

12N60

N-CHANNEL POWER MOSFET

12A, 600V N-CHANNEL POWER MOSFET

DESCRIPTION

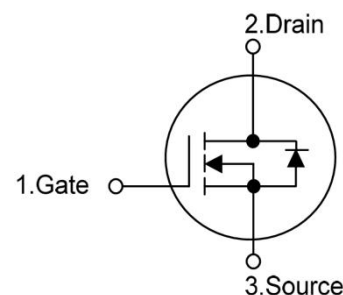
The 12N60 are N-Channel enhancement mode power field effect transistors (MOSFET) which are produced using our proprietary, planar stripe, DMOS technology.

These devices are suited for high efficiency switch mode power supply. To minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode the advanced technology has been especially tailored.



FEATURES

- * $R_{DS(ON)} < 0.88\Omega$ @ $V_{GS} = 10V$
- * Ultra low gate charge (typical 42 nC)
- * Low reverse transfer capacitance (C_{RSS} = typical 25 pF)
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness



MARKING



12N60=Device Code

XXX=Date Code

Solid Dot=Green molding compound

ABSOLUTE MAXIMUM RATINGS($T_A = 25^\circ C$, unless otherwise specified.)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current		I_D	12	A
Pulsed Drain Current (Note 2)		I_{DM}	48	A
Avalanche Energy	Single Pulsed (Note 3)	EAS	75	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation		P_D	51	W
Junction Temperature		T_J	+150	$^\circ C$
Storage Temperature		T_{STG}	-55 ~ +150	$^\circ C$
Operating Temperature		T	-55 ~ +150	$^\circ C$

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



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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 = 10mH, IAS = 12A, VDD= 50V, RG=25Ω , Starting TJ = 25°C.

4.ISD ≤ 12A, di/dt ≤ 200A/μs, VDD≤ BVDSS , Starting TJ = 25°C.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	62.5	°C/W
Junction to Case	θ_{JC}	2.43	°C/W

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BVDSS	VGS=0V, ID=250μA	600			V
Drain-Source Leakage Current	IDSS	VDS=600V, VGS=0V			1	μA
Gate- Source Leakage Current	IGSS	VGS=±30V, VDS=0V			±100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BVDSS/\Delta T_J$	ID=250μA, Referenced to 25°C		0.7		V/°C
ON CHARACTERISTICS						
Gate Threshold Voltage	VGS(TH)	VDS=VGS , ID=250μA	2.0		4.0	V
Static Drain-Source On-State Resistance	RDS(ON)	VGS=10V, ID=1.0A		0.6	0.88	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	CISS	VDS=25V, VGS=0V f= 1.0MHz		1480	1900	pF
Output Capacitance	COSS			200	270	pF
Reverse Transfer Capacitance	CRSS			25	35	pF
Gate Resistance	RG	VDS=0V, VGS=0V, f=1MHz	0.2		1.2	Ω
SWITCHING CHARACTERISTICS						
Total Gate Charge	QG	VDS=480V, VGS=10V ID=12A (Note 1, 2)		42	54	nC
Gate-Source Charge	QGS			8.6		nC
Gate-Drain Charge	QGD			21		nC
Turn-On Delay Time	tD(ON)	VDD= 300V, ID=12A RG=25Ω (Note 1, 2)		30	70	ns
Turn-On Rise Time	tR			115	240	ns
Turn-Off Delay Time	tD(OFF)			95	200	ns
Turn-Off Fall Time	tF			85	180	ns

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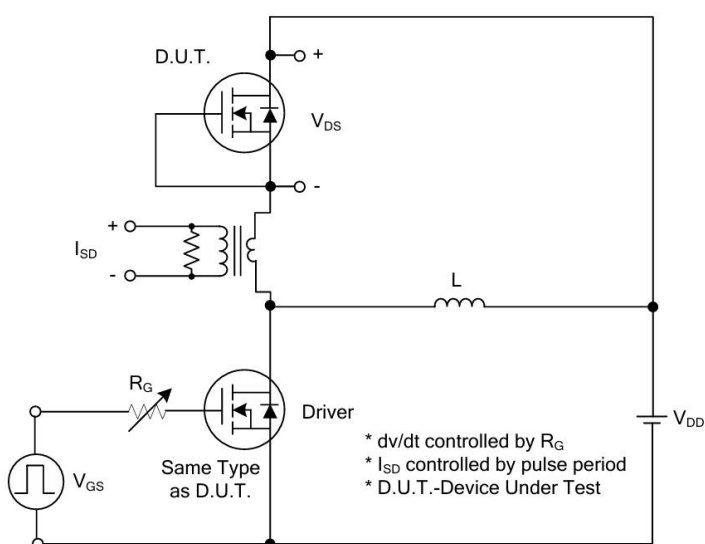
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Maximum Continuous Drain-Source Diode Forward Current	I_S				12	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				48	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=12A, V_{GS}=0V$			1.4	V
Reverse Recovery Time	t_{rr}	$I_S=12A, V_{GS}=0V$		380		ns
Reverse Recovery Charge	Q_{rr}	$di/dt=100A/\mu s$ (Note 1)		3.5		μC

