



## 12A, 650V N-CANNEL POWER MOSFET

### DESCRIPTION

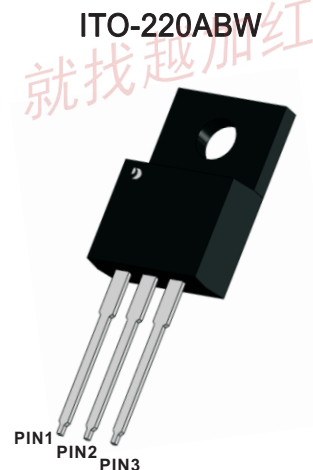
The F12N65 is a high voltage power MOSFET combines advanced trench MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications of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

### Features

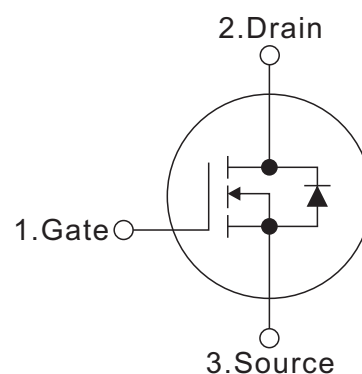
- $R_{DS(ON)} \leq 0.85 \Omega @ V_{GS}=10V, I_D=6.0A$
- Fast switching capability
- Avalanche energy tested
- Improved dv/dt capability, high ruggedness

### 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 (TA=25°C, unless otherwise specified)

PARAMETER	Symbols	RATINGS	Units
Drain-Source Voltage	$V_{DSS}$	650	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	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.  $L = 30mH, I_{AS} = 6.2A, V_{DD} = 50V, R_G = 25 \Omega, \text{Starting } T_J = 25^\circ C$

4.  $I_{SD} \leq 12A, di/dt \leq 200A/\mu s, V_{DD} \leq BVDSS, \text{Starting } T_J = 25^\circ C$

