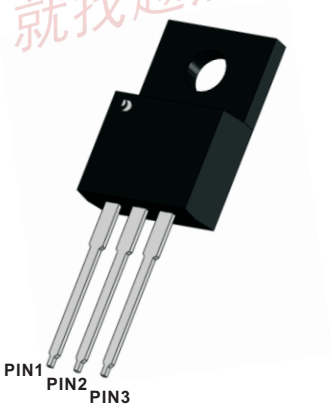
12A, 650V N-CHANNEL POWER MOSFET

ITO-220ABW



DESCRIPTION

The F12N65 is a high voltage power MOSFET combines advanced trench MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications of switching power supplies and adaptors.

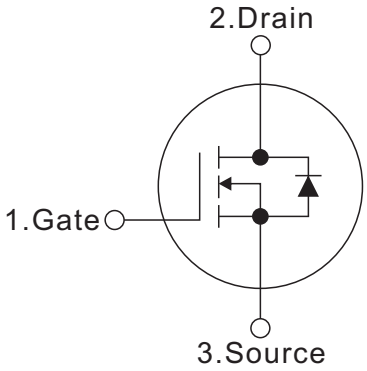
Features

- $R_{DS(ON)} \leq 0.85\ \Omega$ @ V_{GS}=10V, I_D=6.0A
- Fast switching capability
- Avalanche energy tested
- Improved dv/dt capability, high ruggedness

Mechanical data

- Case: ITO-220ABW
- Approx. Weight: 2.1g (0.07oz)
- Lead free finish, RoHS compliant
- Case Material: “Green” molding compound, UL flammability classification 94V-0,“Halogen-free”.

SYMBOL



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

PARAMETER	Symbols	RATINGS	Units
Drain-Source Voltage	V_{DSS}	650	V
Gate-Source Voltage	V_{GSS}	±30	V
Continuous Drain Current	I_D	12	A
Pulsed Drain Current (Note 2)	I_{DM}	24	A
Avalanche Energy Single Pulsed (Note 3)	E_{AS}	576	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	2.4	V/ns
Power Dissipation	P_D	40	W
Operation Junction Temperature and Storage Temperature	T_j,T_{stg}	-55 ~ +150	°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 = 30mH, IAS = 6.2A, VDD = 50V, RG = 25 Ω, Starting TJ = 25°C
4. ISD ≤ 12A, di/dt ≤200A/μs, VDD ≤ BVDSS, Starting TJ = 25°C

THERMAL DATA

PARAMETER	Symbols	RATINGS	Units
Junction to Ambient	R_{thJA}	63	V
Junction to Case	R_{thJC}	4	V

