

PHK4NQ10T-VB Datasheet

N-Channel 100 V (D-S) MOSFET



RoHS
COMPLIANT
HALOGEN
FREE
Available

PRODUCT SUMMARY		
V_{DS}	100	V
$R_{DS(on)}$ $V_{GS} = 10\text{ V}$	32	$m\Omega$
I_D	9	A
Configuration	Single	

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Extremely Low Q_{gd} for Switching Losses
- 100 % R_g Tested
- 100 % Avalanche Tested
- Compliant to RoHS Directive 2002/95/EC

APPLICATIONS

- Primary Side Switch



ABSOLUTE MAXIMUM RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150\text{ }^{\circ}\text{C}$)	I_D	$T_C = 25\text{ }^{\circ}\text{C}$	9
		$T_C = 70\text{ }^{\circ}\text{C}$	6
		$T_A = 25\text{ }^{\circ}\text{C}$	6 ^{b, c}
		$T_A = 70\text{ }^{\circ}\text{C}$	5 ^{b, c}
Pulsed Drain Current	I_{DM}	40	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$	7
		$T_A = 25\text{ }^{\circ}\text{C}$	3.8 ^{b, c}
Single Pulse Avalanche Current	I_{AS}	30	
Single Pulse Avalanche Energy	E_{AS}	112	mJ
Maximum Power Dissipation	P_D	$T_C = 25\text{ }^{\circ}\text{C}$	14
		$T_C = 70\text{ }^{\circ}\text{C}$	5
		$T_A = 25\text{ }^{\circ}\text{C}$	4 ^{b, c}
		$T_A = 70\text{ }^{\circ}\text{C}$	2 ^{b, c}
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^{\circ}\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, †}	R_{thJA}	33	40	$^{\circ}\text{C/W}$
Maximum Junction-to-Foot (Drain)	R_{thJF}	17	21	

Notes:

- Based on $T_C = 25\text{ }^{\circ}\text{C}$.
- Surface mounted on 1" x 1" FR4 board.
- $t = 10\text{ s}$.
- Maximum under steady state conditions is $80\text{ }^{\circ}\text{C/W}$.

