

CDM22010-650

**SILICON
N-CHANNEL POWER MOSFET
10 AMP, 650 VOLT**



TO-220 CASE

DESCRIPTION:

The CENTRAL SEMICONDUCTOR CDM22010-650 is a high current, 650 Volt N-Channel power MOSFET designed for high voltage, fast switching applications such as Power Factor Correction (PFC), lighting and power inverters. This MOSFET combines high voltage capability with low $r_{DS(ON)}$, low threshold voltage and low gate charge.

MARKING CODE: CDM10-650

APPLICATIONS:

- Power Factor Correction
- Motor drives
- Alternative energy inverters
- Solid state lighting

FEATURES:

- High voltage capability ($V_{DS}=650V$)
- Low gate charge ($Q_{GS}=8.0nC$)
- Low $r_{DS(ON)}$ (0.88Ω)

MAXIMUM RATINGS: ($T_A=25^\circ C$ unless otherwise noted)

	SYMBOL		UNITS
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	30	V
Continuous Drain Current (Steady State)	I_D	10	A
Maximum Pulsed Drain Current, $t_p=10\mu s$	I_{DM}	40	A
Continuous Source Current (Body Diode)	I_S	10	A
Maximum Pulsed Source Current (Body Diode)	I_{SM}	40	A
Single Pulse Avalanche Energy (Note 1)	E_{AS}	608	mJ
Power Dissipation	P_D	2.0	W
Power Dissipation ($T_C=25^\circ C$)	P_D	156	W
Operating and Storage Junction Temperature	T_J, T_{stg}	-55 to +150	$^\circ C$
Thermal Resistance	θ_{JC}	0.8	$^\circ C/W$
Thermal Resistance	θ_{JA}	62.5	$^\circ C/W$

Note 1: $L=30mH, I_{AS}=6.2A, V_{DD}=50V, R_G=25\Omega, \text{Initial } T_J=25^\circ C$

ELECTRICAL CHARACTERISTICS: ($T_A=25^\circ C$ unless otherwise noted)

SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
I_{GSSF}, I_{GSSR}	$V_{GS}=30V, V_{DS}=0$		10	100	nA
I_{DSS}	$V_{DS}=650V, V_{GS}=0$		0.03	1.0	μA
BV_{DSS}	$V_{GS}=0, I_D=250\mu A$	650			V
$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2.0	2.8	4.0	V
V_{SD}	$V_{GS}=0, I_S=10A$		0.9	1.4	V
$r_{DS(ON)}$	$V_{GS}=10V, I_D=5.0A$		0.88	1.0	Ω
C_{rss}	$V_{DS}=25V, V_{GS}=0, f=1.0MHz$		4.0		pF
C_{iss}	$V_{DS}=25V, V_{GS}=0, f=1.0MHz$		1200		pF
C_{oss}	$V_{DS}=25V, V_{GS}=0, f=1.0MHz$		140		pF

CDM22010-650

SILICON

N-CHANNEL POWER MOSFET

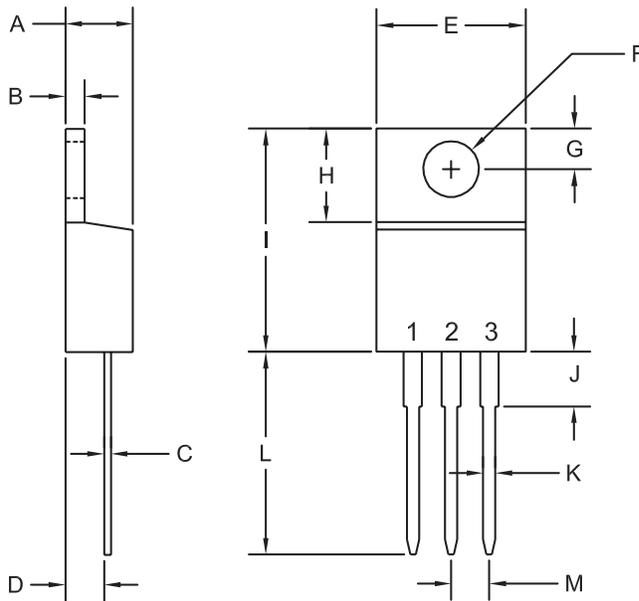
10 AMP, 650 VOLT

ELECTRICAL CHARACTERISTICS - Continued: ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

