

IPG20N04S4-08-VB Datasheet

Dual N-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
40	0.0055 at V _{GS} = 10 V	60	20 nC
	0.0065 at V _{GS} = 4.5 V	45	

FEATURES

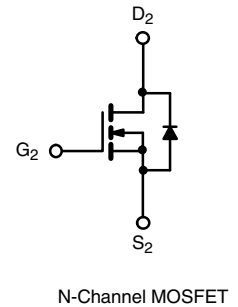
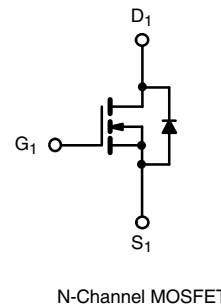
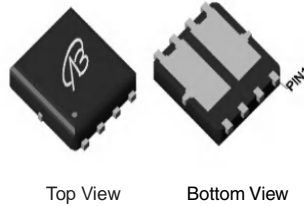
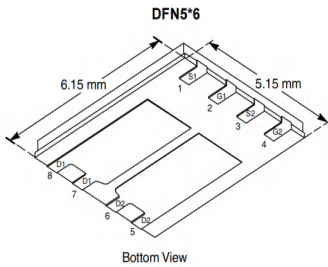
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 % UIS Tested
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Set Top Box
- Low Current DC/DC



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 = 150 °C)	T _C = 25 °C	I _D	60 ^a	A
	T _C = 70 °C		42	
	T _A = 25 °C		50 ^{b, c}	
	T _A = 70 °C		35 ^{b, c}	
Pulsed Drain Current		I _{DM}	180	
Continuous Source-Drain Diode Current	T _C = 25 °C	I _S	2.25	
	T _A = 25 °C		1.48 ^{b, c}	
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	30	mJ
Single Pulse Avalanche Energy		E _{AS}	55	
Maximum Power Dissipation	T _C = 25 °C	P _D	2.7	W
	T _C = 70 °C		4.77	
	T _A = 25 °C		2.78 ^{b, c}	
	T _A = 70 °C		1.14 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{a, c, d}	t ≤ 10 s	R _{thJA}	58	70	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R _{thJF}	38	45	

Notes:

- Package limited, T_C = 25 °C.
- Surface Mounted on 1" x 1" FR4 board.
- t = 10 s.
- Maximum under Steady State conditions is 110 °C/W.

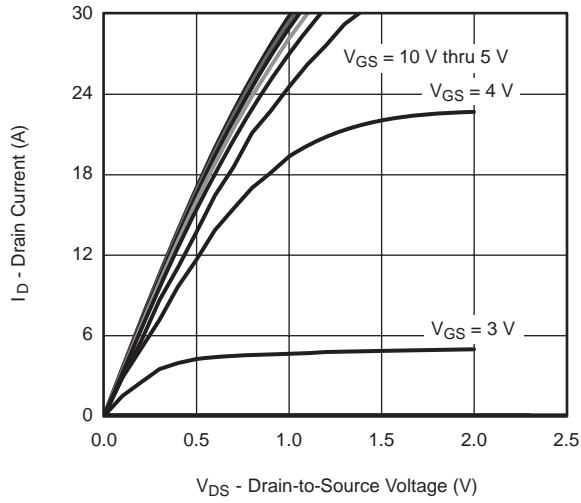
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		32		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.0		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0		2.5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	10			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		0.0055		Ω
		$V_{GS} = 4.5\text{ V}, I_D = 4\text{ A}$		0.0065		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 5\text{ A}$		16		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1000		pF
Output Capacitance	C_{oss}			217		
Reverse Transfer Capacitance	C_{rss}			155		
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		15	25	nC
				6.7	9.6	
Gate-Source Charge	Q_{gs}	$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$		4.4	6.0	
Gate-Drain Charge	Q_{gd}			3.05	4.0	
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.8	4.3	8.6	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		12	24	ns
Rise Time	t_r			55	100	
Turn-Off Delay Time	$t_{d(off)}$			11	22	
Fall Time	t_f			8	16	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		4	8	
Rise Time	t_r			9	18	
Turn-Off Delay Time	$t_{d(off)}$			10	20	
Fall Time	t_f			6	12	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			60	A
Pulse Diode Forward Current	I_{SM}				180	
Body Diode Voltage	V_{SD}	$I_S = 2\text{ A}, V_{GS} = 0\text{ V}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		11	20	ns
Body Diode Reverse Recovery Charge	Q_{rr}			4	8	nC
Reverse Recovery Fall Time	t_a			7		ns
Reverse Recovery Rise Time	t_b			4		