### 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)

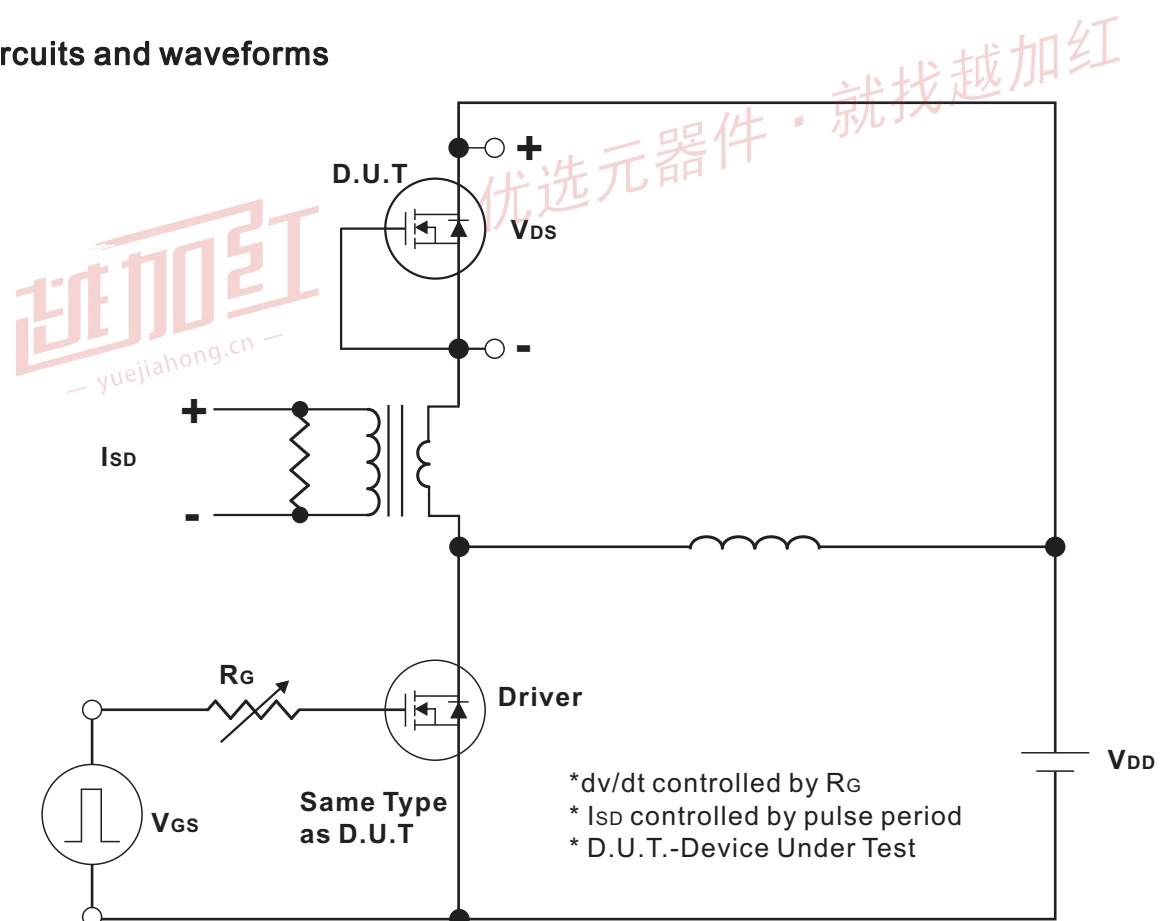
PARAMETER	Symbols	TEST CONDITIONS	Min	Typ	Max	Units
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{DS}=0V, I_D=250\mu A$	650			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$			10	$\mu A$
Gate- Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse					
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=6.0A$			0.85	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V,$ $V_{GS}=0V,$ $f=1.0MHz$		2000		pF
Output Capacitance	$C_{OSS}$			160		pF
Reverse Transfer Capacitance	$C_{RSS}$			5		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=520V, V_{GS}=10V,$ $I_D=12A, I_G=1mA$ (NOTE1,2)		36		nC
Gate-Source Charge	$Q_{GS}$			8.6		nC
Gate-Drain Charge	$Q_{GD}$			10		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=100V, V_{GS}=10V,$ $I_D=12A, R_G=25\Omega$ (NOTE1,2)		22		ns
Turn-On Rise Time	$t_R$			23		ns
Turn-Off Delay Time	$t_{D(OFF)}$			115		ns
Turn-Off Fall Time	$t_F$			32		ns
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
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)	$t_{rr}$	$I_S=12A, V_{GS}=0V,$ $di/dt=100A/us$		470		ns
Reverse Recovery Charge	$Q_{rr}$			12		$\mu C$

Notes:

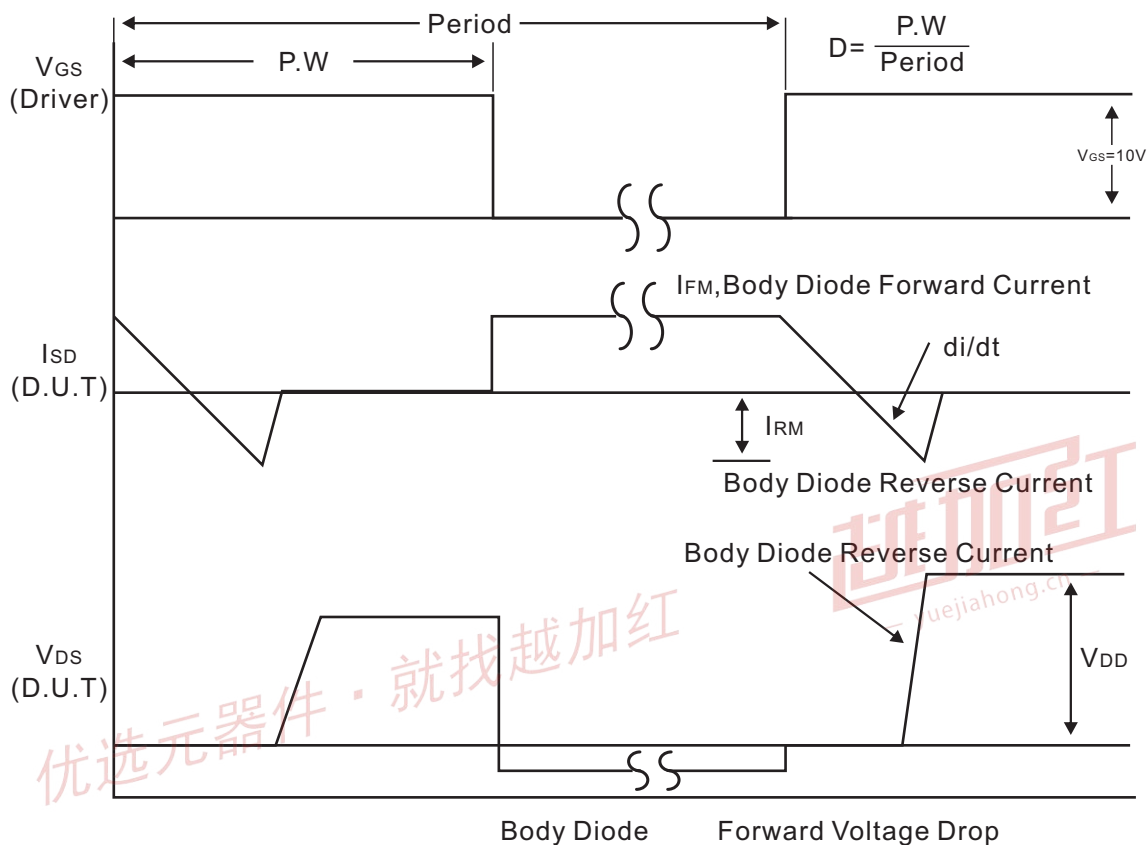
1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .
2. Essentially independent of operating temperature.