SYMBOL	TEST CONDITIONS	TYP	UNITS
$Q_{g(\text{tot})}$	$V_{DS}=520\text{V}, V_{GS}=10\text{V}, I_D=10\text{A}$ (Note 2)	20	nC
Q_{gs}	$V_{DS}=520\text{V}, V_{GS}=10\text{V}, I_D=10\text{A}$ (Note 2)	8.0	nC
Q_{gd}	$V_{DS}=520\text{V}, V_{GS}=10\text{V}, I_D=10\text{A}$ (Note 2)	7.0	nC
t_d	$V_{DD}=325\text{V}, I_D=10\text{A}, R_G=25\Omega$ (Note 2)	40	ns
t_r	$V_{DD}=325\text{V}, I_D=10\text{A}, R_G=25\Omega$ (Note 2)	74	ns
t_s	$V_{DD}=325\text{V}, I_D=10\text{A}, R_G=25\Omega$ (Note 2)	52	ns
t_f	$V_{DD}=325\text{V}, I_D=10\text{A}, R_G=25\Omega$ (Note 2)	35	ns
t_{rr}	$V_{GS}=0, I_S=10\text{A}, di/dt=100\text{A}/\mu\text{s}$ (Note 2)	570	ns
Q_{rr}	$V_{GS}=0, I_S=10\text{A}, di/dt=100\text{A}/\mu\text{s}$ (Note 2)	4.7	μC

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

TO-220 CASE - MECHANICAL OUTLINE



SYMBOL	DIMENSIONS			
	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.170	0.190	4.31	4.82
B	0.045	0.055	1.15	1.39
C	0.013	0.026	0.33	0.65
D	0.083	0.107	2.10	2.72
E	0.394	0.417	10.01	10.60
F (DIA)	0.140	0.157	3.55	4.00
G	0.100	0.118	2.54	3.00
H	0.230	0.270	5.85	6.85
I	0.560	0.625	14.23	15.87
J	-	0.250	-	6.35
K	0.025	0.038	0.64	0.96
L	0.500	0.579	12.70	14.70
M	0.090	0.110	2.29	2.79

TO-220 (REV: R2)

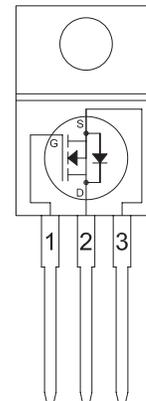
R2

LEAD CODE:

