CMT20N50

POWER FIELD EFFECT TRANSISTOR

GENERAL DESCRIPTION

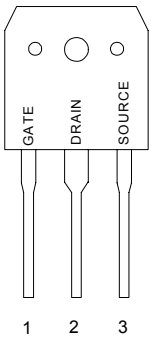
This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. In addition, this advanced MOSFET is designed to withstand high energy in avalanche and commutation modes. The new energy efficient design also offers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

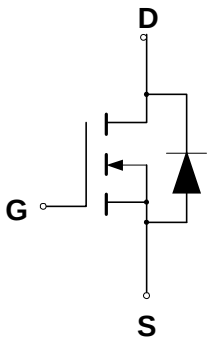
- Robust High Voltage Termination
- Avalanche Energy Specified
- Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- Diode is Characterized for Use in Bridge Circuits
- I_{DSS} and V_{DS}(on) Specified at Elevated Temperature
- Isolated Mounting Hole Reduces Mounting Hardware

PIN CONFIGURATION

TO-3P
Top View



SYMBOL



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain to Current — Continuous	I_D	20	A
— Pulsed	I_{DM}	60	
Gate-to-Source Voltage — Continue	V_{GS}	±20	V
— Non-repetitive	V_{GSM}	±40	V
Total Power Dissipation	P_D	250	W
Derate above 25℃		2.00	W/℃
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	℃
Single Pulse Drain-to-Source Avalanche Energy — T_J = 25℃ (V_{DD} = 100V, V_{GS} = 10V, I_L = 20A, L = 1.38mH, R_G = 25Ω)	E_{AS}	276	mJ
Thermal Resistance — Junction to Case	θ_{JC}	0.50	℃/W
— Junction to Ambient	θ_{JA}	40	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	℃

(1) Pulse Width and frequency is limited by TJ(max) and thermal response

ORDERING INFORMATION

Part Number	Package
CMT20N50N3P	TO-3P

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, T_J = 25℃.

			CMT20N50			
Characteristic		**Symbol**	**Min**	**Typ**	**Max**	**Units**
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} = 500 V, V_{GS} = 0 V, T_J = 125℃)		I_{DSS}			0.05 0.1	mA
Gate-Source Leakage Current-Forward (V_{gsf} = 20 V, V_{DS} = 0 V)		I_{GSSF}			100	nA
Gate-Source Leakage Current-Reverse (V_{gsr} = 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		4.0	V
Static Drain-Source On-Resistance (V_{GS} = 10 V, I_D = 10A) *		$R_{DS(on)}$			0.25	Ω
Drain-Source On-Voltage (V_{GS} = 10 V) (I_D = 20 A)		$V_{DS(on)}$		5.75	6.0	V
Forward Transconductance (V_{DS} = 50 V, I_D = 10A) *		g_{FS}	11			mhos
Input Capacitance	(V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{iss}		3880	6950	pF
Output Capacitance		C_{oss}		452	920	pF
Reverse Transfer Capacitance		C_{rss}		96	140	pF
Turn-On Delay Time	(V_{DD} = 250 V, I_D = 20 A, V_{GS} = 10 V, R_G = 9.1Ω) *	$t_{d(on)}$		29	55	ns
Rise Time		t_r		90	165	ns
Turn-Off Delay Time		$t_{d(off)}$		97	190	ns
Fall Time		t_f		84	170	ns
Total Gate Charge	(V_{DS} = 400 V, I_D = 20 A, V_{GS} = 10 V)*	Q_g		100	132	nC
Gate-Source Charge		Q_{gs}		20		nC
Gate-Drain Charge		Q_{gd}		44		nC
Internal Drain Inductance (Measured from the drain lead 0.25” from package to center of die)		L_D		5.0		nH
Internal Drain Inductance (Measured from the source lead 0.25” from package to source bond pad)		L_S		13		nH
SOURCE-DRAIN DIODE CHARACTERISTICS						
Forward On-Voltage(1)	(I_S = 20 A, d_{IS}/d_t = 100A/μs)	V_{SD}			1.5	V
Forward Turn-On Time		t_{on}		**		ns
Reverse Recovery Time		t_{rr}		431		ns

