



5A, 500V N-CHANNEL POWER MOSFET

TO-220F-3L(*Prefix :F)

Description

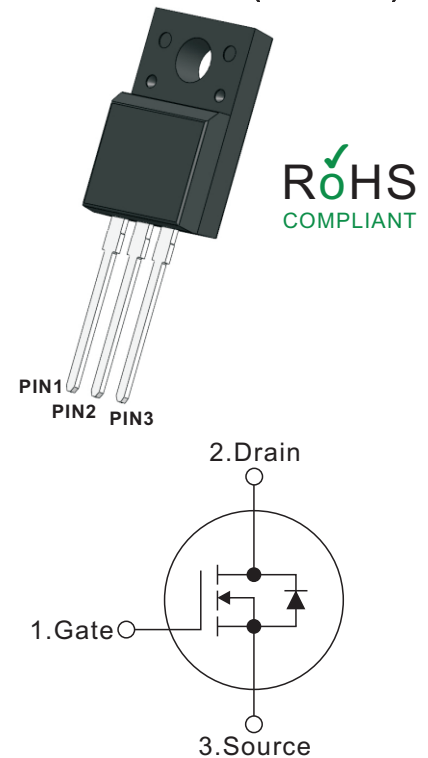
The F5N50L is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in switching power supplies and adaptors.

Features

- $R_{DS(ON)} < 1.6 \Omega$ @ $V_{GS}=10V$, $I_D=2.5A$
- Fast switching capability
- 100% Avalanche tested
- 100% ΔV_{DS} tested

Mechanical data

- Case: TO-220F-3L
- Approx. Weight: 1.77g (0.062oz)
- Lead free finish, RoHS compliant
- Case Material: "Green" molding compound, UL flammability classification 94V-0, "Halogen-free".



ABSOLUTE MAXIMUM RATINGS (TA=25°C, unless otherwise specified)

PARAMETER	Symbols	RATINGS	Units
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current $T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$	I_D	5 3.2	A
Pulsed Drain Current (Note 2)	I_{DM}	20	A
Avalanche Energy Single Pulsed (Note 3)	E_{AS}	112	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	2.1	V/ns
Power Dissipation ($T_c = 25^\circ\text{C}$)	P_D	45	W
Operating junction and storage temperature	T_j, T_{stg}	-55 ~ +150	$^\circ\text{C}$

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

3. $L = 25\text{mH}$, $I_{AS} = 3\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $ISD \leq 10\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DS}$, Starting $T_J = 25^\circ\text{C}$

Thermal Resistance

PARAMETER	Symbols	RATINGS	Units
Thermal resistance, junction – case.	R_{thJC}	4	$^\circ\text{C}/\text{W}$
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	63	$^\circ\text{C}/\text{W}$



