



Power MOSFET

Features

- Robust High Voltage Termination
- 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

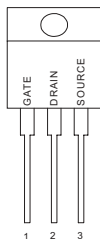
General Description

This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. In addition, this advanced MOSFET is designed to withstand high energy in avalanche and commutation modes. The new energy efficient design also offers a drain-to-source diode with a fast recovery time. Designed for high voltage, high speed switching applications in power supplies, 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 and safety margin against unexpected voltage transients.

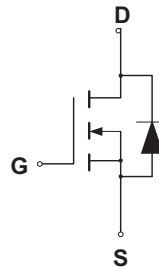
Pin Configuration

TO-220/ITO-220

Top View



Symbol



Absolute Maximum Ratings

Rating	Symbol	Value	Unit
Drain Current – Continuous	I_D	8.0	A
– Pulsed	I_{DM}	32	
Gate-to-Source Voltage – Continuous	V_{GS}	± 20	V
– Non-repetitive	V_{GSM}	± 40	V
Total Power Dissipation	P_D		W
TO-220		125	
ITO-220		72	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^{\circ}\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – $T_J = 25^{\circ}\text{C}$ ($V_{DD} = 100\text{V}$, $V_{GS} = 10\text{V}$, $I_L = 8\text{A}$, $L = 10\text{mH}$, $R_G = 25\Omega$)	E_{AS}	320	mJ
Thermal Resistance – Junction to Case	θ_{JC}	1.0	$^{\circ}\text{C}/\text{W}$
– Junction to Ambient	θ_{JA}	62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^{\circ}\text{C}$



Ordering Information

Part Number	Package
CTM08N50N220	TO-220
CTM08N50N220FP	ITO-220

Electrical Characteristics

Unless otherwise specified, T_J = 25°C.

Characteristic	Symbol	CTM08N50			Units	
		Min	Typ	Max		
Drain-Source Breakdown Voltage (V _{GS} = 0 V, I _D = 250 μA)	V _{(BR)DSS}	500			V	
Drain-Source Leakage Current (V _{DS} = 500 V, V _{GS} = 0 V) (V _{DS} = 400 V, V _{GS} = 0 V, T _J = 125°C)	I _{DSS}			0.25 1.0	mA	
Gate-Source Leakage Current-Forward (V _{GS} = 20 V, V _{DS} = 0 V)	I _{GSSF}			100	nA	
Gate-Source Leakage Current-Reverse (V _{GS} = -20 V, V _{DS} = 0 V)	I _{GSSR}			-100	nA	
Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = 250 μA)	V _{GS(th)}	2.0	2.8	4.0	V	
Static Drain-Source On-Resistance (V _{GS} = 10 V, I _D = 4.0A) *	R _{DS(on)}		0.6	0.8	Ω	
Drain-Source On-Voltage (V _{GS} = 10 V, I _D = 8.0A)	V _{DS(on)}		5.0	7.2	V	
Forward Transconductance (V _{DS} = 15 V, I _D = 4.0A) *	g _{FS}	4.0			mS	
Input Capacitance	C _{ISS}	(V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz)	1450	1680	pF	
Output Capacitance			C _{OSS}	190	246	pF
Reverse Transfer Capacitance			C _{RSS}	45.4	144	pF
Turn-On Delay Time	t _{d(on)}		15	50	ns	
Rise Time	t _r		33	72	ns	
Turn-Off Delay Time	t _{d(off)}	(V _{DD} = 250V, I _O = 8.0A, V _{GS} = 10V, R _G = 9.1Ω)	40	150	ns	
Fall Time	t _f		32	60	ns	
Total Gate Charge	Q _g	(V _{DS} = 400 V, I _D = 8.0 A, V _{GS} = 10 V)*	40	64	nC	
Gate-Source Charge	Q _{gs}		8.0		nC	
Gate-Drain Charge	Q _{gd}		17		nC	
Internal Drain Inductance (Measured from the drain lead 0.25" from package to center of die)	L _D		4.5		nH	
Internal Drain Inductance (Measured from the source lead 0.25" from package to source bond pad)	L _S		7.5		nH	
SOURCE-DRAIN DIODE CHARACTERISTICS						
Forward On-Voltage(1)	V _{SD}	(I _S = 8.0 A, V _{GS} = 0 V, d _{IS} /d _t = 100A/μs)	1.2	2.0	V	
Forward Turn-On Time			t _{on}	**		ns
Reverse Recovery Time			t _{rr}	320		ns

* Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%

** Negligible, Dominated by circuit inductance



Typical Electrical Characteristics

Figure 1. On-Region Characteristics

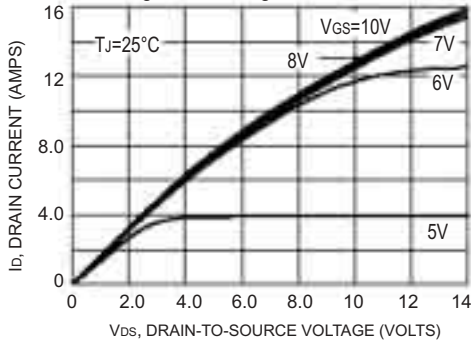


Figure 2. Transfer Characteristics

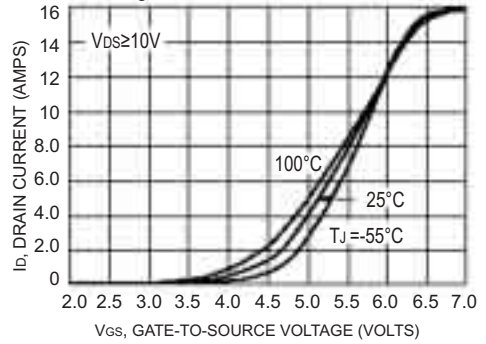


Figure 3. On-Resistance versus Drain Current and Temperature

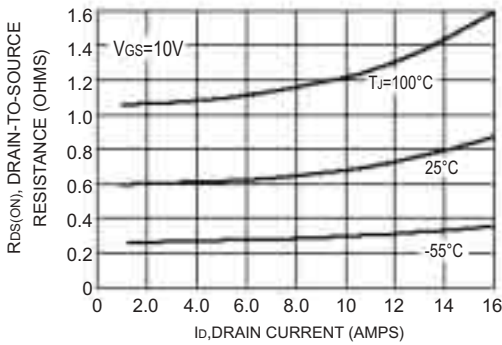


Figure 4. On-Resistance versus Drain Current and Gate Voltage

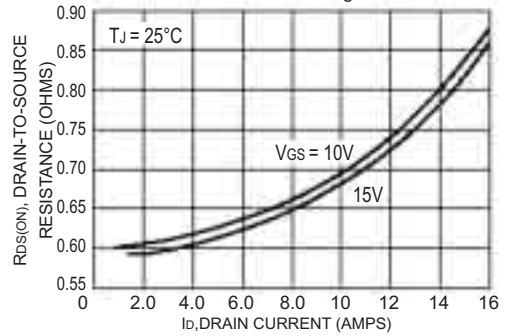


Figure 5. On-Resistance Variation with Temperature

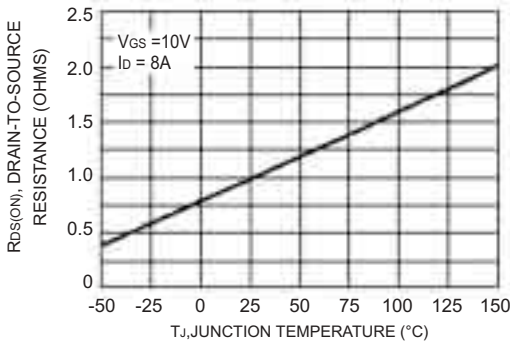


Figure 6. Drain-To-Source Leakage Current versus Voltage

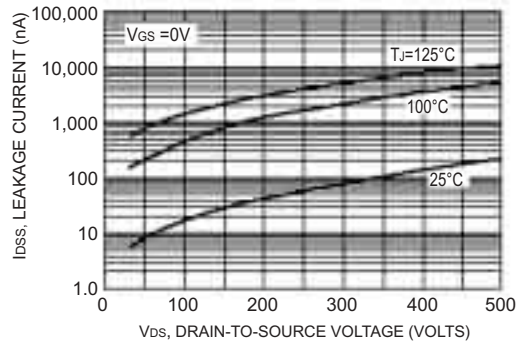




