

*Product Preview*

**WaveFET™**

**Power Surface Mount Products**  
**HDTMOS Single N-Channel**  
**Field Effect Transistor**



**MTD3302**

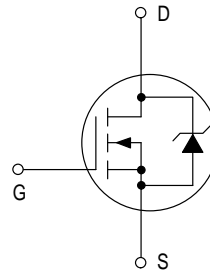
**SINGLE TMOS**  
**POWER MOSFET**  
**30 VOLTS**  
**R<sub>DS(on)</sub> = 10 mΩ**



**CASE 369A-13, Style 2**  
**DPAK**

WaveFET™ devices are an advanced series of power MOSFETs which utilize Motorola's latest MOSFET technology process to achieve the lowest possible on-resistance per silicon area. They are capable of withstanding high energy in the avalanche and commutation modes and the drain-to-source diode has a very low reverse recovery time. WaveFET™ devices are designed for use in low voltage, high speed switching applications where power efficiency is important. Typical applications are dc-dc converters, and power management in portable and battery powered products such as computers, printers, cellular and cordless phones. They can also be used for low voltage motor controls in mass storage products such as disk drives and tape drives. The avalanche energy is specified to eliminate the guesswork in designs where inductive loads are switched and offer additional safety margin against unexpected voltage transients.

- Characterized Over a Wide Range of Power Ratings
- Ultralow R<sub>DS(on)</sub> Provides Higher Efficiency and Extends Battery Life in Portable Applications
- Logic Level Gate Drive — Can Be Driven by Logic ICs
- Diode Is Characterized for Use In Bridge Circuits
- Diode Exhibits High Speed, With Soft Recovery
- I<sub>DSS</sub> Specified at Elevated Temperature
- Avalanche Energy Specified
- Industry Standard DPAK Surface Mount Package



**MAXIMUM RATINGS** (T<sub>J</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V <sub>DSS</sub>	30	Vdc
Drain-to-Gate Voltage	V <sub>DGR</sub>	30	Vdc
Gate-to-Source Voltage	V <sub>GS</sub>	±20	Vdc
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150	°C
Single Pulse Drain-to-Source Avalanche Energy — Starting T <sub>J</sub> = 25°C (V <sub>DD</sub> = 25 Vdc, V <sub>GS</sub> = 10 Vdc, L = 126 mH, I <sub>L(pk)</sub> = 3.0 A, V <sub>DS</sub> = 30 Vdc)	EAS	500	mJ

**DEVICE MARKING**

**ORDERING INFORMATION**

D3302	Device	Reel Size	Tape Width	Quantity
	MTD3302T4	13"	12 mm embossed tape	2500

This document contains information on a product under development. Motorola reserves the right to change or discontinue this product without notice. HDTMOS and WaveFET are trademarks of Motorola, Inc. TMOS is a registered trademark of Motorola, Inc.

## MTD3302

### POWER RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain Current — Continuous @ $T_A = 25^\circ\text{C}$ — Continuous @ $T_A = 100^\circ\text{C}$ — Single Pulse ( $t_p \leq 10 \mu\text{s}$ )	Mounted on heat sink $T_{\text{case}} = 25^\circ\text{C}$	$I_D$	30	Adc
		$I_D$	30	Adc
		$I_{DM}$	70	Adc
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Linear Derating Factor	$V_{GS} = 10 \text{ Vdc}$	$P_D$	96	Watts
			769	mW/ $^\circ\text{C}$
Thermal Resistance — Junction-to-Case	Steady State	$R_{\theta JC}$	1.3	$^\circ\text{C/W}$
Continuous Source Current (Diode Conduction)		$I_S$	2.0	Adc

Parameter		Symbol	Value	Unit
Drain Current — Continuous @ $T_A = 25^\circ\text{C}$ — Continuous @ $T_A = 100^\circ\text{C}$ — Single Pulse ( $t_p \leq 10 \mu\text{s}$ )	Mounted on 1 inch square FR-4 or G10 board	$I_D$	10.8	Adc
		$I_D$	6.6	Adc
		$I_{DM}$	70	Adc
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Linear Derating Factor	$V_{GS} = 10 \text{ Vdc}$	$P_D$	1.8	Watts
			14	mW/ $^\circ\text{C}$
Thermal Resistance — Junction-to-Ambient	Steady State	$R_{\theta JA}$	71.4	$^\circ\text{C/W}$
Continuous Source Current (Diode Conduction)		$I_S$	2.0	Adc

