




**SPECIFICATION SHEET**

<b>SPECIFICATION SHEET NO.</b>	Q0721- TO220FMD10N65F
<b>DATE</b>	July. 21, 2023
<b>REVISION</b>	A0
<b>DESCRIPTION</b>	SMD Plastic-Encapsulate MOSFETS, TO -220F series, 3 Pins MDD10N65F Type, 650V N-Channel Enhancement Mode MOSFET Drain-Source Voltage: 650V, Continuous Drain Current 10A Junction Temperature: +150°C, Package in Tape/Reel, 50pcs/Tube RoHS/RoHS III compliant
<b>CUSTOMER</b>	
<b>CUSTOMER PART NUMBER</b>	
<b>CROSS REF. PART NUMBER</b>	
<b>ORIGINAL PART NUMBER</b>	MDD10N65F
<b>PART CODE</b>	TO220FMD10N65F

<b>VENDOR APPROVE</b>			
Issued/Checked/Approved			
DATE: July. 21, 2023			

<b>CUSTOMER APPROVE</b>	
DATE:	

7/21/2023

**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**

**MAIN FEATURE**

- Ultra Low Gate Charge
- Low Reverse Transfer Capacitance
- Fast Switching Capability
- Avalanche Energy Tested
- Improved dv/dt Capability and High Ruggedness



**APPLICATION**

- High Efficiency Switch Mode Power Supplies
- Electronic Lamp Ballasts Based On Half Bridge
- LED Power Supplies

**RFQ**

[Request For Quotation](#)

**PART CODE GUIDE**

TO220F	MD	10N65	F
1	2	3	4

1) **TO220F**: SMD Plastic-Encapsulate MOSFETS, TO-220F series, 3 pins

2) **MD**: Original Supplier Code

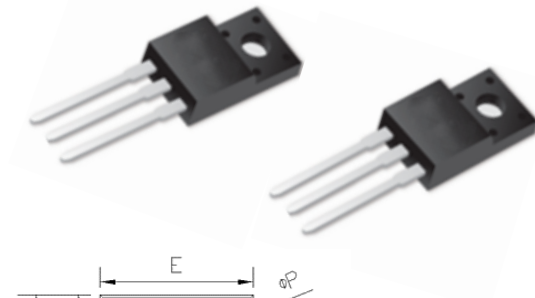
3) **10N65**: Main Specification code for I<sub>D</sub>: 10A , N: N-Channel and V<sub>DS</sub> : 650V

4) **F**: Internal Control Code, (A~Z or 1~9 or Blank) or custom parametric data

**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**

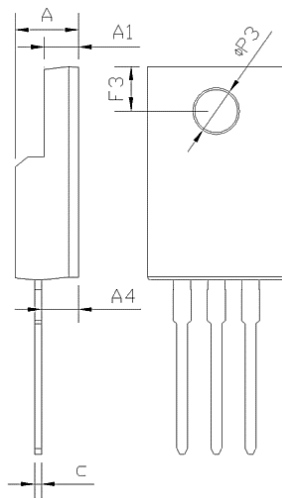
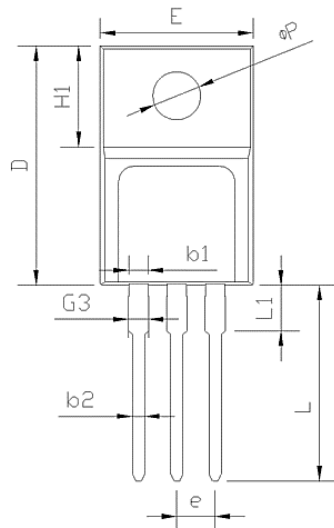
**DIMENSION (Unit: Inch/mm)**

Image for reference



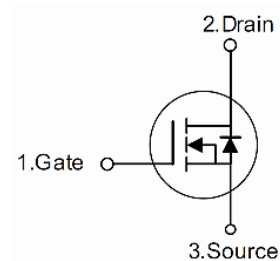
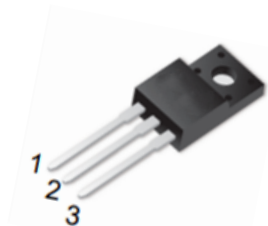
Marking: 10N65F

TO-220F-3L



Symbol	Value ( mm )		
	Min.	Typ.	Max.
E	9.96	10.16	10.36
A	4.50	4.70	1.90
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	6.70 REF		
e	2.54 BSC		
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	0.8	0.95

**EQUIVALENT CIRCUIT DIAGRAM**



**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**
**650V N-CHANNEL ENHANCEMENT MODE MOSFET**

V (BR)DSS	I D (TC+ 25°C)	R DS (on),max	Q g,typ
650V	10A	1 Ω @ VGS=10V	34.2 nC

**ABSOLUTE MAX. RATINGS AT (Ta=25 °C unless otherwise specified)**

Parameter	SYMBOLS	VALUE	UNIT
Drain-Source Voltage	V DS	650	V
Gate-Source Voltage	V GS	±30	V
Continuous Drain Current	I D	10.0	A
Pulsed Drain Current(Note 1)	I D	40	A
Avalanche Energy Single Pulsed (Note 2)	E AS	500	mJ
Continuous diode forward current	I S	10	A
Diode pulse current	I S,pulse	40	A
Peak Diode Recovery dv/dt (Note 3)	dv/dt	5.0	V/ns
Power Dissipation (TO-220F)	P D	40	W
Junction Temperature	T J	+150	°C
Storage Temperature Range	T STG	-55 ~ +150	°C

