

GENERAL DESCRIPTION

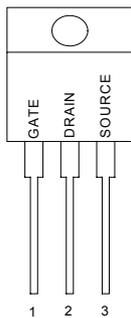
This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. In addition, this advanced MOSFET is designed to withstand high energy in avalanche and commutation modes. The new energy efficient design also offers 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.

FEATURES

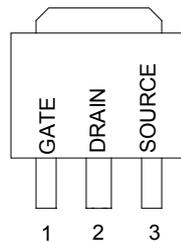
- ◆ Robust High Voltage Termination
- ◆ Avalanche Energy Specified
- ◆ Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- ◆ Diode is Characterized for Use in Bridge Circuits
- ◆ I_{DSS} and $V_{DS(on)}$ Specified at Elevated Temperature

PIN CONFIGURATION

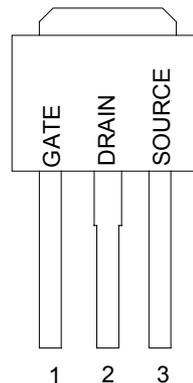
TO-220/TO-220FP
Front View



TO-252
Front View

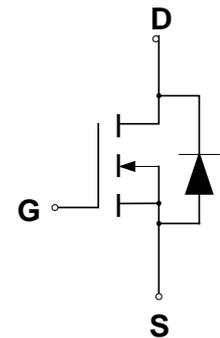


TO-251
Front View



SYMBOL

N-Channel MOSFET



ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain to Current – Continuous	I_D	2.0	A
– Pulsed	I_{DM}	9.0	
Gate-to-Source Voltage – Continue	V_{GS}	± 20	V
– Non-repetitive	V_{GSM}	± 40	V
Total Power Dissipation	P_D	50	W
Derate above 25°C		0.4	W/°C
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	°C
Single Pulse Drain-to-Source Avalanche Energy – $T_J = 25^\circ\text{C}$ ($V_{DD} = 100\text{V}, V_{GS} = 10\text{V}, I_L = 2\text{A}, L = 10\text{mH}, R_G = 25\Omega$)	E_{AS}	20	mJ
Thermal Resistance – Junction to Case	θ_{JC}	1.0	°C/W
– Junction to Ambient	θ_{JA}	62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	°C

ORDERING INFORMATION

Part Number	Package
CMT02N60N251	TO-251
CMT02N60N252	TO-252
CMT02N60N220	TO-220
CMT02N60N220FP	TO-220 Full Package
CMT02N60GN251*	TO-251
CMT02N60GN252*	TO-252
CMT02N60GN220*	TO-220
CMT02N60GN220FP*	TO-220 Full Package