Notes:

- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, 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

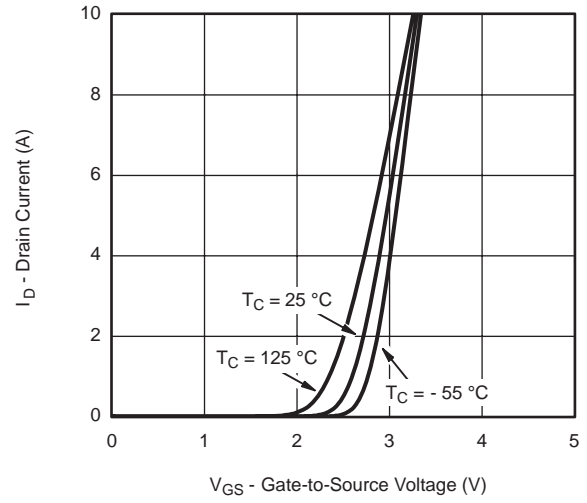


$V_{GS} = 10\text{ V thru } 5\text{ V}$
 $V_{GS} = 4\text{ V}$
 $V_{GS} = 3\text{ V}$

I_D - Drain Current (A)

V_{DS} - Drain-to-Source Voltage (V)

Output Characteristics

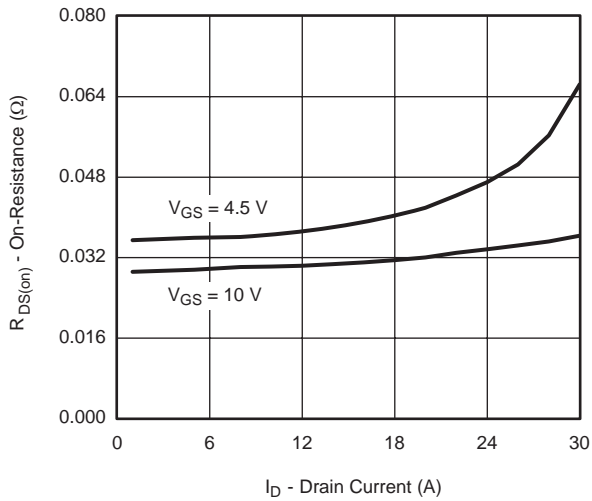


$T_C = 25\text{ }^\circ\text{C}$
 $T_C = 125\text{ }^\circ\text{C}$
 $T_C = -55\text{ }^\circ\text{C}$

I_D - Drain Current (A)

V_{GS} - Gate-to-Source Voltage (V)

Transfer Characteristics

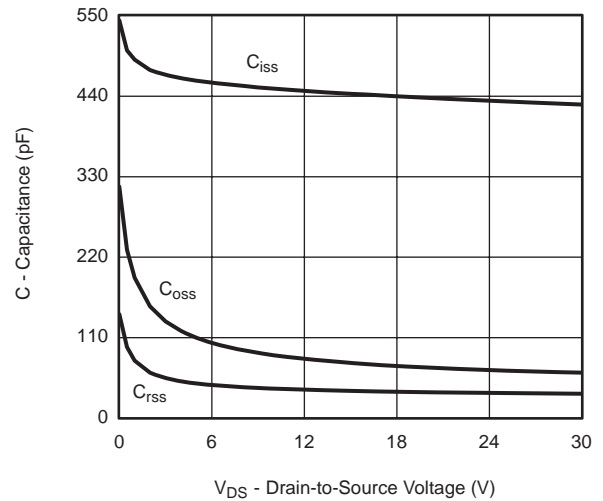


$V_{GS} = 4.5\text{ V}$
 $V_{GS} = 10\text{ V}$

$R_{DS(on)}$ - On-Resistance (Ω)

I_D - Drain Current (A)

On-Resistance vs. Drain Current

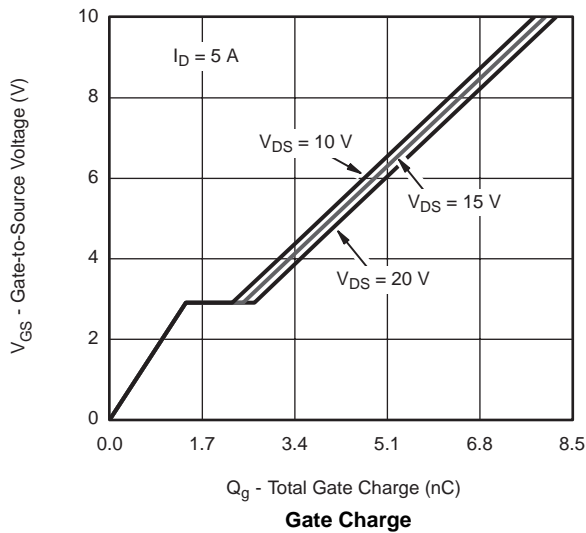


C_{iss}
 C_{oss}
 C_{rss}

C - Capacitance (pF)