**THERMAL CHARACTERISTICS**

Parameter	SYMBOLS	VALUE (TO-220F)	UNIT
Thermal resistance, Junction-to-case	R θJC	3.13	°C/W
Thermal resistance, Junction-to-ambient	R θJA	110	°C/W

Notes:

1. Pulse width limited by maximum junction temperature. 2. L=10mH, I AS = 10A, Starting T j= 25°C.
3. I SD = 10A, di/dt≤100A/us, VDD≤BVDS, Starting Tj= 25°C.

**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**
**MOSFET ELECTRICAL CHARACTERISTICS AT Ta=25 °C (unless otherwise specified)**

Parameter		SYMBOLS	VALUE			UNIT	Condition
			Min.	Typ.	Max.		
Drain-Source Breakdown Voltage		V (BR) DSS	650	-	-	V	VGS=0V I D=250μA
Gate-Source Leakage Current	Forward	I GSS	-	-	100	nA	VGS=30V, VDS=0V
	Reverse		-	-	-100	nA	VGS=-30V, VDS=0V
Drain-Source Leakage Current		I DSS	-	-	1	μA	VDS=650V, VGS=0V
Gate Threshold Voltage		V GS(TH)	2.0	-	4.0	V	VDS=VGS, ID=250μA
Drain-Source On-State Resistance		R DS (ON)	-	0.81	1.0	Ω	VGS=10V, IDS=5.0A

**DYNAMIC ELECTRICAL CHARACTERISTICS**

Parameter		SYMBOLS	VALUE			UNIT	Condition
			Min.	Typ.	Max.		
Input Capacitance		C iss	-	1622	-	pF	V DS=25V V GS=0V f =1MHz
Output Capacitance		C oss	-	142.2	-		
Reverse Transfer Capacitance		C rss	-	6.8	-		
Total Gate Charge		Q g	-	34.2	-	nC	VDS=520V V GS =10V ID=10A (Note1, 2)
Gate Source Charge		Q gs	-	8.8	-		
Gate Drain Charge		Q gd	-	12.89			

**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**
**SWITCHING CHARACTERISTICS**

Parameter	SYMBOLS	VALUE			UNIT	Condition
		Min.	Typ.	Max.		
Turn on Delay Time	t <sub>d(on)</sub>	-	-	14.16	ns	V <sub>DD</sub> =325V I <sub>D</sub> =10A R <sub>G</sub> = 10Ω (Note 1, 2)
Turn on Rise Time	t <sub>r</sub>	-	-	34.64		
Turn Off Delay Time	t <sub>d(off)</sub>	-	-	65.72		
Turn Off Fall Time	t <sub>f</sub>	-	-	16.04		

**SOURCE DRAIN DIODE CHARACTERISTICS**

Parameter	SYMBOLS	VALUE			UNIT	Condition
		Min.	Typ.	Max.		
Source drain current (Body Diode)	I <sub>SD</sub>	-	-	10	A	
Pulsed Current	I <sub>SM</sub>	-	-	40	A	
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	-	-	1.5	V	I <sub>S</sub> =10A, V <sub>GS</sub> =0V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	-	418.8	-	ns	V <sub>R</sub> =325 V I <sub>F</sub> =10A, -diF/dt =100A/μs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	-	3.40	-	uC	

Notes:

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

**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**

**ELECTRICAL CHARACTERISTICS DIAGRAMS (For Reference Only)**

Figure 1. Typical Output Characteristics

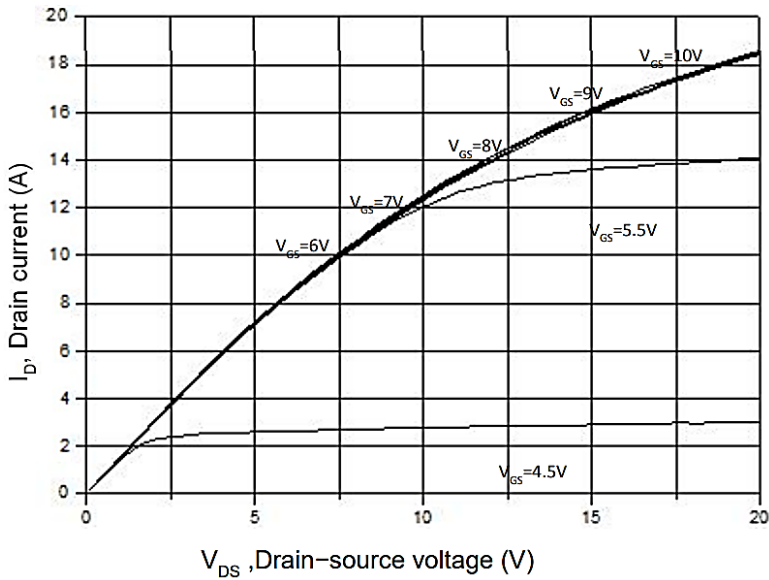
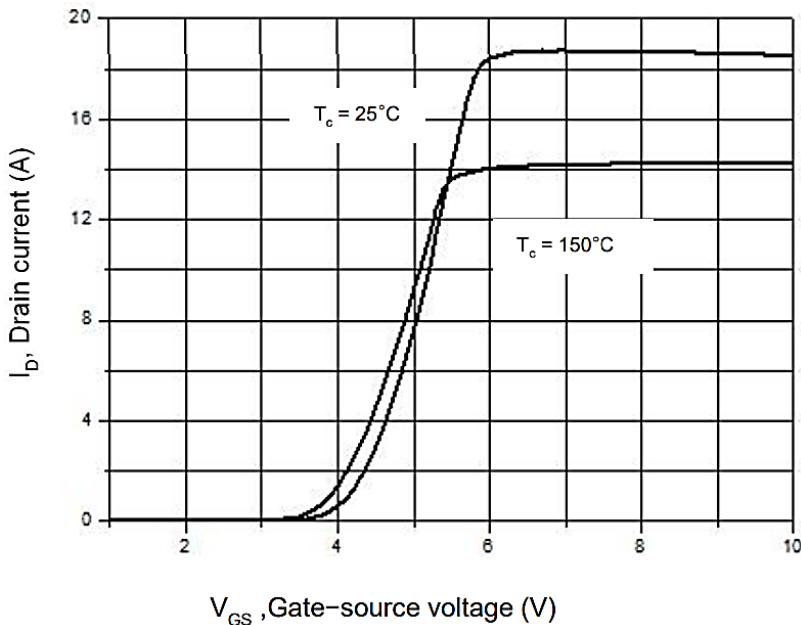


Figure 2. Transfer Characteristics



**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**

**ELECTRICAL CHARACTERISTICS DIAGRAMS (For Reference Only)**

Figure 3. On-Resistance Variation vs. Drain Current

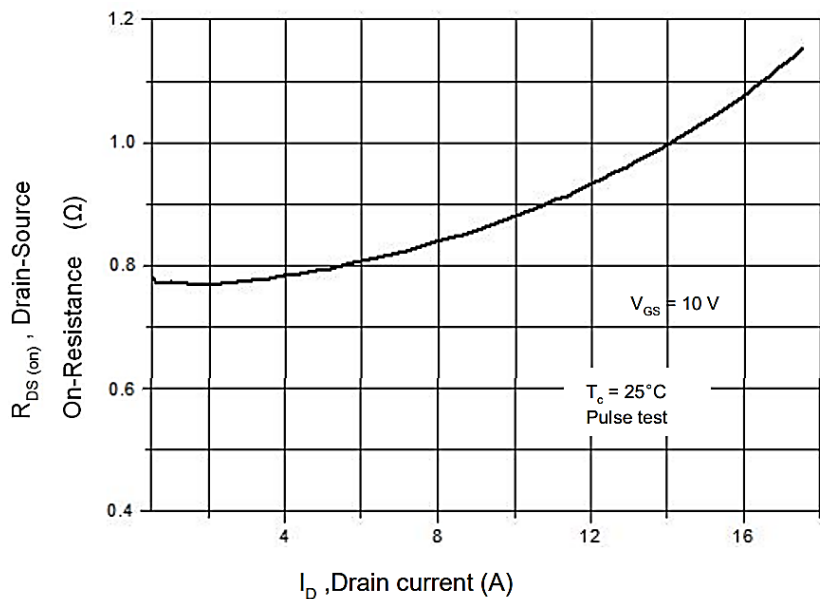
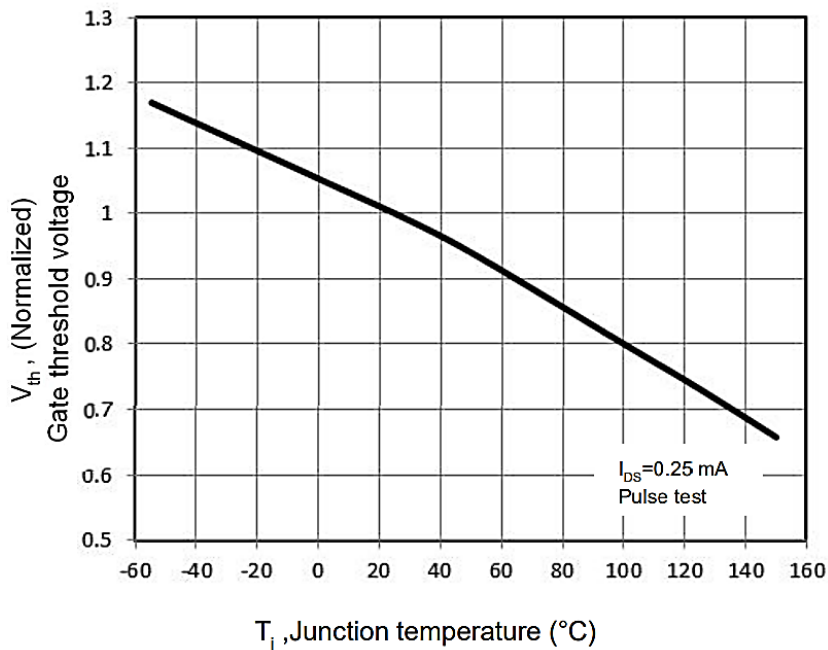