- 1) Gate
- 2) Drain
- 3) Source
- Tab) Drain

MARKING CODE: CDM10-650

PIN CONFIGURATION

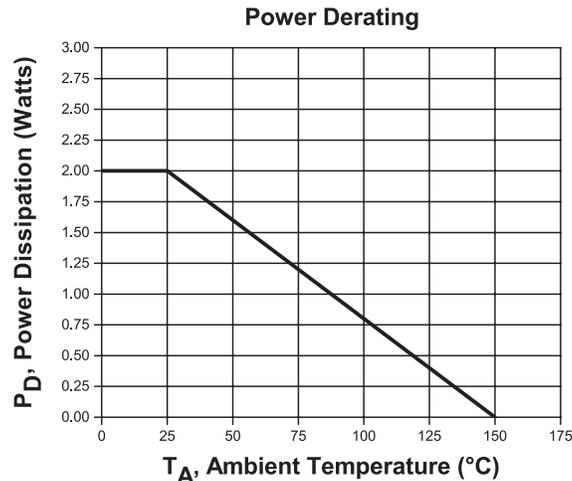
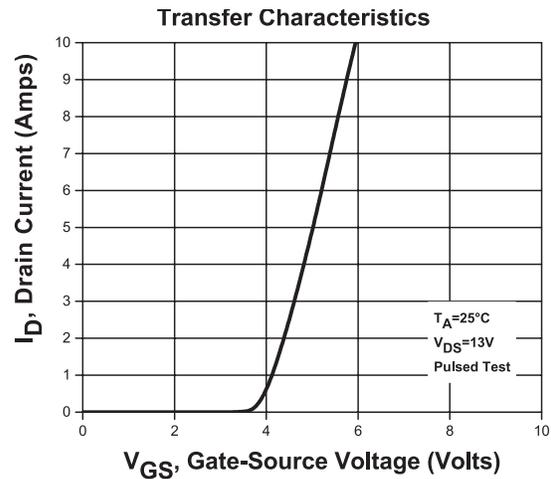
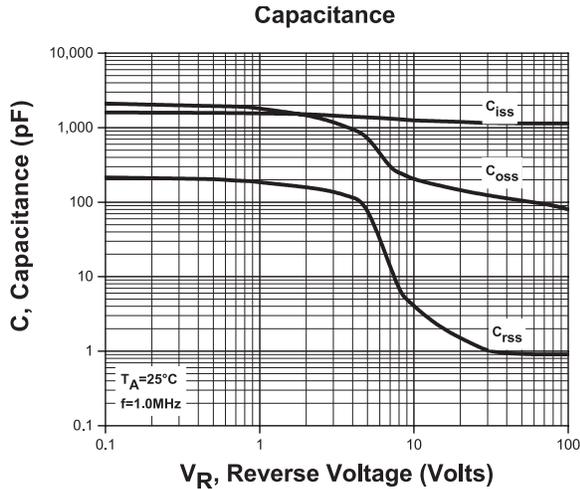
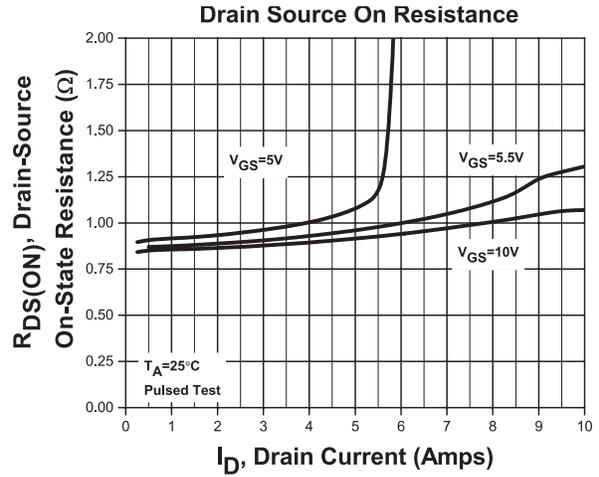
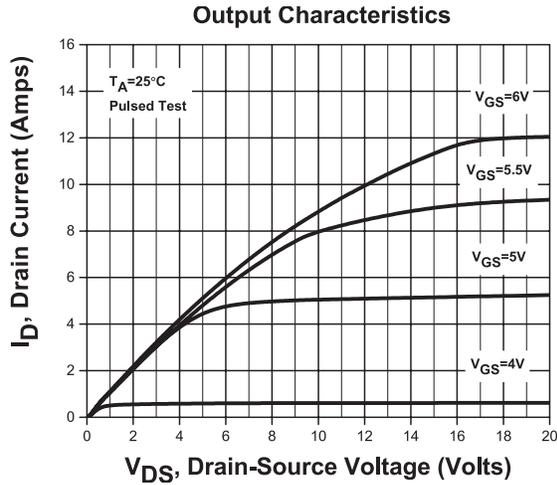


R2 (20-July 2023)

CDM22010-650

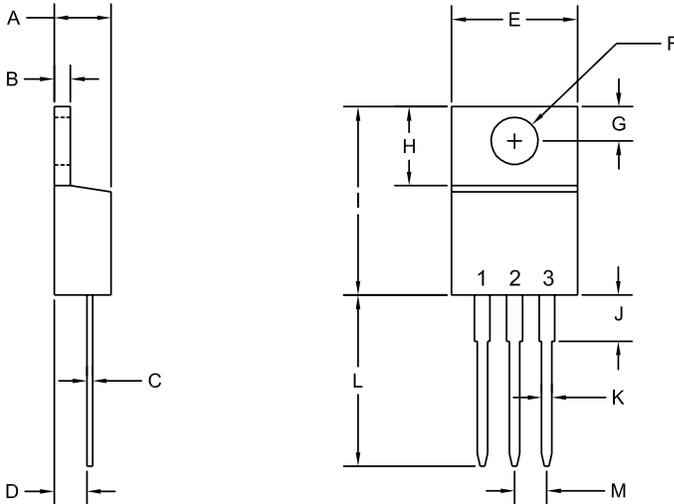
SILICON
N-CHANNEL POWER MOSFET
10 AMP, 650 VOLT

TYPICAL ELECTRICAL CHARACTERISTICS



Package Details - TO-220

Mechanical Drawing



SYMBOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.170	0.190	4.31	4.82
B	0.045	0.055	1.15	1.39
C	0.013	0.026	0.33	0.65
D	0.083	0.107	2.10	2.72
E	0.394	0.417	10.01	10.60
F (DIA)	0.140	0.157	3.55	4.00
G	0.100	0.118	2.54	3.00
H	0.230	0.270	5.85	6.85
I	0.560	0.625	14.23	15.87
J	-	0.250	-	6.35
K	0.025	0.038	0.64	0.96
L	0.500	0.579	12.70	14.70
M	0.090	0.110	2.29	2.79

TO-220 (REV: R2)

LEAD CODE:

R2

TRIAC

- 1) MT1
- 2) MT2
- 3) GATE

SCR

- 1) CATHODE
- 2) ANODE
- 3) GATE

TRANSISTOR

- 1) BASE
- 2) COLLECTOR
- 3) EMITTER

Note: TAB is Common to Pin 2

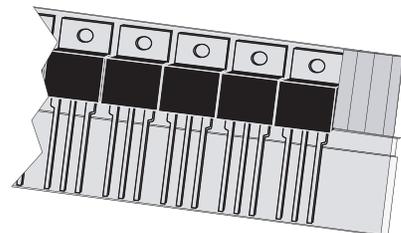
Packing Information

Standard: Bulk

Devices are bulk packed in white corrugated box with black conductive coating (surface resistivity of $<10^5$ ohms per square).