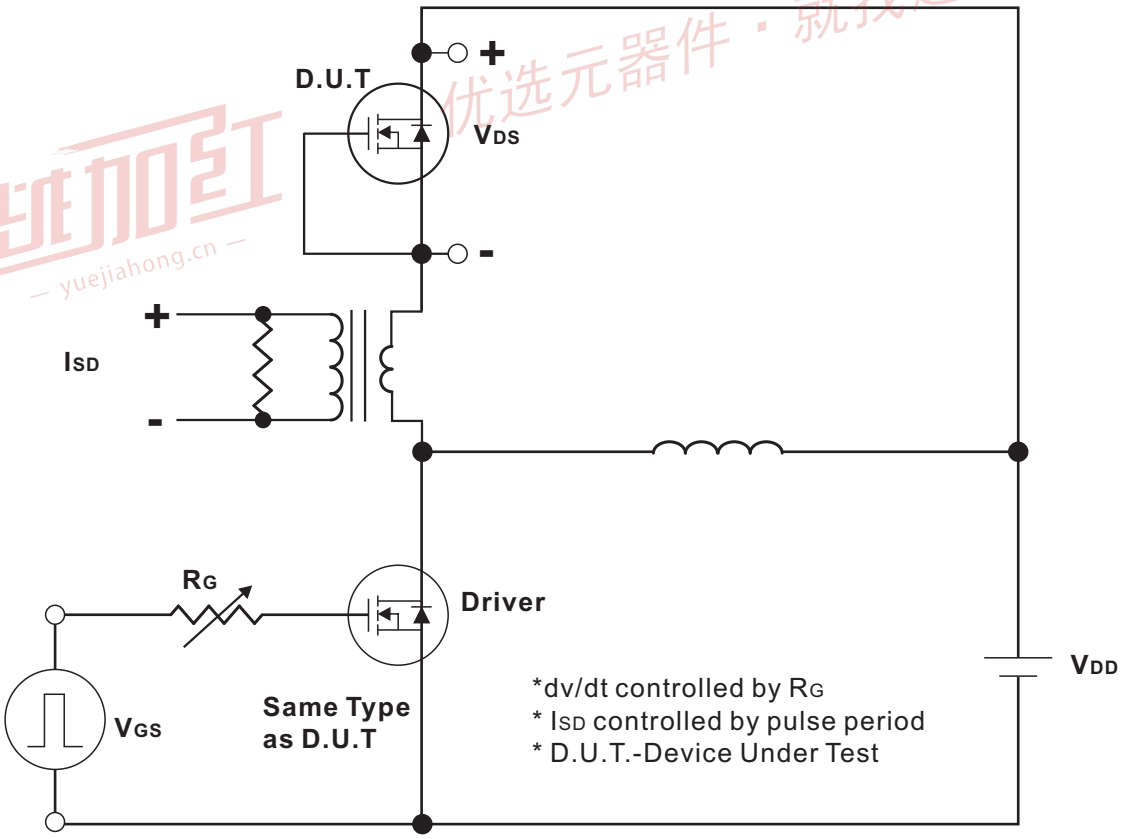
Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