Figure 4. Threshold Voltage vs. Temperature





**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**

**ELECTRICAL CHARACTERISTICS DIAGRAMS (For Reference Only)**

Figure 5. Breakdown Voltage vs. Temperature

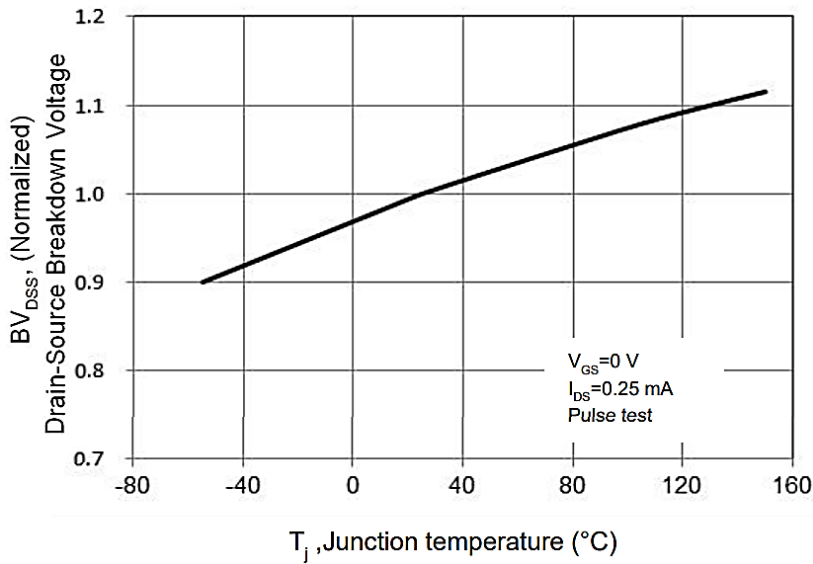
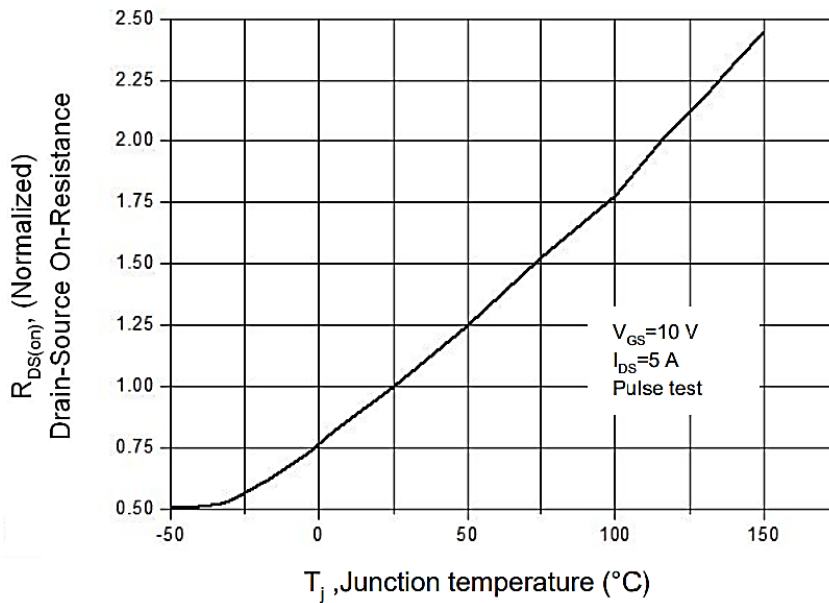


