

# HUF76407P3-VB Datasheet N-Channel 60 V(D-S) MOSFET

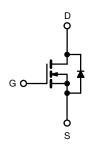
PRODUCT SUMMARY					
V <sub>DS</sub> (V)	60				
$R_{DS(on)}(\Omega)$	V <sub>GS</sub> = 10 V	0.072			
Q <sub>g</sub> max. (nC)	25				
Q <sub>gs</sub> (nC)	5.8				
Q <sub>gd</sub> (nC)	11				
Configuration	Single				

#### **FEATURES**

- Dynamic dV/dt rating
- Fast switching
- Ease of paralleling Simple drive requirements







<b>ABSOLUTE MAXIMUM RATINGS</b> (T <sub>C</sub> = 25 °C, unless otherwise noted)						
PARAMETER			SYMBOL	LIMIT	UNIT	
Drain-Source Voltage			$V_{DS}$	60	- V	
Gate-Source Voltage			$V_{GS}$	± 20		
Continuous Drain Current	V <sub>GS</sub> at 10 V	$T_C = 25 ^{\circ}C$ $T_C = 100 ^{\circ}C$	I <sub>D</sub>	20		
Continuous Drain Current		T <sub>C</sub> = 100 °C		12	Α	
Pulsed Drain Current <sup>a</sup>			I <sub>DM</sub>	68	]	
Linear Derating Factor				0.40	W/°C	
Single Pulse Avalanche Energy <sup>b</sup>			E <sub>AS</sub>	100	mJ	
Maximum Power Dissipation	T <sub>C</sub> = 25 °C		$P_{D}$	60	W	
Peak Diode Recovery dV/dt <sup>c</sup>			dV/dt	4.5	V/ns	
Operating Junction and Storage Temperature Range			T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	- °C	
Soldering Recommendations (Peak temperature) <sup>d</sup>	for 10 s			300	7	
Mounting Torque	6 22 or l	0.00 - 140		10	lbf ⋅ in	
Mounting Torque	6-32 or M3 screw			1.1	N · m	

#### Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b.  $V_{DD} = 25 \text{ V}$ , starting  $T_J = 25 \,^{\circ}\text{C}$ ,  $L = 403 \,\mu\text{H}$ ,  $R_g = 25 \,\Omega$ ,  $I_{AS} = 17 \,\text{A}$  (see fig. 12).
- c.  $I_{SD} \le 17$  A,  $dI/dt \le 140$  A/ $\mu$ s,  $V_{DD} \le V_{DS}$ ,  $T_J \le 175$  °C.
- d. 1.6 mm from case.

服务热线:400-655-8788

1



THERMAL RESISTANCE RATINGS						
PARAMETER	SYMBOL	TYP.	MAX.	UNIT		
Maximum Junction-to-Ambient	R <sub>thJA</sub>	-	62			
Case-to-Sink, Flat, Greased Surface	R <sub>thCS</sub>	0.50	-	°C/W		
Maximum Junction-to-Case (Drain)	R <sub>thJC</sub>	=	2.5			

