N6442-VB Datasheet

N-Channel 40 V (D-S) MOSFET

PRODUCT SUMMARY

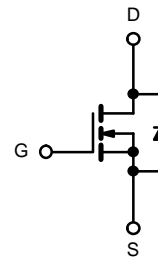| V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a, e]	Q_g (Typ.)
40	0.0050 at V_{GS} = 10 V	70	67 nC
	0.0060 at V_{GS} = 4.5 V	65	

FEATURES
- Trench Power MOSFET
- 100 % R_g and UIS Tested

APPLICATIONS
- Notebook PC Core
- VRM/POL

RoHS COMPLIANT

DFN5X6

Top View   Bottom View

PIN1

Top View

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S [ 1 ●        8 ] D
S [ 2          7 ] D
S [ 3          6 ] D
G [ 4          5 ] D
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N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 175 °C)	T_C = 25 °C	I_D	70[a, e]	A
	T_C = 70 °C		60[e]	
	T_A = 25 °C		19[b, c]	
	T_A = 70 °C		18.6[b, c]	
Pulsed Drain Current		I_{DM}	120	
Avalanche Current Pulse	L = 0.1 mH	I_{AS}	21	
Single Pulse Avalanche Energy		E_{AS}	47.2	mJ
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	70[a, e]	A
	T_A = 25 °C		2.36[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	100[a]	W
	T_C = 70 °C		55	
	T_A = 25 °C		6.15[b, c]	
	T_A = 70 °C		3.07[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[b, d]	t ≤ 10 s	R_{thJA}	47	56	°C/W
Maximum Junction-to-Case	Steady State	R_{thJC}	0.8	1.1	

Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. Maximum under steady state conditions is 90 °C/W.
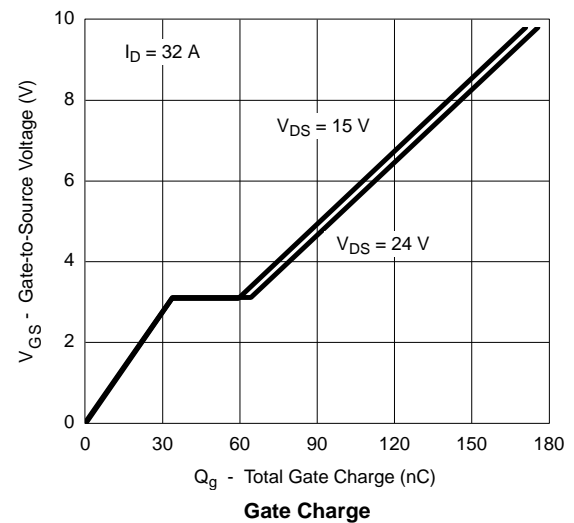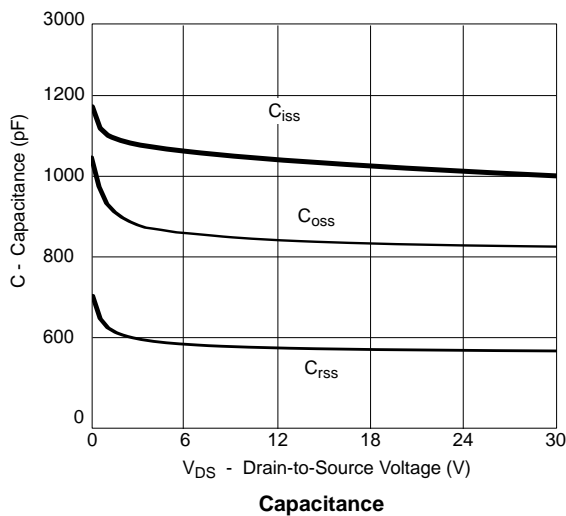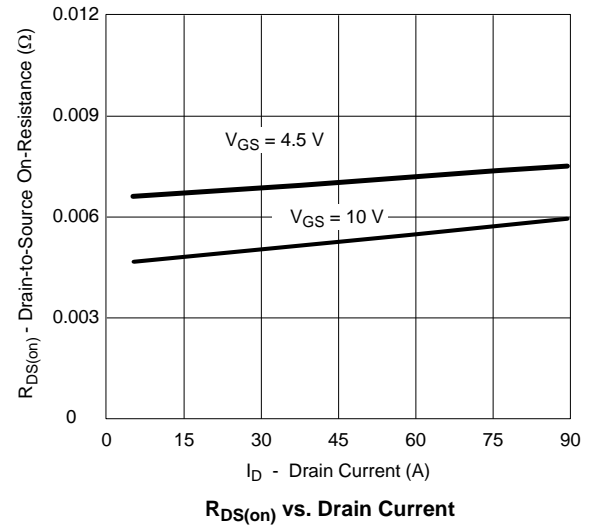e. Calculated based on maximum junction temperature. Package limitation current is 80 A.
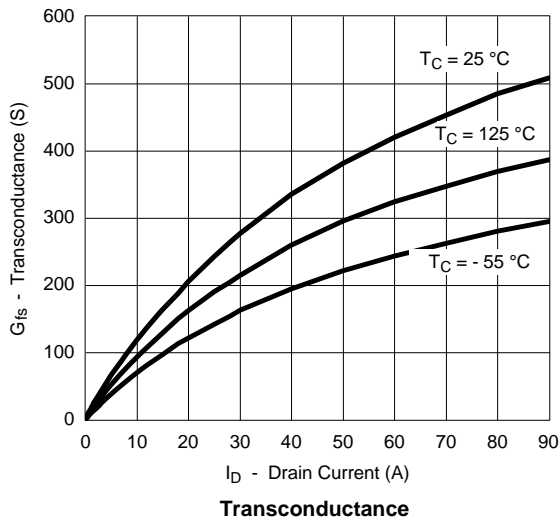
400- 655- 8788