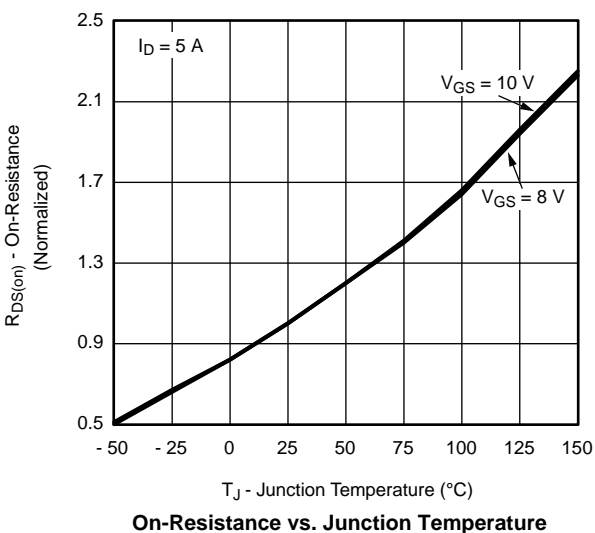
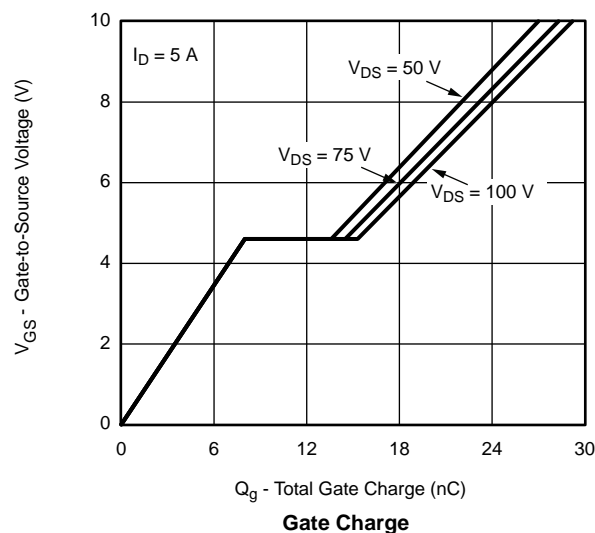
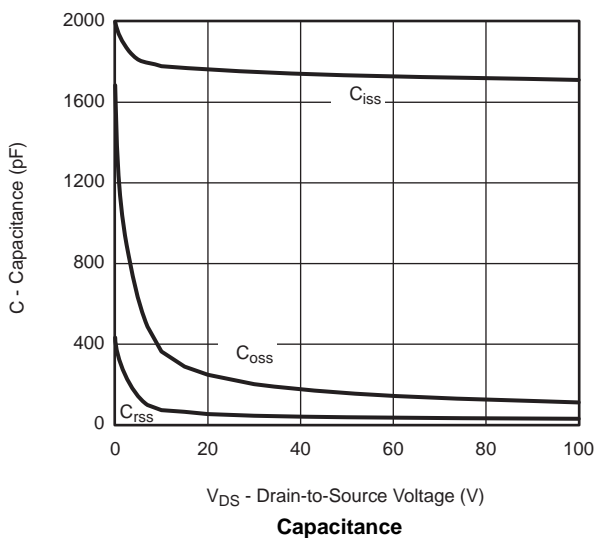
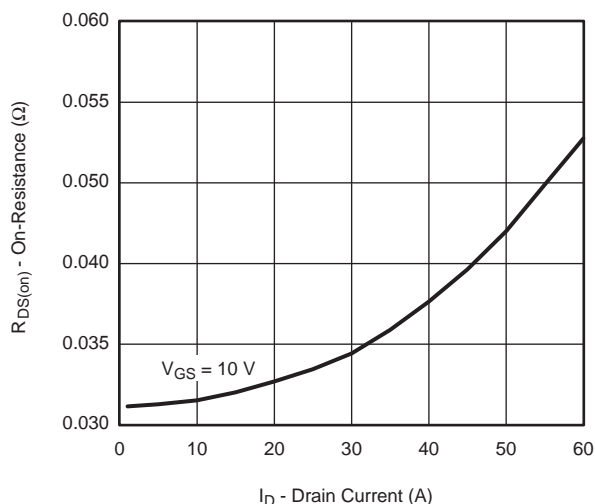
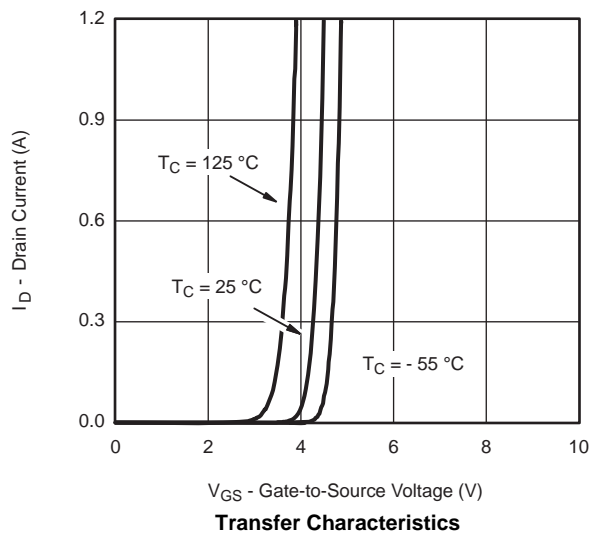
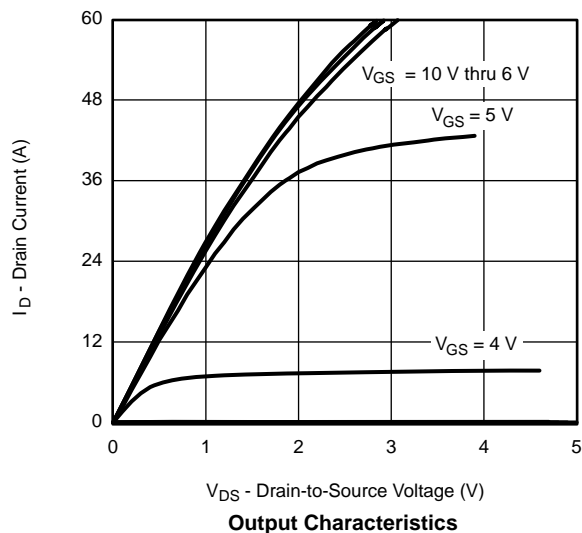
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	100			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		172		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 10		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.0		3.0	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 100 V, V _{GS} = 0 V			1	μA
		V _{DS} = 100 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 10 V, V _{GS} = 10 V	30			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 5 A		32		mΩ
		V _{GS} = 4.5 V, I _D = 5 A		33		
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 5 A		20		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 50 V, V _{GS} = 0 V, f = 1 MHz		1900		pF
Output Capacitance	C _{oss}			150		
Reverse Transfer Capacitance	C _{rss}			50		
Total Gate Charge	Q _g	V _{DS} = 75 V, V _{GS} = 10 V, I _D = 5 A		28.5	43	nC
		V _{DS} = 75 V, V _{GS} = 8 V, I _D = 5 A		23	35	
Gate-Source Charge	Q _{gs}			8		
Gate-Drain Charge	Q _{gd}			6.5		
Gate Resistance	R _g	f = 1 MHz		0.80	1.3	Ω
Turn-on Delay Time	t _{d(on)}	V _{DD} = 50 V, R _L = 10 Ω I _D ≡ 5 A, V _{GEN} = 10 V, R _g = 1 Ω		14	21	ns
Rise Time	t _r			12	18	
Turn-Off Delay Time	t _{d(off)}			22	33	
Fall Time	t _f			6	10	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 50 V, R _L = 10 Ω I _D ≡ 5 A, V _{GEN} = 8 V, R _g = 1 Ω		16	24	
Rise Time	t _r			12	18	
Turn-Off Delay Time	t _{d(off)}			20	30	
Fall Time	t _f			7	12	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			7.7	A
Pulse Diode Forward Current ^a	I _{SM}				50	
Body Diode Voltage	V _{SD}	I _S = 2.6 A		0.77	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 5 A, dI/dt = 100 A/μs, T _J = 25 °C		63	95	ns
Body Diode Reverse Recovery Charge	Q _{rr}			110	165	nC
Reverse Recovery Fall Time	t _a			49		ns
Reverse Recovery Rise Time	t _b			14		