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

** Negligible, Dominated by circuit inductance

TYPICAL ELECTRICAL CHARACTERISTICS

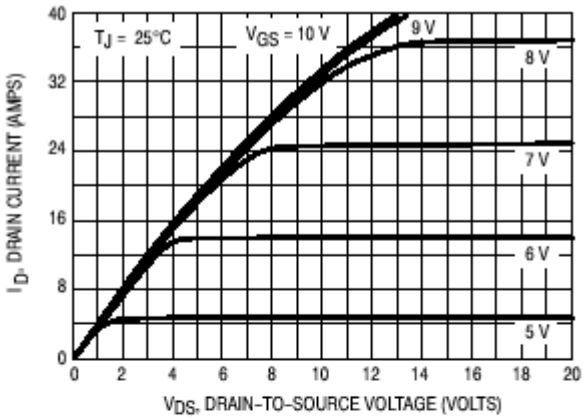


Figure 1. On–Region Characteristics

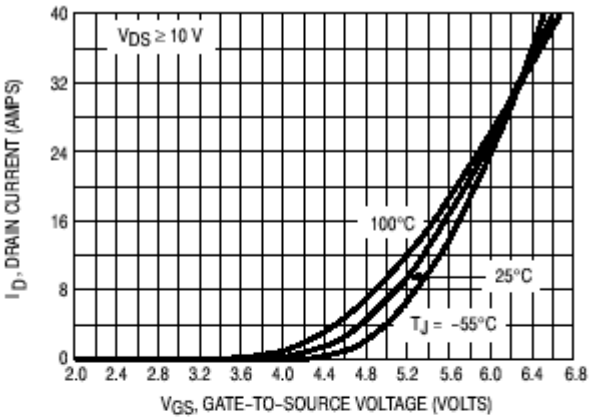


Figure 2. Transfer Characteristics

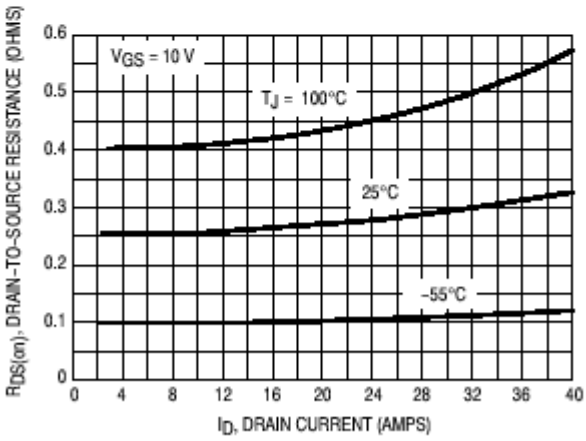


Figure 3. On–Resistance versus Drain Current and Temperature

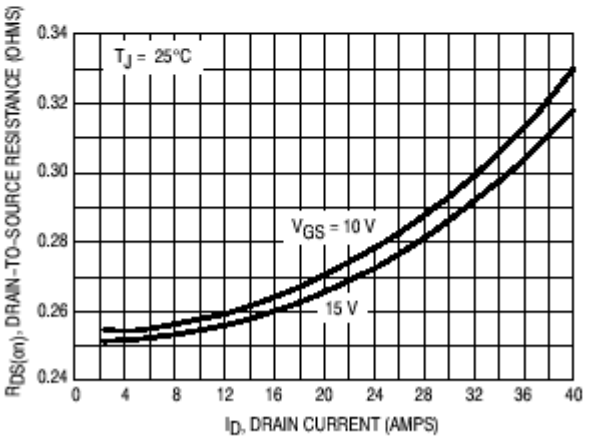


Figure 4. On–Resistance versus Drain Current and Gate Voltage

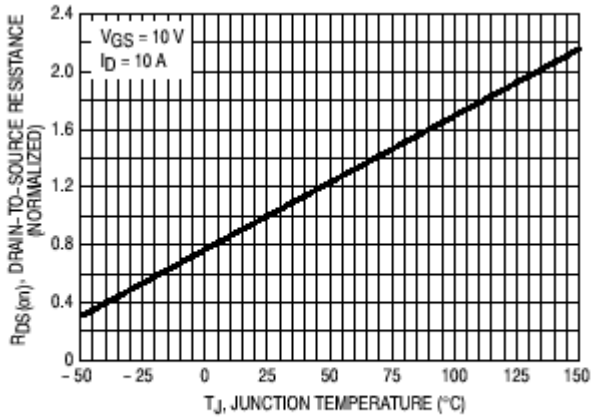


Figure 5. On–Resistance Variation with Temperature

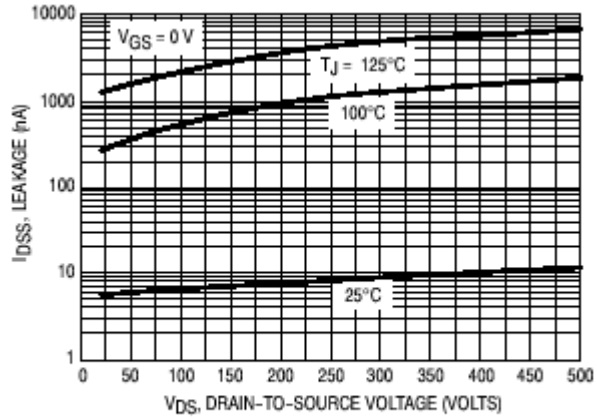
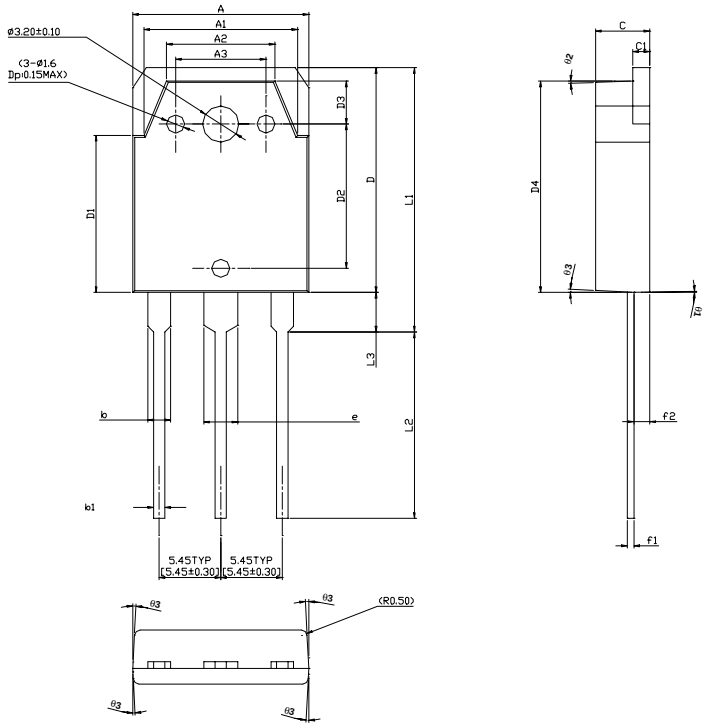


Figure 6. Drain–To–Source Leakage Current versus Voltage

PACKAGE DIMENSION

TO-3P



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	15.40	---	15.80	0.606	---	0.622
A1	13.40	---	13.80	0.527	---	0.543
A2	9.40	---	9.80	0.370	---	0.386
A3	---	8.00	---	---	0.315	---
b	1.80	---	2.20	0.071	---	0.087
b1	0.80	---	1.20	0.031	---	0.047
C	4.60	---	5.00	0.181	---	0.197
C1	1.45	---	1.65	0.057	---	0.065
D	19.70	---	20.10	0.775	---	0.791
D1	13.70	---	14.10	0.539	---	0.555
D2	12.56	---	12.96	0.494	---	0.510
D3	3.60	---	4.00	0.142	---	0.157
D4	18.50	---	18.90	0.728	---	0.744
e	2.80	---	3.20	0.110	---	0.126