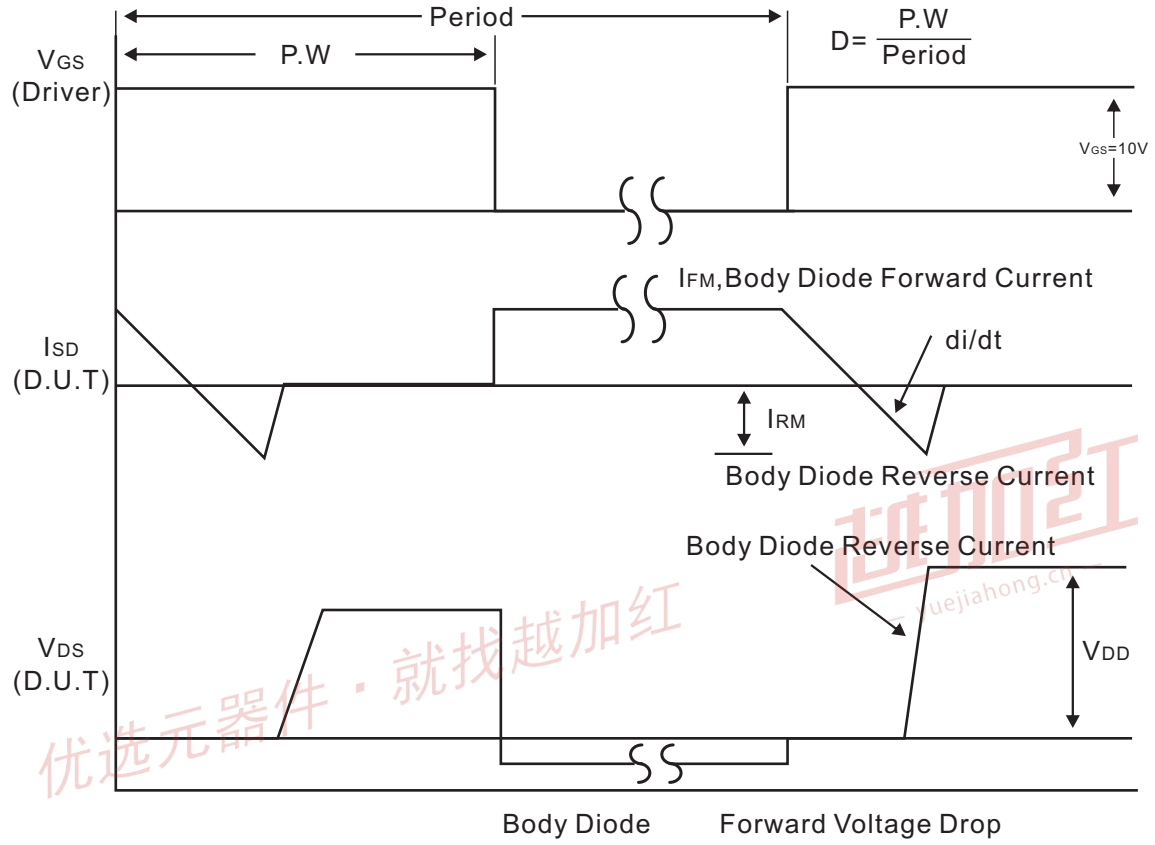
PARAMETER		Symbols	TEST CONDITIONS	Min	Typ	Max	Units
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{DS}=0V,I_D=250uA	650			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=650V,V_{GS}=0V			10	uA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=30V,V_{DS}=0V			100	nA
	Reverse		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=6.0A			0.85	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS}=25V,		2000		pF
Output Capacitance		C_{OSS}	V_{GS}=0V,		160		pF
Reverse Transfer Capacitance		C_{RSS}	f=1.0MHz		5		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=520V,V_{GS}=10V,		36		nC
Gate-Source Charge		Q_{GS}	I_D=12A,I_G=1mA		8.6		nC
Gate-Drain Charge		Q_{GD}	(NOTE1,2)		10		nC
Turn-On Delay Time (Note 1)		$t_{D(ON)}$	V_{DS}=100V,V_{GS}=10V,		22		ns
Turn-On Rise Time		t_R	I_D=12A,R_G=25Ω		23		ns
Turn-Off Delay Time		$t_{D(OFF)}$	(NOTE1,2)		115		ns
Turn-Off Fall Time		t_F			32		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Body-Diode Continuous Current		I_S				12	A
Maximum Body-Diode Pulsed Current		I_{SM}				24	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=12A,V_{GS}=0V			1.4	V
Reverse Recovery Time (Note 1)		trr	I_S=12A,V_{GS}=0V,		470		ns
Reverse Recovery Charge		Qrr	di/dt=100A/us		12		uC