V_{DS} - Drain-to-Source Voltage (V)

Capacitance

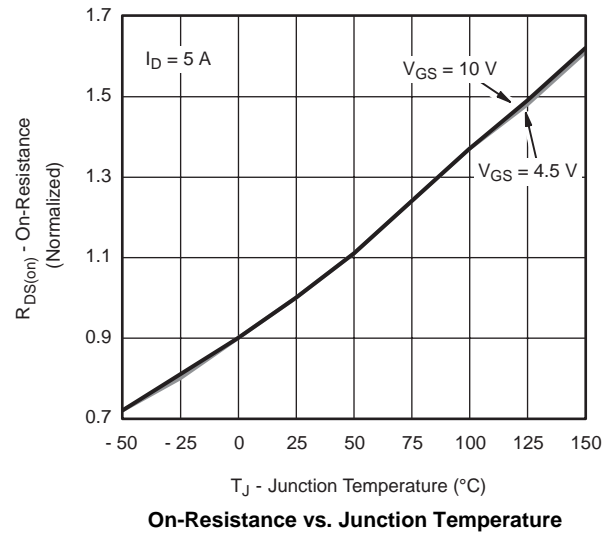


$I_D = 5\text{ A}$
 $V_{DS} = 10\text{ V}$
 $V_{DS} = 15\text{ V}$
 $V_{DS} = 20\text{ V}$

V_{GS} - Gate-to-Source Voltage (V)

Q_g - Total Gate Charge (nC)

