

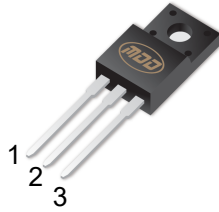


MDD4N65F/MDD4N65P/MDD4N65D

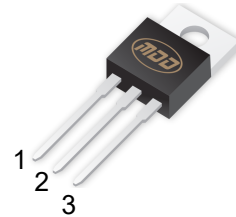
650V N-Channel Enhancement Mode MOSFET

V_{DS}	650 V
$I_D(T_c=25^\circ\text{C})$	4A
$R_{DS(on),max}$	2.8Ω@ $V_{GS}=10V$
$Q_{g,typ}$	12nC

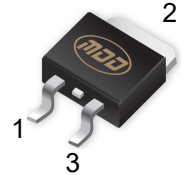
TO-220F-3L



TO-220-3L



TO-252



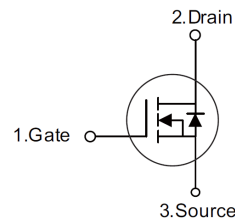
General Features

- Ultra low gate charge
- Low reverse transfer Capacitance
- Fast switching capability
- Avalanche energy tested
- Improved dv/dt capability, high ruggedness

Application

- High efficiency switch mode power supplies
- Electronic lamp ballasts based on half bridge
- LED power supplies

Equivalent Circuit



Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current	I_D	4	A
Pulsed Drain Current (Note 1)	I_{DM}	16	A
Avalanche Energy Single Pulsed (Note 2)	E_{AS}	198	mJ
Continuous diode forward current	I_S	4	A
Diode pulse current	$I_{S,pulse}$	16	A
Peak Diode Recovery dv/dt (Note 3)	dv/dt	5	V/ns
Power Dissipation TO-220F	P_D	32	W
Power Dissipation TO-220/TO-252		77	W
Junction Temperature	T_J	150	°C
Storage Temperature	T_{stg}	-55 ~ 150	°C

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F	TO-220/TO-252	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	3.8	1.62	°C/W
Thermal resistance, Junction-to-ambient	$R_{\theta JA}$	62.5	110	°C/W

- Notes:**
1. Pulse width limited by maximum junction temperature.
 2. L=10mH, IAS = 6.3A, Starting $T_J=25^\circ\text{C}$.
 3. ISD = 4A, di/dt ≤ 100A/us, VDD ≤ BVDS, Starting $T_J=25^\circ\text{C}$.



MDD4N65F/MDD4N65P/MDD4N65D

650V N-Channel Enhancement Mode MOSFET

Ta = 25°C unless otherwise specified

Symbol	Parameter	Condition	Min	Typ	Max	Unit	
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	650	--	--	V	
I _{GSS}	Gate-Source Leakage Current	Forward	V _{GS} =30V, V _{DS} =0V	--	--	100	nA
		Reverse	V _{GS} =-30V, V _{DS} =0V	--	--	-100	nA
I _{DSS}	Drain-Source Leakage Current	V _{DS} =650V, V _{GS} =0V	--	--	1	uA	
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	2.0	--	4.0	V	
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =10V, I _D =2A	--	2.5	2.8	Ω	

Dynamic Electrical Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	V _{DS} =25V V _{GS} =0V f=1MHz	--	600		pF
C _{oss}	Output Capacitance		--	55		pF
C _{rss}	Reverse Transfer Capacitance		--	3.2		pF
Q _g	Total Gate Charge	V _{DS} =520V, V _{GS} =10V, I _D =4A (Note1,2)	--	12	--	nC
Q _{gs}	Gate Source Charge		--	3.2	--	nC
Q _{gd}	Gate Drain Charge		--	5.1	--	nC

Switching Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
t _{d(on)}	Turn on Delay Time	V _{DS} =325V, I _D =4A, R _G =10Ω (Note1,2)	--	--	12	ns
t _r	Turn on Rise Time		--	--	31	ns
t _{d(off)}	Turn Off Delay Time		--	--	42	ns
t _f	Turn Off Fall Time		--	--	15	ns

Source Drain Diode Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
I _{SD}	Source drain current(Body Diode)		--	--	4	A
I _{SM}	Pulsed Current		--	--	16	A
V _{SD}	Drain-Source Diode Forward Voltage	I _S =4A, V _{GS} =0V	--	0.8	1.5	V
t _{rr}	Body Diode Reverse Recovery Time	V _R =400 I _F =4A, -dI _F /dt=100A/μs	--	282	--	ns
Q _{rr}	Body Diode Reverse Recovery Charge		--	1.4	--	uC

Notes:

- 1.Pulse test ; Pulse width≤300us, duty cycles≤2%.
- 2.Essentially independent of operating temperature.