*Note: G : Suffix for Pb Free Product

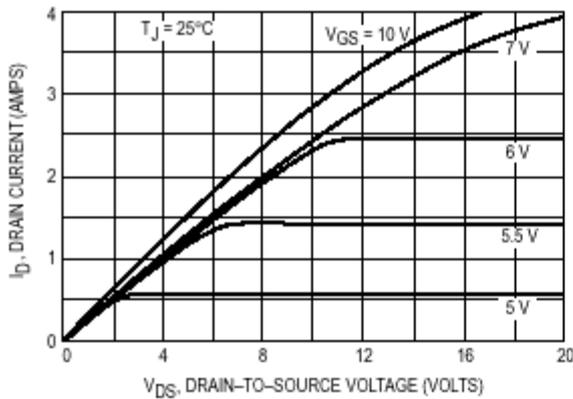
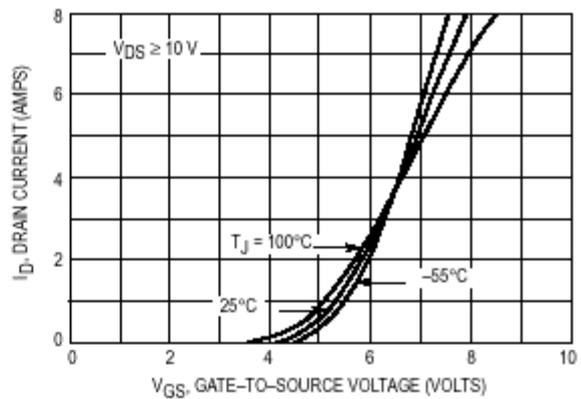
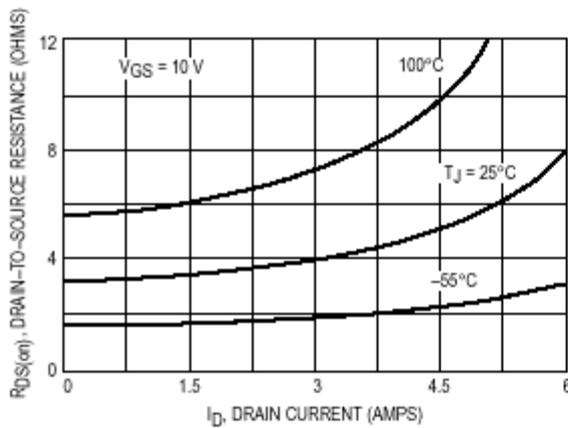
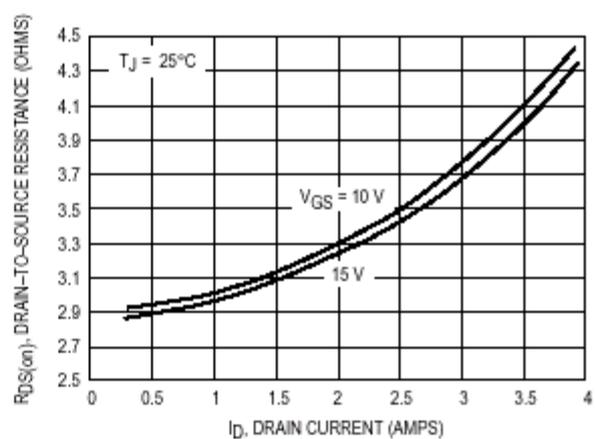
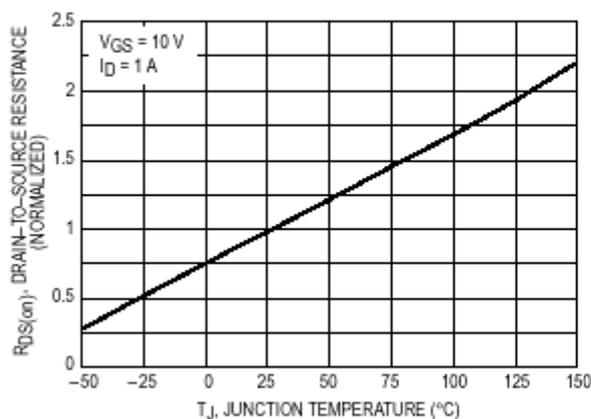
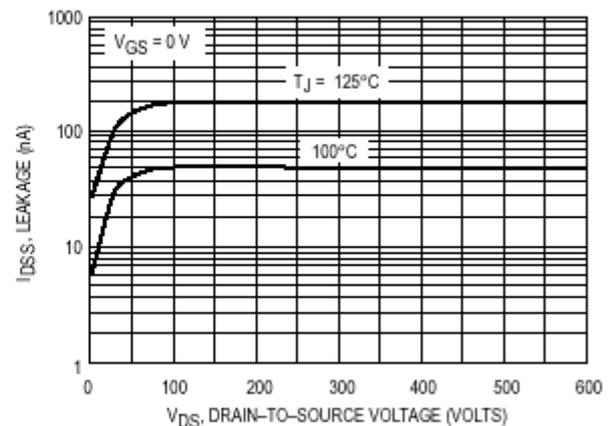
ELECTRICAL CHARACTERISTICS

Unless otherwise specified, $T_J = 25^\circ\text{C}$.