PARAMETER	SYMBOL	TES	MIN.	TYP.	MAX.	UNIT	
Static		1		<u> </u>			
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> :	= 0 V, I <sub>D</sub> = 250 μA	60	-	-	V
V <sub>DS</sub> Temperature Coefficient	$\Delta V_{DS}/T_{J}$	Reference	Reference to 25 °C, I <sub>D</sub> = 1 mA		0.061	-	V/°C
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =	= V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1.0	-	3.0	V
Gate-Source Leakage	I <sub>GSS</sub>		V <sub>GS</sub> = ± 20 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>		$V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 48 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 150 \text{ °C}$		-	25 250	μA
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 10 A <sup>b</sup>	-	0.072	-	Ω
Forward Transconductance	9 <sub>fs</sub>	$V_{DS}$	= 25 V, I <sub>D</sub> = 10 A	5.5	-	-	S
Dynamic							
Input Capacitance	C <sub>iss</sub>		V <sub>GS</sub> = 0 V,	-	640	-	
Output Capacitance	Coss	1	$V_{DS} = 25 \text{ V},$	-	360	-	pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1	.0 MHz, see fig. 5	-	79	-	
Total Gate Charge	Qg			-	-	25	
Gate-Source Charge	Q <sub>gs</sub>	V <sub>GS</sub> = 10 V	$I_D = 17 \text{ A}, V_{DS} = 48 \text{ V},$ see fig. 6 and 13 b	-	-	5.8	nC
Gate-Drain Charge	Q <sub>gd</sub>	1		-	-	11	
Turn-On Delay Time	t <sub>d(on)</sub>				13	-	- ns
Rise Time	t <sub>r</sub>	$V_{DD}$ = 30 V, $I_{D}$ = 17 A, $R_{g}$ = 18 $\Omega$ , $R_{D}$ = 1.7 $\Omega$ , see fig. 10 <sup>b</sup>		-	58	-	
Turn-Off Delay Time	t <sub>d(off)</sub>			-	25	-	
Fall Time	t <sub>f</sub>			-	42		
Internal Drain Inductance	L <sub>D</sub>	6 mm (0.25")	Between lead, 6 mm (0.25") from		4.5	-	-11
Internal Source Inductance	L <sub>S</sub>	package and center of die contact		-	7.5	-	- nH
Drain-Source Body Diode Characteristic	s				•	I.	
Continuous Source-Drain Diode Current	I <sub>S</sub>	MOSFET symbol showing the integral reverse p - n junction diode		-	-	20	Α
Pulsed Diode Forward Current <sup>a</sup>	I <sub>SM</sub>			-	-	68	A
Body Diode Voltage	V <sub>SD</sub>	T <sub>J</sub> = 25 °C, I <sub>S</sub> = 17 A, V <sub>GS</sub> = 0 V b		-	-	1.5	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	$T_J = 25 ^{\circ}\text{C}$ , $I_F = 17 \text{A}$ , $dI/dt = 100 \text{A}/\mu\text{s}$		-	88	180	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			-	0.29	0.64	μC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> and L <sub>D</sub> )				L <sub>D</sub> )	

### Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. Pulse width  $\leq 300~\mu s$ ; duty cycle  $\leq 2~\%$ .



### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

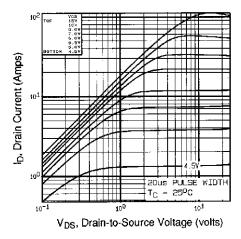


Fig. 1 - Typical Output Characteristics, T<sub>C</sub> = 25 °C

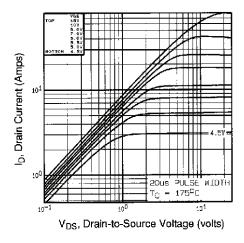


Fig. 2 - Typical Output Characteristics,  $T_C$  = 175  $^{\circ}C$ 

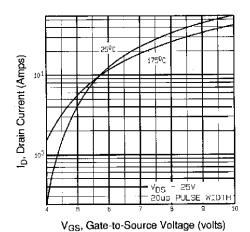


Fig. 3 - Typical Transfer Characteristics

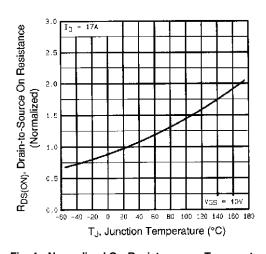


Fig. 4 - Normalized On-Resistance vs. Temperature

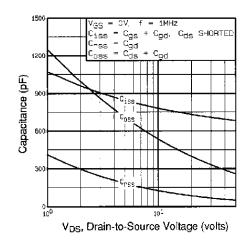


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

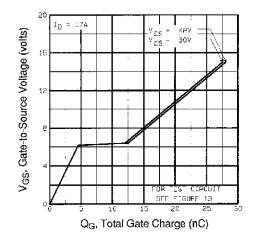


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage



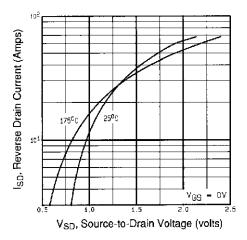


Fig. 7 - Typical Source-Drain Diode Forward Voltage

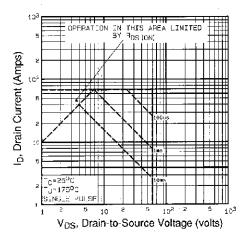


Fig. 8 - Maximum Safe Operating Area

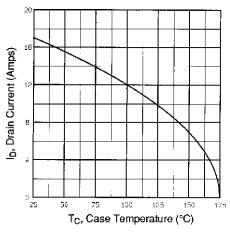


Fig. 9 - Maximum Drain Current vs. Case Temperature

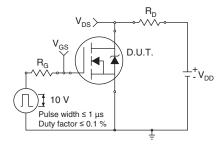


Fig. 10a - Switching Time Test Circuit

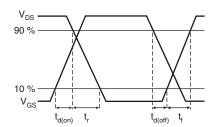


Fig. 10b - Switching Time Waveforms

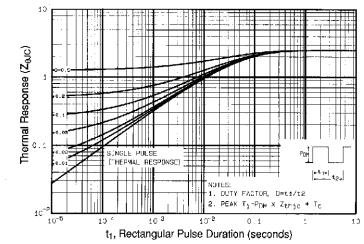
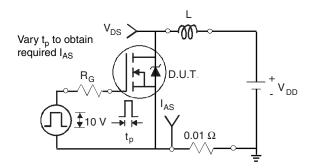


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case





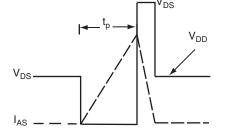


Fig. 12a - Unclamped Inductive Test Circuit

Fig. 12b - Unclamped Inductive Waveforms

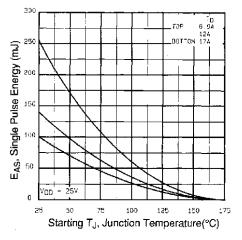


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

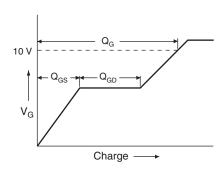


Fig. 13a - Basic Gate Charge Waveform

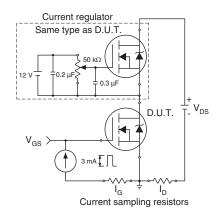
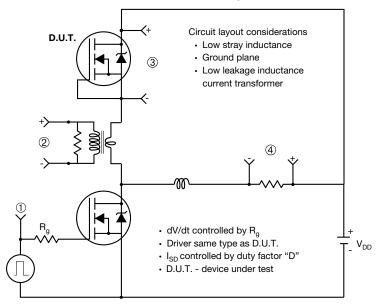


Fig. 13b - Gate Charge Test



### Peak Diode Recovery dV/dt Test Circuit



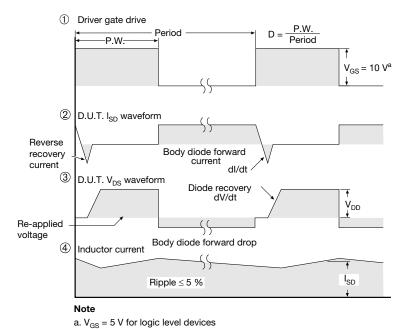
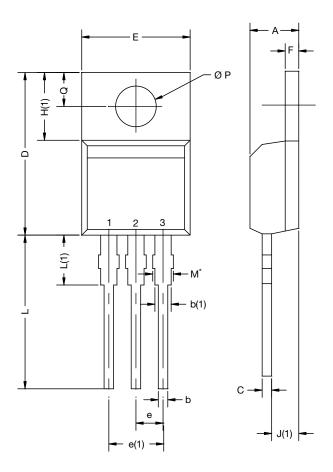


Fig. 14 - For N-Channel



### **TO-220**



DIM.	MILLIN	IETERS	INCHES			
DIN.	MIN.	MAX.	MIN.	MAX.		
Α	4.24	4.65	0.167	0.183		
b	0.69	1.02	0.027	0.040		
b(1)	1.14	1.78	0.045	0.070		
С	0.36	0.61	0.014	0.024		
D	14.33	15.85	0.564	0.624		
Е	9.96	10.52	0.392	0.414		
е	2.41	2.67	0.095	0.105		
e(1)	4.88	5.28	0.192	0.208		
F	1.14	1.40	0.045	0.055		
H(1)	6.10	6.71	0.240	0.264		
J(1)	2.41	2.92	0.095	0.115		
L	13.36	14.40	0.526	0.567		
L(1)	3.33	4.04	0.131	0.159		
ØР	3.53	3.94	0.139	0.155		
Q	2.54	3.00	0.100	0.118		
ECN: X15-0364-Rev. C, 14-Dec-15						

### DWG: 6031

### Note

 $\bullet~M^{\star}=0.052$  inches to 0.064 inches (dimension including protrusion), heatsink hole for HVM



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