MDD4N65F/MDD4N65P/MDD4N65D

650V N-Channel Enhancement Mode MOSFET

Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

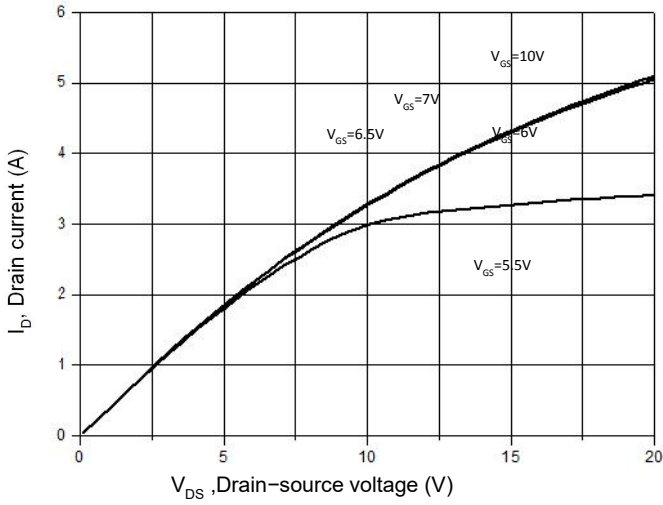


Figure 2. Transfer Characteristics

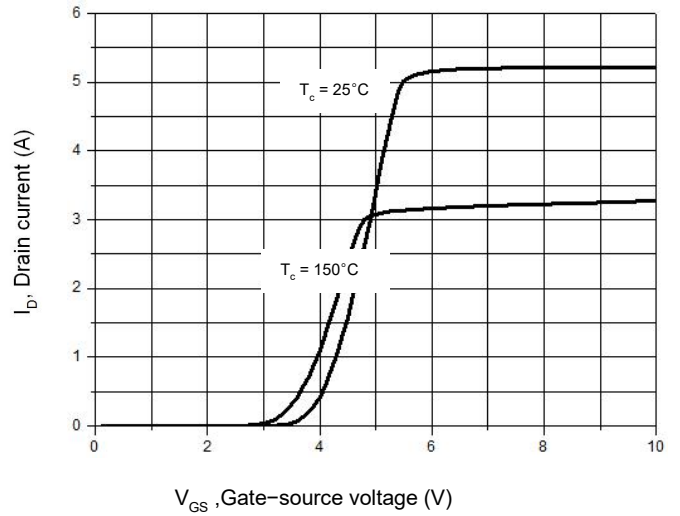


Figure 3. On-Resistance Variation vs. Drain Current

