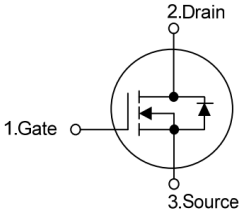
20A, 650V N-CHANNEL POWER MOSFET

Feature

- $R_{DS(on)}$=0.5Ω(Max.) @V_{GS}=10V, I_D=10A
- Fast switching
- Low gate charge
- Low C_{iss}



Applications

- LED Power Supplies
- Cell Phone Charger
- Standby Power

Key Performance and Package Parameters

Order codes	V_{DS}	I_D	$R_{DS(ON)}$, Typ	T_{vjmax}	Marking	Package
XD020M065BX1H3	650V	20A	0.42Ω	150℃	D20M65BX1	TO220F-3L

Absolute Maximum Ratings (T_c= 25℃ unless otherwise noted.)

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	650	V
V_{GSS}	Gate-Source Voltage	±30	V
I_D	Continuous Drain Current (T_C=25℃)	20	A
	Continuous Drain Current (T_C=100℃)	10	A
I_{DM}	Pulsed Drain Current	80	A
P_D	Maximum Power Dissipation (T_C=25℃)	50	W
	Maximum Power Dissipation (T_C=100℃)	20	W
E_{AS}	Avalanche Energy, Single Pulse (Note1)	870	mJ
T_J	Operating Junction Temperature Range	-55 to 150	℃
T_{STG}	Storage Temperature Range	-55 to 150	℃

Thermal Data

Symbol	Parameter	Condition	Max.	Units
$R_{\theta JC}$	Thermal Resistance-Junction to Case (Steady State)	TO-220F-3L	2.5	℃/W

Electrical Characteristics (T_C= 25℃ unless otherwise noted.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}= 0V, I_{DS}= 250uA	650	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V, V_{GS}=0V	---	---	1.0	uA
I_{GSS}	Gate Leakage Current, Forward	V_{GS}=30V, V_{DS}= 0V	---	---	100	nA
	Gate Leakage Current, Reverse	V_{GS}= -30V, V_{DS}= 0V	---	---	-100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}= V_{GS}, I_{DS}= 250uA	2	3	4	V
$R_{DS(ON)}$	Drain-Source On-state Resistance	V_{GS}=10V, I_{DS}=10A	--	0.42	0.5	Ω
Q_g	Total Gate ChargeS	V_{DS}=520V	---	53	---	nC
Q_{gs}	Gate-Source Charge	V_{GS}=10V	---	16	---	nC
Q_{gd}	Gate-Drain Charge	I_{DS}=20A	---	10	---	nC
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=325V, V_{GE}=10V	---	28	---	ns
t_r	Turn-on Rise Time	I_{DS}=20A, R_G=10Ω	--	6	--	ns
$t_{d(off)}$	Turn-off Delay Time			83	---	ns
t_f	Turn-off Fall Time		---	49	---	ns
C_{iss}	Input Capacitance	V_{DS}=25V	---	3352	---	pF
C_{oss}	Output Capacitance	V_{GS}=0V	---	203	---	pF
C_{rss}	Reverse Transfer Capacitance	f = 1MHz	---	28	---	pF

Diode Characteristics (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{SD}	Diode Forward Voltage	I_{SD}=20A, V_{GS}=0V	---	---	1.5	V
t_{rr}	Diode Reverse Recovery Time	V_{DS}=30V, I_{SD}=1A	---	190	---	ns
Q_{rr}	Diode Reverse Recovery Charge	dI_{SD}/dt=100A/μs, (Note2)	---	0.84	---	uC

