

Product Preview

WaveFET™

Power Surface Mount Products

HDTMOS Single N-Channel Field Effect Transistor



MTD3302

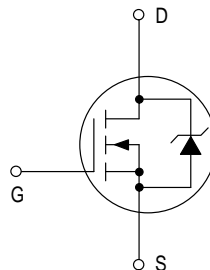
**SINGLE TMOS
POWER MOSFET
30 VOLTS
 $R_{DS(on)} = 10 \text{ m}\Omega$**



**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 $R_{DS(on)}$ 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_{DSS} Specified at Elevated Temperature
- Avalanche Energy Specified
- Industry Standard DPAK Surface Mount Package



WaveFET™

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	30	Vdc
Drain-to-Gate Voltage	V_{DGR}	30	Vdc
Gate-to-Source Voltage	V_{GS}	± 20	Vdc
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy — Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 25 \text{ Vdc}$, $V_{GS} = 10 \text{ Vdc}$, $L = 126 \text{ mH}$, $I_{L(pk)} = 3.0 \text{ A}$, $V_{DS} = 30 \text{ Vdc}$)	EAS	500	mJ

DEVICE MARKING

ORDERING INFORMATION

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

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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
		P_D	96	Watts
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Linear Derating Factor	$V_{GS} = 10 \text{ Vdc}$		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
		P_D	1.8	Watts
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Linear Derating Factor	$V_{GS} = 10 \text{ Vdc}$		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
		P_D	1.0	Watts
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Linear Derating Factor	$V_{GS} = 10 \text{ Vdc}$		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
OFF CHARACTERISTICS					
Drain-to-Source Breakdown Voltage ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\text{ }\mu\text{Adc}$) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	30 —	33 23	— —	Vdc mV/ $^\circ\text{C}$
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	μAdc
Gate-Body Leakage Current ($V_{GS} = \pm 20\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	—	—	± 100	nAdc

ON CHARACTERISTICS(1)

Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{Adc}$) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0 —	1.9 4.7	— —	Vdc mV/ $^\circ\text{C}$
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 Ω
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	($V_{DD} = 25\text{ Vdc}$, $I_D = 1.0\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$, $R_G = 6.0\text{ }\Omega$)	$t_{d(on)}$	—	9	—	ns
Rise Time		t_r	—	10	—	
Turn-Off Delay Time		$t_{d(off)}$	—	60	—	
Fall Time		t_f	—	43	—	
Turn-On Delay Time	($V_{DD} = 25\text{ Vdc}$, $I_D = 1.0\text{ Adc}$, $V_{GS} = 4.5\text{ Vdc}$, $R_G = 6.0\text{ }\Omega$)	$t_{d(on)}$	—	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	—	

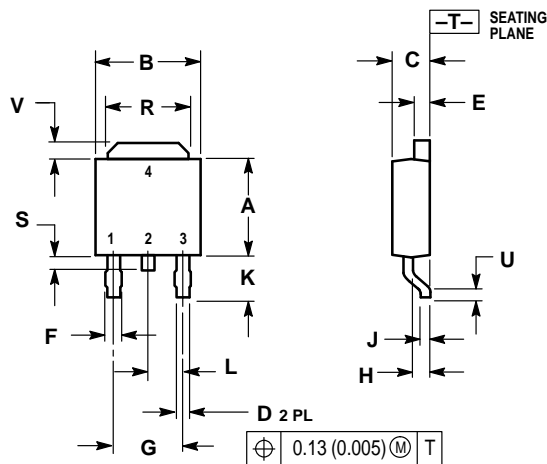
SOURCE-DRAIN DIODE CHARACTERISTICS

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		t_{rr}	—	36	—	ns
Reverse Recovery Stored Charge	($I_S = 2.3\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $dI_S/dt = 100\text{ A}/\mu\text{s}$)	t_a	—	21	—	
		t_b	—	15	—	
		Q_{RR}	—	0.041	—	μC

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

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

PACKAGE DIMENSIONS




- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.250	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.175	0.215	4.45	5.46
S	0.020	0.050	0.51	1.27
U	0.020	—	0.51	—
V	0.030	0.050	0.77	1.27
Z	0.138	—	3.51	—

- STYLE 2:
- PIN 1. GATE
 - DRAIN
 - SOURCE
 - DRAIN

CASE 369A-13
ISSUE Y

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