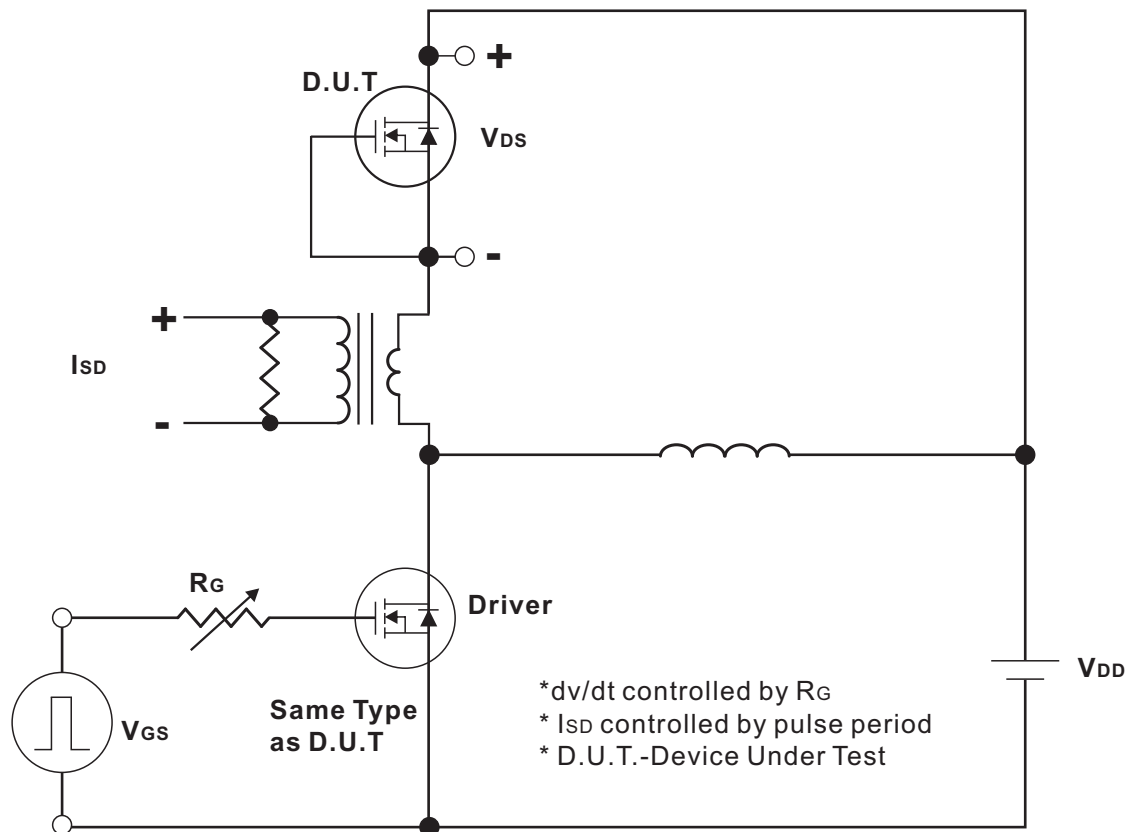
ELECTRICAL CHARACTERISTICS (TA=25°C, unless otherwise specified)

PARAMETER		Symbols	TEST CONDITIONS	Min	Typ	Max	Units
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V,I _D =250uA	500			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =500V,V _{GS} =0V			1.0	uA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V,V _{DS} =0V			100	nA
	Reverse		V _{GS} =-30V,V _{DS} =0V			-100	
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} ,I _D =250uA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V,I _D =2.5A		1.3	1.6	Ω
Forward Transconductance		g _{FS}	V _{DS} =15V,I _D =2.5A		3.3		S
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz		564		pF
Output Capacitance		C _{OSS}			66		pF
Reverse Transfer Capacitance		C _{RSS}			12		pF
Gate resistance		R _G			2.1		Ω
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =400V,V _{GS} =10V, I _D =5A,I _G =1mA (NOTE1,2)		17		nC
Gate-Source Charge		Q _{GS}			4		nC
Gate-Drain Charge		Q _{GD}			8		nC
Turn-On Delay Time (Note 1)		t _{D(ON)}	V _{DS} =250V,V _{GS} =10V, I _D =5A,R _G =25Ω (NOTE1,2)		11		ns
Turn-On Rise Time		t _R			28		ns
Turn-Off Delay Time		t _{D(OFF)}			36		ns
Turn-Off Fall Time		t _F			26		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Body-Diode Continuous Current		I _S				5	A
Maximum Body-Diode Pulsed Current		I _{SM}				20	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _{SD} =5A,V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)		trr	I _F =5A,V _{GS} =0V		319		ns
Reverse Recovery Charge		Q _{rr}	di/dt=100A/us		3.9		uC