Figure 7. Capacitance Variation

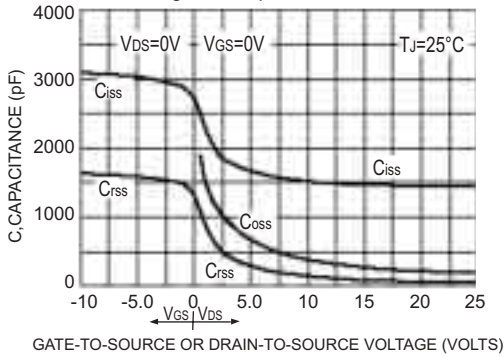


Figure 8. High Voltage Capacitance Variation

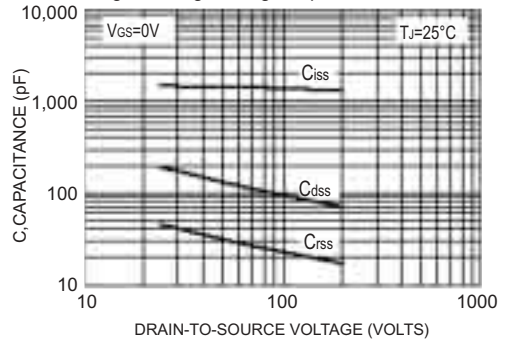


Figure 9. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

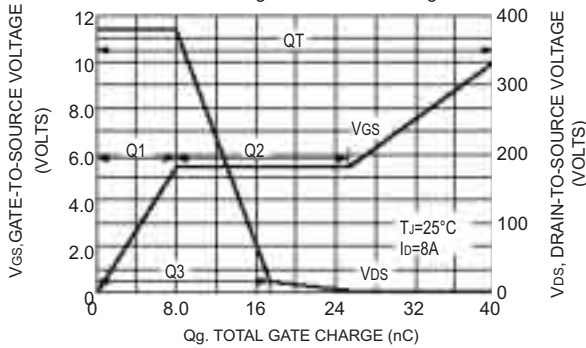


Figure 10. Resistive Switching Time Variation versus Gate Resistance

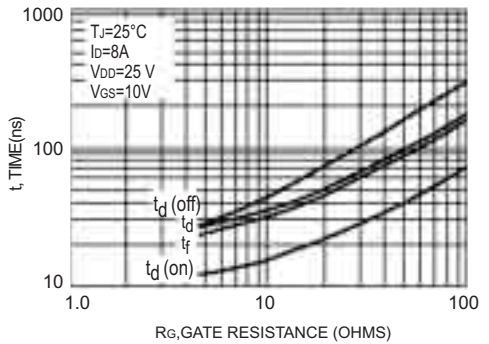


Figure 11. Diode Forward Voltage versus Current

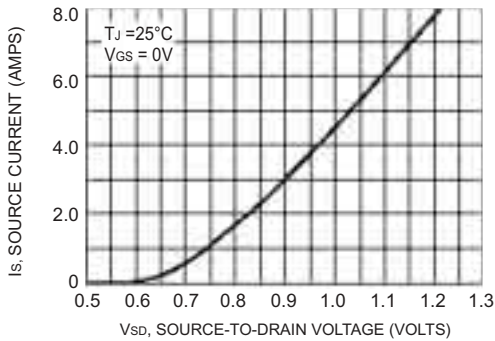


Figure 12. Maximum Rated Forward Biased Safe Operating Area

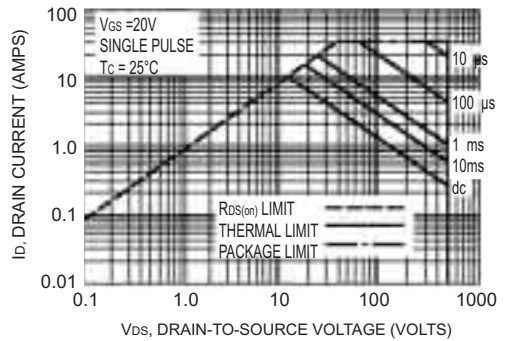




Figure 13. Maximum Avalanche Energy versus Starting Junction Temperature

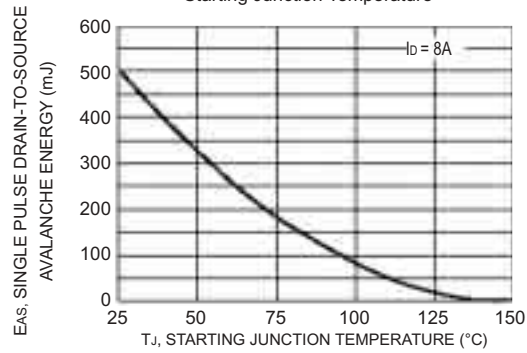
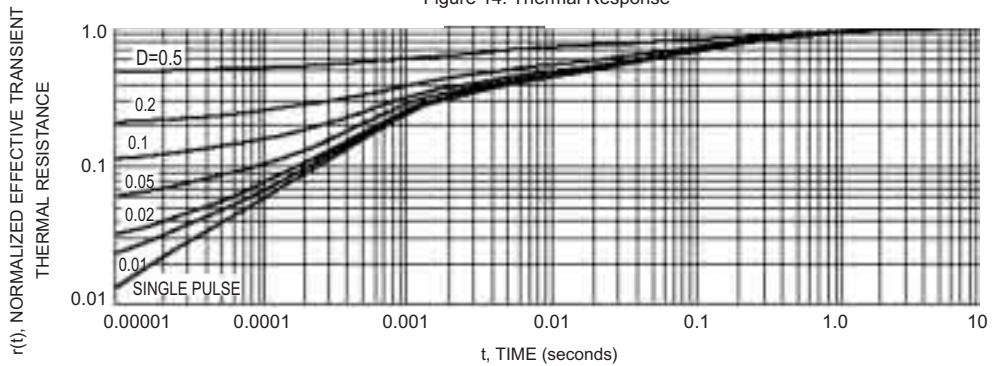