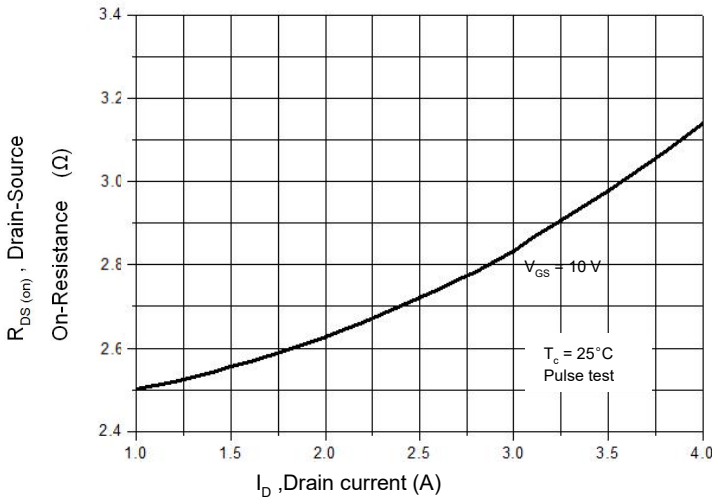


Figure 4. Threshold Voltage vs. Temperature

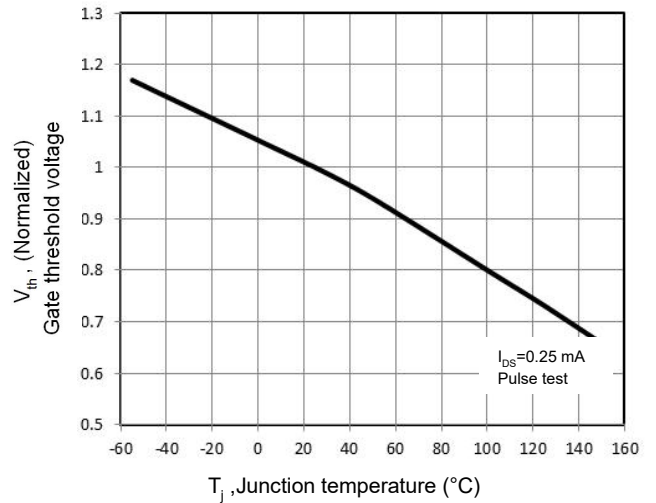


Figure 5. Breakdown Voltage vs. Temperature

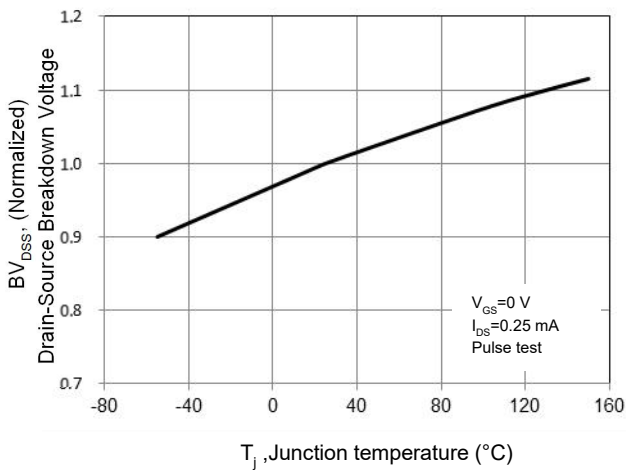
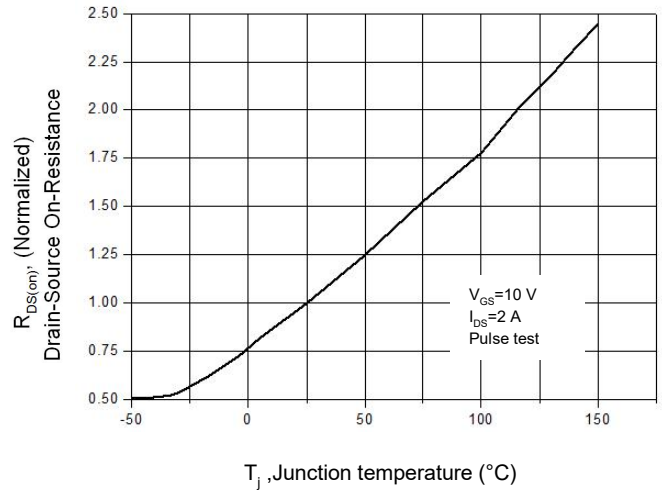