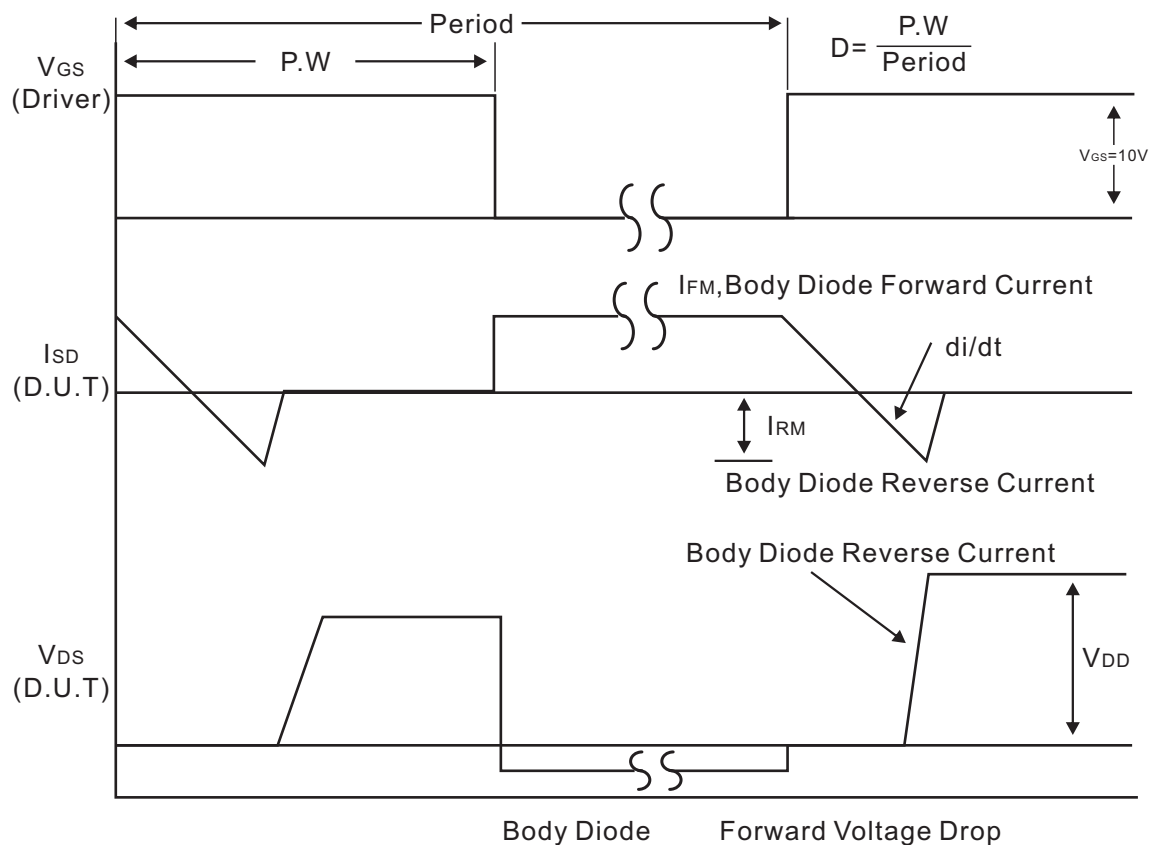
Notes:

1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.