Test Circuits and waveforms



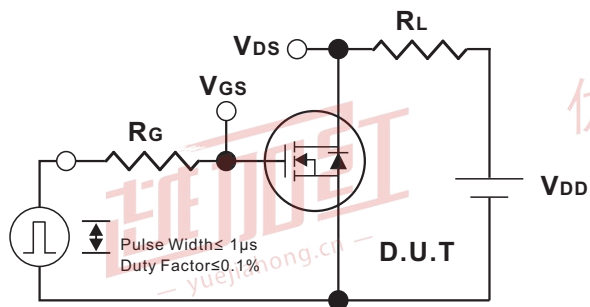
Peak Diode Recovery dv/dt Test Circuit



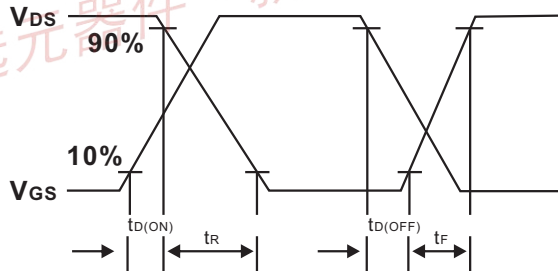
Peak Diode Recovery dv/dt Waveforms



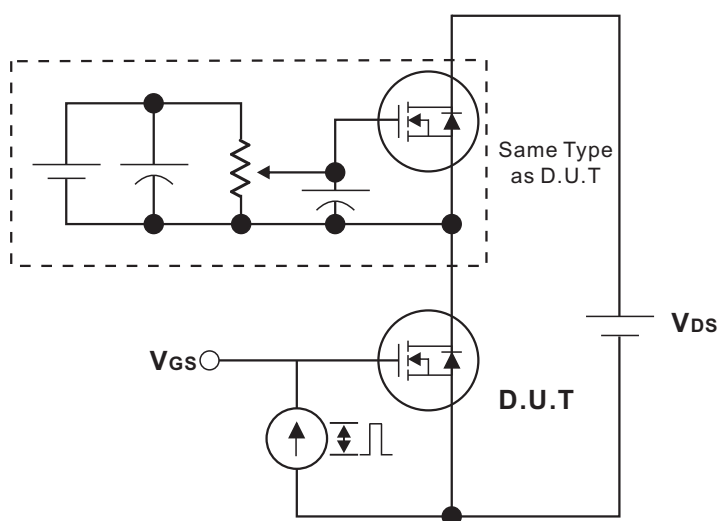
### Test Circuits and waveforms



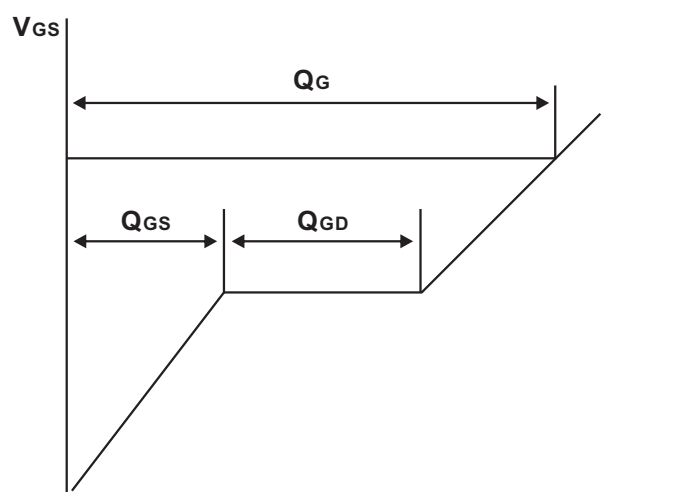
Switching Test Circuit



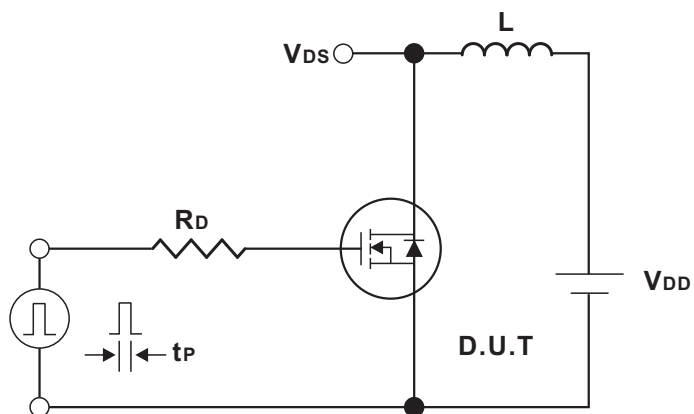
Switching Waveforms



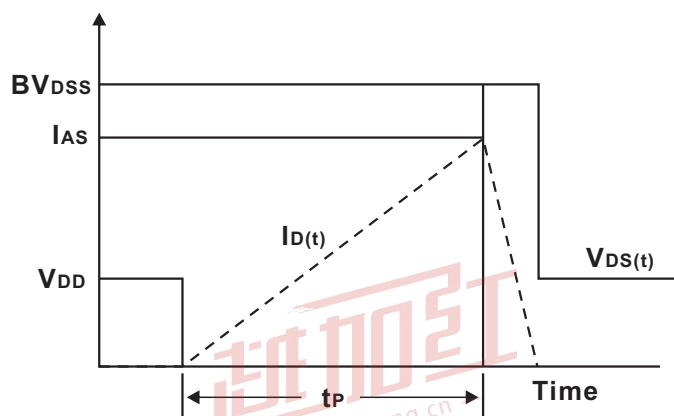