Standard Packing Quantity: 500

Sleeve Packing Quantity: 50



TO-220 Antistatic Sleeve

CentralTM
Semiconductor Corp.
www.centalsemi.com

R0 (9-August 2004)

Material Composition Specification

TO-220 Case



Device average mass 1.89 g
 Fluctuation margin +/-10%

Component	Material	Material		Substance	CAS No.	Substance		
		(%wt)	(mg)			(%wt)	(mg)	(ppm)
active device	doped Si	0.3%	5.67	Si	7440-21-3	0.3%	5.67	3,006
bond wire	aluminum	0.14%	2.55	Al	7429-90-5	0.14%	2.55	1,352
leadframe	Cu alloy	66.89%	1261.86	Cu	7440-50-8	66.79%	1,260	667,944
				Fe	7439-89-6	0.003%	0.06	32
				P	7723-14-0	0.1%	1.8	954
die attach	high temperature solder	0.33%	6.21	Pb	7439-92-1	0.3%	5.74	3,043
				Sn	7440-31-5	0.02%	0.31	164
				Ag	7440-22-4	0.01%	0.16	82
encapsulation*	EMC	31.81%	600	silica	7631-86-9	23.22%	438	232,190
				epoxy resin	Proprietary	7.32%	138	73,156
				Sb ₂ O ₃	1309-64-4	0.64%	12	6,361
				TBBA	79-94-7	0.64%	12	6,361
	EMC GREEN	31.81%	600	silica	7631-86-9	23.86%	450	238,552
				epoxy resin	Proprietary	4.93%	93	49,301
				epoxy polymer	Proprietary	2.39%	45	23,855
				Sb ₂ O ₃	1309-64-4	0.54%	10.2	5,406
carbon black				1333-86-4	0.1%	1.8	954	
plating**	tin/lead process	0.54%	10.1	Sn	7440-31-5	0.43%	8.08	4,283
				Pb	7439-92-1	0.11%	2.02	1,071
	matte tin	0.54%	10.1	Sn	7440-31-5	0.54%	10.1	5,354

*EMC GREEN molding compound is Halogen-Free.

**For Lead Free plating, add suffix "PB FREE" to part number.

For Tin/Lead plating, add suffix "TIN/LEAD" to part number.

No suffix designation allows for the supply of either lead-free or tin/lead plated product depending on availability.

Disclaimer

The information provided in this Material Composition data sheet is, to the best of our knowledge, correct. However, there is no guarantee to completeness or accuracy, as some information is derived from data sources outside the company.

R4 (16-July 2018)

Material Composition Specification

TO-220 Case



Device average mass 1.89 g
 Fluctuation margin +/-10%

Component	Material	Material		Substance	CAS No.	Substance		
		(%wt)	(mg)			(%wt)	(mg)	(ppm)
active device	doped Si	0.3%	5.67	Si	7440-21-3	0.3%	5.67	3,006
bond wire	aluminum	0.14%	2.55	Al	7429-90-5	0.14%	2.55	1,352
leadframe	Cu alloy	66.89%	1261.86	Cu	7440-50-8	66.79%	1,260	667,944
				Fe	7439-89-6	0.003%	0.06	32
				P	7723-14-0	0.1%	1.8	954
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				Sn	7440-31-5	0.02%	0.31	164
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				epoxy resin	Proprietary	7.32%	138	73,156
				Sb ₂ O ₃	1309-64-4	0.64%	12	6,361
				TBBA	79-94-7	0.64%	12	6,361
	EMC GREEN	31.81%	600	silica	7631-86-9	23.86%	450	238,552
				epoxy resin	Proprietary	4.93%	93	49,301
				epoxy polymer	Proprietary	2.39%	45	23,855
				Sb ₂ O ₃	1309-64-4	0.54%	10.2	5,406
carbon black				1333-86-4	0.1%	1.8	954	
plating**	tin/lead process	0.54%	10.1	Sn	7440-31-5	0.43%	8.08	4,283
				Pb	7439-92-1	0.11%	2.02	1,071
	matte tin	0.54%	10.1	Sn	7440-31-5	0.54%	10.1	5,354

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R4 (16-July 2018)

OUTSTANDING SUPPORT AND SUPERIOR SERVICES



PRODUCT SUPPORT

Central's operations team provides the highest level of support to insure product is delivered on-time.