Gate Charge



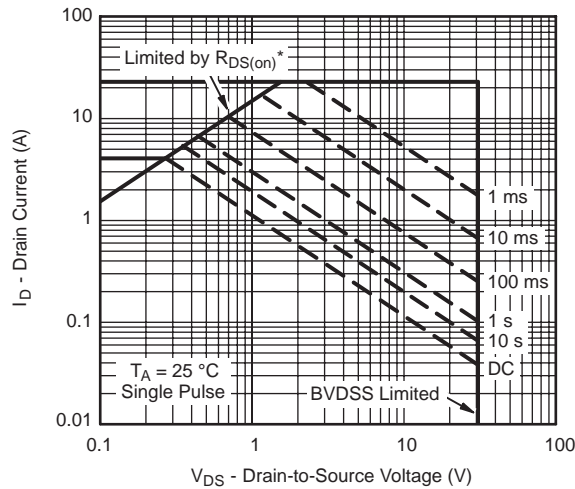
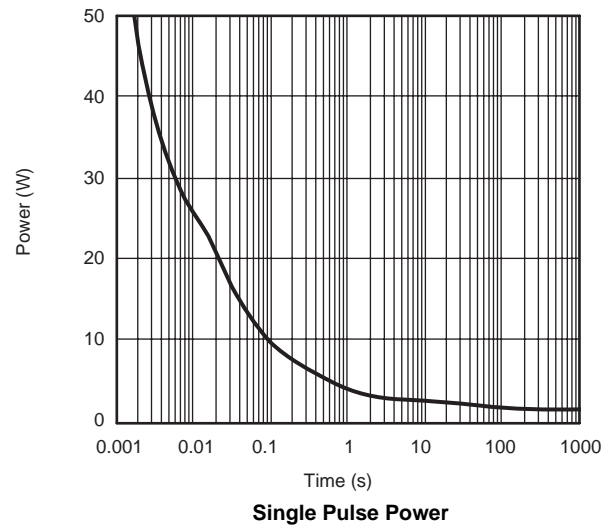
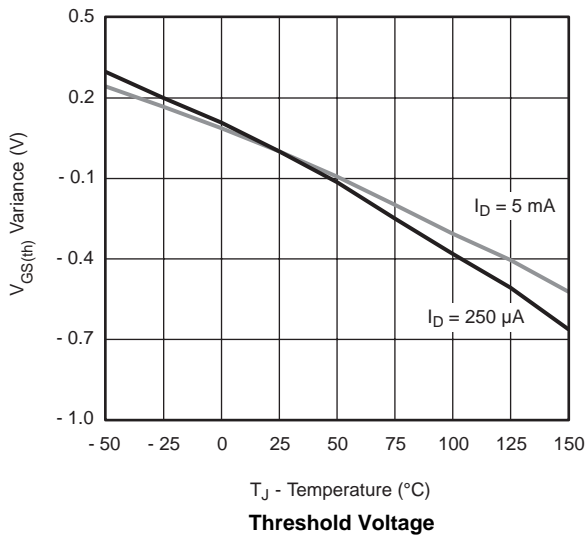
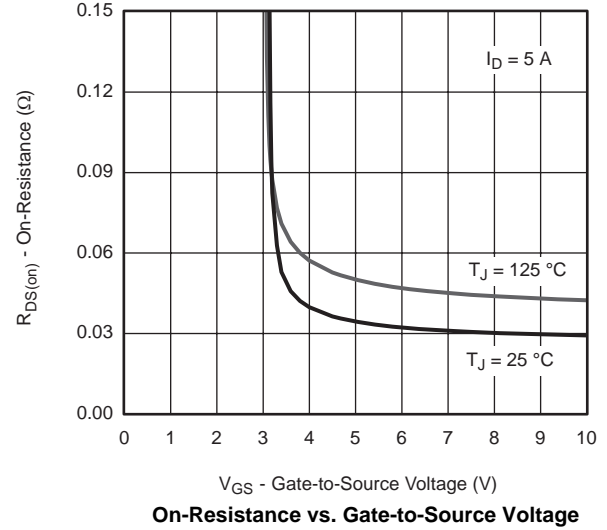
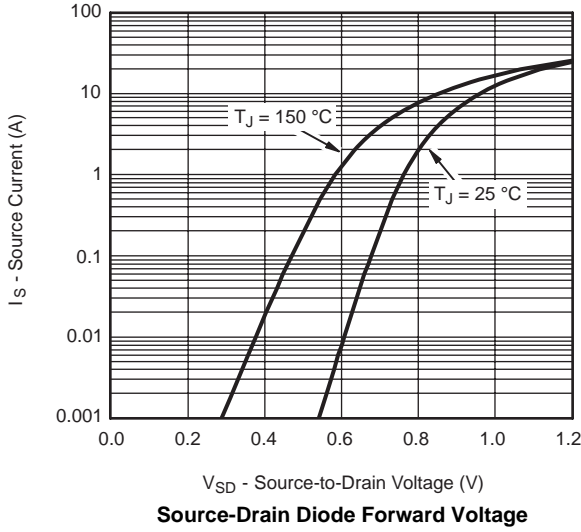
$I_D = 5\text{ A}$
 $V_{GS} = 10\text{ V}$
 $V_{GS} = 4.5\text{ V}$

$R_{DS(on)}$ - On-Resistance (Normalized)

T_J - Junction Temperature ($^\circ\text{C}$)