Notes：

1. L=10mH, V_{DD}=50V, Starting T_J=25℃.
2. Pluse width≤300us, duty cycle≤2%.

Typical Characteristics

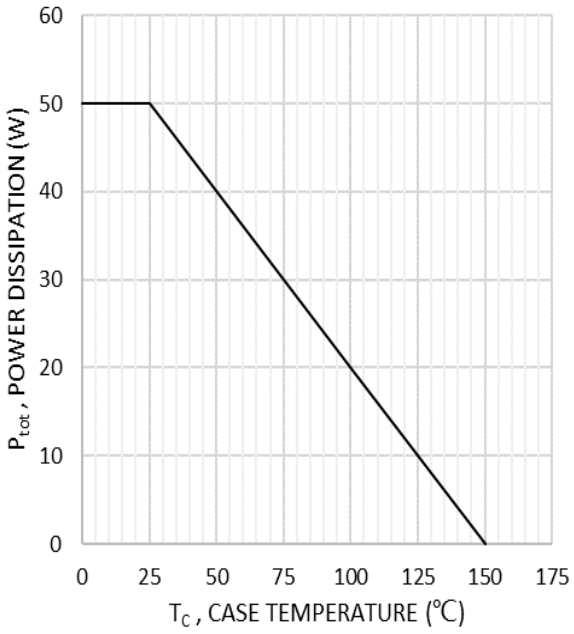


Fig.1 Power Dissipation

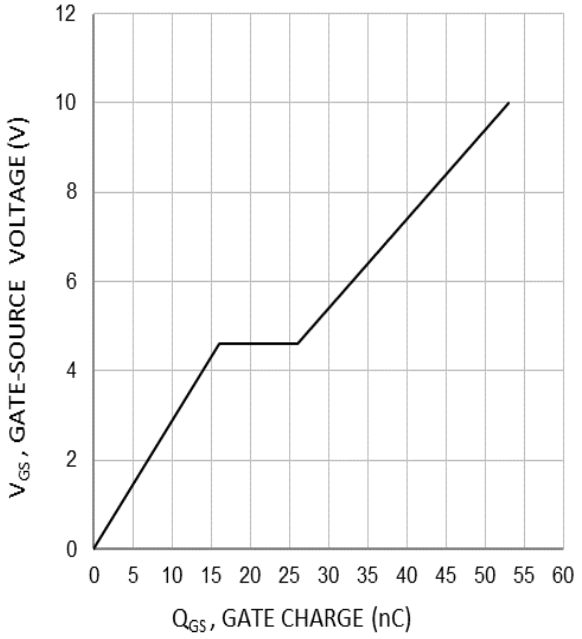


Fig.2 Gate Charge