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	40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		35		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.5		mV/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	1.2		2.5	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} = 40 V, V_{GS} = 0 V			1	µA
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 55 °C			10	µA
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 10 V	70			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 32 A		0.005		Ω
		V_{GS} = 4.5 V, I_D = 29 A		0.006		Ω
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 32 A		110		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 12.5 V, V_{GS} = 0 V, f = 1 MHz		1195		pF
Output Capacitance	C_{oss}			975		pF
Reverse Transfer Capacitance	C_{rss}			670		pF
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 32 A		67		nC
		V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 29 A		57.3		nC
Gate-Source Charge	Q_{gs}			31		nC
Gate-Drain Charge	Q_{gd}			25		nC
Gate Resistance	R_g	f = 1 MHz		1.4	2.1	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 0.555 Ω, $I_D \cong$ 27 A, V_{GEN} = 10 V, R_g = 1 Ω		18	27	ns
Rise Time	t_r			11	17	ns
Turn-Off Delay Time	$t_{d(off)}$			70	105	ns
Fall Time	t_f			10	15	ns
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 0.625 Ω, $I_D \cong$ 24 A, V_{GEN} = 4.5 V, R_g = 1 Ω		55	83	ns
Rise Time	t_r			180	270	ns
Turn-Off Delay Time	$t_{d(off)}$			55	83	ns
Fall Time	t_f			12	18	ns
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			70	A
Pulse Diode Forward Current[a]	I_{SM}				100	A
Body Diode Voltage	V_{SD}	I_S = 22 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 20 A, di/dt = 100 A/µs, T_J = 25 °C		52	78	ns
Body Diode Reverse Recovery Charge	Q_{rr}			70.2	105	nC
Reverse Recovery Fall Time	t_a			27		ns
Reverse Recovery Rise Time	t_b			25		ns

Notes:
a. Pulse test; pulse width $\leq$ 300 µs, duty cycle $\leq$ 2 %.
b. 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)

Output Characteristics

Transfer Characteristics

Transconductance

R$_{DS(on)}$ vs. Drain Current

Capacitance

Gate Charge

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

$V_{GS} = 10$ V, $I_D = 32$ A
$V_{GS} = 4.5$ V, $I_D = 29.8$ A
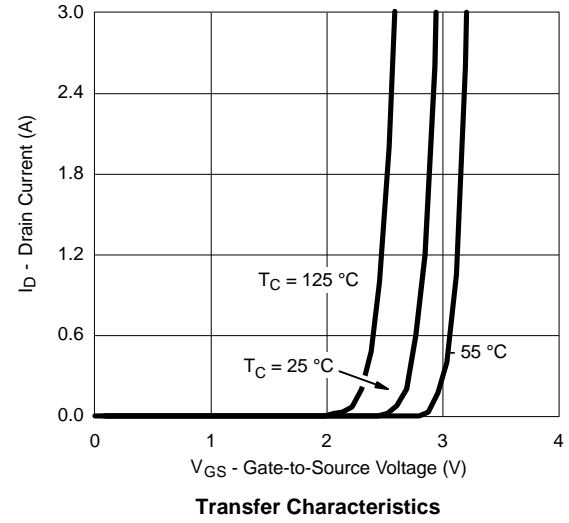
On-Resistance vs. Junction Temperature

