

MTP20N15E

Power MOSFET 20 Amps, 150 Volts N-Channel TO-220

This Power MOSFET is designed to withstand high energy in the avalanche and commutation modes. The energy efficient design also offers a drain-to-source diode with a fast recovery time. Designed for low voltage, high speed switching applications in power converters and PWM motor controls, these devices are particularly well suited for bridge circuits where diode speed and commutating safe operating areas are critical and offer additional safety margin against unexpected voltage transients.

- Avalanche Energy Specified
- Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- Diode is Characterized for Use in Bridge Circuits
- I_{DSS} and $V_{DS(on)}$ Specified at Elevated Temperature
- This is a Pb-Free Device*

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

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	150	Vdc
Drain-Gate Voltage ($R_{GS} = 1.0\text{ M}\Omega$)	V_{DGR}	150	Vdc
Gate-Source Voltage	V_{GS}	± 20	Vdc
– Continuous	V_{GSM}	± 32	
– Non-Repetitive ($t_p \leq 10\text{ ms}$)			
Drain – Continuous	I_D	20	Adc
– Continuous @ 100°C	I_D	12	
– Single Pulse ($t_p \leq 10\text{ }\mu\text{s}$)	I_{DM}	60	
Total Power Dissipation	P_D	112	Watts
Derate above 25°C		0.9	W/ $^\circ\text{C}$
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Single Drain-to-Source Avalanche Energy	E_{AS}	60	mJ
– Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 120\text{ Vdc}$, $V_{GS} = 10\text{ Vdc}$, $I_L = 20\text{ Apk}$, $L = 0.3\text{ mH}$)			
Thermal Resistance	$R_{\theta JC}$	1.1	$^\circ\text{C/W}$
– Junction to Case	$R_{\theta JA}$	62.5	
– Junction to Ambient			
Maximum Lead Temperature for Soldering Purposes, $1/8''$ from case for 10 seconds	T_L	260	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

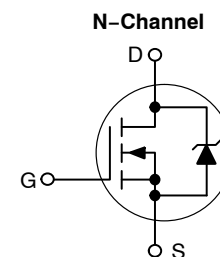


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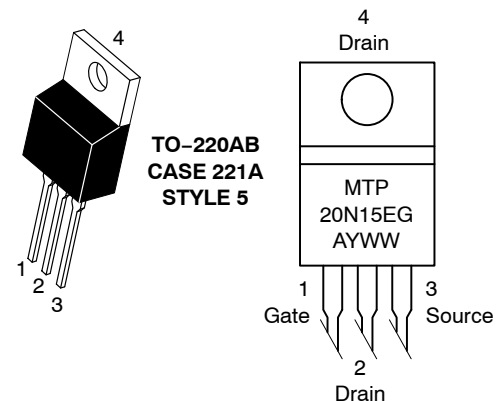
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**20 AMPERES
150 VOLTS**

$R_{DS(on)} = 130\text{ m}\Omega$



MARKING DIAGRAM & PIN ASSIGNMENT



MTP20N15E = Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping
MTP20N15EG	TO-220AB (Pb-Free)	50 Units/Rail

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain-Source Breakdown Voltage ($V_{GS} = 0\text{ Vdc}$, $I_D = 0.25\text{ mAdc}$) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	150 –	– TBD	– –	Vdc mV/ $^\circ\text{C}$
Zero Gate Voltage Collector Current ($V_{DS} = 150\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 150\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	I_{DSS}	– –	– –	10 100	μAdc
Gate-Body Leakage Current ($V_{GS} = \pm 20\text{ Vdc}$, $V_{DS} = 0$)	$I_{GSS(f)}$	–	–	100	nAdc
	$I_{GSS(r)}$	–	–	100	

ON CHARACTERISTICS (Note 1.)

Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 0.25\text{ mAdc}$) Temperature Coefficient (Negative)	$V_{GS(th)}$	2.0 –	– TBD	4.0 –	Vdc mV/ $^\circ\text{C}$
Static Drain-Source On-Resistance ($V_{GS} = 10\text{ Vdc}$, $I_D = 10\text{ Adc}$)	$R_{DS(on)}$	–	0.12	0.13	Ohm
Drain-Source On-Voltage ($V_{GS} = 10\text{ Vdc}$) ($I_D = 20\text{ Adc}$) ($I_D = 10\text{ Adc}$, $T_J = 125^\circ\text{C}$)	$V_{DS(on)}$	–	–	2.8	Vdc
		–	–	2.6	
Forward Transconductance ($V_{DS} = 13\text{ Vdc}$, $I_D = 10\text{ Adc}$)	g_{FS}	8.0	11	–	mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = 25\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{iss}	–	1133	1627	pF
Output Capacitance		C_{oss}	–	332	474	
Transfer Capacitance		C_{rss}	–	105	174	

SWITCHING CHARACTERISTICS (Note 2.)

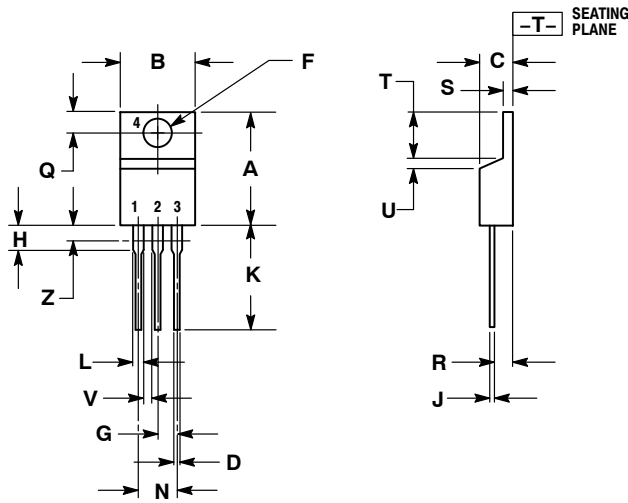
Turn-On Delay Time	$(V_{DD} = 75\text{ Vdc}$, $I_D = 20\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$, $R_G = 9.1\ \Omega$)	$t_{d(on)}$	–	11	25	ns
Rise Time		t_r	–	77	153	
Turn-Off Delay Time		$t_{d(off)}$	–	33	67	
Fall Time		t_f	–	49	97	
Gate Charge	$(V_{DS} = 120\text{ Vdc}$, $I_D = 20\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$)	Q_T	–	39.1	55.9	nC
		Q_1	–	7.5	–	
		Q_2	–	22	–	
		Q_3	–	17	–	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage (Note 1.)	$(I_S = 20\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) $(I_S = 20\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	V_{SD}	– –	– –	1.5 –	Vdc
Reverse Recovery Time	$(I_S = 20\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $dI_S/dt = 100\text{ A}/\mu\text{s}$)	t_{rr}	–	160	–	ns
		t_a	–	123	–	
		t_b	–	36.5	–	
Reverse Recovery Stored Charge		Q_{RR}	–	1.1	–	μC

1. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.
2. Switching characteristics are independent of operating junction temperature.

PACKAGE DIMENSIONS

TO-220
CASE 221A-09
ISSUE AF


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.014	0.025	0.36	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 5:

1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

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