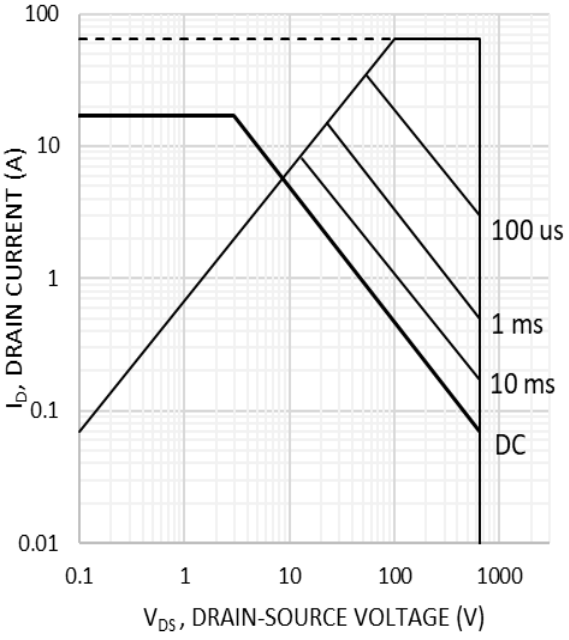


Fig.3 Safe Operation Area

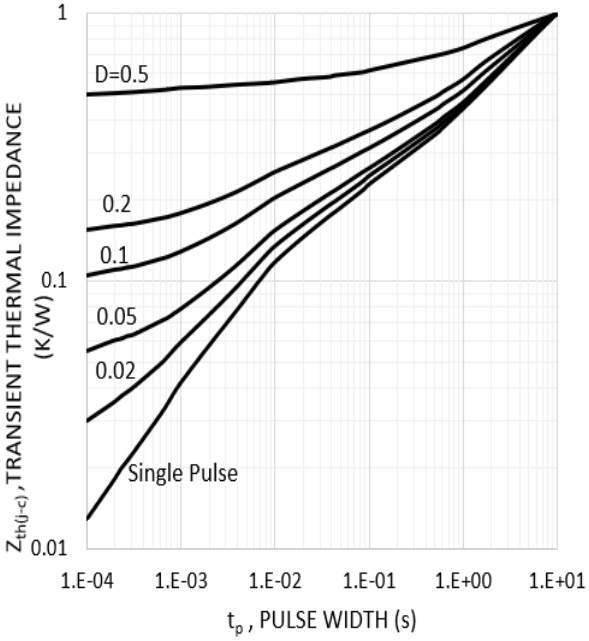


Fig.4 Thermal Transient Impedance

Typical Characteristics

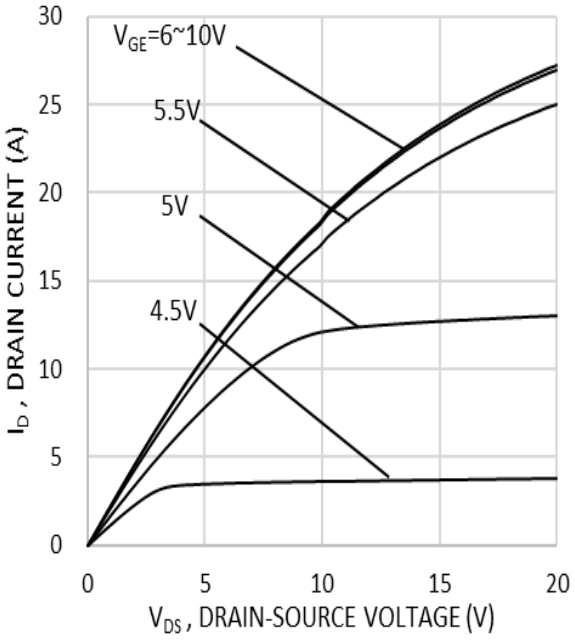


Fig.5 Output Characteristics

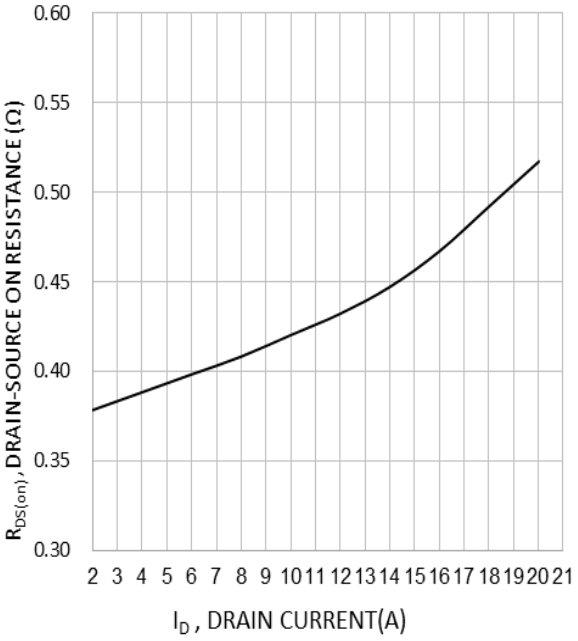


