

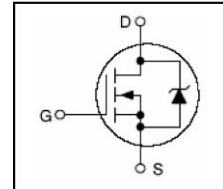
## N-Channel Enhancement Mode Field Effect Transistor

### Features

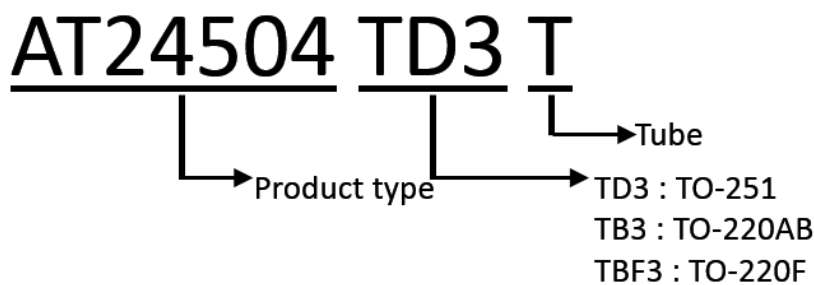
$V_{(BR)DSS}$	$R_{DS(ON)}$	$I_D$
400V	1.9Ω	4A

### Application

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



### Order information:



### ABSOLUTE MAXIMUM RATINGS

PARAMETERS/TEST CONDITIONS	SYMBOL	LIMITS	UNITS
Drain-Source Voltage	$V_{DS}$	400	V
Drain Current –continuous @25°C	$I_D$	4	A
Drain Current –continuous @100°C	$I_D$	2.5	A
Pulsed Drain Current <sup>1</sup>	$I_{DM}$	16	A
Gate-Source Voltage	$V_{GS}$	±30	V
Single Pulse Avalanche <sup>2</sup>	$E_{AS}$	80	mJ
Pulsed Avalanche Rating <sup>2</sup>	$I_{AS}$	4	A
Operating Junction & Storage Temperature	$T_j, T_{stg}$	-55 to 150	°C
Lead Temperature ( <sup>1</sup> / <sub>16</sub> " from case for 10sec.)	$T_L$	300	°C

### Note:

1. Pulse width limited by maximum junction temperature.
2.  $V_{DD} = 50V, V_{DS} = 400V, R_G = 25 \Omega, T_J: 25^\circ C$

## N-Channel Enhancement Mode Field Effect Transistor

### ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
<b>STATIC</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	400			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0		4.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0V, V_{GS} = \pm 30V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 400V, V_{GS} = 0V$			1	$\mu A$
		$V_{DS} = 400V, V_{GS} = 0V, T_J = 150^\circ C$			10	
On-State Drain Current	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 2A$		1.9	2.3	$\Omega$
Forward Transconductance	$G_{FS}$	$V_{DS} = 40V, I_D = 2A$		2.8		S
<b>DYNAMIC</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0V, V_{DS} = 25V, f = 1MHz$		262		pF
Output Capacitance	$C_{oss}$			51		
Reverse Transfer Capacitance	$C_{rss}$			16		
Total Gate Charge	$Q_g$	$V_{DD} = 400V, I_D = 4A, V_{GS} = 10V$		8.5		nC
Gate-Source Charge	$Q_{gs}$			3.1		
Gate-Drain Charge	$Q_{gd}$			4.3		
<b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (<math>T_C = 25^\circ C</math>)</b>						
Continuous Current	$I_S$				4	A
Forward Voltage	$V_{SD}$	$I_F = I_S, V_{GS} = 0V$			1.5	V
Reverse Recovery Time	$t_{rr}$	$I_S = 4A, di_F/dt = 100A / \mu S$		170		nS
Reverse Recovery Charge	$Q_{rr}$	$V_{GS} = 0V$		845		nC
<b>THERMAL DATA</b>						
Thermal Resistance Junction to Case	$R_{\theta JC}$	AT24504 (TO-251)			3.5	$^\circ C/W$
		AT24504 (TO-220AB)			3.0	$^\circ C/W$
		AT24504 (TO-220F)			5.5	$^\circ C/W$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	AT24504 (TO-251)			100	$^\circ C/W$
		AT24504 (TO-220AB)			62.5	$^\circ C/W$
		AT24504 (TO-220F)			62.5	$^\circ C/W$

