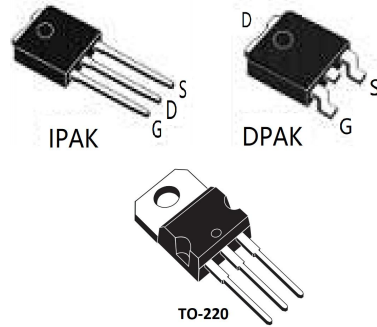


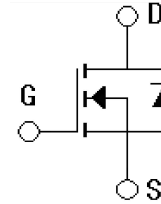
Features

- Low gate charge
- Low Crss (typical 22pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



Applications

- High efficiency switch mode power supplies
- Electronic lamp ballasts based on half bridge
- UPS



Absolute Ratings (Tc=25°C)

Parameter	Symbol	Value		Unit
		MS9N20FI/FD	MS9N20FT	
Drain-Source Voltage	V_{DSS}	200		V
Transient Gate-Source Voltage	V_{GSM}	± 30		V
Transient Gate-Source Voltage	V_{GSS}	± 20		V
Drain Current-continuous	I_D	$T_C=25^{\circ}\text{C}$	9.0	A
		$T_C=100^{\circ}\text{C}$	5.7	A
Drain Current-pulse (note 1)	I_{DM}	36.0		A
Single Pulsed Avalanche Energy (note 2)	E_{AR}	162.0		mJ
Avalanche Current (note 1)	I_{AR}	9.0		A
Repetitive Avalanche Current (note 1)	E_{AR}	4.8		mJ
Peak Diode Recovery dv/dt (note 3)	dv/dt	5.5		V/ns
Power Dissipation	$P_D, T_C=25^{\circ}\text{C}$ Derate above 25°C	51	100	W
		0.39	0.80	W/ $^{\circ}\text{C}$
Operating and Storage Temperature Range	T_J, T_{STG}	$-55 \sim +150$		$^{\circ}\text{C}$
Maximum lead Temperature for Soldering Purposes	T_L	300		$^{\circ}\text{C}$

Electrical Characteristics($T_{CASE}=25^{\circ}C$ unless otherwise specified)

Parameter	Symbol	Tests conditions	Min	Typ	Max	Units
Drain-Source Voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0V$	200	-	-	V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$, referenced to $25^{\circ}C$	-	0.2	-	V/ $^{\circ}C$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=200V, V_{GS}=0V$	-	-	1	μA
		$V_{DS}=160V, T_C=25^{\circ}C$	-	-	10	μA
Gate body leakage current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	± 100	nA
On-Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{DS}=10V, I_D=4.5A$	-	0.34	0.4	Ω
Forward Transconductance	g_{fs}	$V_{DS}=40V, I_D=4.5A$ (note 4)	-	7.05	-	S
Dynamic Characteristics						
Input capacitance	C_{iss}	$V_{DS}=25V, V_{GS}=0V$, $f=1.0MHz$	-	550	720	pF
Output capacitance	C_{oss}		-	85	110	pF
Reverse transfer capacitance	C_{rss}		-	22	29	pF

Electrical Characteristics($T_{CASE}=25^{\circ}C$ unless otherwise specified)

Parameter	Symbol	Tests conditions	Min	Typ	Max	Units
Switching-Characteristics						
Turn-On delay time	$t_{d(on)}$	$V_{DD}=100V, I_D=9A$, $R_G=25\Omega, V_{GS}=10V$ (note 4,5)	-	11	30	ns
Turn-On rise time	t_r		-	70	150	ns
Turn-Off delay time	$t_{d(off)}$		-	60	130	ns
Turn-Off rise time	t_f		-	65	140	ns
Total Gate Charge	Q_g	$V_{DS}=160V, I_D=9A$, $V_{GS}=10V$	-	22	29	nC
Gate-Source charge	Q_{gs}		-	3.6	-	nC

Gate-Drain charge	Q_{gd}	(note 4,5)	-	10.2	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=9A$	-		1.5	V
Reverse recovery time	t_{rr}	$V_{GS}=0V, I_S=9A$ $di_F/dt=100A/\mu s$ (note 4)		140		ns
Reverse recovery charge	Q_{rr}			0.87		μC

Thermal Characteristics

Parameter	Symbol	Value		Unit
		MS9N20FI/FD	MS9N20FT	
Thermal Resistance, junction to Case, Max	$R_{th(j-c)}$	2.50	1.25	$^{\circ}C/W$
Thermal Resistance, junction to Ambient, Max	$R_{th(j-a)}$	83	62.5	$^{\circ}C/W$