Fig.6 Drain-Source On Resistance

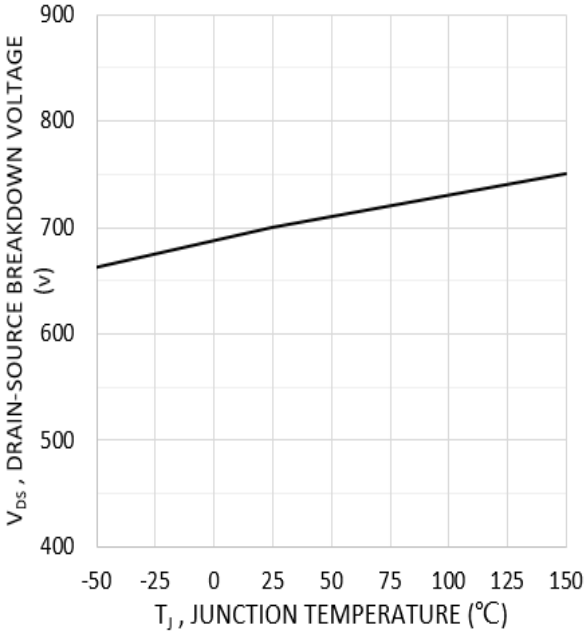


Fig.7 Drain-source Breakdown Voltage

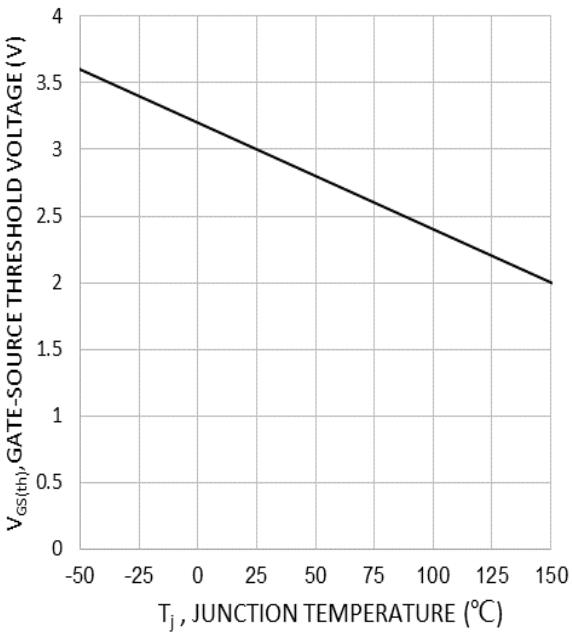


Fig.8 Gate Threshold Voltage

Typical Characteristics

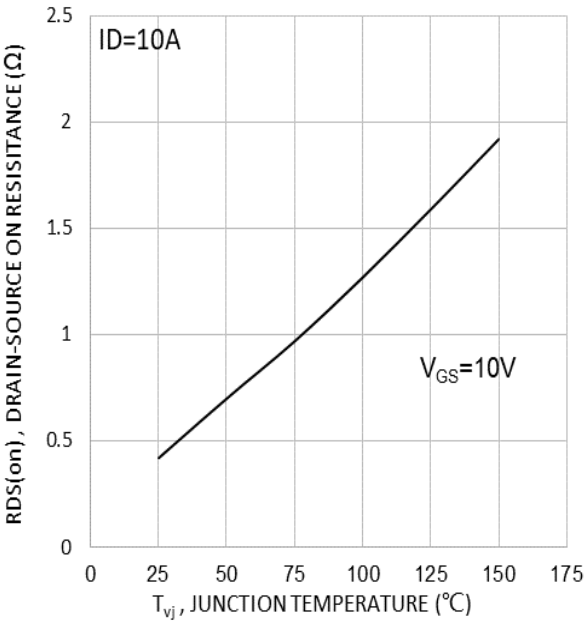