- Supply management (Customer portals)
- Inventory bonding
- Consolidated shipping options
- Custom bar coding for shipments
- Custom product packing

DESIGNER SUPPORT/SERVICES

Central's applications engineering team is ready to discuss your design challenges. Just ask.

- Free quick ship samples (2nd day air)
- Online technical data and parametric search
- SPICE models
- Custom electrical curves
- Environmental regulation compliance
- Customer specific screening
- Up-screening capabilities
- Special wafer diffusions
- PbSn plating options
- Package details
- Application notes
- Application and design sample kits
- Custom product and package development

REQUESTING PRODUCT PLATING

1. If requesting Tin/Lead plated devices, add the suffix "TIN/LEAD" to the part number when ordering (example: 2N2222A TIN/LEAD).
2. If requesting Lead (Pb) Free plated devices, add the suffix "PBFREE" to the part number when ordering (example: 2N2222A PBFREE).

CONTACT US

Corporate Headquarters & Customer Support Team

Central Semiconductor Corp.
145 Adams Avenue
Hauppauge, NY 11788 USA
Main Tel: (631) 435-1110
Main Fax: (631) 435-1824
Support Team Fax: (631) 435-3388
www.centrasemi.com

Worldwide Field Representatives:
www.centrasemi.com/wwreps

Worldwide Distributors:
www.centrasemi.com/wwdistributors

For the latest version of Central Semiconductor's **LIMITATIONS AND DAMAGES DISCLAIMER**, which is part of Central's Standard Terms and Conditions of sale, visit: www.centrasemi.com/terms



Product End of Life Notification

PDN ID:	PDN01263
Notification Date:	9/06/23
Last Buy Date:	Stock Only
Last Shipment Date:	Stock Only

<https://www.centrasemi.com>

Please be advised that Central Semiconductor must immediately discontinue the product(s) listed in the attached PDN notice. Orders can only be accepted for products with available inventory on hand.

You may have purchased one or more of the products listed. Please do not hesitate to contact your local Central Semiconductor sales representative with any questions or needs you may have. Central regrets any inconvenience this may cause.

Sincerely,

Central Semiconductor, LLC

DISCLAIMER: This End of Life (EOL) notification is in accordance with JEDEC standard JESD48 - Product Discontinuance. Central Semiconductor will make every effort to offer life-time buy (LTB) opportunities and/or offer replacement devices to existing customers for discontinued devices, however, one or both may not be possible for all devices. Please contact your local Central Semiconductor sales representative for LTB opportunities/additional information.



<https://www.centalsemi.com>

Product End of Life Notification

PDN ID:	PDN01263
Notification Date:	9/06/23
Last Buy Date:	Stock Only
Last Shipment Date	Stock Only

Summary: The following devices in the TO-220 case are discontinued and now classified as End of Life (EOL).

Although Central Semiconductor makes every effort to continue to produce devices that have been proclaimed EOL (End of Life) by other manufacturers, it is an accepted industry practice to discontinue certain devices when customer demand falls below a minimum level of sustainability. Accordingly, the following product(s) have been transitioned to End of Life status as part of Central's ongoing Product Portfolio Management. Any replacement products are noted below. The effective date for placing last purchase orders will be six (6) months from the date of this notice and twelve (12) months from the notice date for final shipments, and minimum order quantities may apply. The last purchase and shipment dates may be extended if inventory is available.

*** All Plating types (PBFREE,TIN/LEAD) for each item listed are included in this notice.**

Central Part Number	Suggested Replacement
CDM22010-650	N/A
CDM22010-650 SL	N/A
CDM2209-900FP SL	N/A
CR15U-06S SL	N/A

Central would be happy to assist you by providing additional information or technical data to help locate an alternate source if we have no replacement available. If you would like assistance, please visit <https://my.centalsemi.com/submit-inquiry?type=ER> to submit an online inquiry.

DISCLAIMER: This End of Life (EOL) notification is in accordance with JEDEC standard JESD48 - Product Discontinuance. Central Semiconductor will make every effort to offer life-time buy (LTB) opportunities and/or offer replacement devices to existing customers for discontinued devices, however, one or both may not be possible for all devices. Please contact your local Central Semiconductor sales representative for LTB opportunities/additional information.