Order Message

Order codes	Package	Packaging
MS9N20FD	DPAK	Tube
MS9N20FI	IPAK	Tube
MS9N20FT	TO-220	Tube

Notes:

1: Pulse width limited by maximum junction temperature

2: $L=20mH, I_{AS}=10A, V_{DD}=50V, R_G=25\Omega$, Starting $T_J=25^{\circ}C$

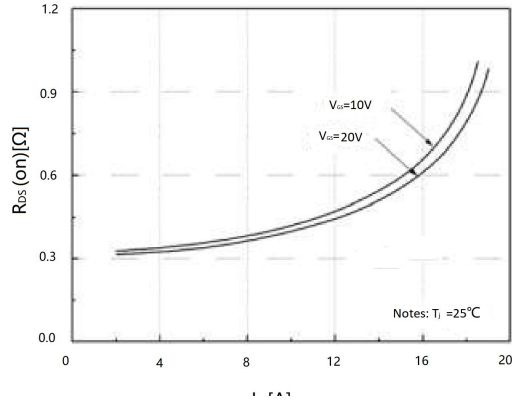
3: $I_{SD}\leq 10A, di/dt\leq 200A/\mu s, V_{DD}\leq BV_{DSS}$, Starting $T_J=25^{\circ}C$

4: Pulse Test: Pulse Width $\leq 200\mu s$, Duty Cycle $\leq 2\%$

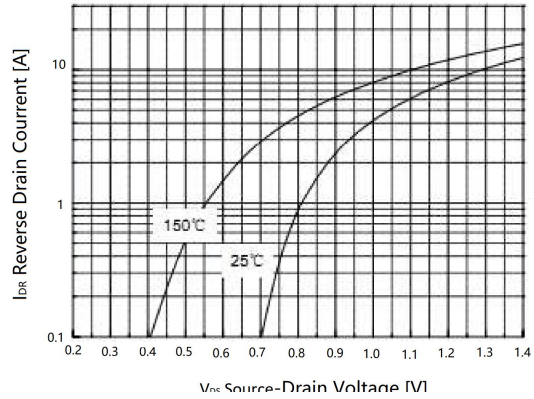
5: Essentially independent of operating temperature

Electrical Characteristics

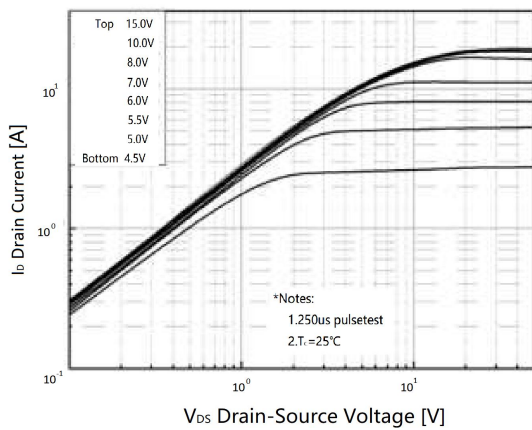
On-Resistance Variation vs. Drain Current and Gate Voltage



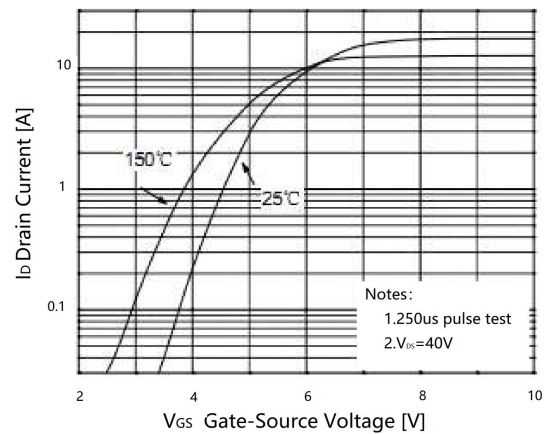
Body Diode Forward Voltage Variation vs. Source Current and Temperature