Test Circuits and waveforms



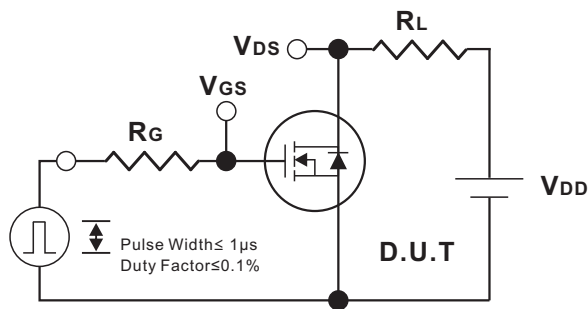
Peak Diode Recovery dv/dt Test Circuit



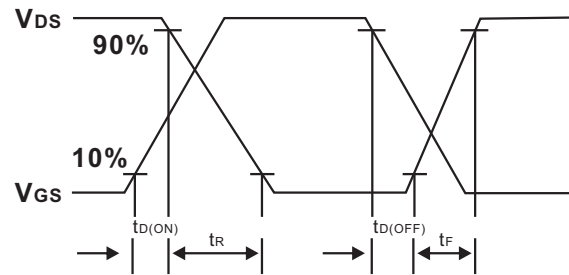
Peak Diode Recovery dv/dt Waveforms



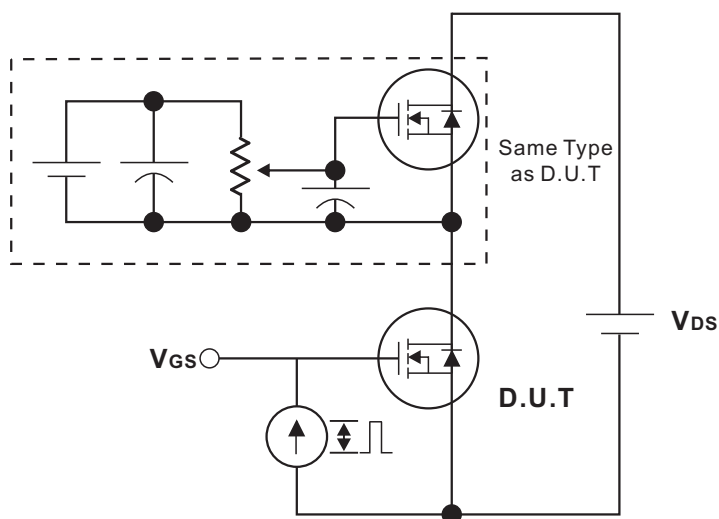
Test Circuits and waveforms



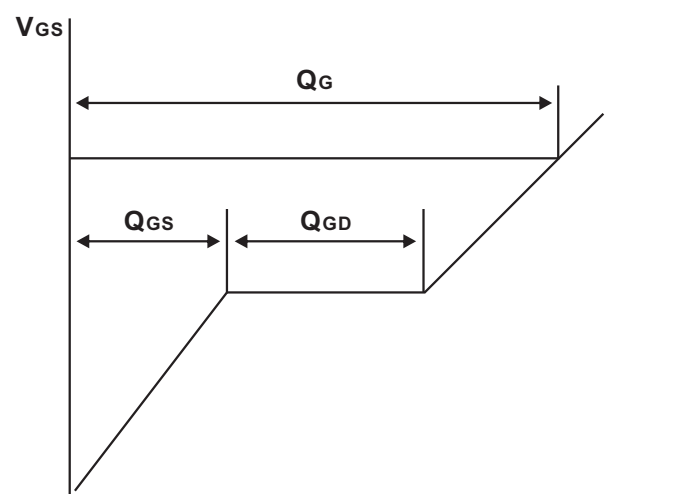
Switching Test Circuit



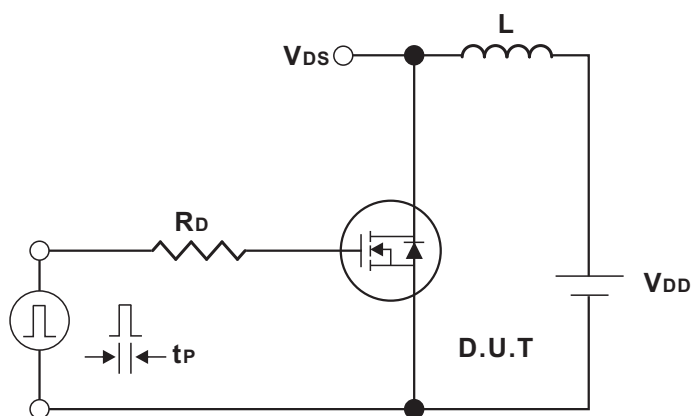
Switching Waveforms



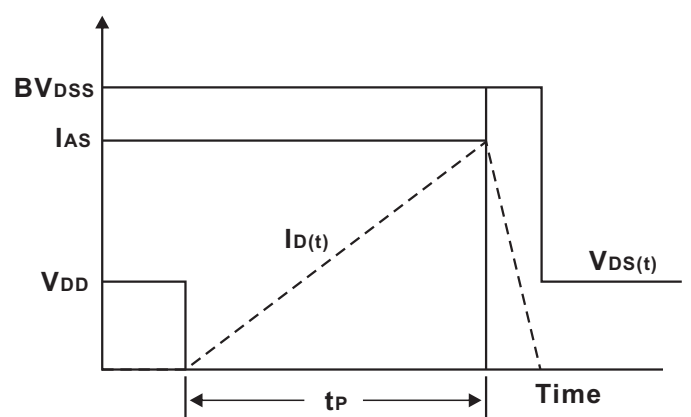
Gate Charge Test Circuit



Charge
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