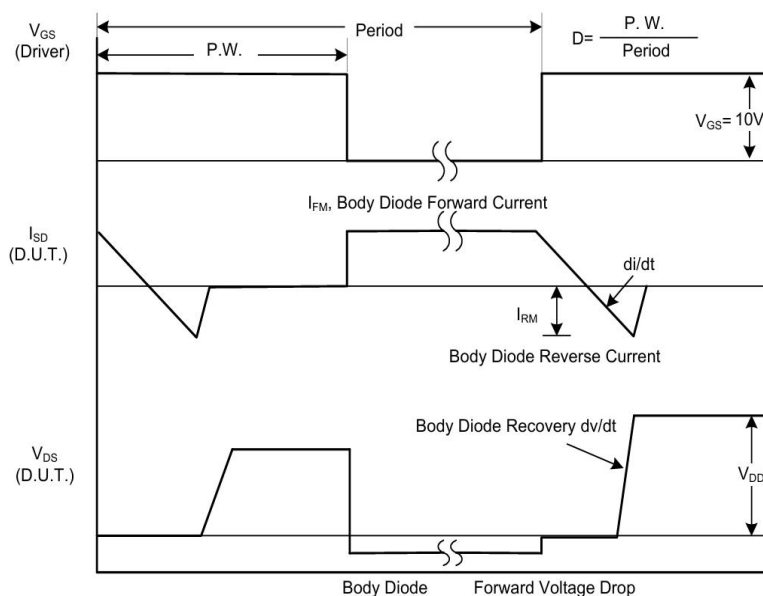
Note: 1.Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$;

2.Essentially independent of operating temperature.

TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery dv/dt Test Circuit

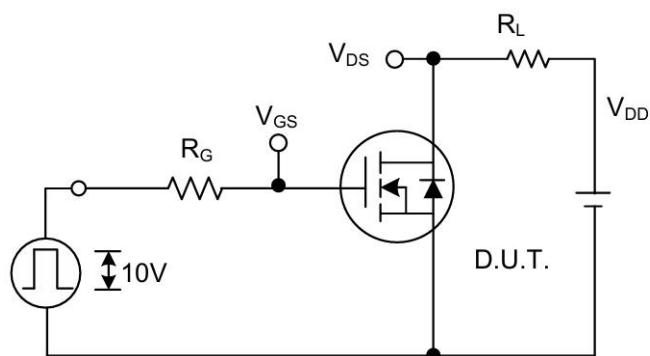


Peak Diode Recovery dv/dt Waveforms

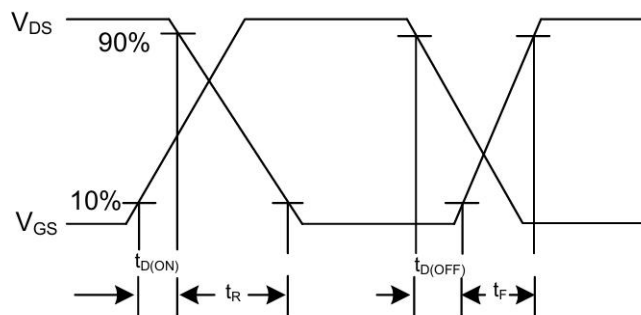
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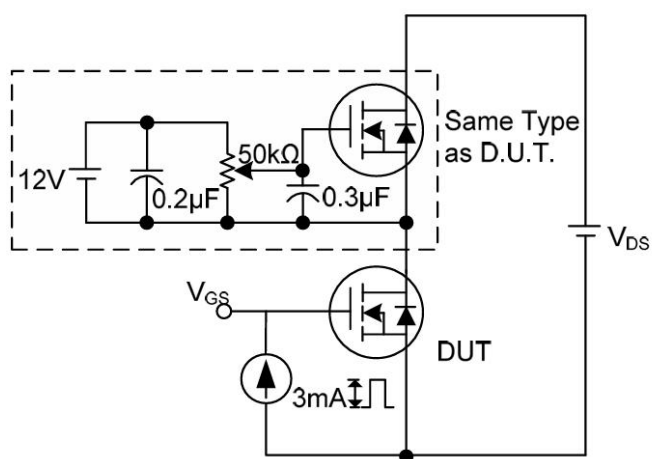
■ TEST CIRCUITS AND WAVEFORMS(Con.t)