Notes:
1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

Test Circuits and waveforms

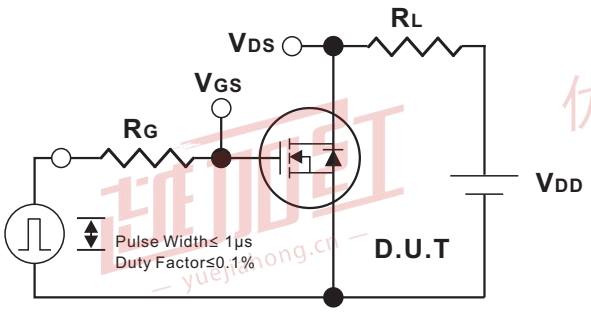


Peak Diode Recovery dv/dt Test Circuit

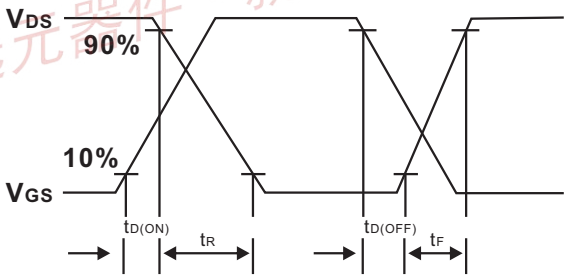


Peak Diode Recovery dv/dt Waveforms

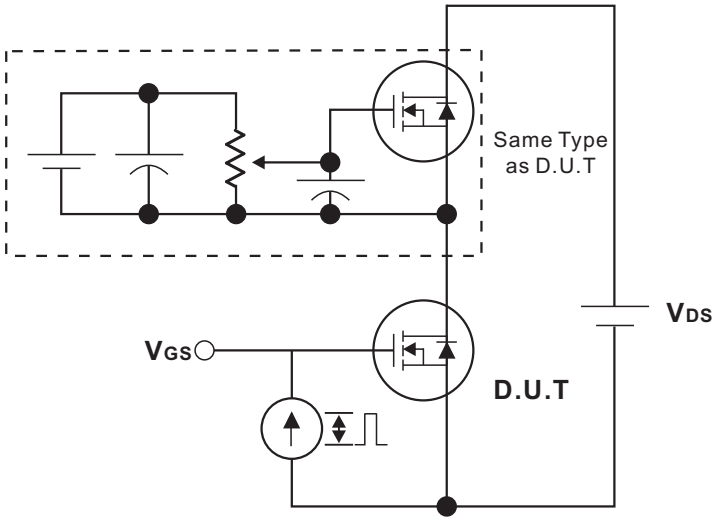
Test Circuits and waveforms



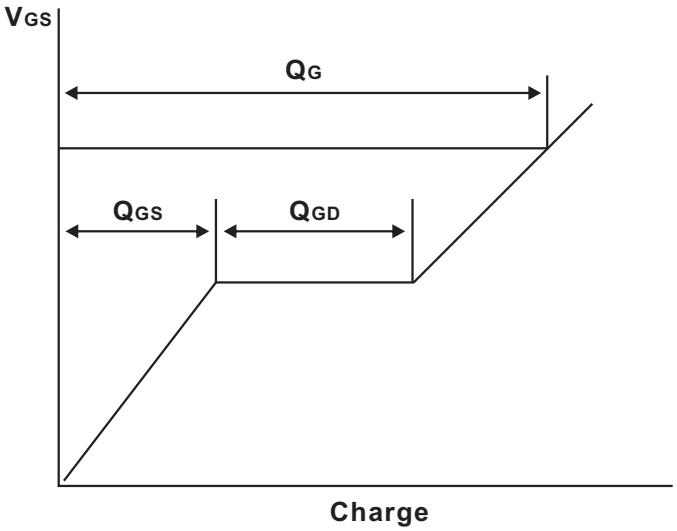
Switching Test Circuit



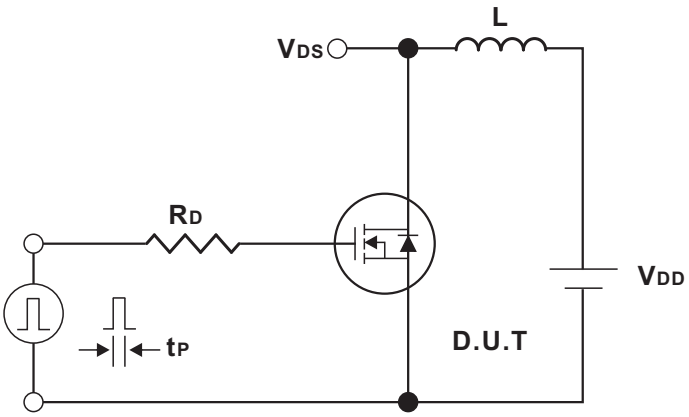
Switching Waveforms



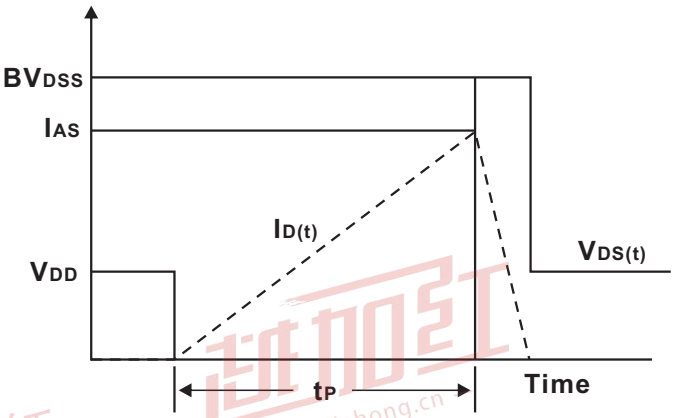
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