Characteristic	Symbol	CMT02N60			Units	
		Min	Typ	Max		
Drain-Source Breakdown Voltage ($V_{GS} = 0\text{ V}$, $I_D = 250\ \mu\text{A}$)	$V_{(BR)DSS}$	600			V	
Drain-Source Leakage Current ($V_{DS} = 600\text{ V}$, $V_{GS} = 0\text{ V}$) ($V_{DS} = 480\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125^\circ\text{C}$)	I_{DSS}			0.25 1.0	mA	
Gate-Source Leakage Current-Forward ($V_{gsf} = 20\text{ V}$, $V_{DS} = 0\text{ V}$)	I_{GSSF}			100	nA	
Gate-Source Leakage Current-Reverse ($V_{gsr} = 20\text{ V}$, $V_{DS} = 0\text{ V}$)	I_{GSSR}			100	nA	
Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$)	$V_{GS(th)}$	2.0	3.1	4.0	V	
Static Drain-Source On-Resistance ($V_{GS} = 10\text{ V}$, $I_D = 1.0\text{ A}$) *	$R_{DS(on)}$		3.3	4.4	Ω	
Drain-Source On-Voltage ($V_{GS} = 10\text{ V}$) ($I_D = 2.0\text{ A}$)	$V_{DS(on)}$			8.8	V	
Forward Transconductance ($V_{DS} \geq 50\text{ V}$, $I_D = 1.0\text{ A}$) *	g_{FS}	1.0			mhos	
Input Capacitance	$(V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$)	C_{iss}	435		pF	
Output Capacitance		C_{oss}	56		pF	
Reverse Transfer Capacitance		C_{rss}	9.2		pF	
Turn-On Delay Time	$(V_{DD} = 300\text{ V}$, $I_D = 2.0\text{ A}$, $V_{GS} = 10\text{ V}$, $R_G = 18\Omega$) *	$t_{d(on)}$	12		ns	
Rise Time		t_r	21		ns	
Turn-Off Delay Time		$t_{d(off)}$	30		ns	
Fall Time		t_f	24		ns	
Total Gate Charge	$(V_{DS} = 400\text{ V}$, $I_D = 2.0\text{ A}$, $V_{GS} = 10\text{ V}$) *	Q_g	13	22	nC	
Gate-Source Charge		Q_{gs}	2.0		nC	
Gate-Drain Charge		Q_{gd}	6.0		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)	$(I_S = 2.0\text{ A}$, $V_{GS} = 0\text{ V}$, $d_i/d_t = 100\text{ A}/\mu\text{s}$)	V_{SD}		1.0	1.6	V
Forward Turn-On Time		t_{on}		**		ns
Reverse Recovery Time		t_{rr}		340		ns

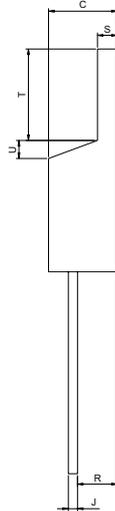
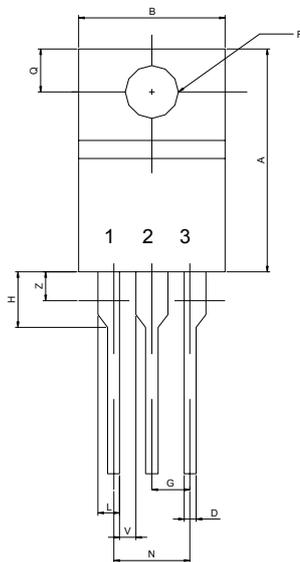
* Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$

** 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

PACKAGE DIMENSION

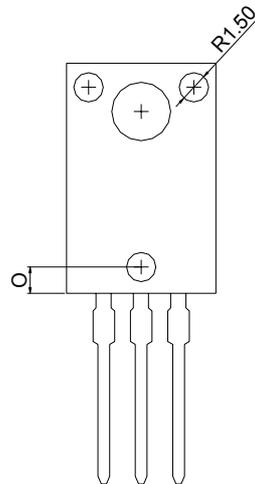
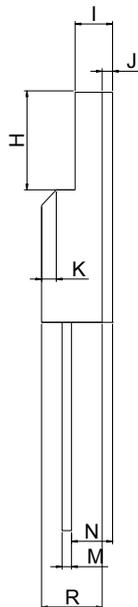
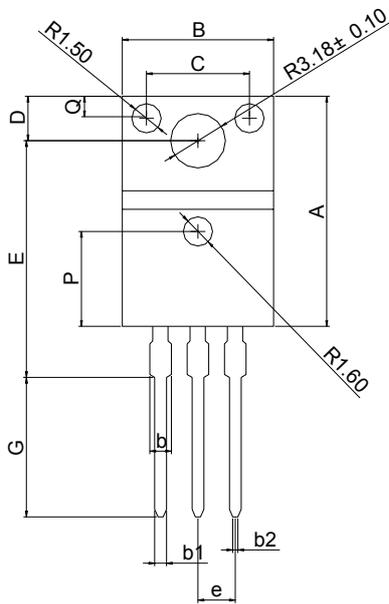
TO-220



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

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	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	---	0.080
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

TO-220FP



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	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	0.177	---	0.193
b	---	---	1.47	---	---	0.058
b1	0.70	---	0.90	0.028	---	0.035
b2	0.25	---	0.45	0.010	---	0.018
e	---	2.54	---	---	0.100	---