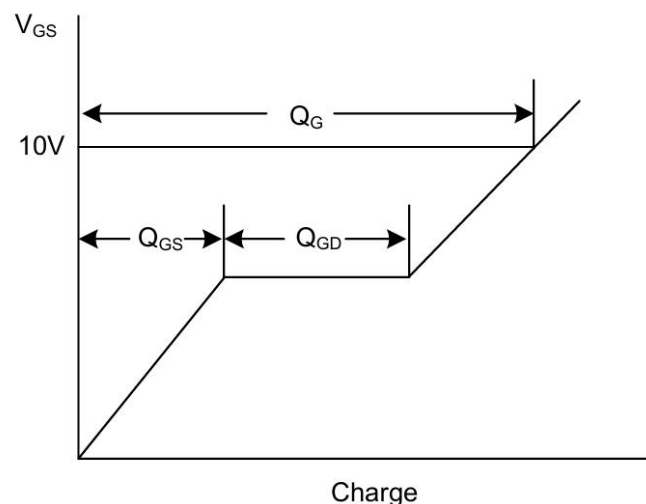
Switching Test Circuit



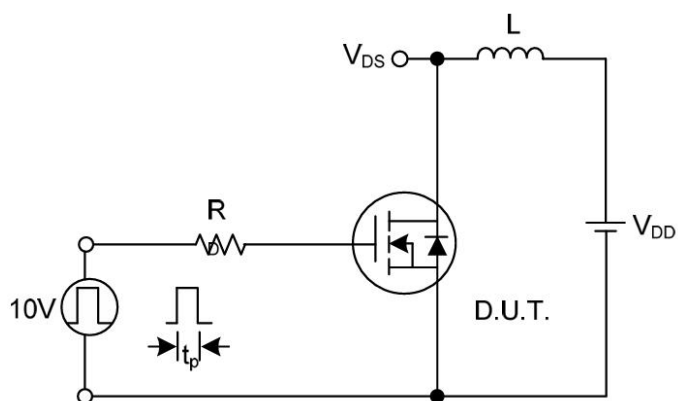
Switching Waveforms



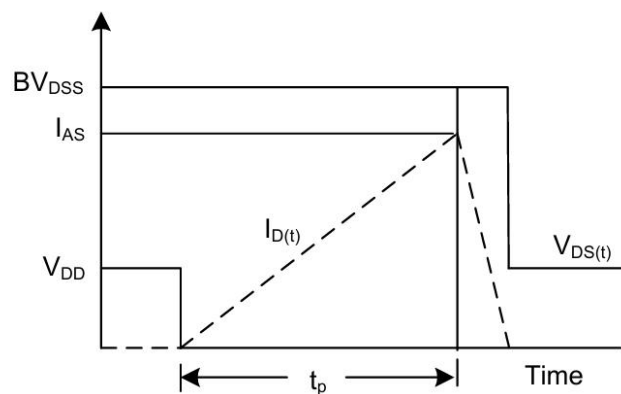
Gate Charge Test Circuit



Gate Charge Waveform

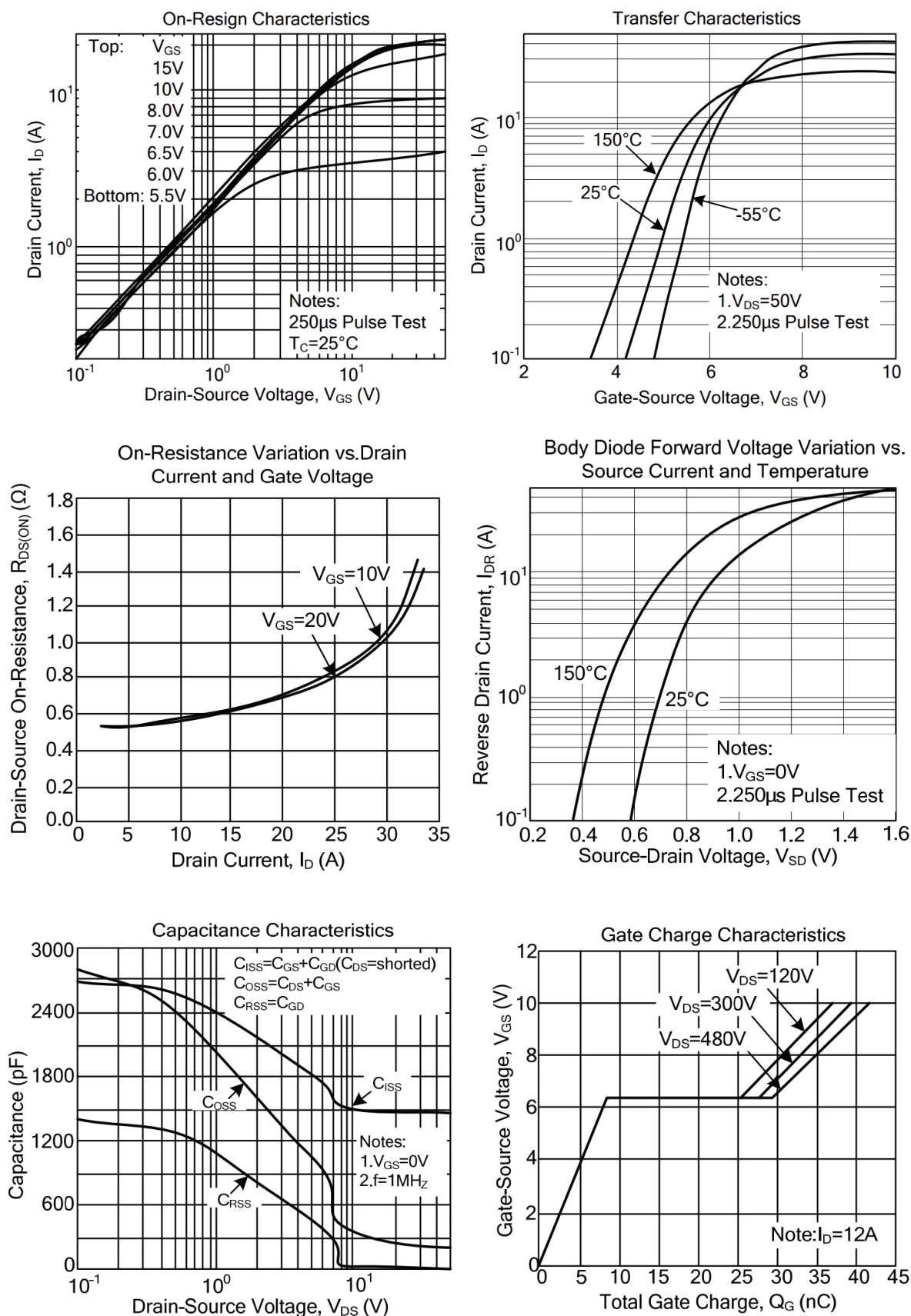


Unclamped Inductive Switching Test Circuit

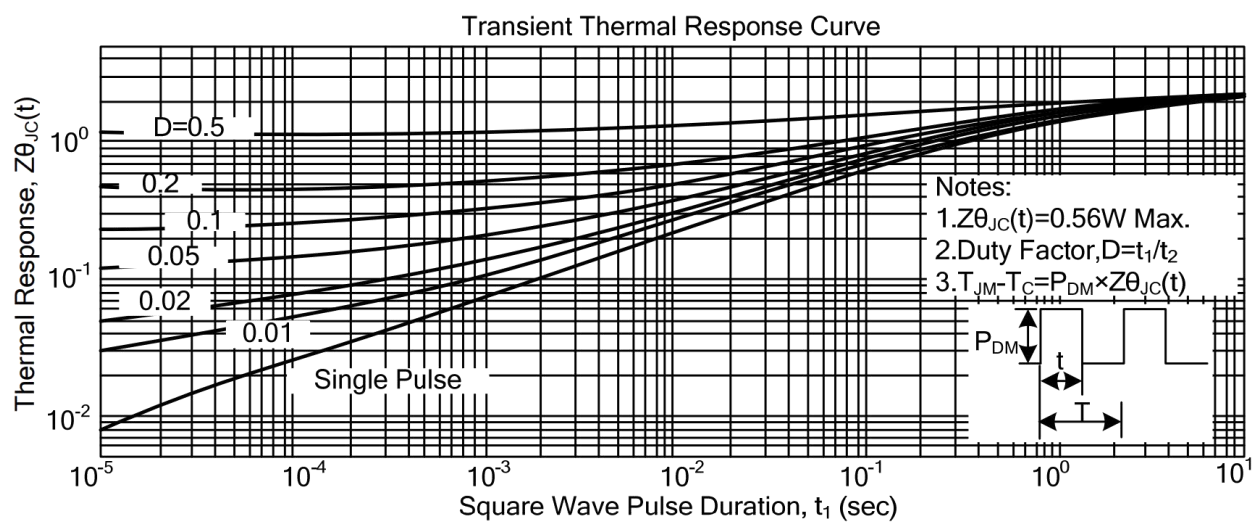
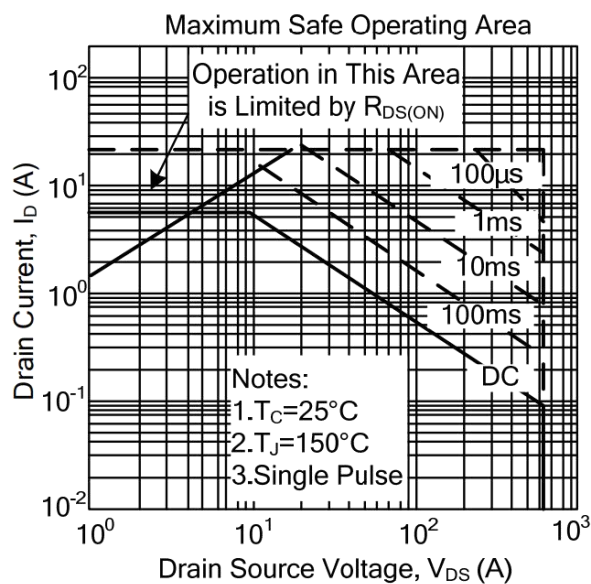


Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



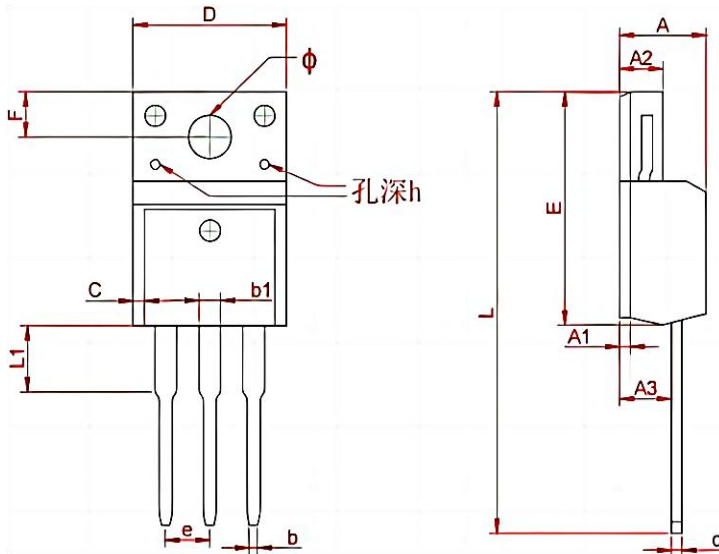
TYPICAL CHARACTERISTICS(Con.t)



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■ TO - 220F PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters	
	Min	Max
A	4.300	4.750
A1	0.7 REF	
A2	2.300	2.850
A3	2.500	2.900
b	0.380	0.420
b1	1.220	1.280
C	1.08	1.200
c	0.480	0.520
D	10.15	10.450
E	15.700	15.950
e	2.574 TYP	
F	3.470 REF	
y	3.200 REF	
h	0.000	0.800
L	28.780	28.900
L1	2.990	3.100

■ TO - 220F PACKING INFORMATION

Package version	Tube dimensions LxWxH (mm)	Per Tube (pcs)	Tube per box	Inner box dimensions LxWxH (mm)	PCS/ Inner box	Outer box dimensions LxWxH(mm)	PCS/ Outer box
TO-220F	530*32*7	50	20	580*155*50	1000	602*277*188	5000