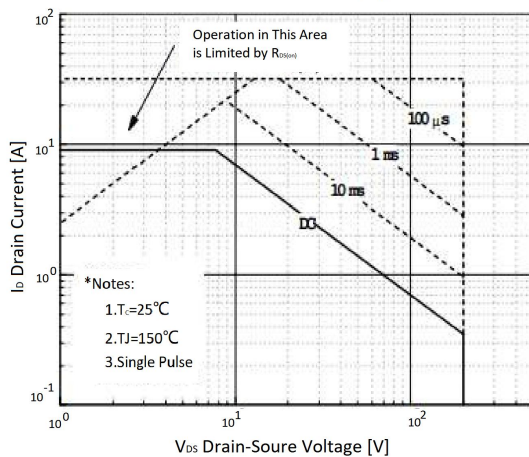
On-Region Characteristics



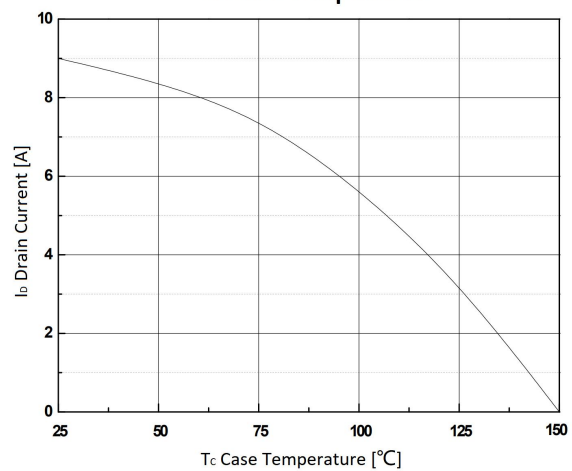
Transfer Characteristics



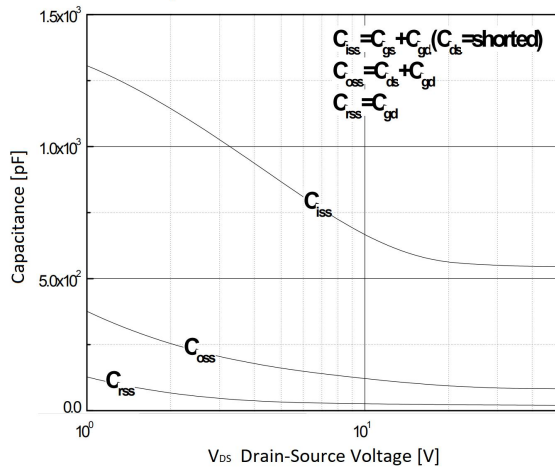
Maximum Safe Operating Area For MS9N20FI(D)



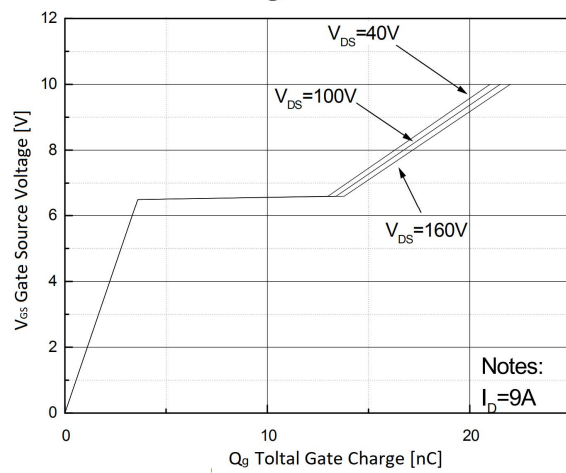
Maximum Drain Current vs. Case Temperature