Fig.9 Drain-Source On Resistance

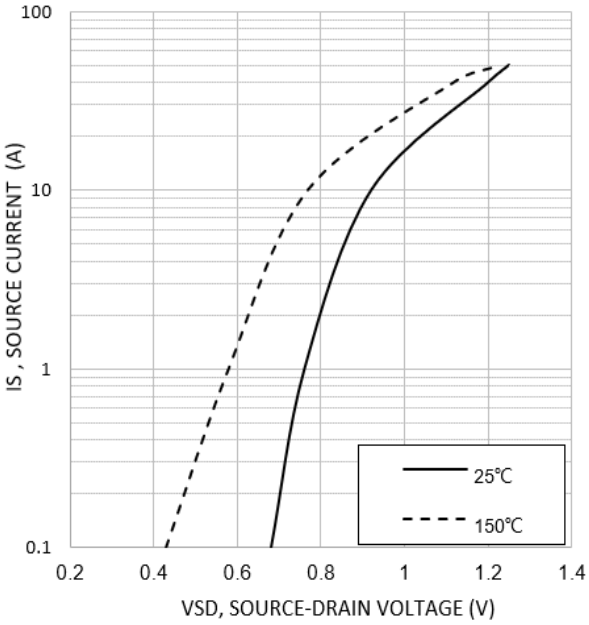


Fig.10 Source-Drain Diode Forward Current

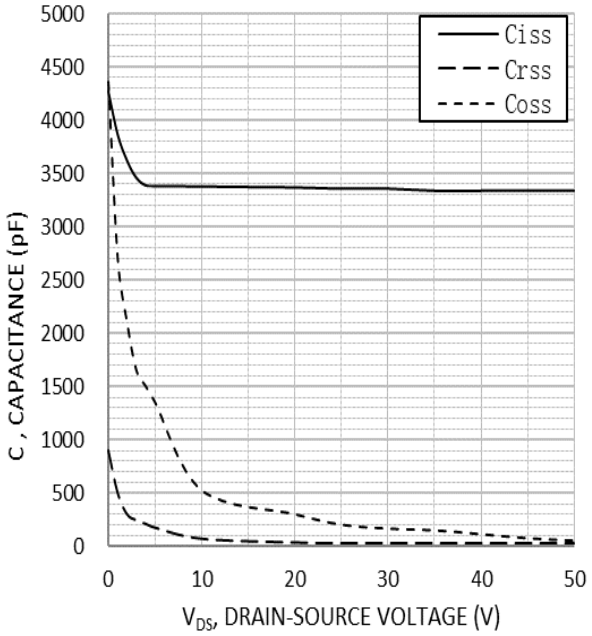
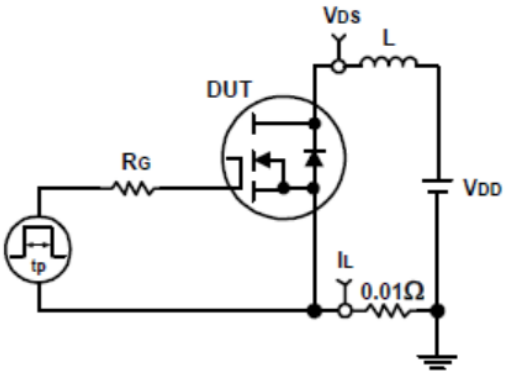
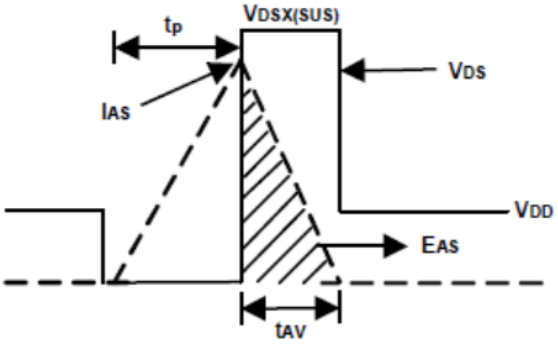