Parameter		Symbol	Value	Unit
Drain Current — Continuous @ $T_A = 25^\circ\text{C}$ — Continuous @ $T_A = 100^\circ\text{C}$ — Single Pulse ( $t_p \leq 10 \mu\text{s}$ )	Mounted on minimum recommended FR-4 or G10 board	$I_D$	8.3	Adc
		$I_D$	5.2	Adc
		$I_{DM}$	60	Adc
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Linear Derating Factor	$V_{GS} = 10 \text{ Vdc}$	$P_D$	1.0	Watts
			8.3	mW/ $^\circ\text{C}$
Thermal Resistance — Junction-to-Ambient	Steady State	$R_{\theta JA}$	120	$^\circ\text{C/W}$
Continuous Source Current (Diode Conduction)		$I_S$	2.0	Adc

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-to-Source Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 250\ \mu\text{Adc}$ ) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	30 —	33 23	— —	Vdc mV/°C
Zero Gate Voltage Drain Current ( $V_{DS} = 30\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) ( $V_{DS} = 30\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 125^\circ\text{C}$ )	$I_{DSS}$	— —	0.02 0.5	1.0 10	$\mu\text{Adc}$
Gate-Body Leakage Current ( $V_{GS} = \pm 20\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	—	—	$\pm 100$	nAdc

**ON CHARACTERISTICS(1)**

Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{Adc}$ ) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0 —	1.9 4.7	— —	Vdc mV/°C
Static Drain-to-Source On-Resistance ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 10\text{ Adc}$ ) ( $V_{GS} = 4.5\text{ Vdc}$ , $I_D = 5.0\text{ Adc}$ )	$R_{DS(on)}$	— —	8.9 13	10 16	m $\Omega$
Forward Transconductance ( $V_{DS} = 15\text{ Vdc}$ , $I_D = 10\text{ Adc}$ )	gFS	5	13	—	Mhos

**DYNAMIC CHARACTERISTICS**

Input Capacitance	$(V_{DS} = 24\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $f = 1.0\text{ MHz}$ )	$C_{iss}$	—	1810	—	pF
Output Capacitance		$C_{oss}$	—	165	—	
Transfer Capacitance		$C_{rss}$	—	595	—	

**SWITCHING CHARACTERISTICS(2)**

Turn-On Delay Time	$(V_{DD} = 25\text{ Vdc}$ , $I_D = 1.0\text{ Adc}$ , $V_{GS} = 10\text{ Vdc}$ , $R_G = 6.0\ \Omega$ )	$t_{d(on)}$	—	9	—	ns
Rise Time		$t_r$	—	10	—	
Turn-Off Delay Time		$t_{d(off)}$	—	60	—	
Fall Time		$t_f$	—	43	—	
Turn-On Delay Time	$(V_{DD} = 25\text{ Vdc}$ , $I_D = 1.0\text{ Adc}$ , $V_{GS} = 4.5\text{ Vdc}$ , $R_G = 6.0\ \Omega$ )	$t_{d(on)}$	—	18	—	ns
Rise Time		$t_r$	—	32	—	
Turn-Off Delay Time		$t_{d(off)}$	—	42	—	
Fall Time		$t_f$	—	44	—	
Gate Charge	$(V_{DS} = 15\text{ Vdc}$ , $I_D = 2.0\text{ Adc}$ , $V_{GS} = 10\text{ Vdc}$ )	$Q_T$	—	46	60	nC
		$Q_1$	—	5.3	—	
		$Q_2$	—	10.7	—	
		$Q_3$	—	10.3	—	

