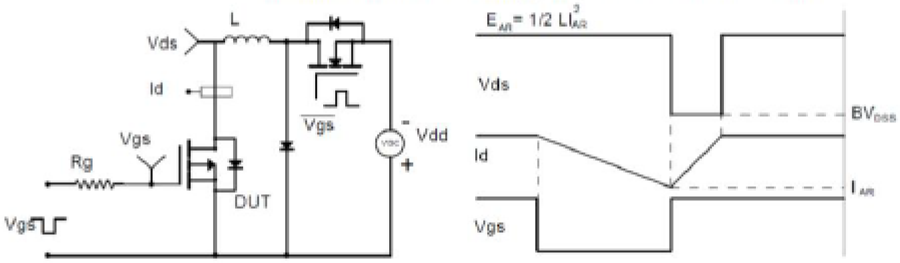
Gate Charge Test Circuit & Waveform



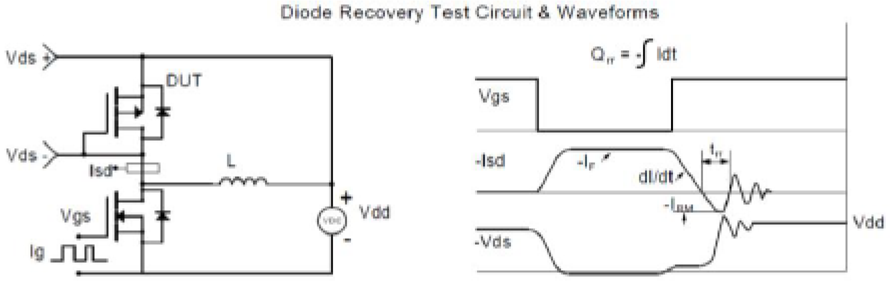
Resistive Switching Test Circuit & Waveforms



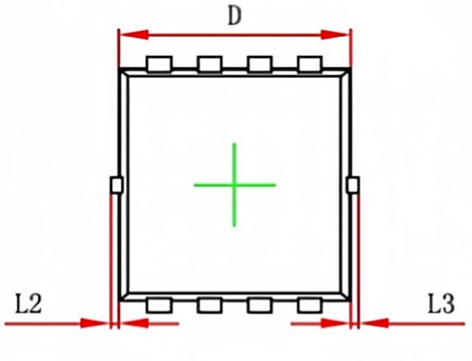
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



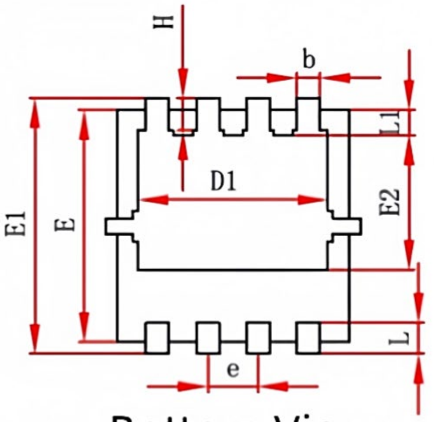
Diode Recovery Test Circuit & Waveforms



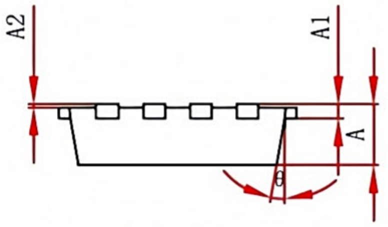
Package Mechanical Data(PDFN 3.3x3.3-8)



Top View

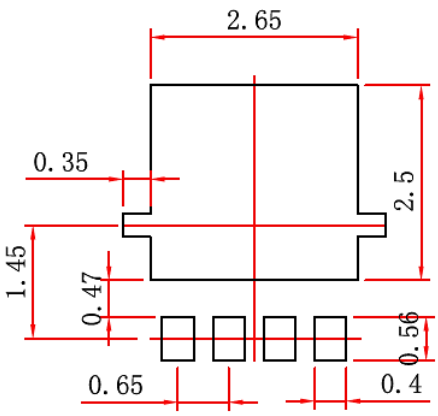


Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	**Max.**	**Min.**	**Max.**
A	0.650	0.850	0.026	0.033
A1	0.152 REF.		0.006 REF.	
A2	0~0.05		0~0.002	
D	2.900	3.100	0.114	0.122
D1	2.300	2.600	0.091	0.102
E	2.900	3.100	0.114	0.122
E1	3.150	3.450	0.124	0.136
E2	1.535	1.935	0.060	0.076
b	0.200	0.400	0.008	0.016
e	0.550	0.750	0.022	0.030
L	0.300	0.500	0.012	0.020
L1	0.180	0.480	0.007	0.019
L2	0~0.100		0~0.004	
L3	0~0.100		0~0.004	
H	0.315	0.515	0.012	0.020
θ	9°	13°	9°	13°



Note:

1.Controlling dimension: in millimeters.

2.General tolerance: ±0.05mm.

3.The pad layout is for reference purposes only.

Ordering information

Order Code	Package	V_{DS}(V)	I_D(A)	$R_{DS(ON)}$(mΩ)	
QNM40NP2444	PDFN 3.3x3.3-8	40	10	V_{GS}=10V	<35
				V_{GS}=4.5V	<40
		-40	-10	V_{GS}=-10V	<44
				V_{GS}=-4.5V	<52