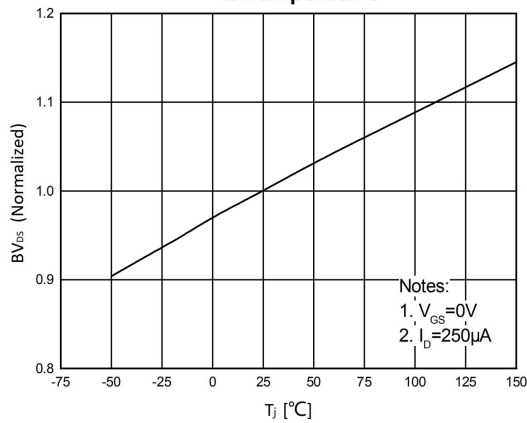
Capacitance Characteristics



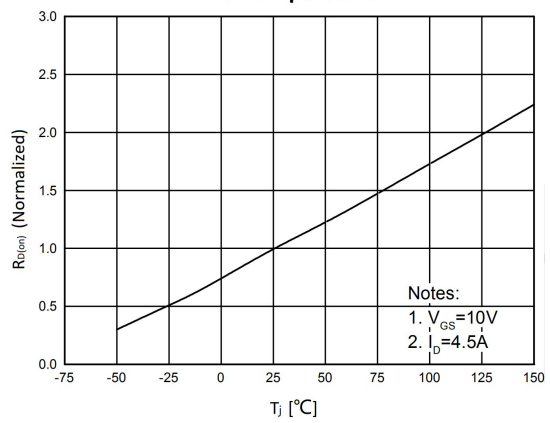
Gate Charge Characteristics



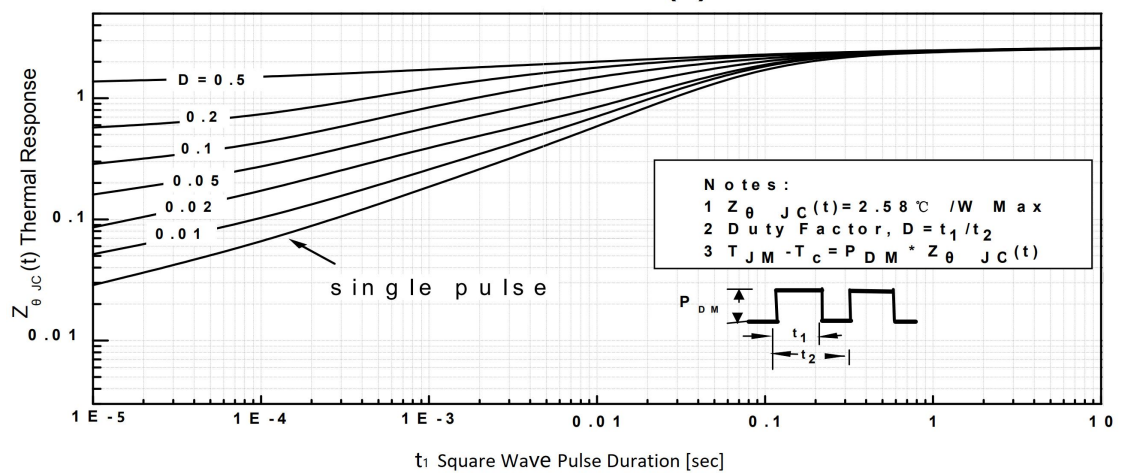
Breakdown Voltage Variation vs. Temperature