## N-Channel Enhancement Mode Field Effect Transistor

### Typical Characteristics

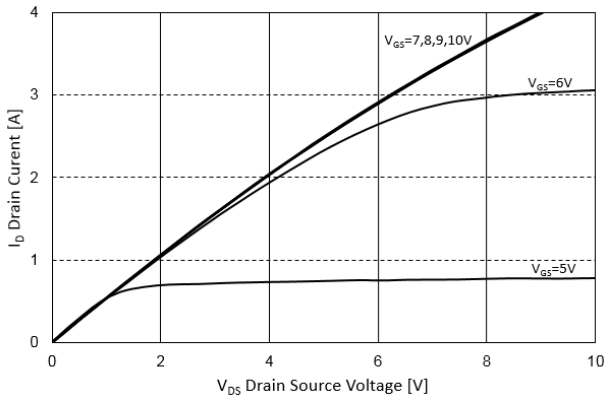


Figure 1. On-Region Characteristics

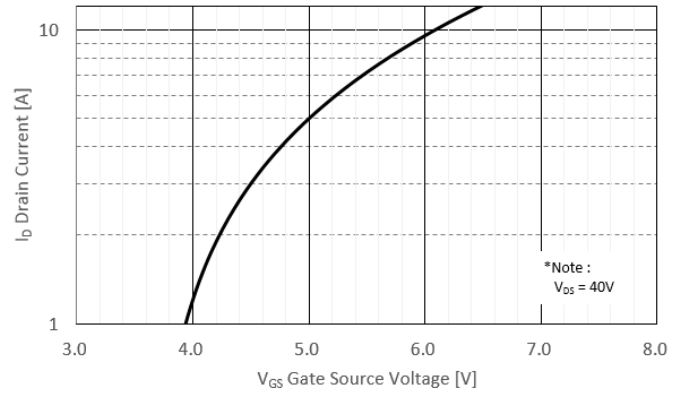


Figure 2.  $G_{FS}$  Characteristics

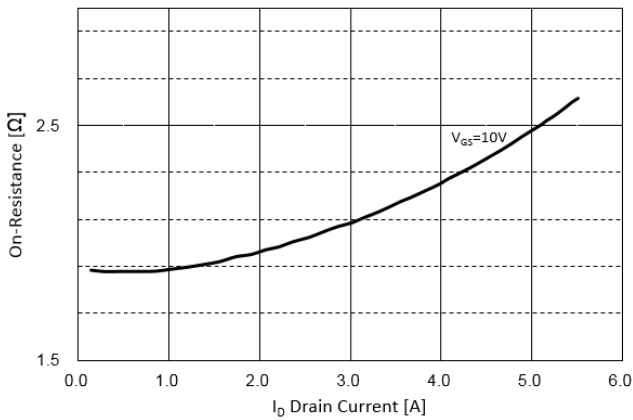


Figure 3. On-Resistance Variation vs Drain Current

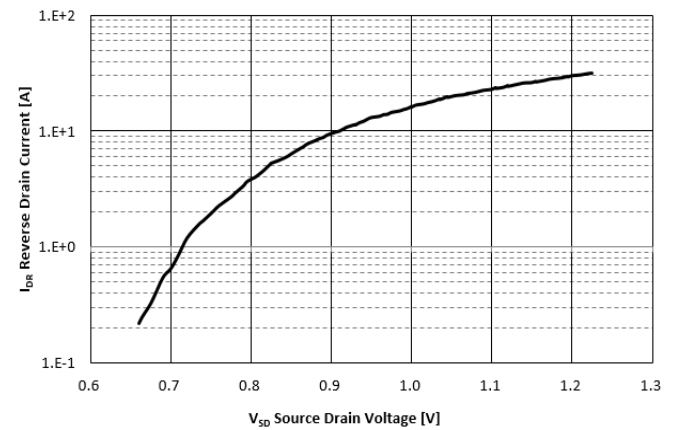


Figure 4. Body diode Forward Voltage

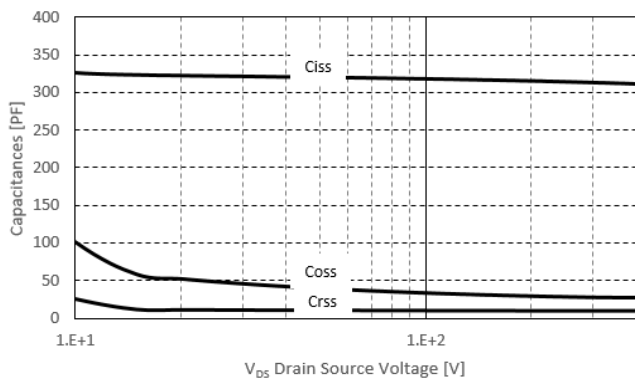