Figure 6. On-Resistance vs. Temperature



**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**

**ELECTRICAL CHARACTERISTICS DIAGRAMS (For Reference Only)**

Figure 7. Capacitance Characteristics

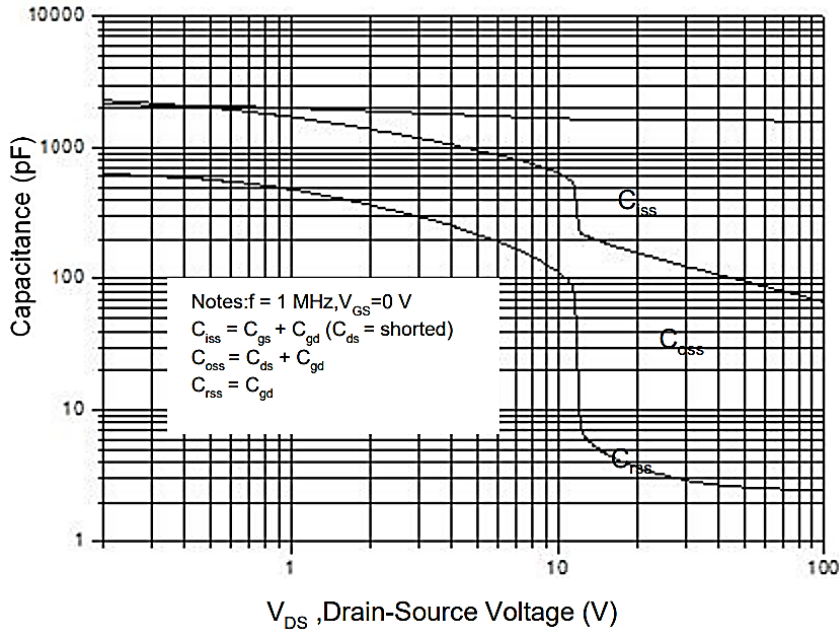
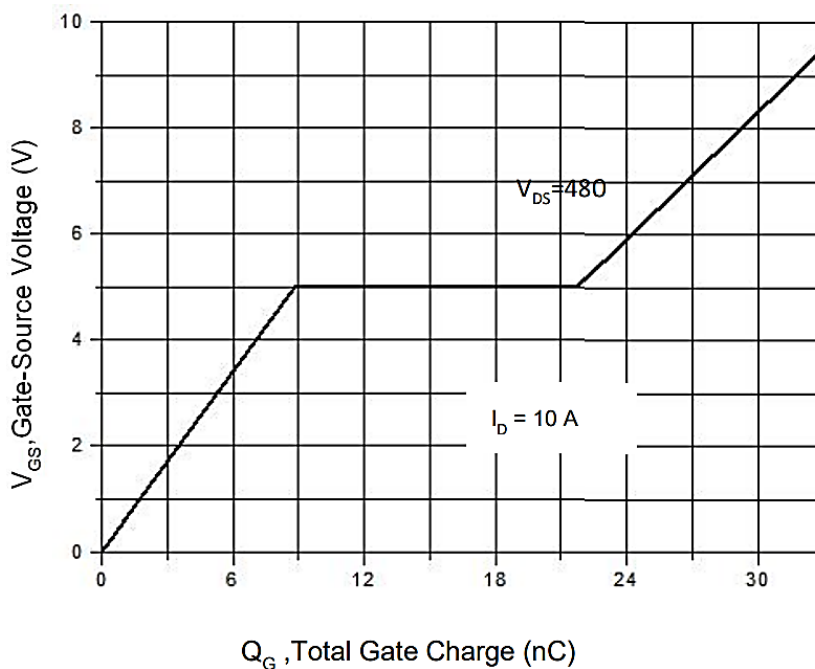


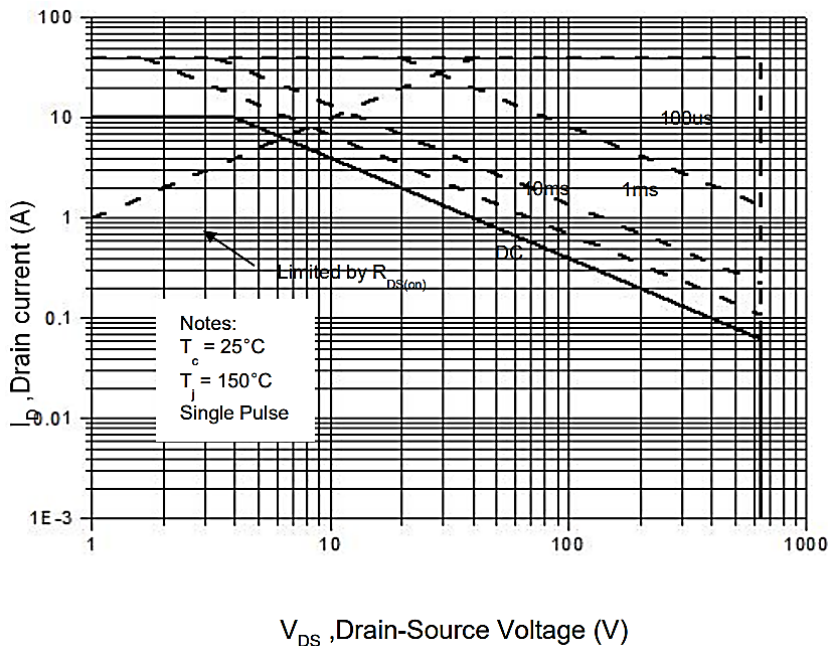
Figure 8. Gate Charge Characterist



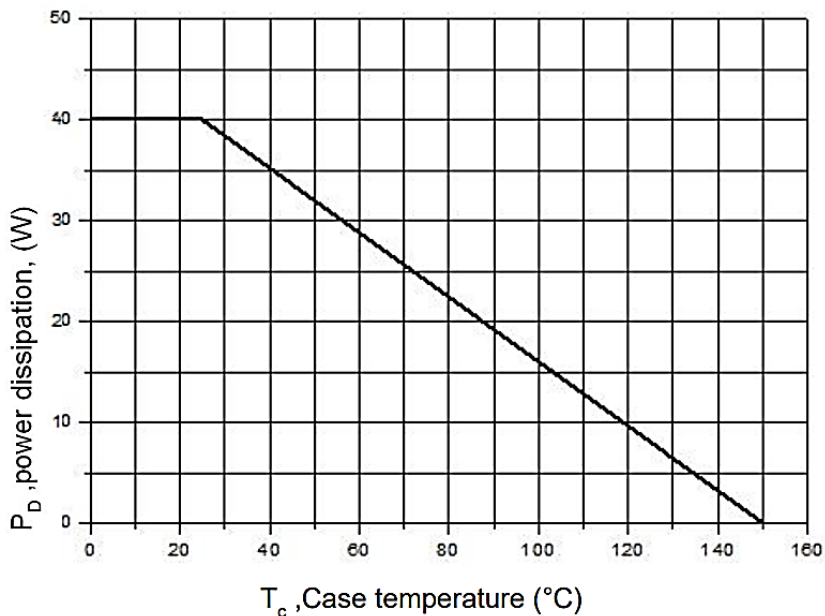
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**ELECTRICAL CHARACTERISTICS DIAGRAMS (For Reference Only)**