Figure 6. On-Resistance vs. Temperature





MDD4N65F/MDD4N65P/MDD4N65D

650V N-Channel Enhancement Mode MOSFET

Figure 7. Capacitance Characteristics

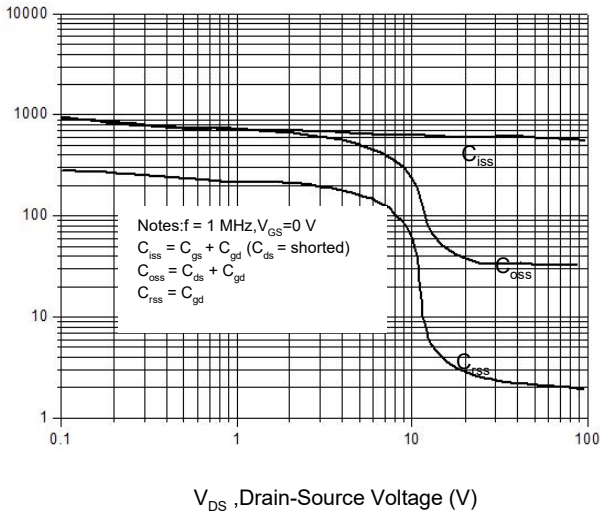


Figure 8. Gate Charge Characteristic

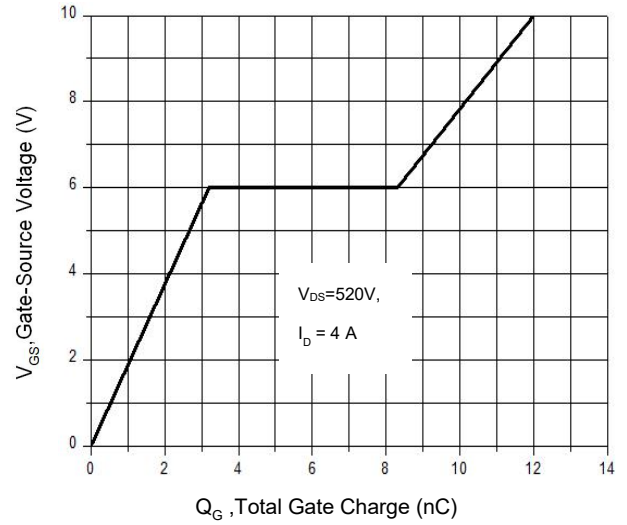


Figure 9. Maximum Safe Operating Area
TO-220F

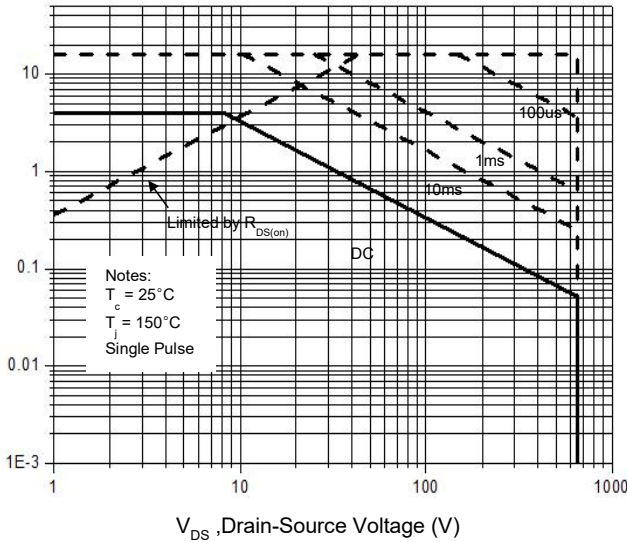


Figure 10. Maximum Safe Operating Area
TO-220/ TO-252

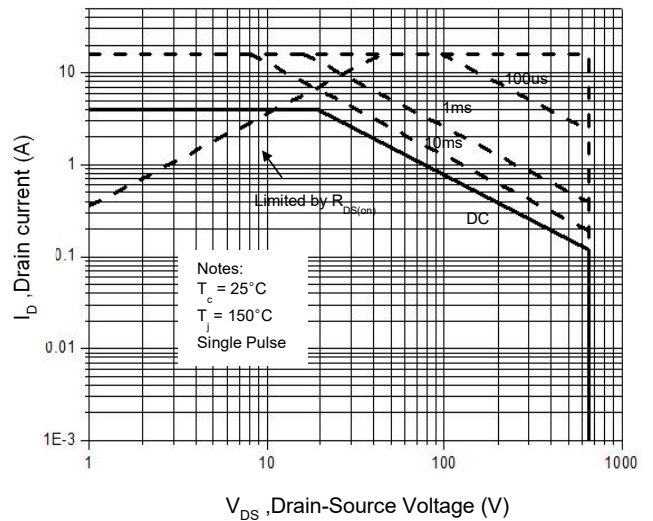


Figure 11. Power Dissipation vs. Temperature
TO-220F

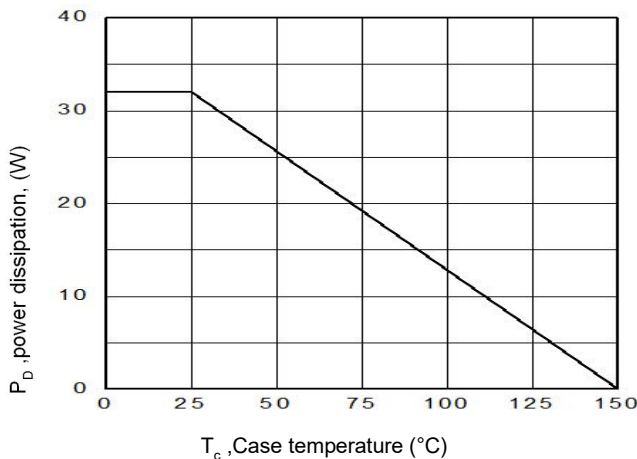
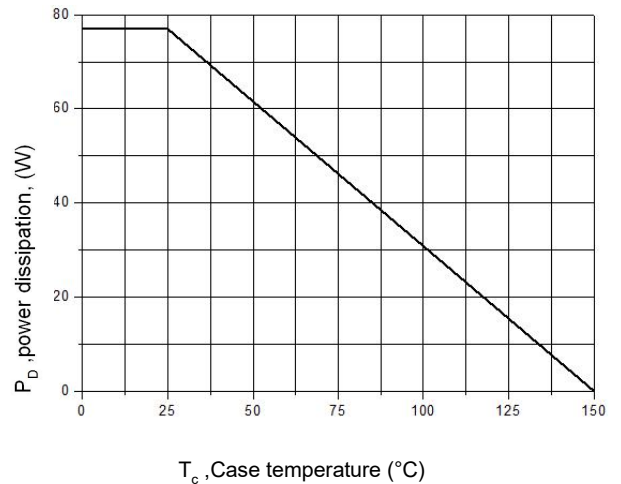