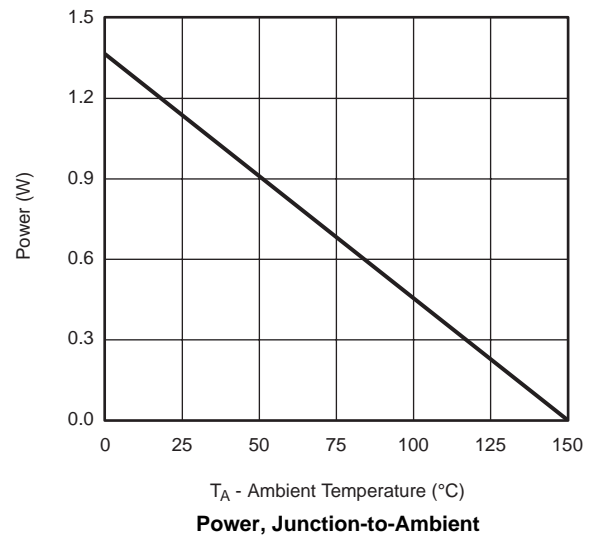
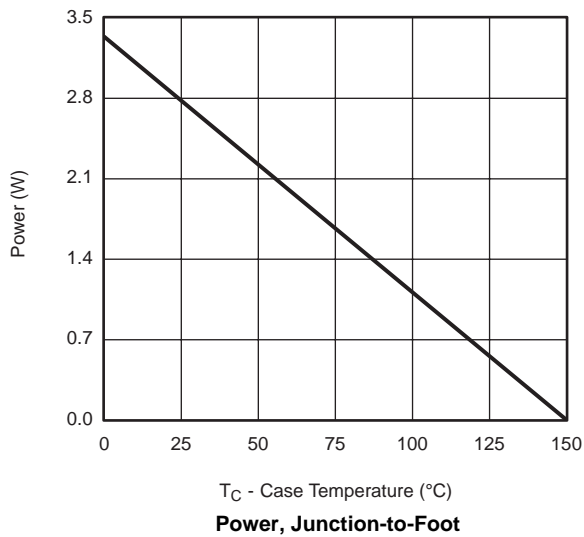
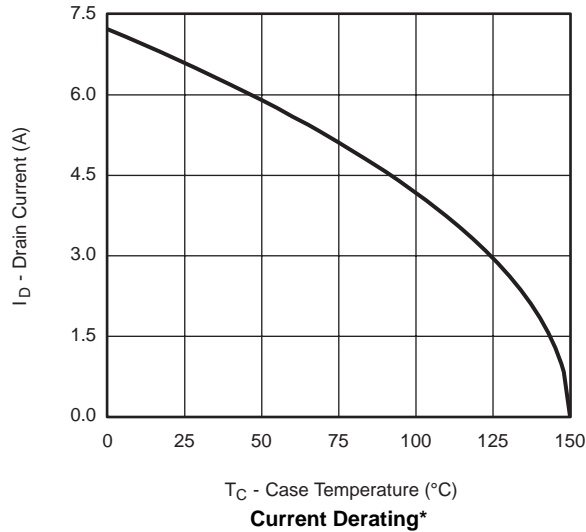
On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



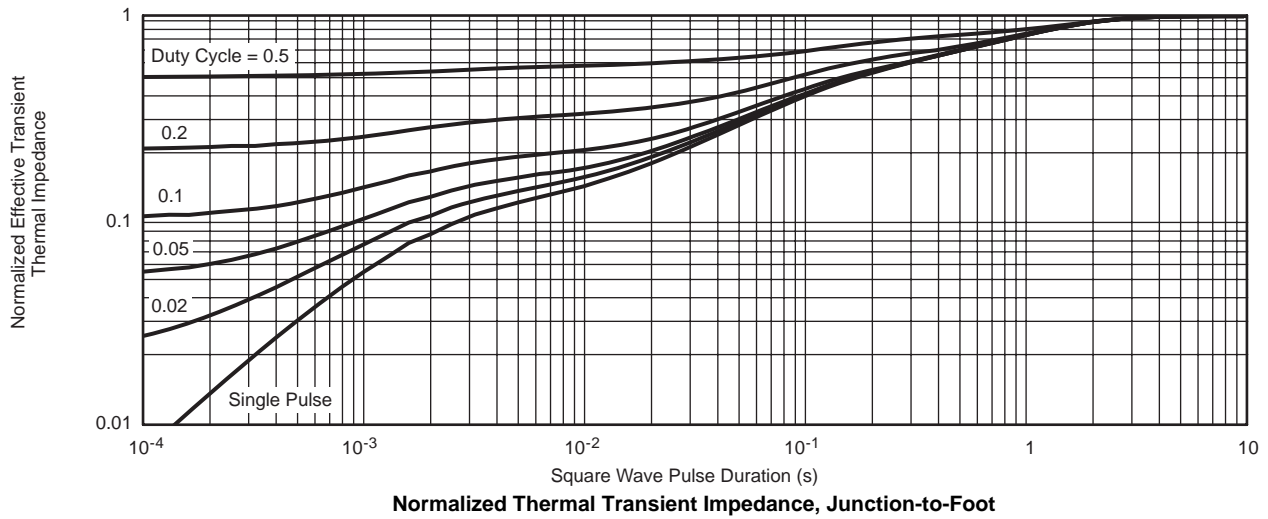
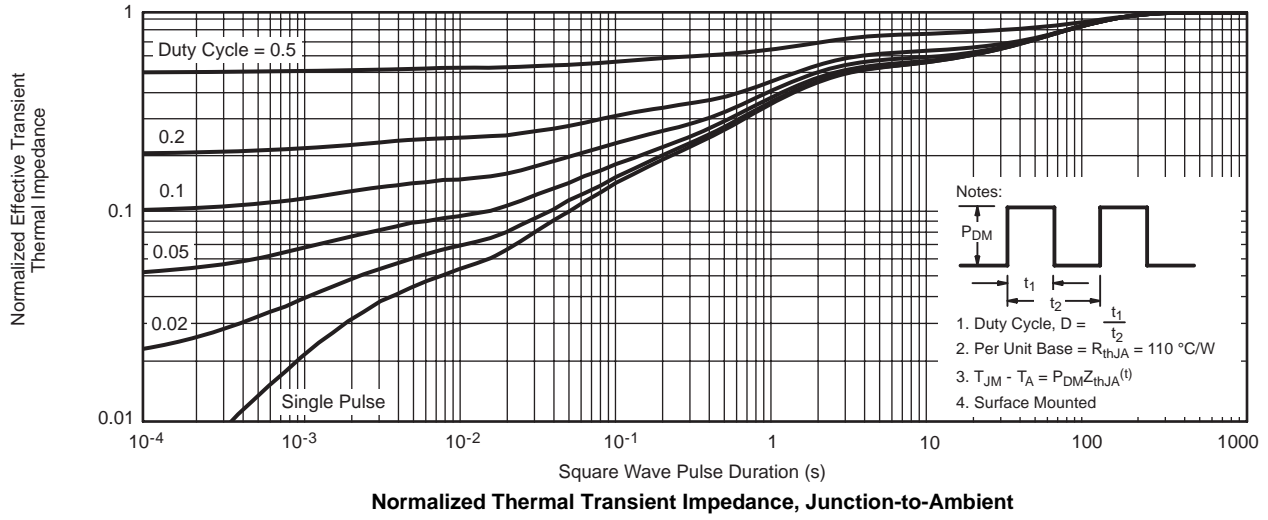
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