Figure 5. Capacitance Characteristics

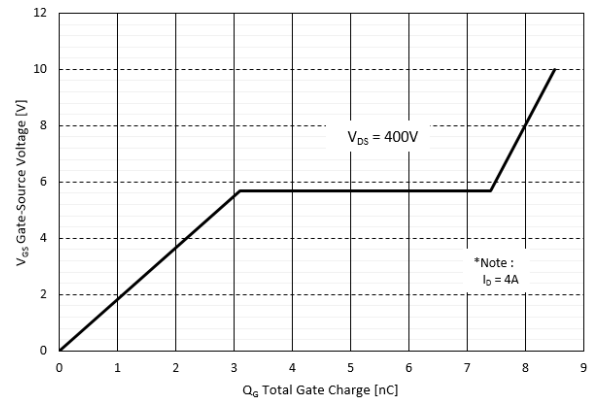
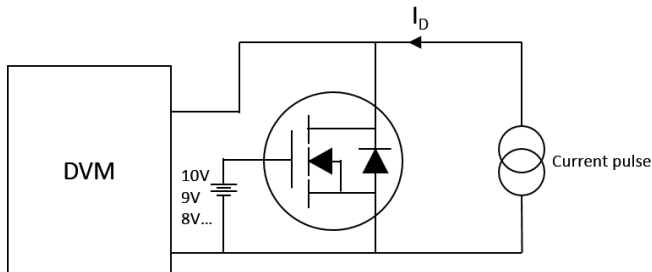


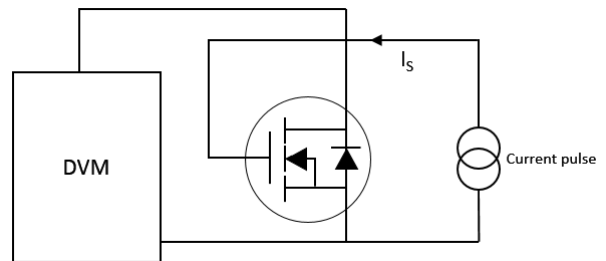
Figure 6. Gate Charge Characteristics

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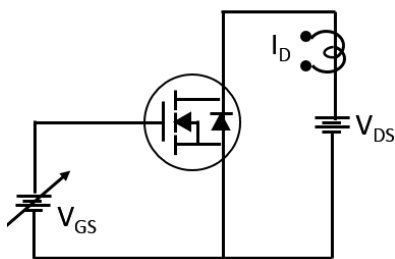
**On-Region Characteristics Test Circuit**



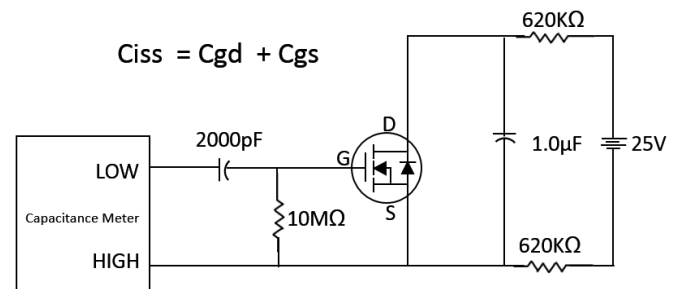
**$V_{SD}$  Characteristics Test Circuit**