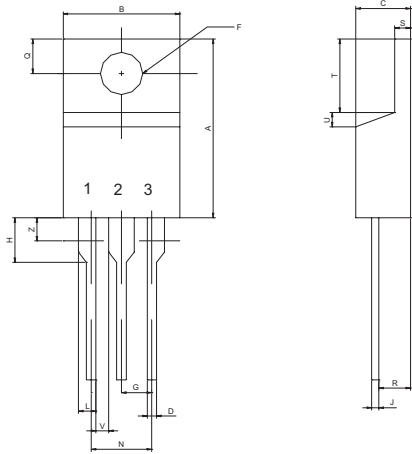
Figure 14. Thermal Response





Package Dimension

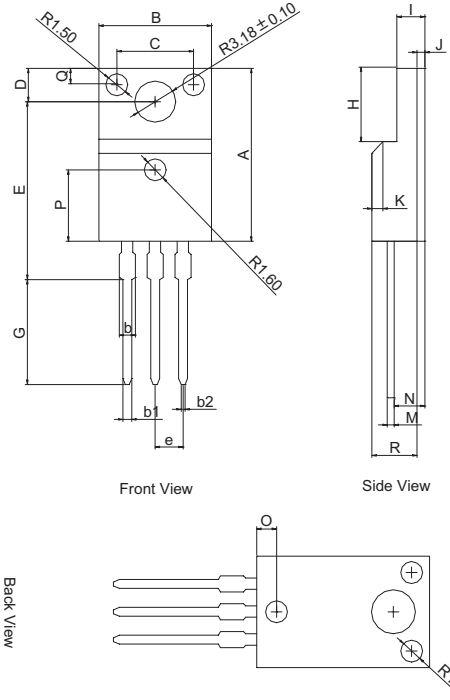
TO-220



PIN 1: GATE
 PIN 2: DRAIN
 PIN 3: SOURCE

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	14.48	----	15.75	0.570	----	0.620
B	9.66	----	10.28	0.380	----	0.405
C	4.07	----	4.82	0.160	----	0.190
D	0.64	----	0.88	0.025	----	0.035
F	3.61	----	3.73	0.142	----	0.147
G	2.42	----	2.66	0.095	----	0.105
H	2.80	----	3.93	0.110	----	0.155
J	0.46	----	0.64	0.018	----	0.025
K	12.70	----	14.27	0.500	----	0.562
L	1.15	----	1.52	0.045	----	0.060
N	4.83	----	5.33	0.190	----	0.210
Q	2.54	----	3.04	0.100	----	0.120
R	2.04	----	2.79	0.080	----	0.110
S	1.15	----	1.39	0.045	----	0.055
T	5.97	----	6.47	0.235	----	0.255
U	0.00	----	1.27	0.000	----	0.050
V	1.15	----	----	0.045	----	----
Z	----	----	2.04	----	----	0.080

ITO-220



Back View

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	15.67	----	16.07	0.617	----	0.633
B	9.96	----	10.36	0.392	----	0.408
C	----	7.00	----	----	0.275	----
D	3.20	----	3.40	0.126	----	0.134
E	15.60	----	16.00	0.614	----	0.630
G	9.45	----	10.05	0.372	----	0.396
H	6.48	----	6.88	0.255	----	0.279
I	2.34	----	2.74	0.092	----	0.108
J	----	0.70	----	----	0.028	----
K	----	1.00	----	----	0.039	----
M	0.45	----	0.60	0.018	----	0.024
N	2.56	----	2.96	0.101	----	0.117
O	----	1.80	----	----	0.071	----
P	----	6.50	----	----	0.256	----
Q	----	1.50	----	----	0.059	----
R	4.50	----	4.90	0.028	----	0.035
b	----	----	1.47	----	----	0.058
b1	0.70	----	0.90	0.028	----	0.035
b2	0.25	----	0.45	0.100	----	0.018
e	----	2.54	----	----	0.100	----