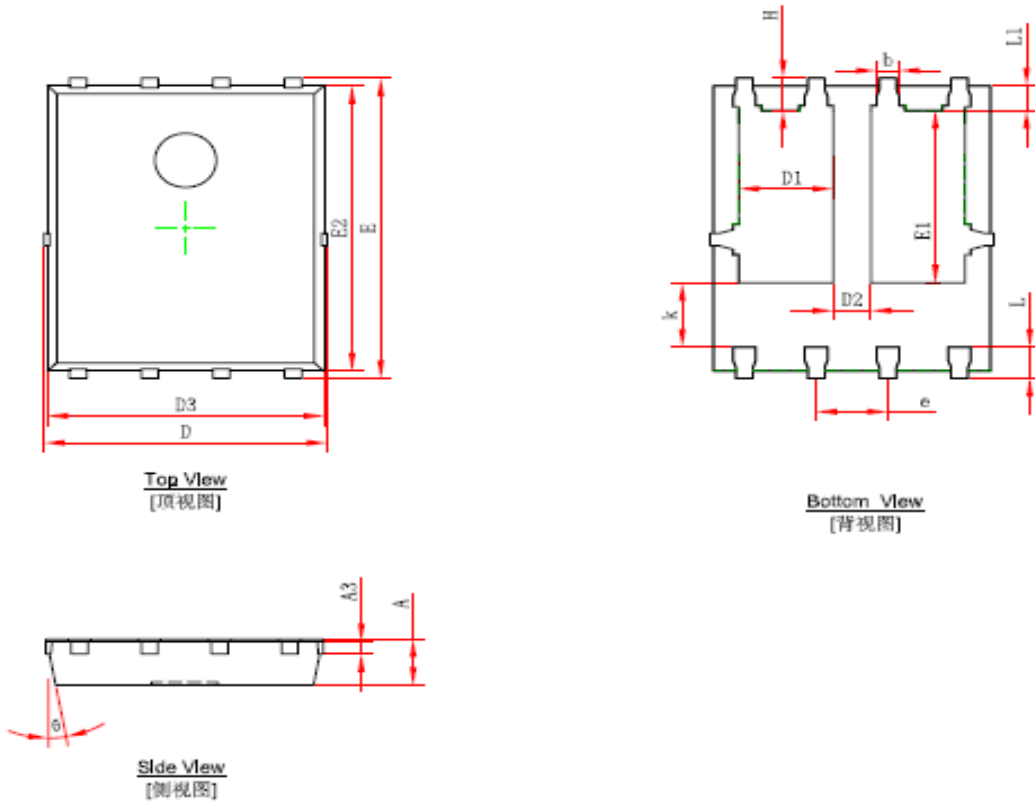


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



PDFNWB5×6-8L-A PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254 REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	1.470	1.870	0.058	0.074
D2	0.470	0.870	0.019	0.034
E1	3.375	3.575	0.133	0.141
D3	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	10°	12°	10°	12°

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