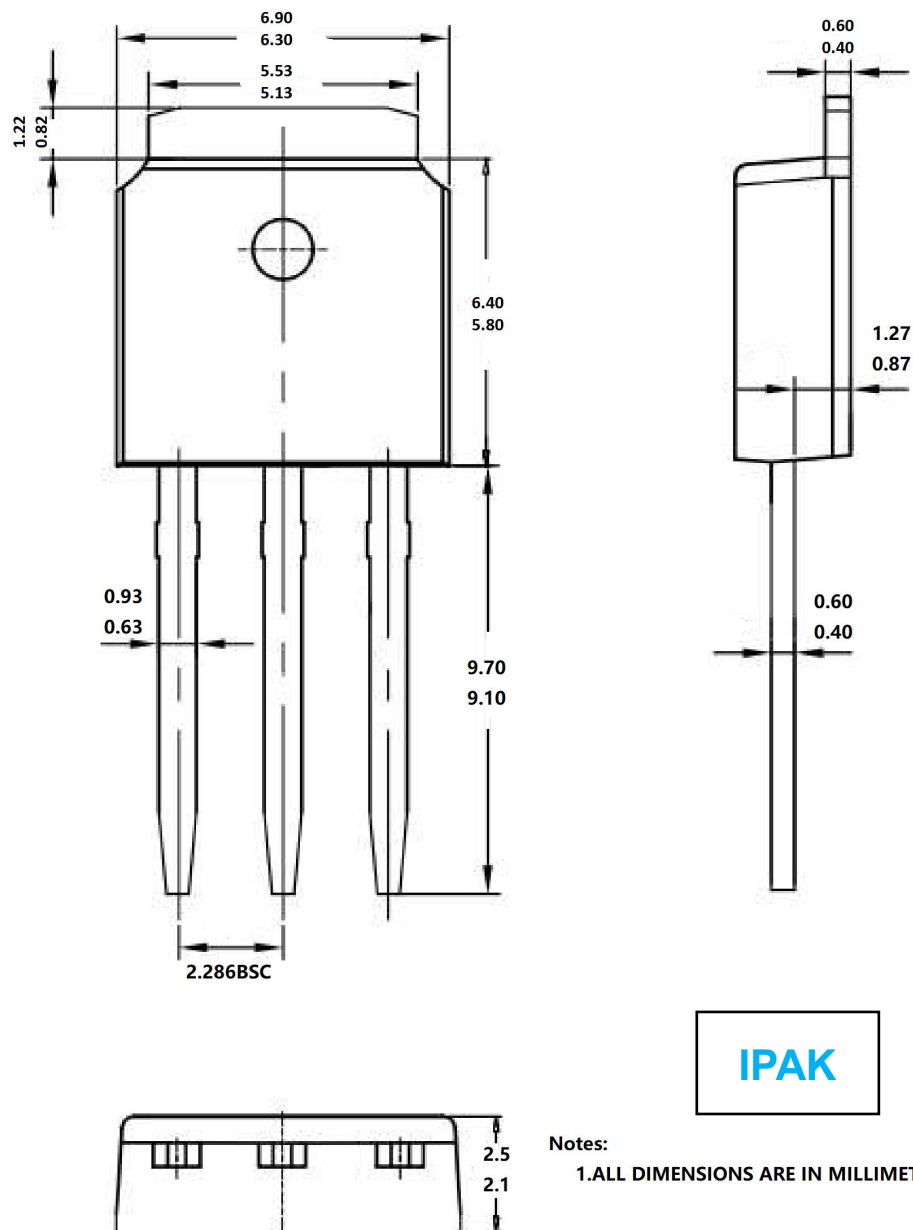
On-Resistance Variation vs. Temperature



Transient Thermal Response Curve For MS9N20FI(D)