Typical Characteristics

Fig.1 Output characteristics

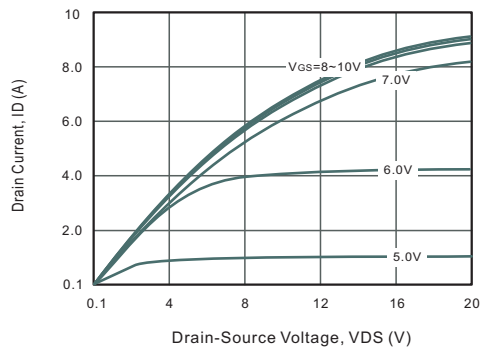


Fig.2 Drain-Source On-Resistance vs. Drain Current

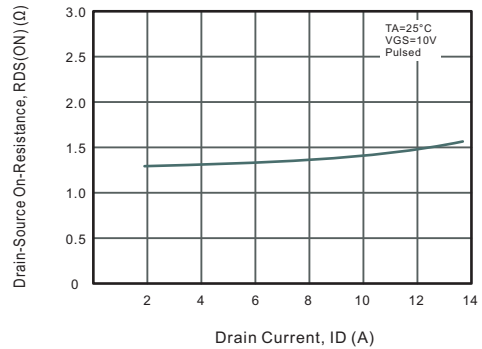


Fig.3 Power Dissipation

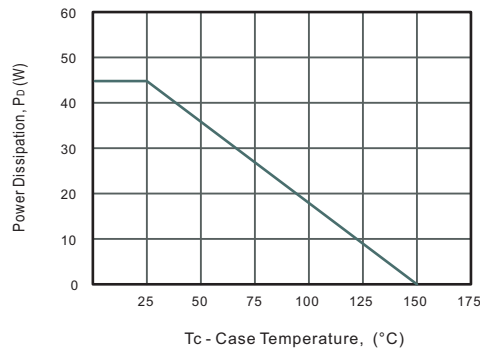


Fig.4 Capacitance Characteristics

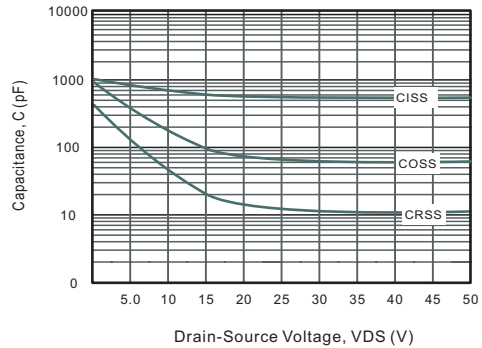


Fig.5 Drain-Source On-Resistance vs. Junction Temperature

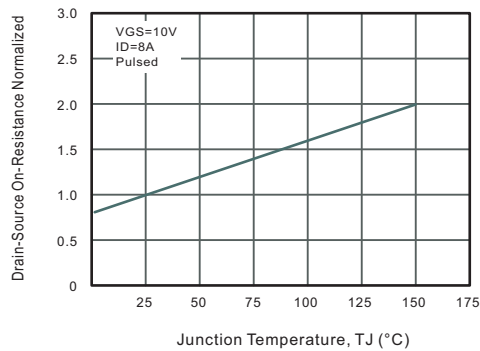


Fig.6 Breakdown Voltage vs. Junction Temperature