Typical Characteristics

Fig.1 Drain Current vs. Gate-Source Voltage

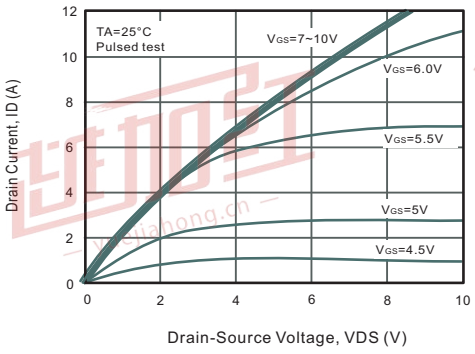


Fig.2 Drain-Source On-Resistance vs. Gate-Source Voltage

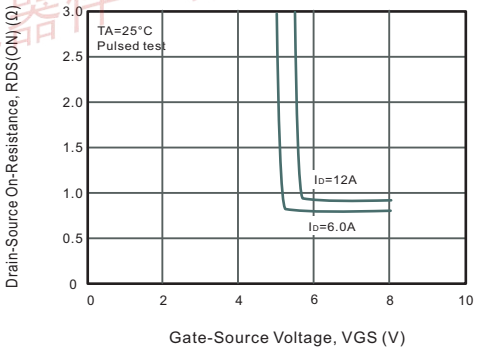


Fig.3 Gate Charge Characteristics

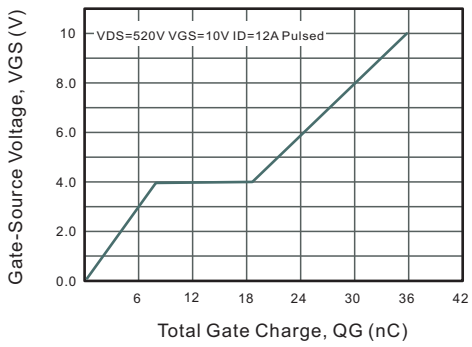


Fig.4 Capacitance Characteristics

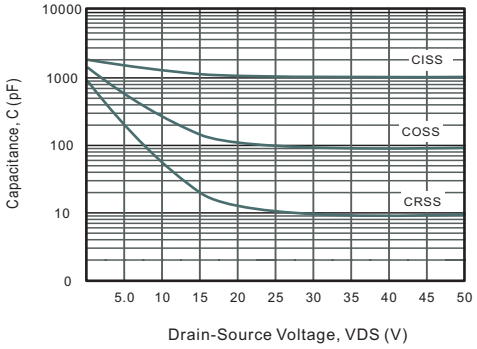


Fig.5 Drain-Source On-Resistance vs. Junction Temperature

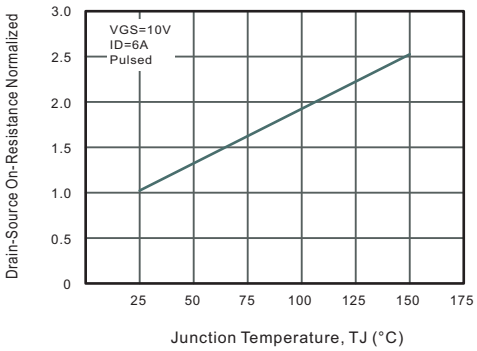


Fig.6 Breakdown Voltage vs. Junction Temperature

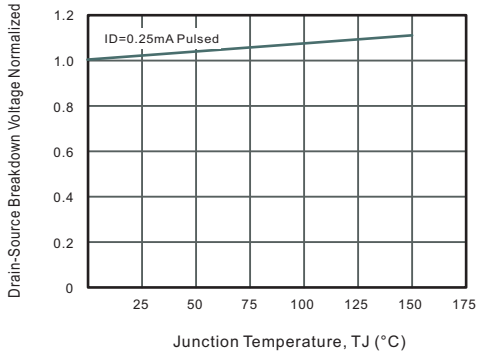


Fig.7 Gate Threshold Voltage vs. Junction Temperature

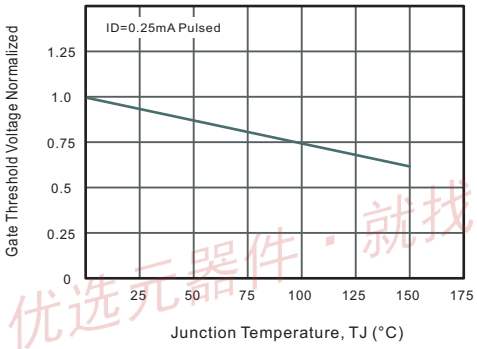
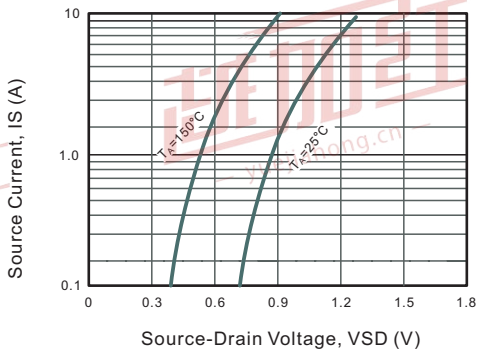