Gate Charge Test Circuit



Charge Gate Charge Waveform



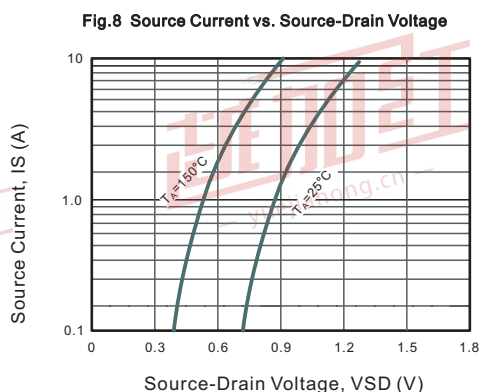
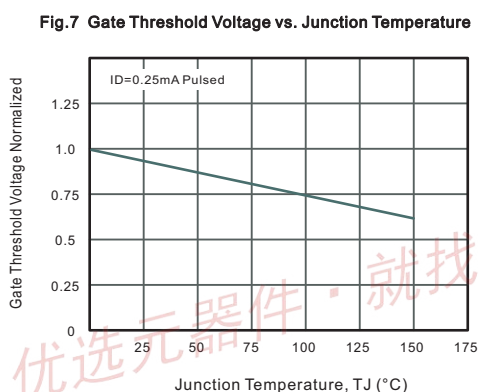
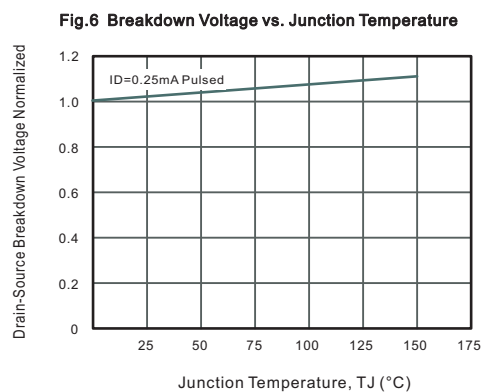
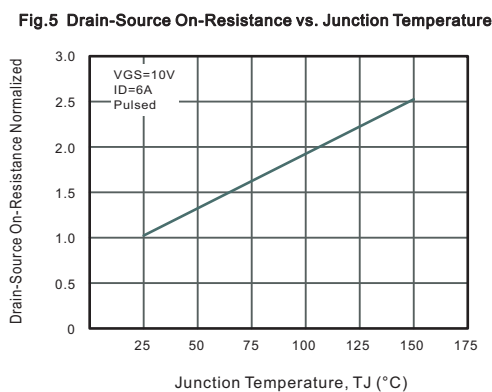
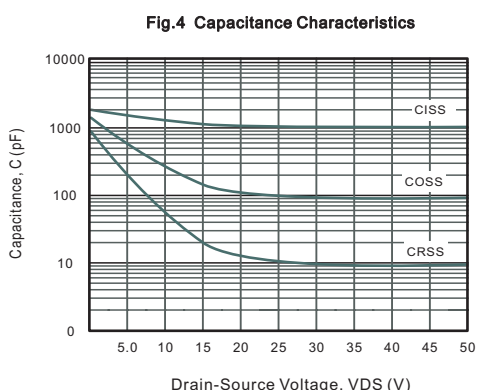
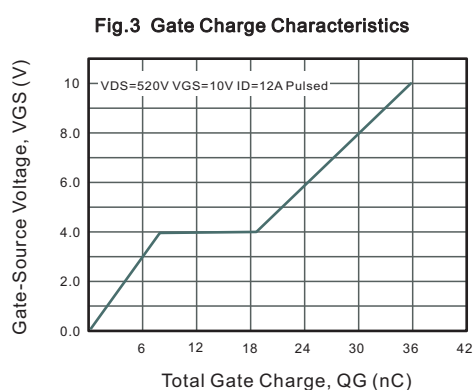
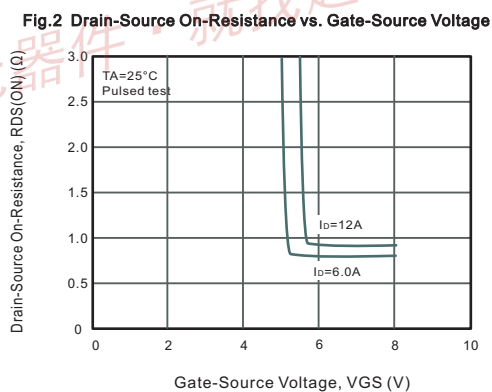
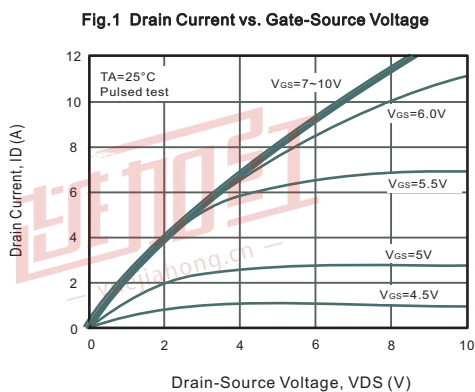
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