$T_J = 150$ °C

$T_J = 25$ °C
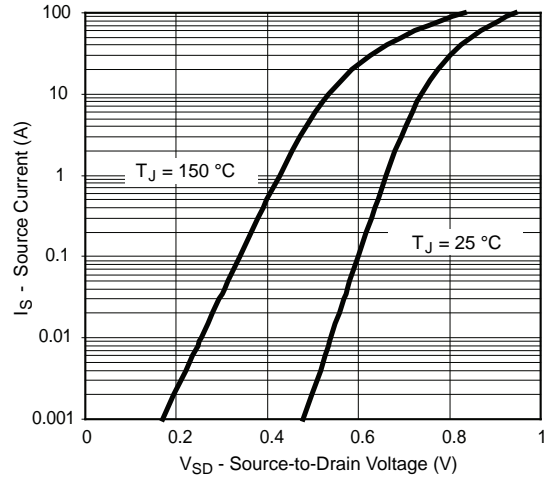
Forward Diode Voltage vs. Temperature

$I_D = 32$ A

$T_A = 125$ °C

$T_A = 25$ °C
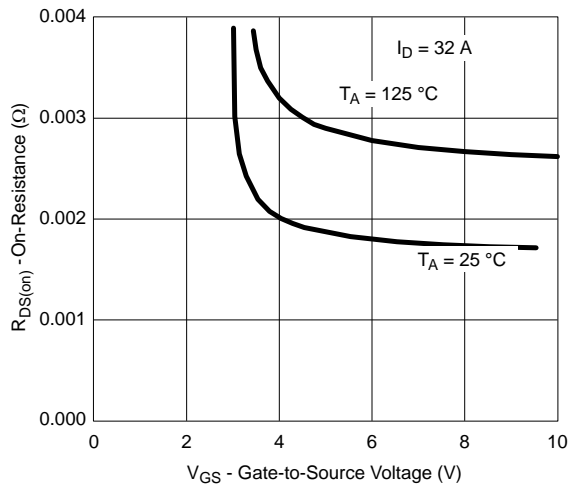
$R_{DS(on)}$ vs. V_{GS} vs. Temperature

$I_D = 250$ µA

Threshold Voltage

Limited by $r_{DS(on)}$*

100 µs
1 ms
10 ms
100 ms
1 s
10 s
DC

$T_A = 25$ °C
Single Pulse

BVDSS Limited
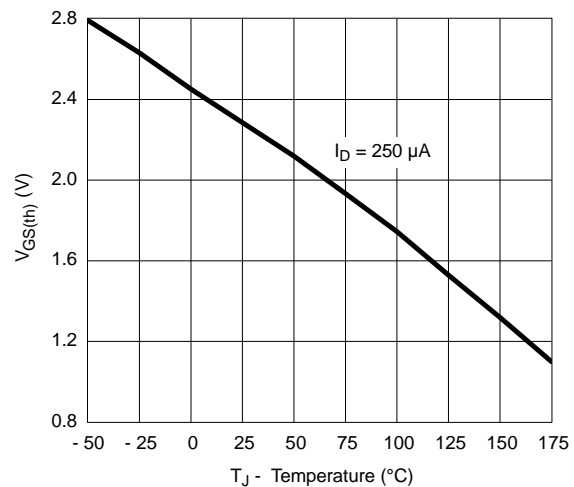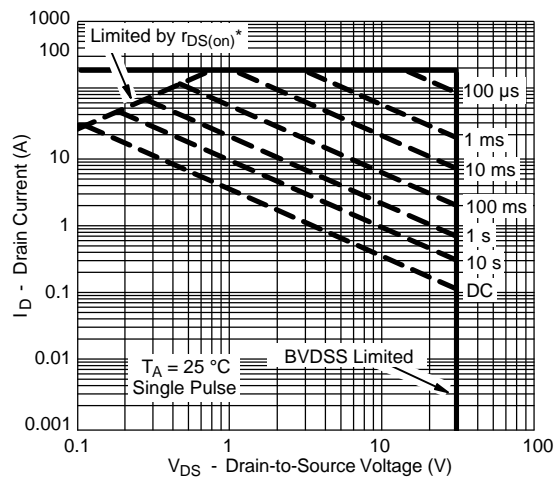
*V_{GS} > minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Package Limited