Fig.8 Source Current vs. Source-Drain Voltage



Typical Characteristics

Fig.9 Drain Current vs. Gate-Source Voltage

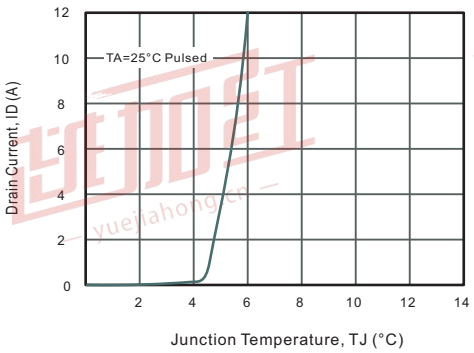


Fig.10 Drain-Source On-Resistance vs. Drain Current

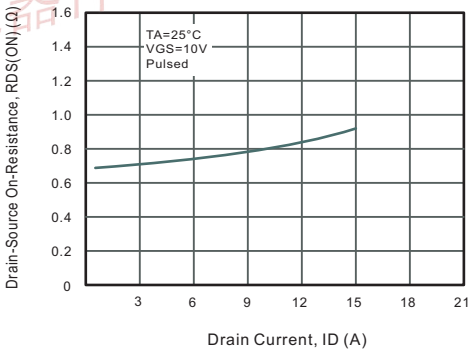


Fig.11 Power Dissipation vs. Junction Temperature

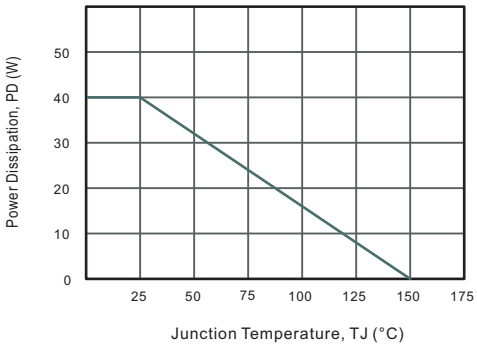


Fig.12 Drain Current vs. Junction Temperature