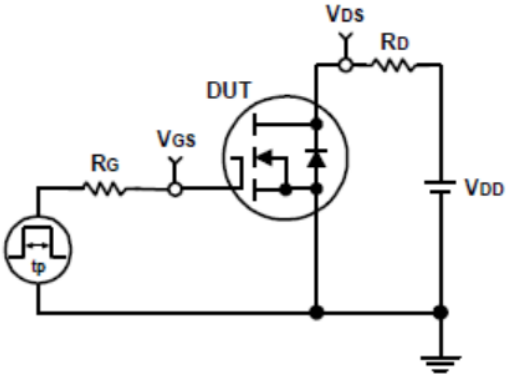
Fig.11 Capacitance

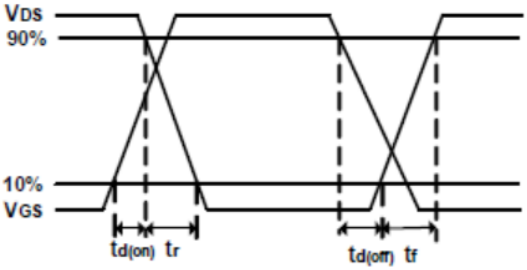
Avalanche Test Circuit and Waveforms





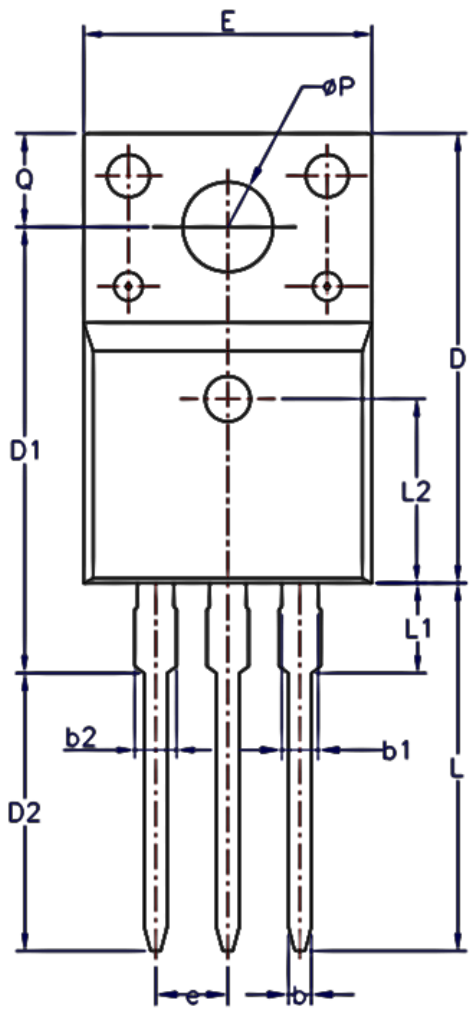
Switching Time Test Circuit and Waveforms

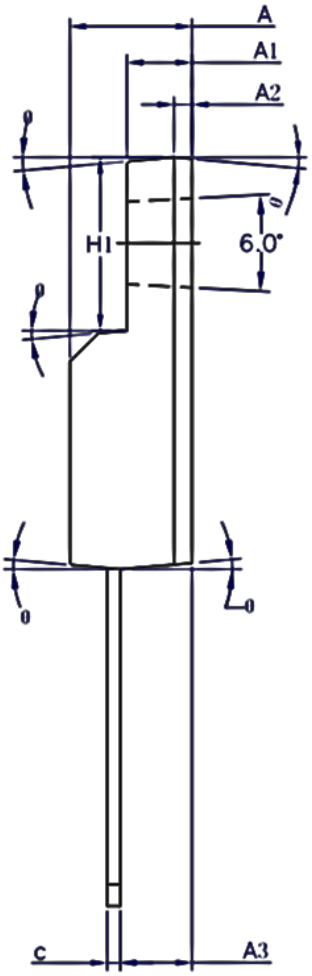


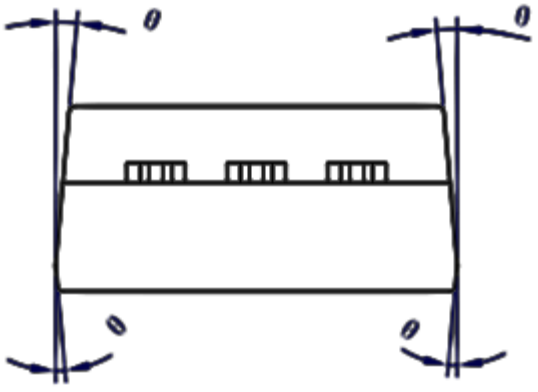


Package Information

TO-220F-3L







SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2		0.70 REF	
A3	2.56	2.76	2.93
b	0.70	–	0.90
b1	1.18	–	1.38
b2	–	–	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	9.60	9.80	10.0
E	9.96	10.16	10.36
e		2.54BSC	
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	–	–	3.50
L2		6.50REF	
øP	3.08	3.18	3.28
Q	3.20	–	3.40
θ1	1°	3°	5°