**Figure 9. Maximum Safe Operating**



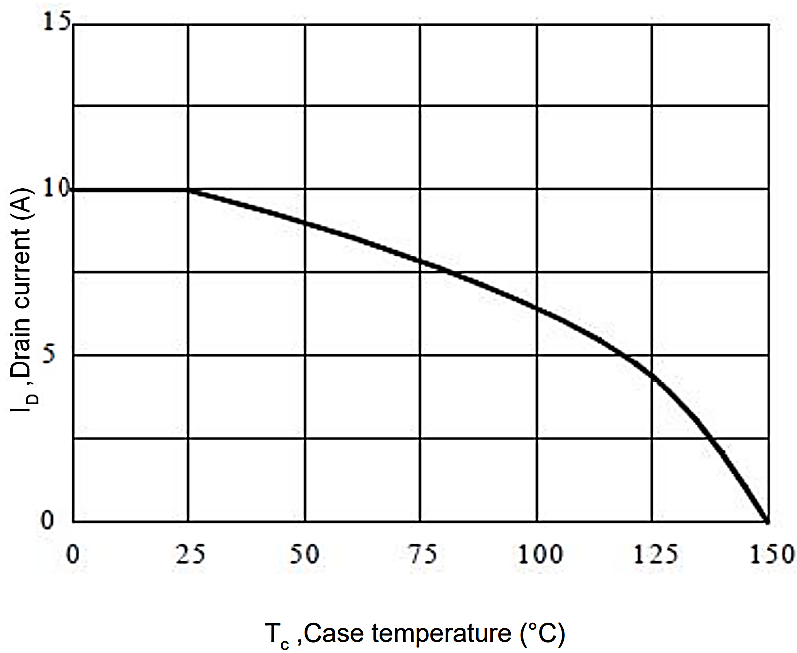
**Figure 10. Power Dissipation vs. Temperature**



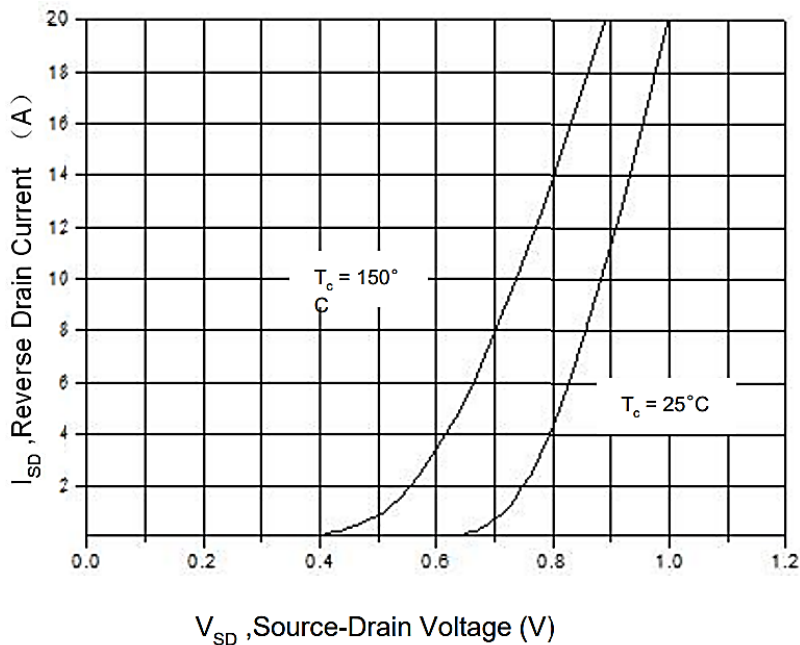
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**ELECTRICAL CHARACTERISTICS DIAGRAMS (For Reference Only)**