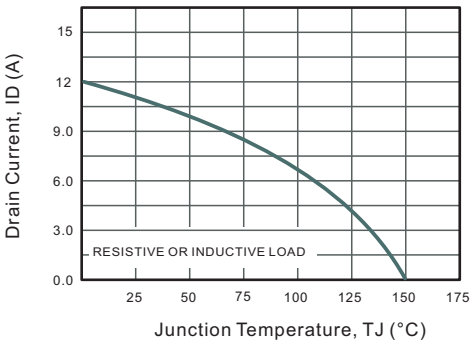
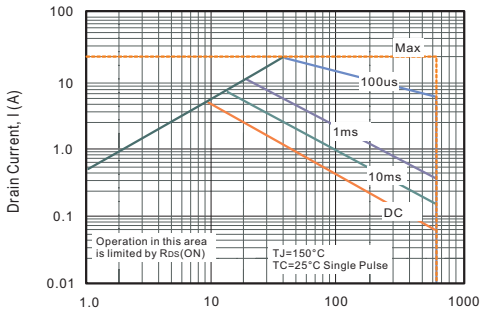
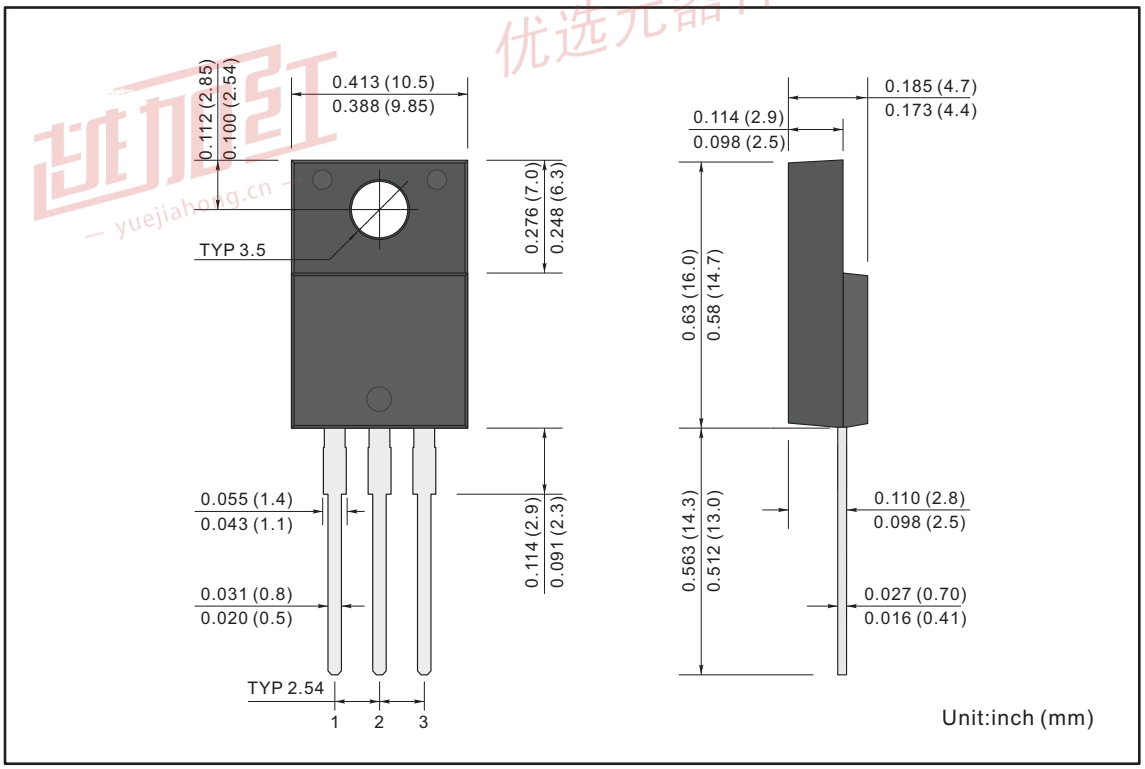


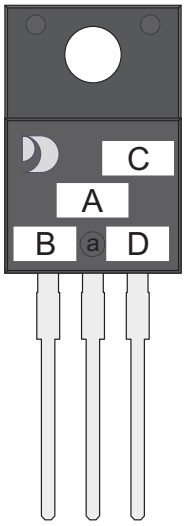
Fig.13 Safe Operating Area



PACKAGE OUTLINE
Plastic surface mounted package; 3 leads **ITO-220ABW**



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

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