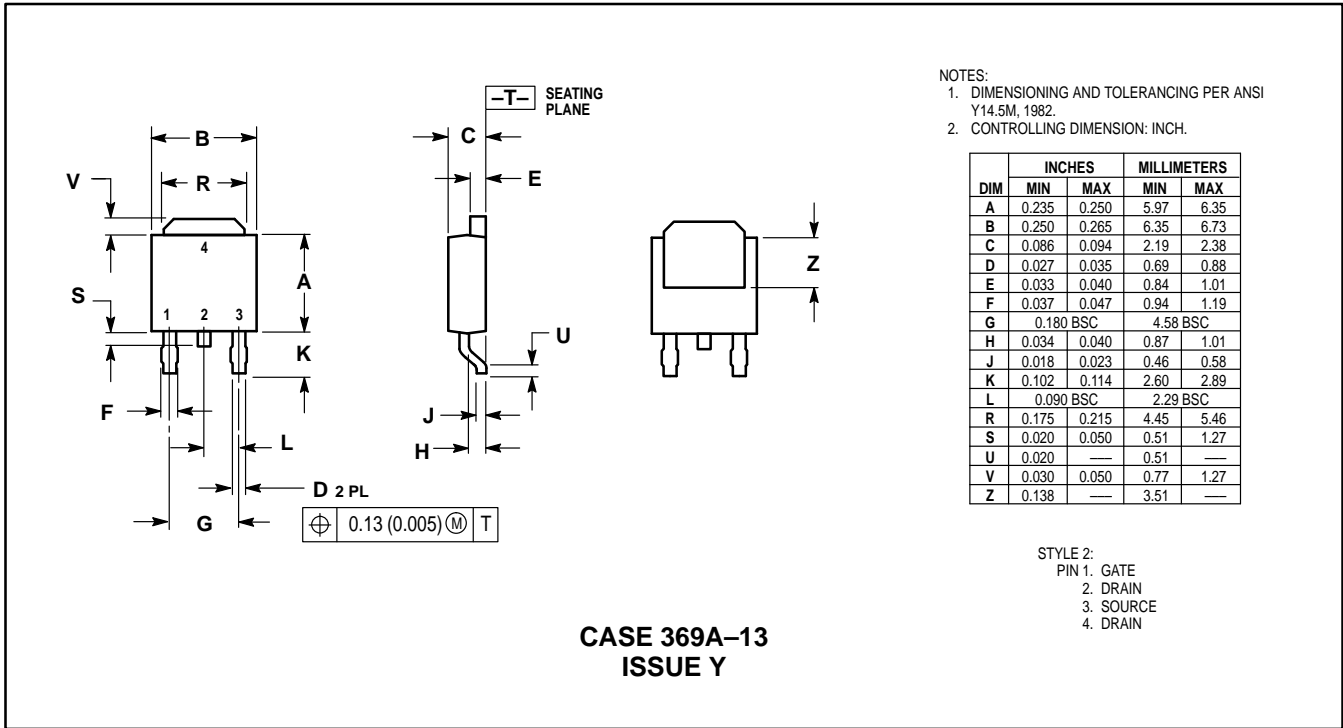
**SOURCE-DRAIN DIODE CHARACTERISTICS**

Forward On-Voltage (1)	$(I_S = 2.3\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ ) $(I_S = 2.3\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 125^\circ\text{C}$ )	$V_{SD}$	— —	0.75 0.58	1.1 —	Vdc
Reverse Recovery Time		$(I_S = 2.3\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ , $dI_S/dt = 100\text{ A}/\mu\text{s}$ )	$t_{rr}$	—	36	—
	$t_a$		—	21	—	
	$t_b$		—	15	—	
Reverse Recovery Stored Charge		$Q_{RR}$	—	0.041	—	$\mu\text{C}$

(1) Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

(2) Switching characteristics are independent of operating junction temperatures.

PACKAGE DIMENSIONS



Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Mfax is a trademark of Motorola, Inc.

**How to reach us:**

**USA/EUROPE/Locations Not Listed:** Motorola Literature Distribution;  
 P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

**JAPAN:** Nippon Motorola Ltd.: SPD, Strategic Planning Office, 141,  
 4-32-1 Nishi-Gotanda, Shagawa-ku, Tokyo, Japan. 03-5487-8488

**Customer Focus Center: 1-800-521-6274**

**Mfax™:** RMFAX0@email.sps.mot.com – TOUCHTONE 1-602-244-6609  
 Motorola Fax Back System – US & Canada ONLY 1-800-774-1848  
 –http://sps.motorola.com/mfax/

**ASIA/PACIFIC:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
 51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

**HOME PAGE:** http://motorola.com/sps/