Current Derating*

I_D - Drain Current (A)

T_C - Case Temperature (°C)

Power Dissipation (W)

T_C - Case Temperature (°C)

Power Derating

* The power dissipation P_D is based on $T_{J(max)}$ = 175 °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.

Duty Cycle = 0.5

0.2

0.1

0.05

0.02

Single Pulse

Normalized Effective Transient Thermal Impedance

Square Wave Pulse Duration (s)

Normalized Thermal Transient Impedance, Junction-to-Case

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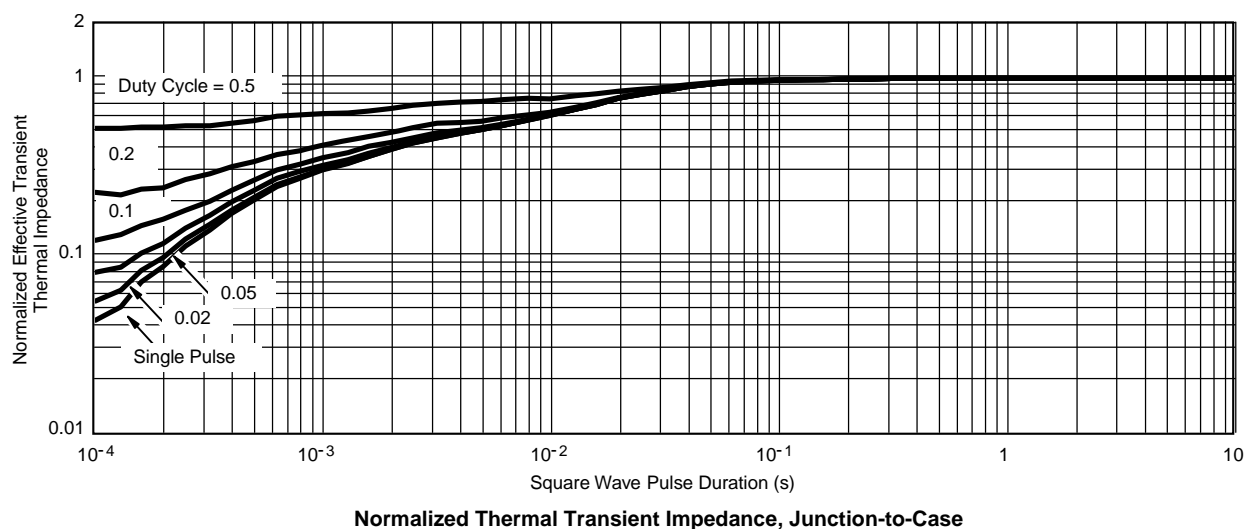
DFN5x6_8L_EP1_P PACKAGE OUTLIN

BOTTOM VIEW

VIEW 'A'
(SCALE 5:1)

RECOMMENDED LAND PATTERN

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	0.95	1.00	0.033	0.037	0.039
A1	0.00	---	0.05	0.000	---	0.002
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.15	0.20	0.25	0.006	0.008	0.010
D	5.10	5.20	5.30	0.201	0.205	0.209
D1	4.25	4.35	4.45	0.167	0.171	0.175
E	5.45	5.55	5.65	0.215	0.219	0.222
E1	5.95	6.05	6.15	0.234	0.238	0.242
E2	3.525	3.625	3.725	0.139	0.143	0.147
E3	1.175	1.275	1.375	0.046	0.050	0.054
e	1.27 BSC			0.050 BSC		
L	0.45	0.55	0.65	0.018	0.022	0.026
L1	0	---	0.15	0	---	0.006
L2	0.68 REF			0.027 REF		
θ	0°	---	10°	0°	---	10°

UNIT: mm

NOTE
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
   MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
2. CONTROLLING DIMENSION IS MILLIMETER.
   CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

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