Figure 12. Power Dissipation vs. Temperature
TO-220/ TO-252





MDD4N65F/MDD4N65P/MDD4N65D

650V N-Channel Enhancement Mode MOSFET

Figure 13. Continuous Drain Current vs. Temperature

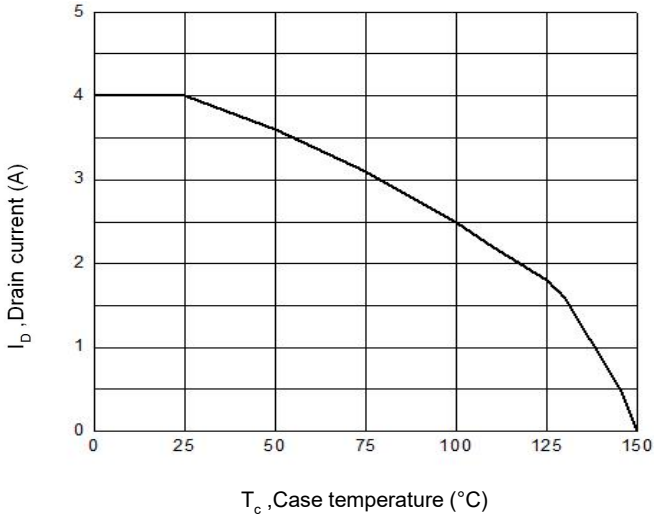


Figure 14. Body Diode Transfer Characteristics

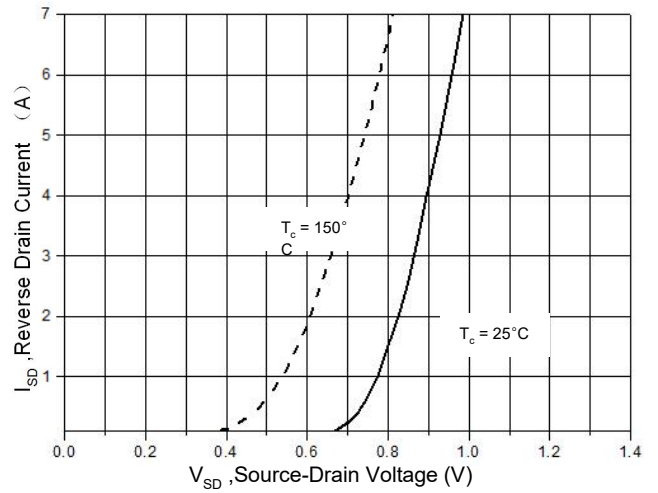


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F

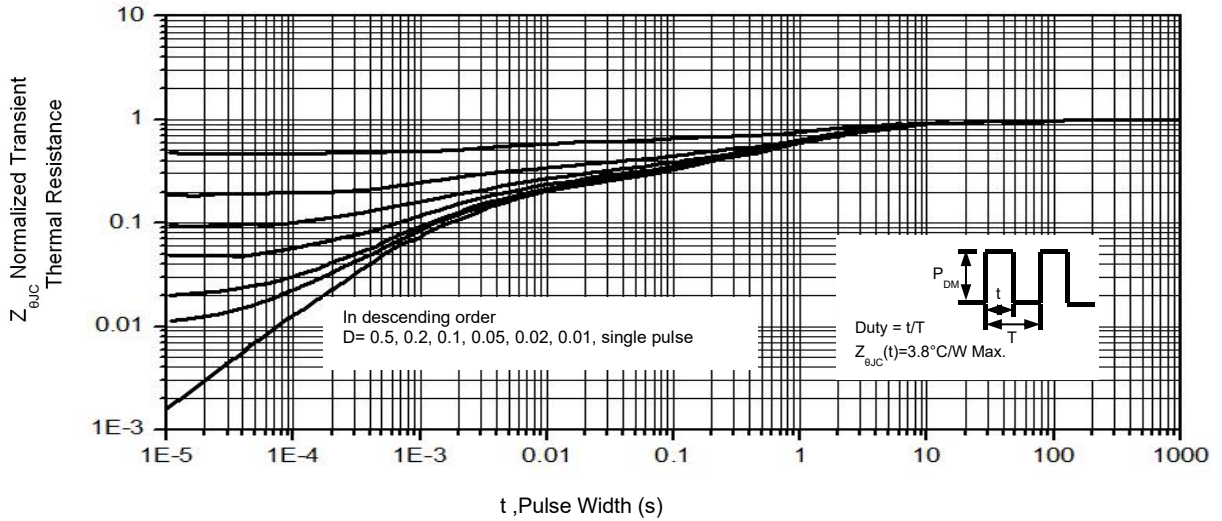
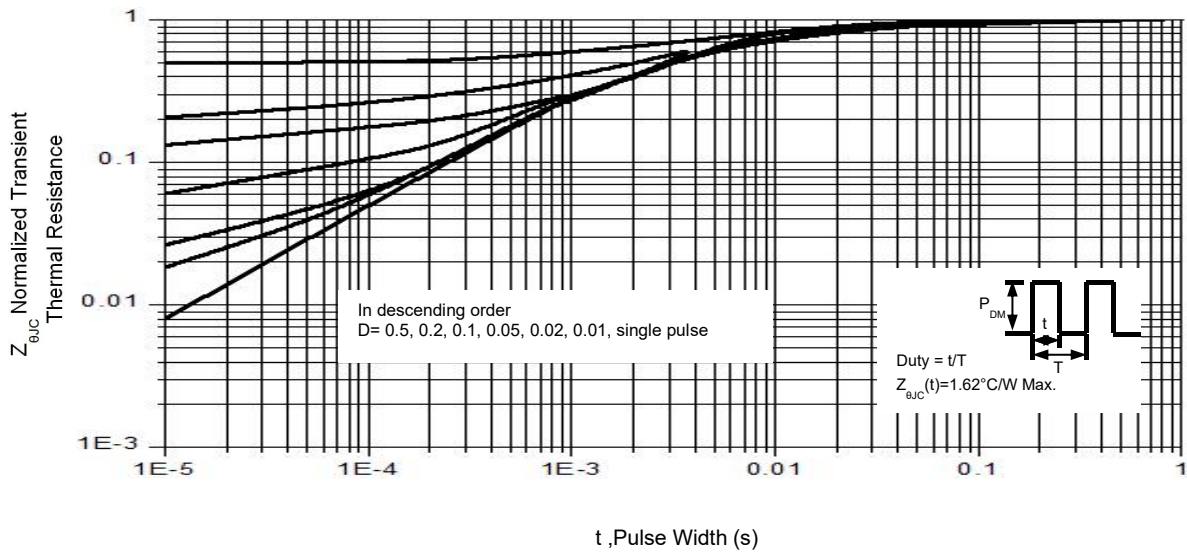