Notes:

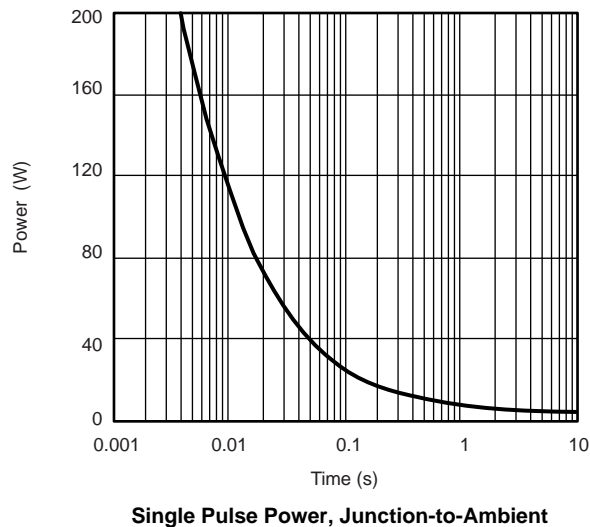
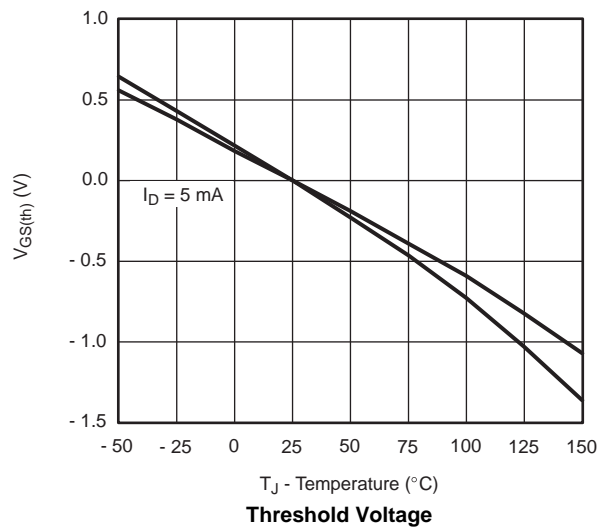
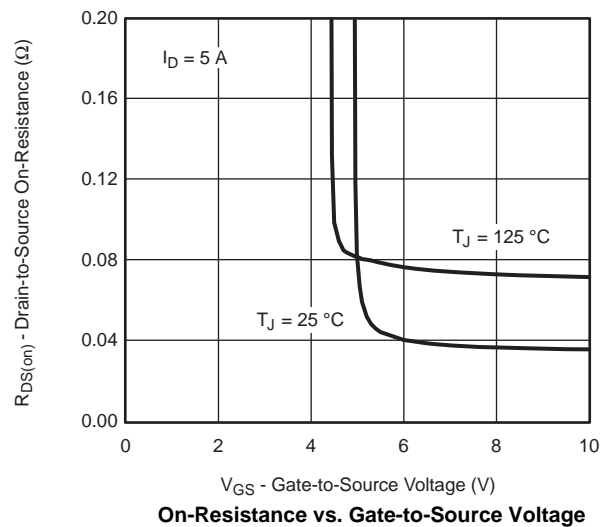
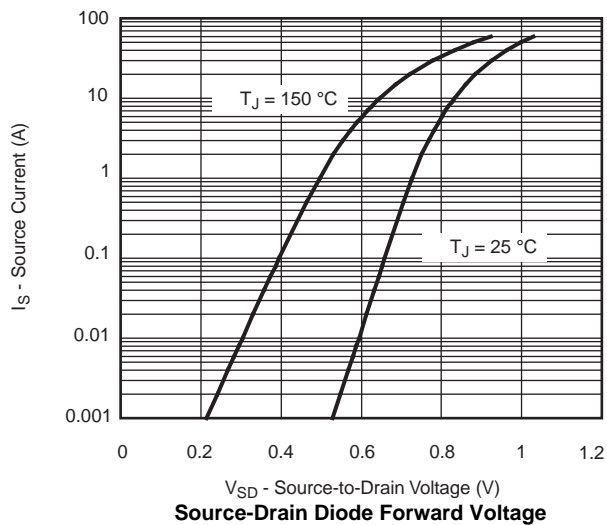
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
 a. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