**Figure 11. Continuous Drain Current vs. Temperature**



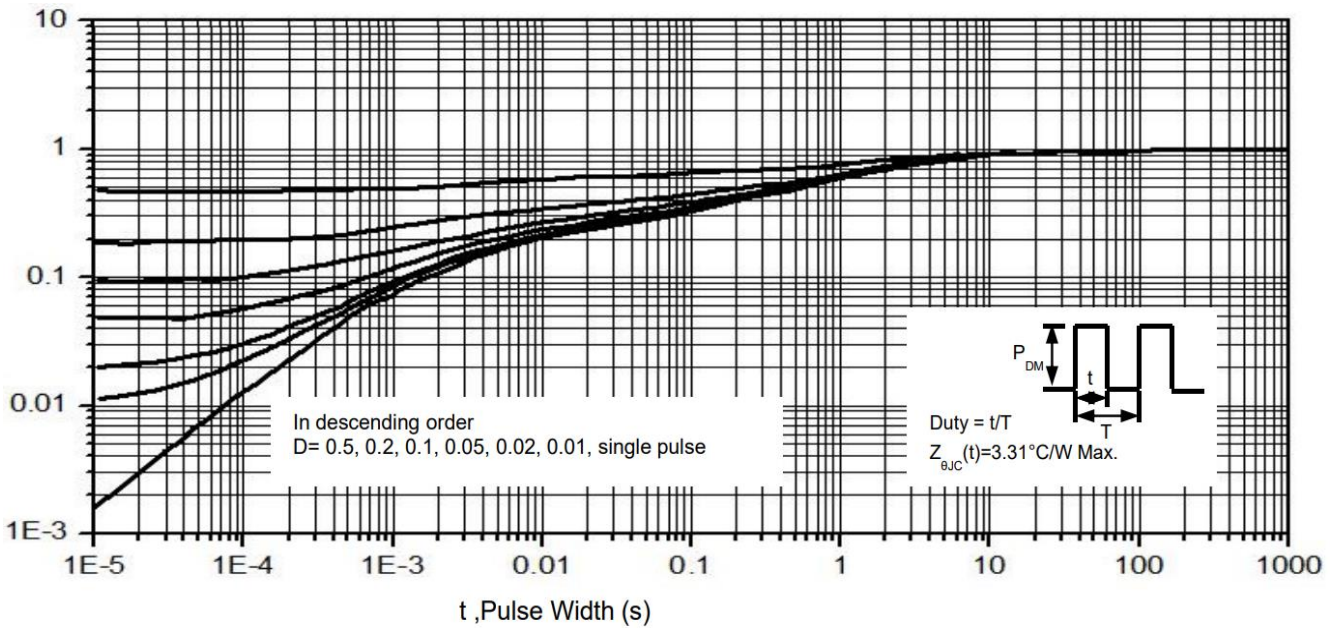
**Figure 12. Body Diode Transfer Characteristics**



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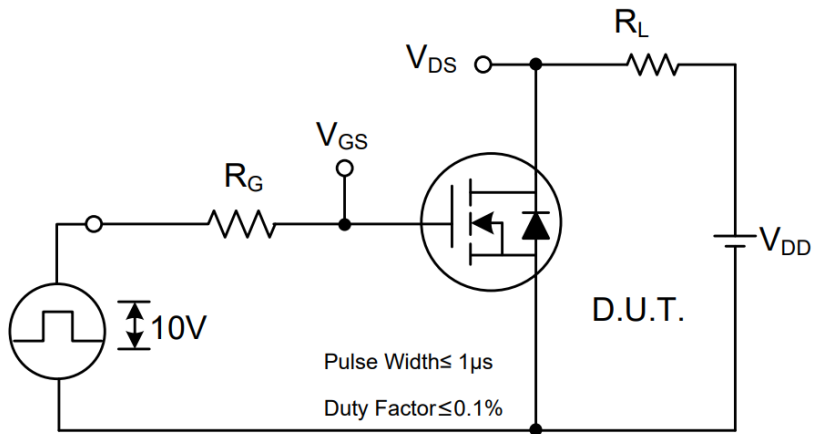
**ELECTRICAL CHARACTERISTICS DIAGRAMS (For Reference Only)**