**$G_{FS}$  Characteristics Test Circuit**

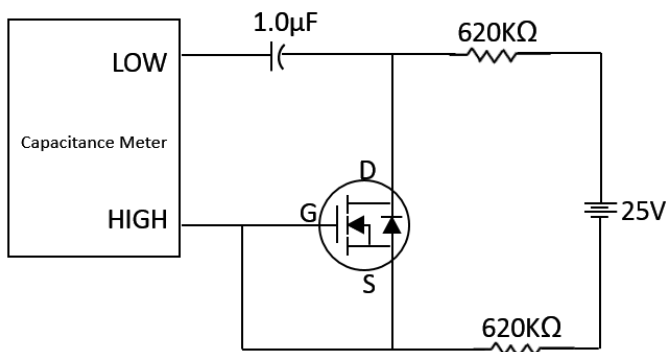


**Input Capacitance Characteristics Test Circuit**



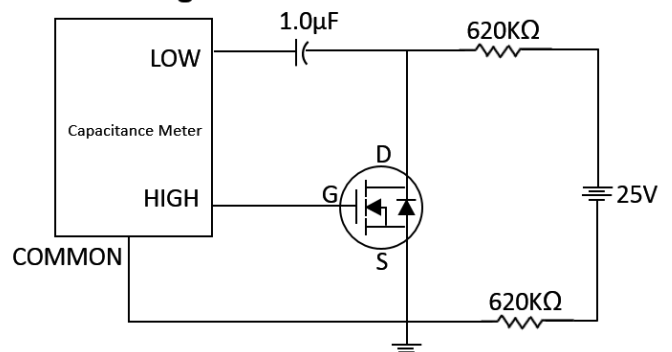
**Output Capacitance Characteristics Test Circuit**

$$C_{oss} = C_{gd} + C_{ds}$$



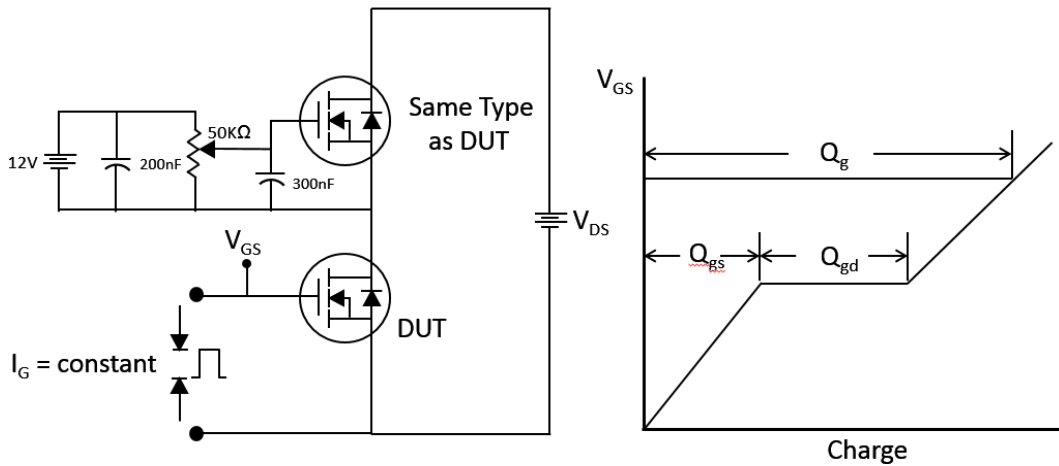
**Reverse Capacitance Characteristics Test Circuit**