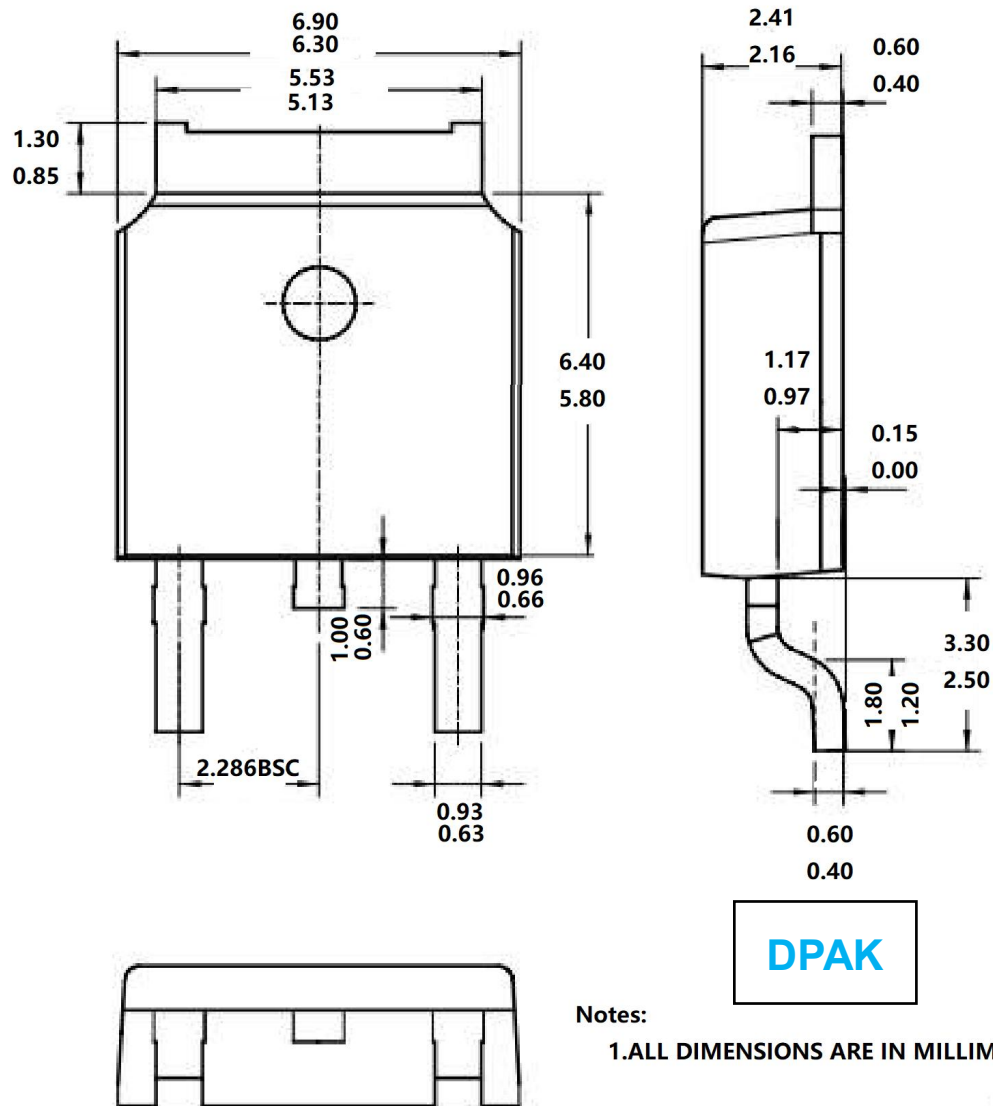
Package Mechanical DATA



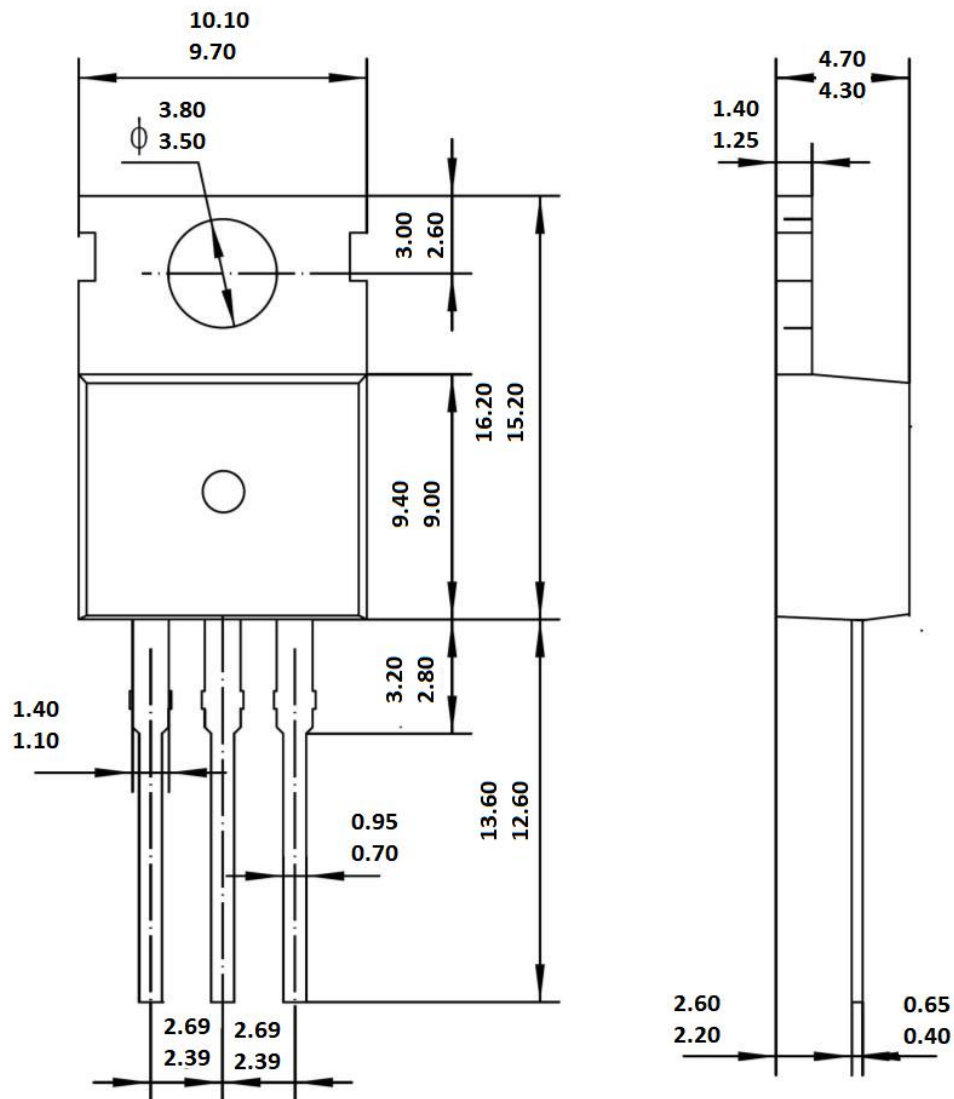
IPAK

Notes:

1.ALL DIMENSIONS ARE IN MILLIMETERS



DPAK



TO-220

Unit: mm