f1	0.55	---	0.75	0.021	---	0.029
f2	1.20	---	1.60	0.047	---	0.063
L1	23.20	---	23.60	0.913	---	0.929
L2	16.20	---	16.80	0.638	---	0.661
L3	3.30	---	3.70	0.130	---	0.146
θ1	---	1°	---	---	1°	---
θ2	---	2°	---	---	2°	---
θ3	---	3°	---		3°	---

IMPORTANT NOTICE

Champion Microelectronic Corporation (CMC) reserves the right to make changes to its products or to discontinue any integrated circuit product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

A few applications using integrated circuit products may involve potential risks of death, personal injury, or severe property or environmental damage. CMC integrated circuit products are not designed, intended, authorized, or warranted to be suitable for use in life-support applications, devices or systems or other critical applications. Use of CMC products in such applications is understood to be fully at the risk of the customer. In order to minimize risks associated with the customer's applications, the customer should provide adequate design and operating safeguards.

HsinChu Headquarter

5F-1, No. 11, Park Avenue II,
Science-Based Industrial Park,
HsinChu City, Taiwan
TEL: +886-3-567 9979
FAX: +886-3-567 9909

Sales & Marketing

11F, No. 306-3, SEC. 1, Ta Tung Road,
Hsichih, Taipei Hsien 221, Taiwan

TEL: +886-2-8692 1591
FAX: +886-2-8692 1596