$$C_{rss} = C_{gd}$$

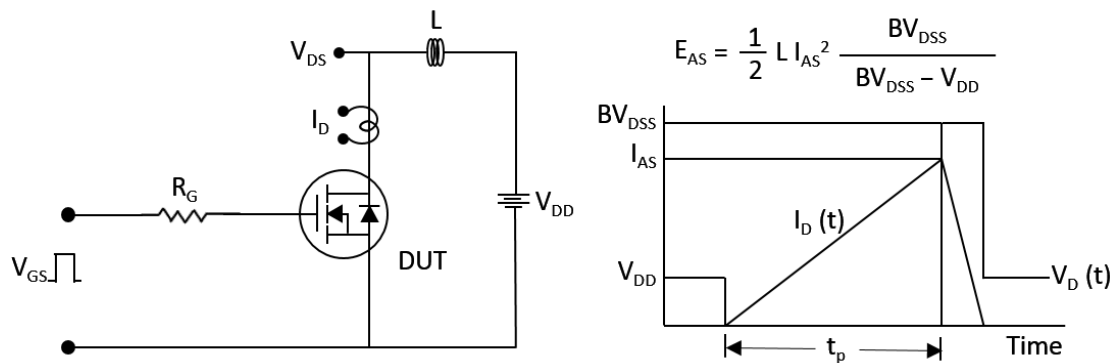


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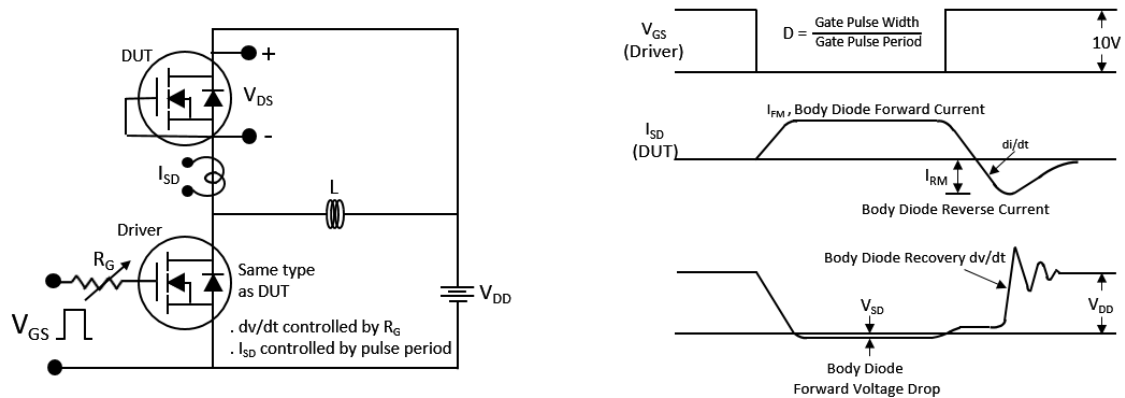
### Gate Charge Characteristics Test Circuit



### Avalanche Characteristics Test Circuit



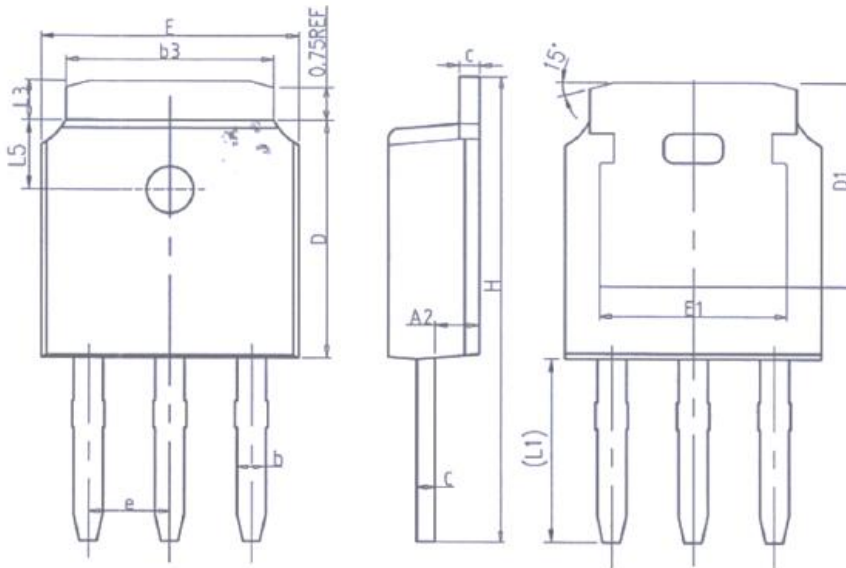
### Diode Reverse recovery Characteristics Test Circuit