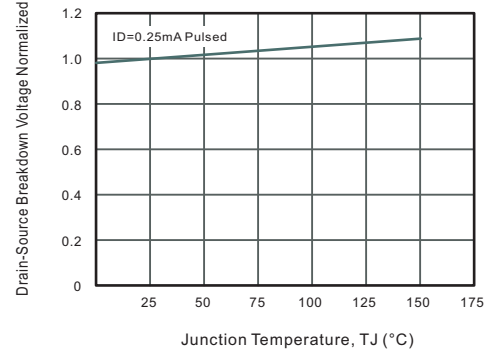


Fig.7 Gate Threshold Voltage vs. Junction Temperature

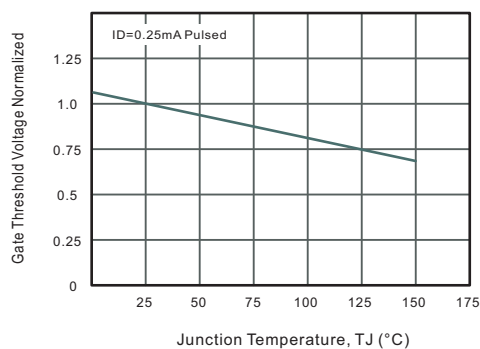
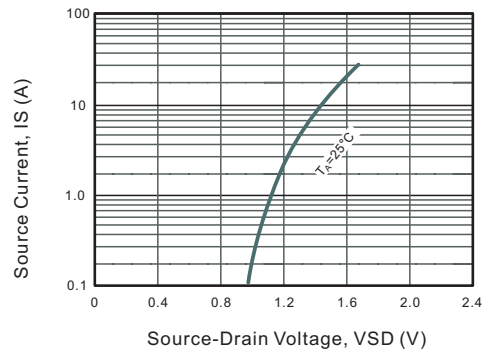


Fig.8 Source Current vs. Source-Drain Voltage





Typical Characteristics

Fig.9 Safe Operating Area

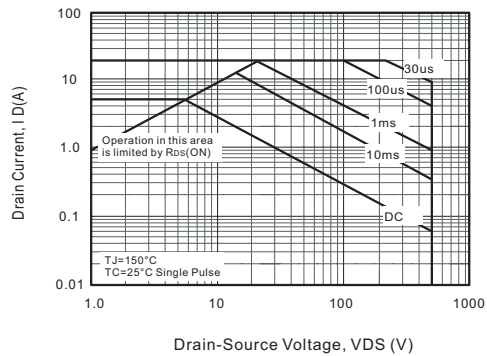


Fig.10 Drain Current Derating

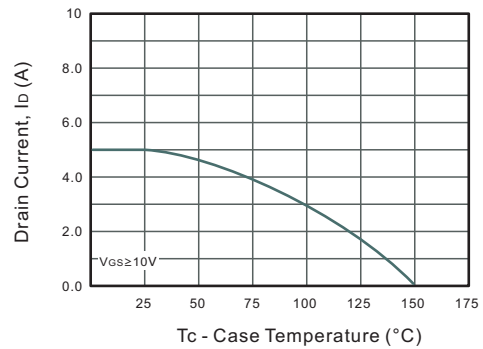


Fig.11 Gate Charge Characteristics

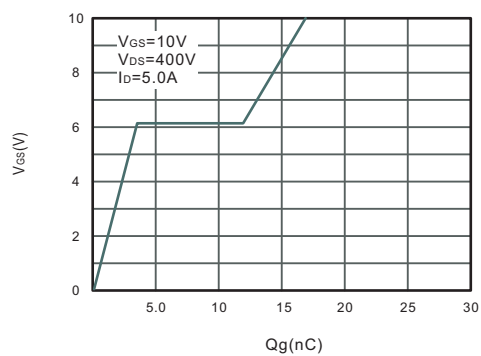
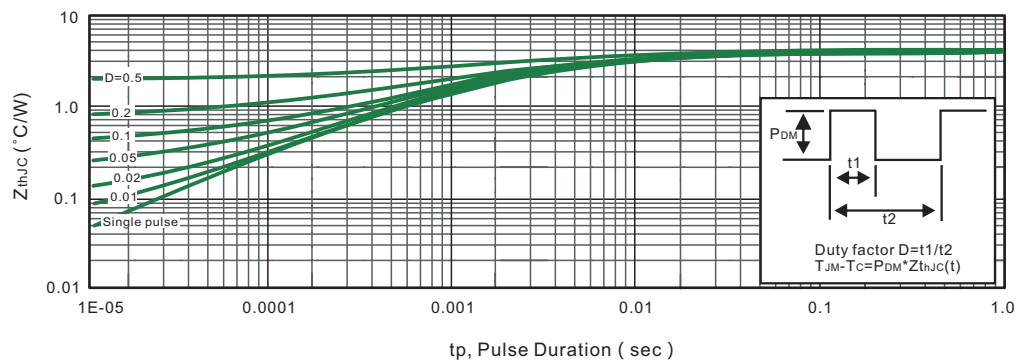