Figure 13. Transient Thermal Impedance, Junction to Case,

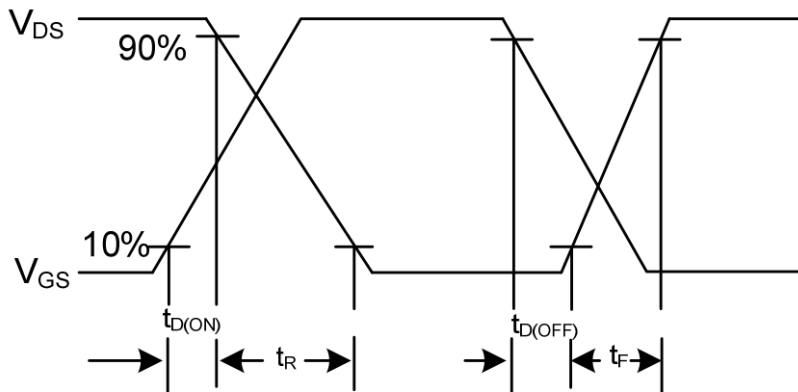


**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**

**TEST CIRCUIT AND WAVEFORMS CURVE (For Reference Only)**



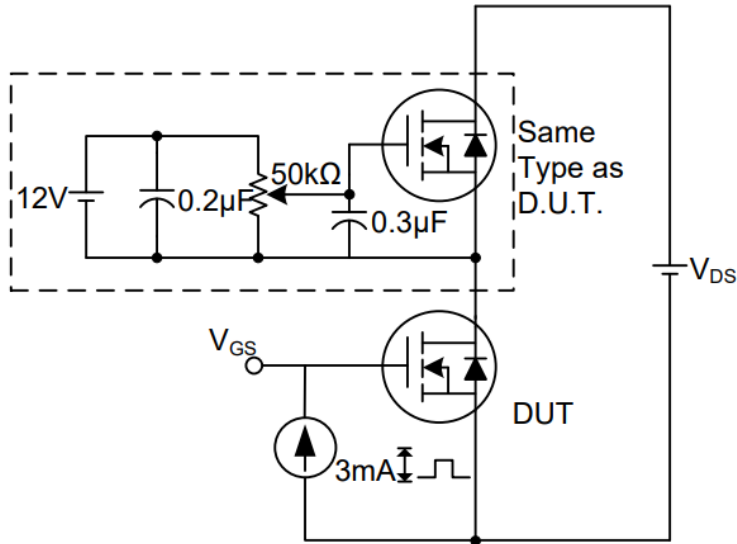
**Switching Test Circuit**



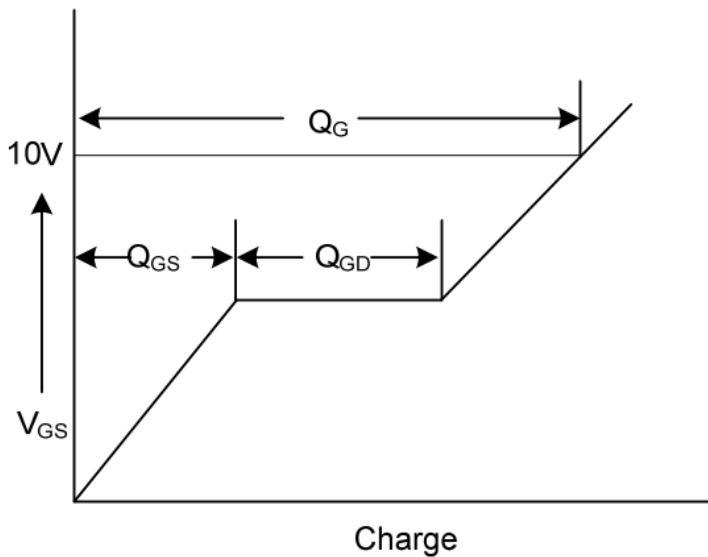
**Switching Waveforms**

**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**

**TEST CIRCUIT AND WAVEFORMS CURVE (For Reference Only)**



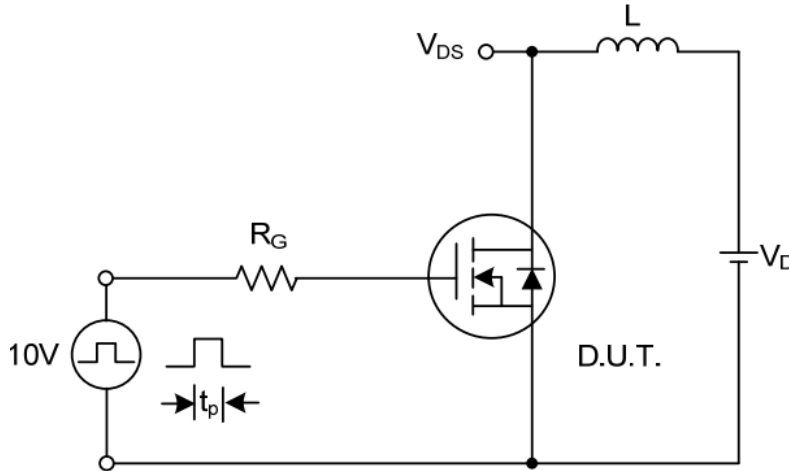
**Gate Charge Test Circuit**



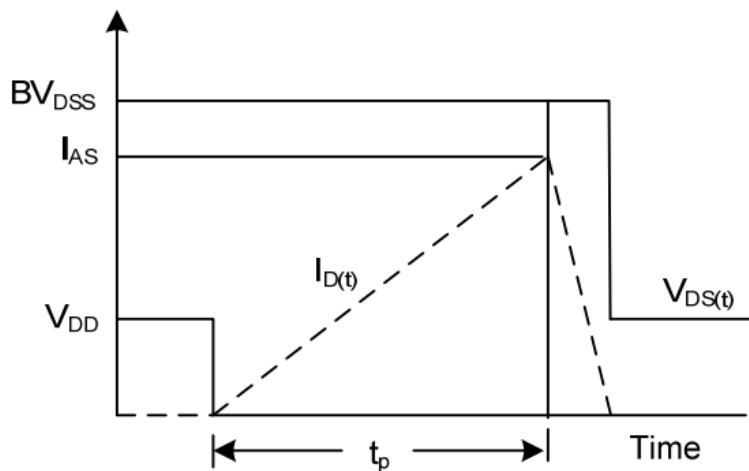
**Gate Charge Waveform**

**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**

**TEST CIRCUIT AND WAVEFORMS CURVE (For Reference Only)**



**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**



**SMD PLASTIC-ENCAPSULATE MOSFETS TO-220F SERIES**

**PACKAGE For Reference**

Case Code	TO- 220F
SPQ/Tube	50 pcs
Qty. /Box	1000 pcs
G.W/Box	6.0 LBS

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7/21/2023

17