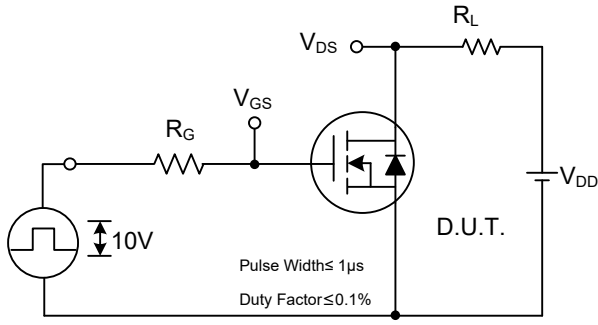
Figure 16. Transient Thermal Impedance, Junction to Case, TO-220/ TO-252



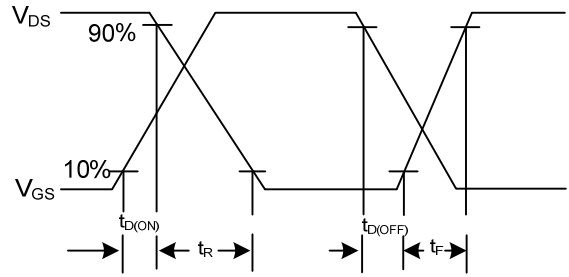


MDD4N65F/MDD4N65P/MDD4N65D

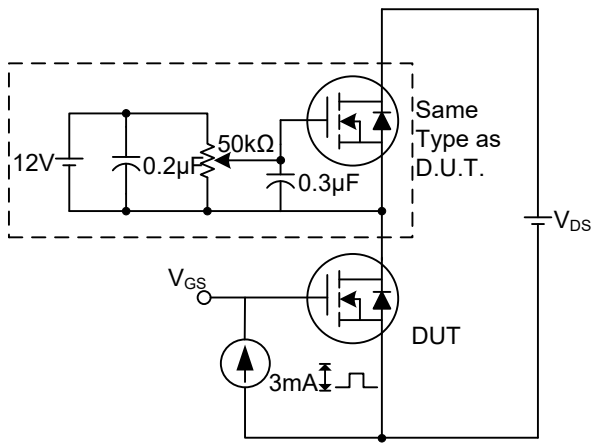
650V N-Channel Enhancement Mode MOSFET



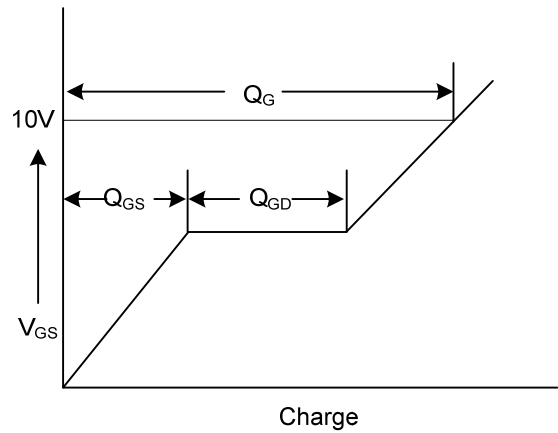
Switching Test Circuit



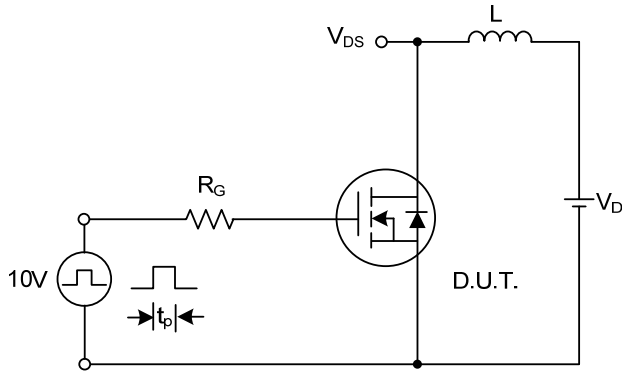
Switching Waveforms



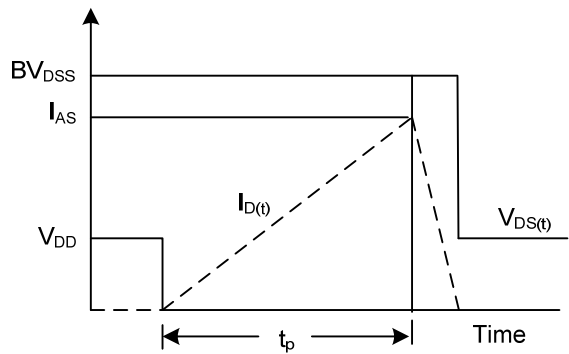
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