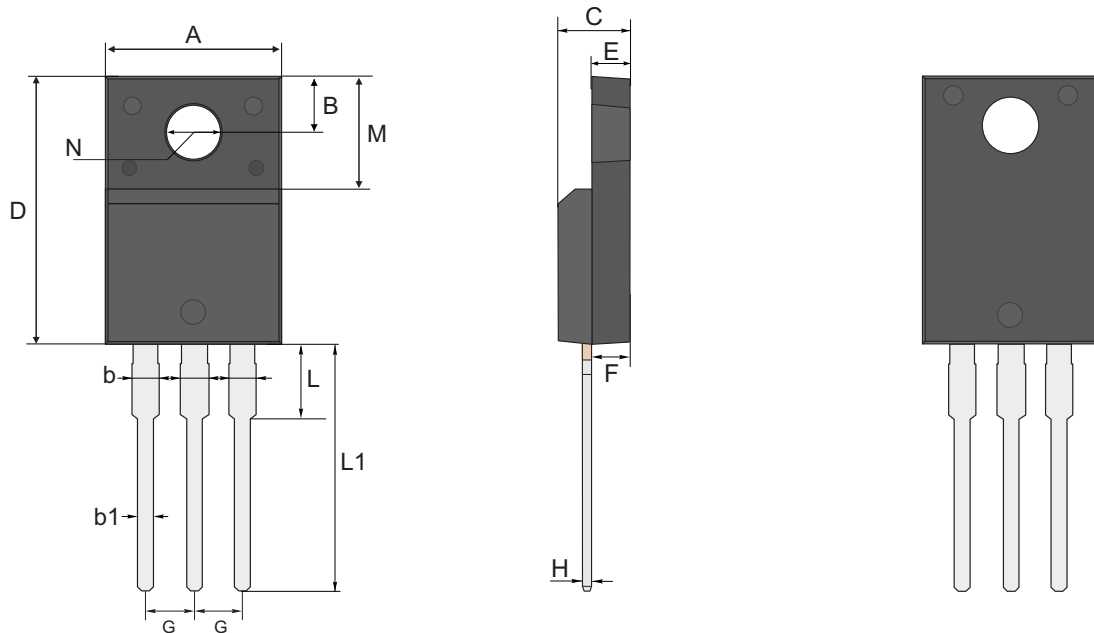
Fig.12 Max. Transient Thermal Impedance





Package Outline
Through Hole Package ; 3 leads

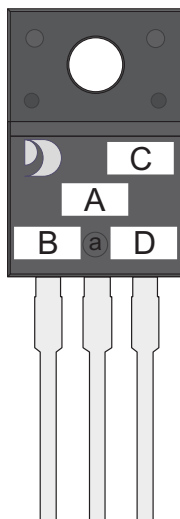
TO-220F-3L



TO-220F-3L Mechanical data

UNIT		A	B	b	b1	C	D	E	F	G	H	L	L1	M	N
mm	max	10.28	3.37	1.44	0.9	4.9	16.07	2.74	2.74	2.64	0.6	3.38	13.7	6.98	3.18 typ.
	typ	10.18	3.27	1.34	0.8	4.7	15.87	2.54	2.54	2.54	0.5	3.18	13.5	6.68	
	min	10.08	3.17	1.24	0.7	4.5	15.67	2.34	2.34	2.44	0.4	2.98	13.3	6.38	
mil	max	405	133	57	35	193	633	108	108	104	24	133	539	275	125 typ.
	typ	401	129	53	31	185	625	100	100	100	20	125	531	263	
	min	397	125	49	28	177	617	92	92	96	16	117	524	251	

Marking Diagram



- Unmarkable Surfacea
- Marking Composition Field
- a: Ejector Pin Mark
- A: Marking Area
- B: Lot Code
- C: Additional Information
- D: Date Code (YWW)
- Y: Years(0~9)
- WW: Week



Important Notice and Disclaimer

Jingdao Microelectronics reserves the right to make changes to this document and its products and specifications at any time without notice. Customers should obtain and confirm the latest product information and specifications before final design, purchase or use.

Jingdao Microelectronics makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, not does Jingdao Microelectronics assume any liability for application assistance or customer product design.

Jingdao Microelectronics does not warrant or accept any liability with products which are purchased or used for any unintended or unauthorized application.

No license is granted by implication or otherwise under any intellectual property rights of Jingdao Microelectronics.

Jingdao Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of Jingdao Microelectronics.