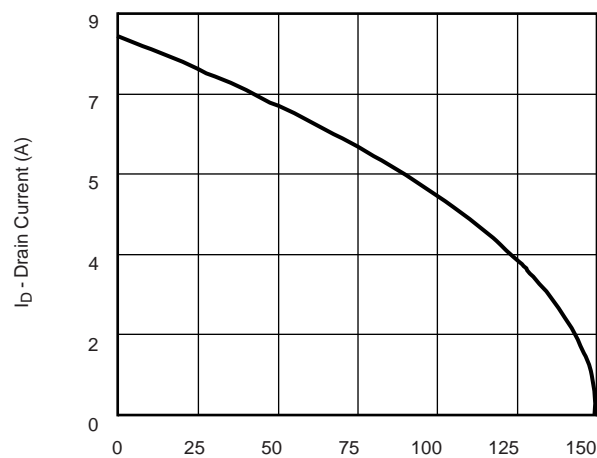
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



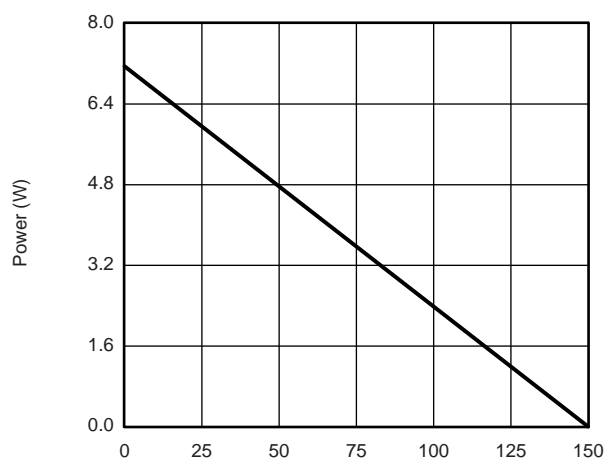
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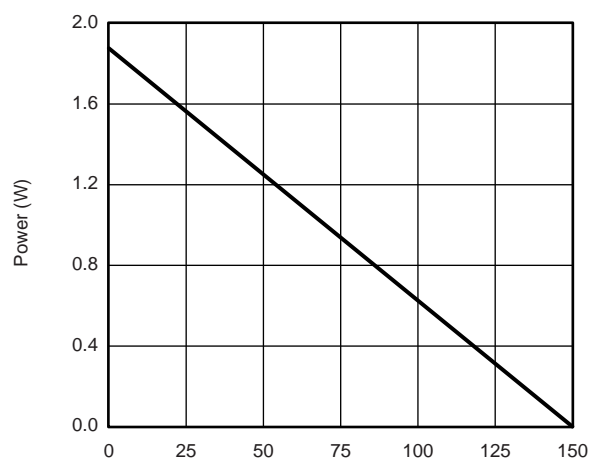
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)


T_C - Case Temperature (°C)
Current Derating*



T_C - Case Temperature (°C)
Power, Junction-to-Case



T_A - Ambient Temperature (°C)
Power, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A ₁	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026

ECN: C-06527-Rev. I, 11-Sep-06
DWG: 5498

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

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