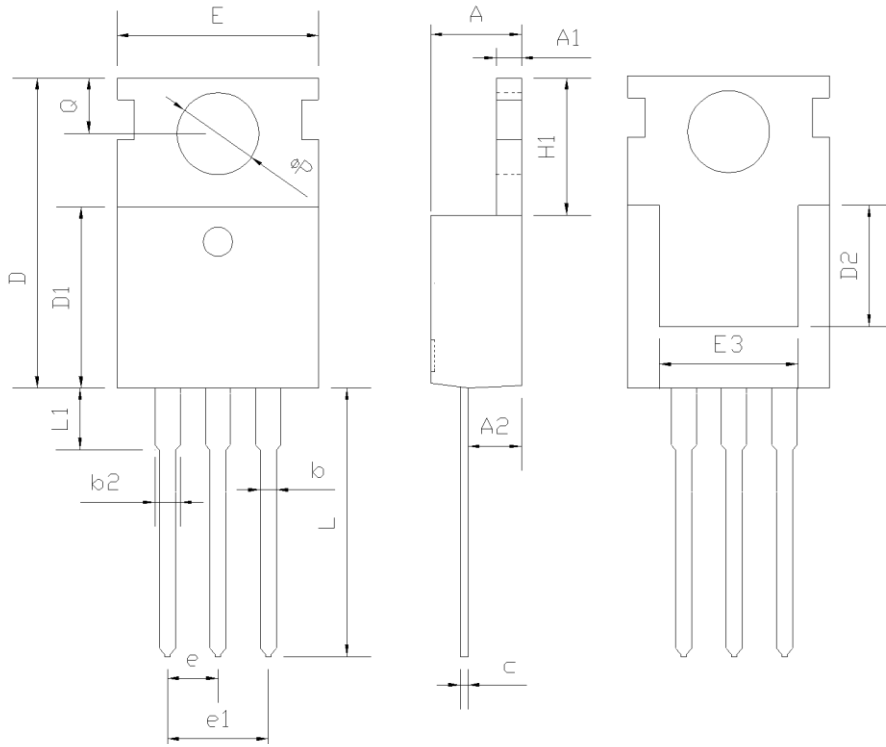
The curve above is for reference only.



MDD4N65F/MDD4N65P/MDD4N65D

650V N-Channel Enhancement Mode MOSFET

Mechanical Dimensions for TO-220



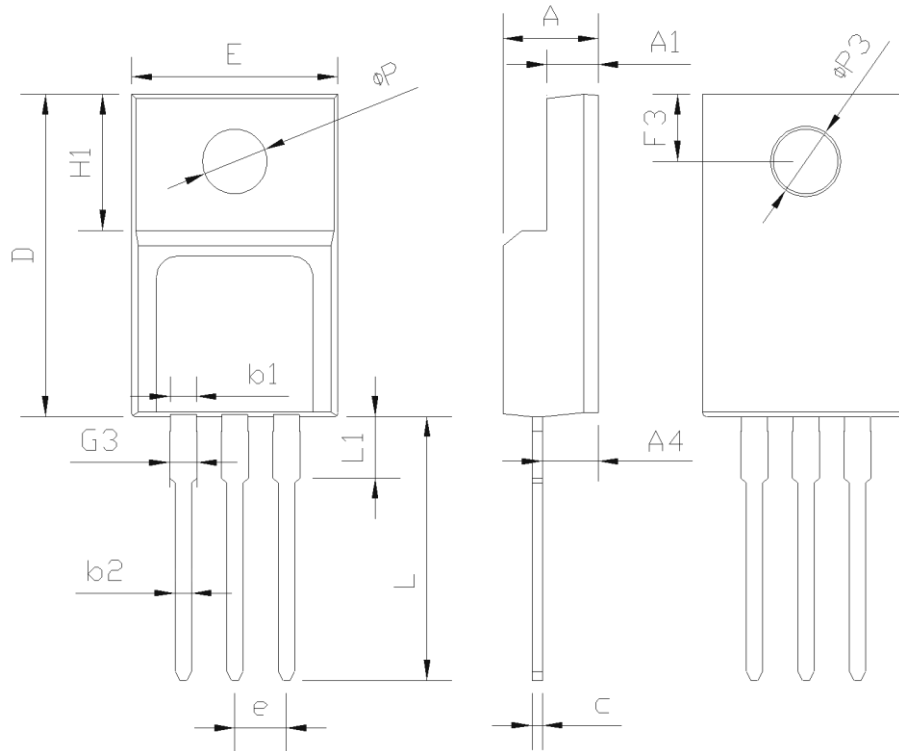
SYMBOL	mm		
	MIN	NOM	MAX
A	4.37	4.57	4.70
A1	1.25	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.45	0.50	0.60
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
ΦP	3.40	3.60	3.80
Q	2.60	2.80	3.00