## N-Channel Enhancement Mode Field Effect Transistor

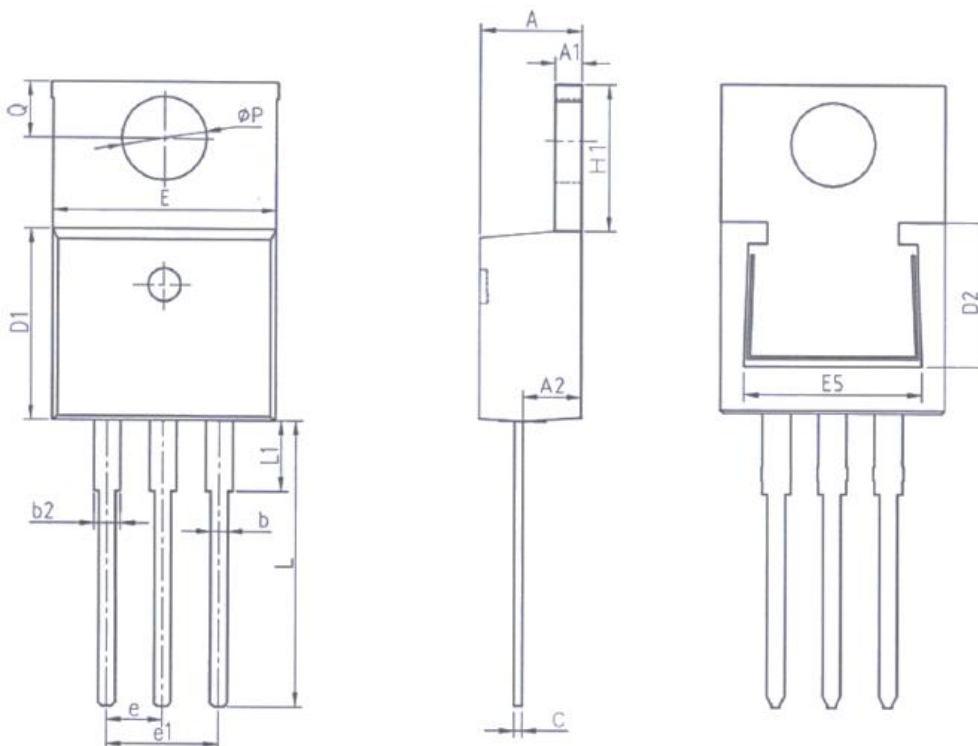
### Mechanical Dimensions

#### TO-251



SYMBOL	MM		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.50
c	0.43	0.53	0.63
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.80
E1	4.63	-	-
e	2.286BSC		
H	10.00	11.22	11.44
L1	3.90	4.10	4.30
L3	0.88	1.02	1.28
L5	1.65	1.80	1.95

#### TO-220AB

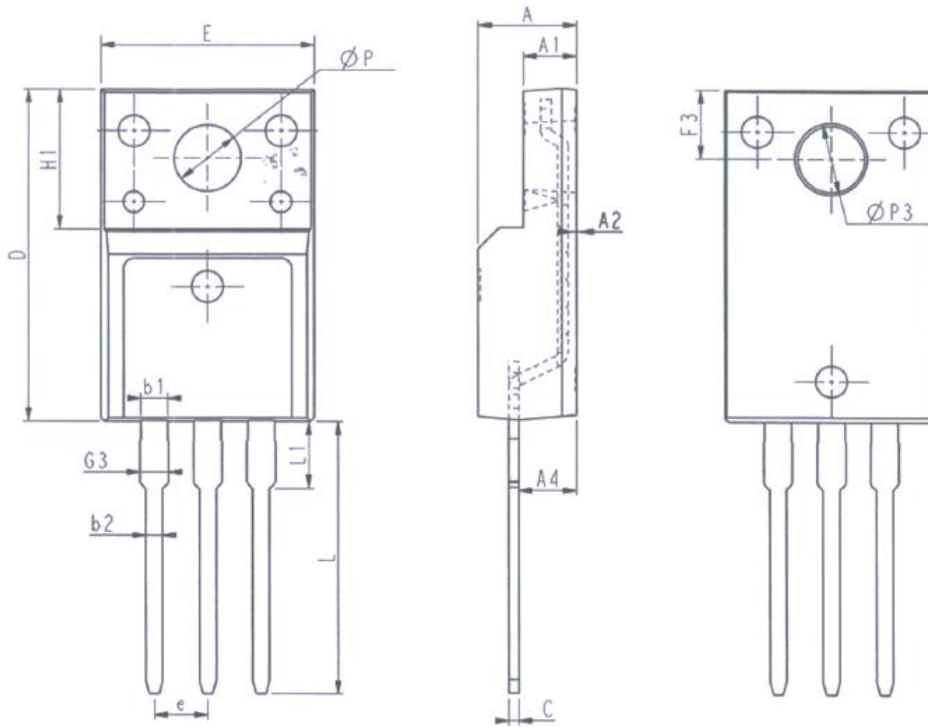


SYMBOL	MM		
	MIN	NOM	MAX
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
b	0.75	0.81	0.96
b2	1.22	1.27	1.47
c	0.30	0.38	0.48
D1	8.50	8.70	8.90
D2	5.20	-	-
E	9.86	10.16	10.36
E5	7.06	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.10	6.30	6.50
L	13.10	13.40	13.70
L1	-	3.75	4.10
ΦP	3.70	3.84	3.99
Q	2.54	2.74	2.94

## N-Channel Enhancement Mode Field Effect Transistor

### Mechanical Dimensions

### TO-220F



SYMBOL	MM		
	MIN	NOM	MAX
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.30	0.45	0.60
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
L	12.68	12.98	13.28
L1	2.93	3.03	3.13
ØP	3.03	3.18	3.38
ØP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35	1.55
b1	1.18	1.28	1.43
b2	0.70	0.80	0.95