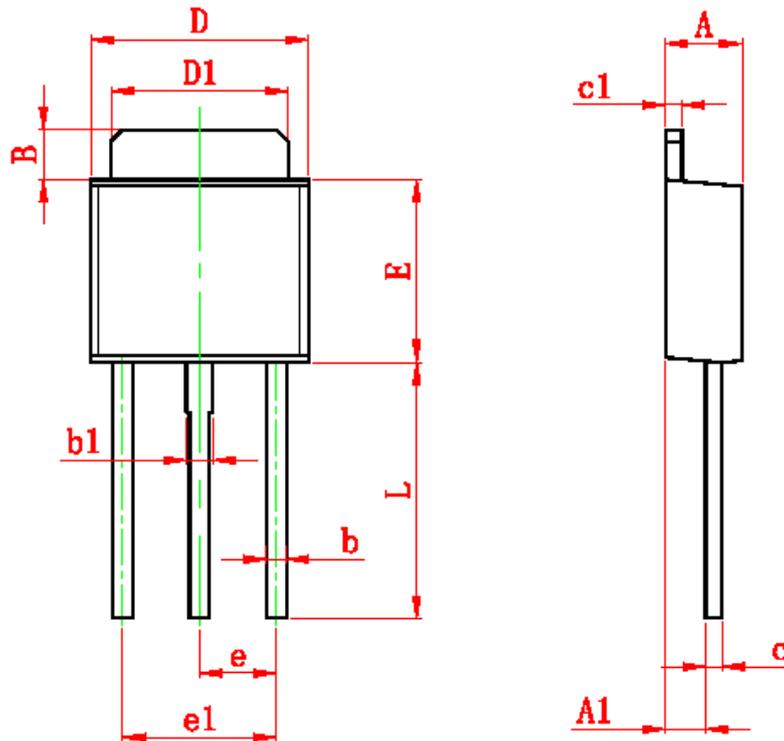
Front View

Side View

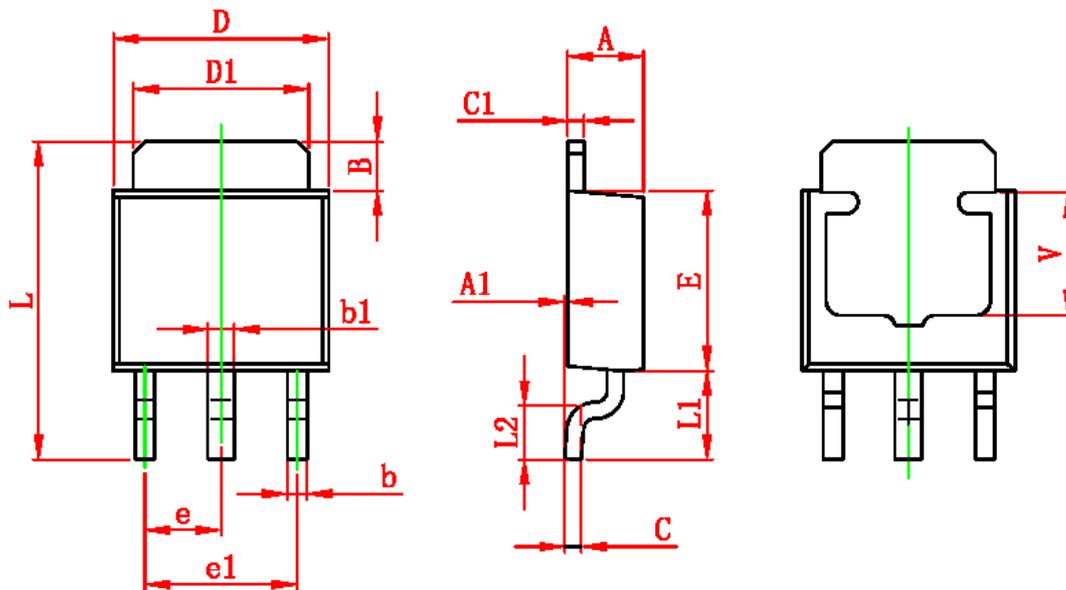
Back View

PACKAGE DIMENSION

TO-251



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	1.020	1.270	0.040	0.050
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	7.500	7.900	0.295	0.311

PACKAGE DIMENSION
TO-252


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
V	3.80 REF		0.150 REF	

IMPORTANT NOTICE

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