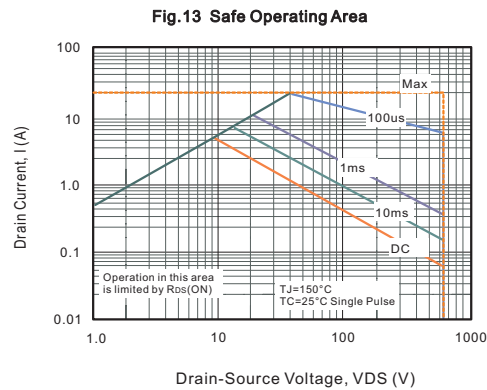
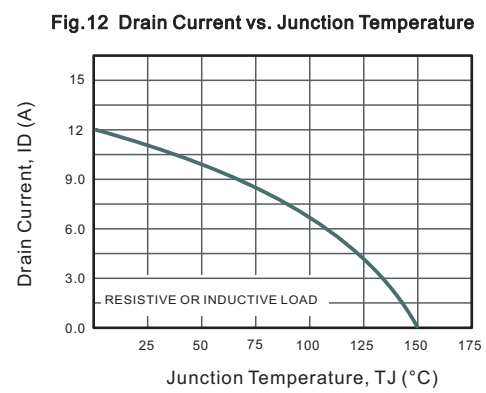
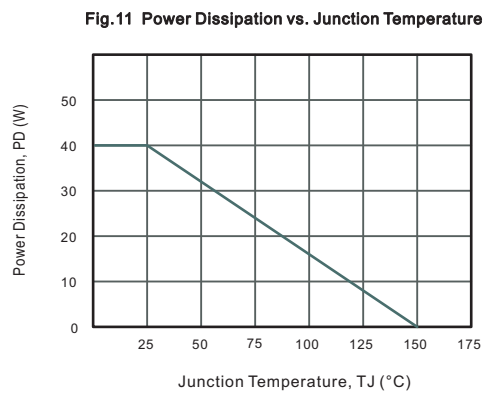
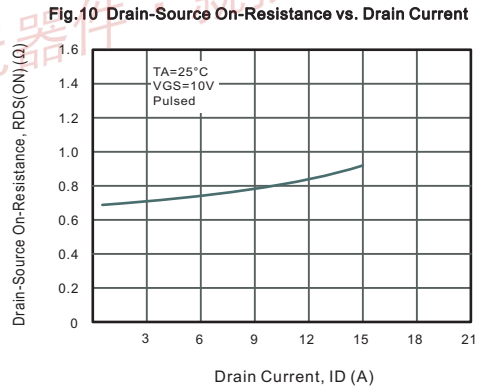
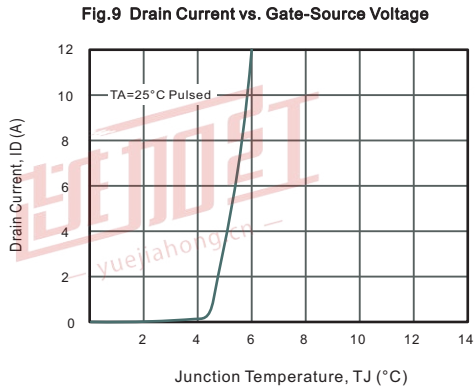