MDD4N65F/MDD4N65P/MDD4N65D

650V N-Channel Enhancement Mode MOSFET

Mechanical Dimensions for TO-220F



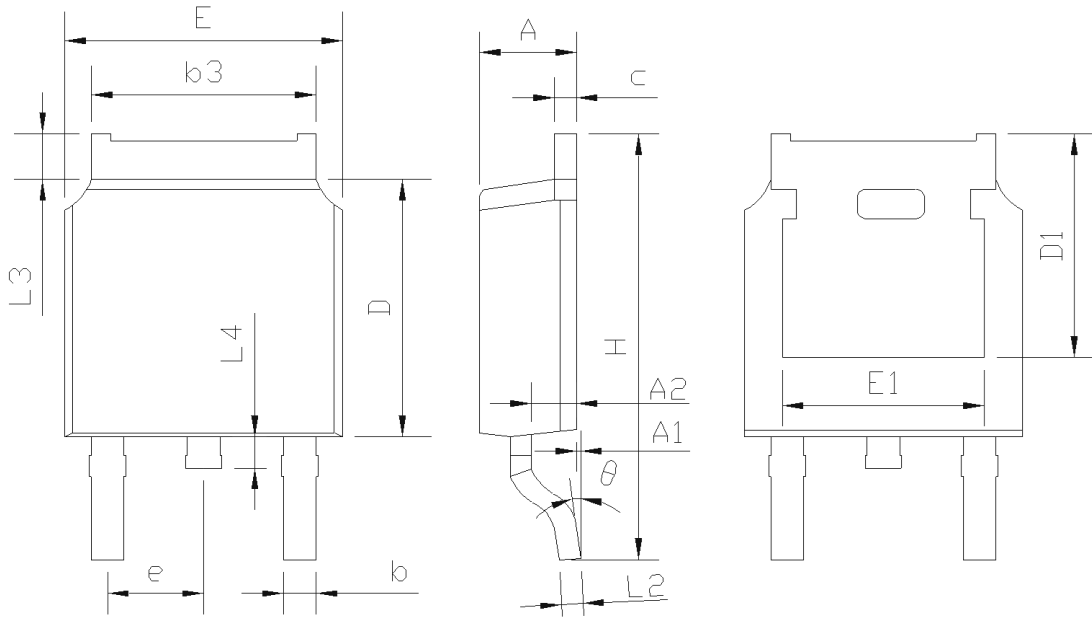
SYMBOL	mm		
	MIN	NOM	MAX
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
L	12.68	12.98	13.28
L1	2.88	3.03	3.18
ΦP	3.03	3.18	3.38
ΦP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35	1.55
b1	1.18	1.28	1.43
b2	0.70	0.80	0.95



MDD4N65F/MDD4N65P/MDD4N65D

650V N-Channel Enhancement Mode MOSFET

Mechanical Dimensions for TO-252



SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	-	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	-	-
e	2.286BSC		
H	9.40	10.10	10.50
L2	0.51BSC		
L3	0.88	-	1.28
L4	0.50	-	1.00
θ	0°	-	8°

Package Marking and Ordering Information

Part Number	Marking	Package	Units/Tube	Units/Reel
MDD4N65F	4N65F	TO-220F	50	
MDD4N65P	4N65P	TO-220-3L	50	
MDD4N65D	4N65D	TO-252		2500

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for [MOSFET](#) category:

Click to view products by [Microdiode Electronics](#) manufacturer:

Other Similar products are found below :

[IRFD120](#) [JANTX2N5237](#) [2SK2267\(Q\)](#) [BUK455-60A/B](#) [TK100A10N1,S4X\(S](#) [MIC4420CM-TR](#) [VN1206L](#) [NDP4060](#) [SI4482DY](#)
[IRS2092STRPBF-EL](#) [IPS70R2K0CEAKMA1](#) [TK31J60W5,S1VQ\(O](#) [TK31J60W,S1VQ\(O](#) [TK16J60W,S1VQ\(O](#) [2SK2614\(TE16L1,Q\)](#)
[DMN1017UCP3-7](#) [EFC2J004NUZTDG](#) [P85W28HP2F-7071](#) [NTE2384](#) [DMC2700UDMQ-7](#) [DMN2080UCB4-7](#) [DMN61D9UWQ-13](#)
[US6M2GTR](#) [DMN31D5UDJ-7](#) [DMP22D4UFO-7B](#) [IPS60R3K4CEAKMA1](#) [DMN1006UCA6-7](#) [DMN16M9UCA6-7](#) [STF5N65M6](#)
[IRF40H233XTMA1](#) [STU5N65M6](#) [DMN6022SSD-13](#) [DMN13M9UCA6-7](#) [DMTH10H4M6SPS-13](#) [IPS60R360PFD7SAKMA1](#)
[DMN2990UFB-7B](#) [SSM3K35CT,L3F](#) [IPLK60R1K0PFD7ATMA1](#) [2N7002W-G](#) [MCAC30N06Y-TP](#) [IPWS65R035CFD7AXKSA1](#)
[MCQ7328-TP](#) [SSM3J143TU,LXHF](#) [DMN12M3UCA6-7](#) [PJMF280N65E1_T0_00201](#) [PJMF380N65E1_T0_00201](#)
[PJMF280N60E1_T0_00201](#) [PJMF600N65E1_T0_00201](#) [PJMF900N65E1_T0_00201](#) [PJMF900N60E1_T0_00201](#)