### Typical Characteristics





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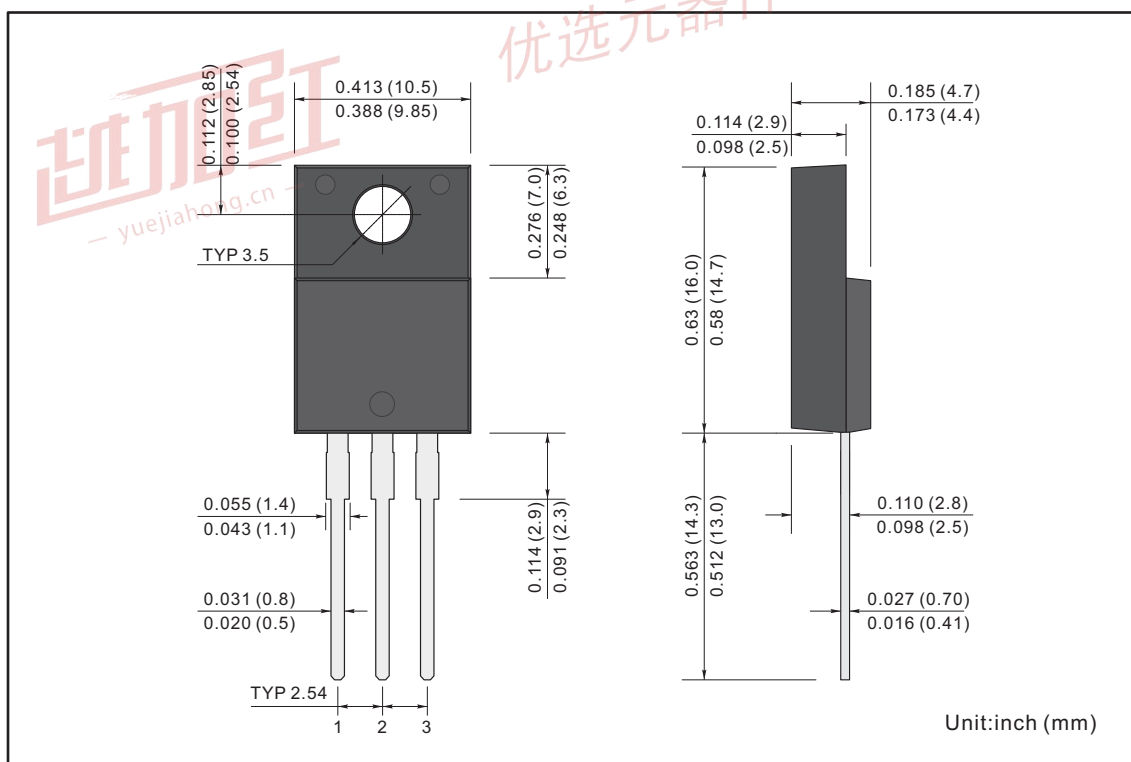
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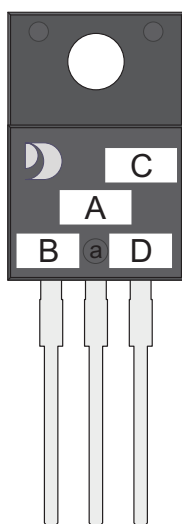
PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

ITO-220ABW



MARKING DIAGRAM



- Unmarkable Surface
- 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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