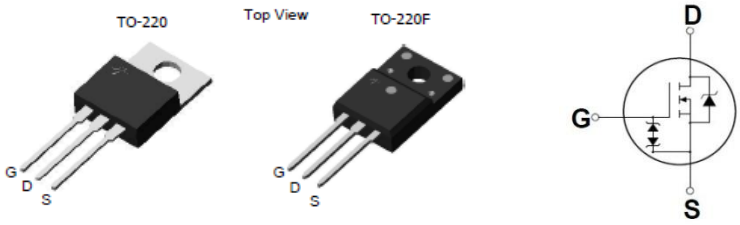
TMP4N60AZ(G)/TMPF4N60AZ(G)

N-channel MOSFET

BV_{DSS}	I_D	$R_{DS(on)}$
600V	4.0A	< 2.5Ω

Features

- Low gate charge
- 100% avalanche tested
- Improved dv/dt capability
- RoHS compliant
- Halogen free package
- JEDEC Qualification
- Improved ESD performance



Device	Package	Marking	Remark
TMP4N60AZ / TMPF4N60AZ	TO-220 / TO-220F	TMP4N60AZ / TMPF4N60AZ	RoHS
TMP4N60AZG / TMPF4N60AZG	TO-220 / TO-220F	TMP4N60AZG / TMPF4N60AZG	Halogen Free

Absolute Maximum Ratings

Parameter		Symbol	TMP4N60AZ(G)	TMPF4N60AZ(G)	Unit
Drain-Source Voltage		V_{DSS}	600		V
Gate-Source Voltage		V_{GS}	±30		V
Continuous Drain Current	T_C = 25 ℃	I_D	4	4 *	A
	T_C = 100 ℃		2.34	2.34 *	A
Pulsed Drain Current (Note 1)		I_{DM}	16	16 *	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	192		mJ
Repetitive Avalanche Current (Note 1)		I_{AR}	4		A
Repetitive Avalanche Energy (Note 1)		E_{AR}	8.62		mJ
Power Dissipation	T_C = 25 ℃	P_D	86.2	30.4	W
	Derate above 25 ℃		0.68	0.24	W/℃
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5		V/ns
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55~150		℃
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		T_L	300		℃

* Limited only by maximum junction temperature

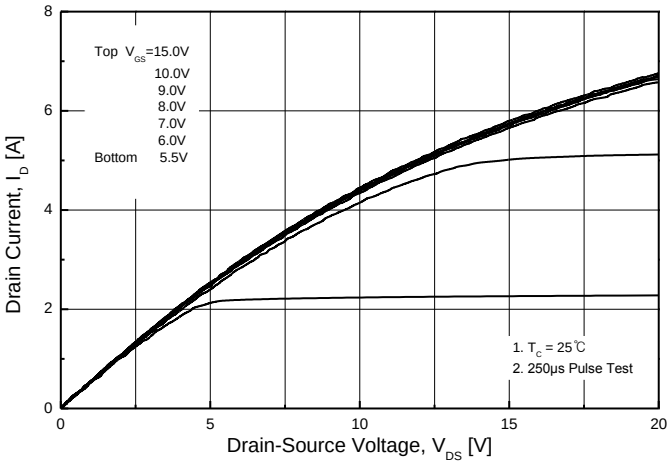
Thermal Characteristics

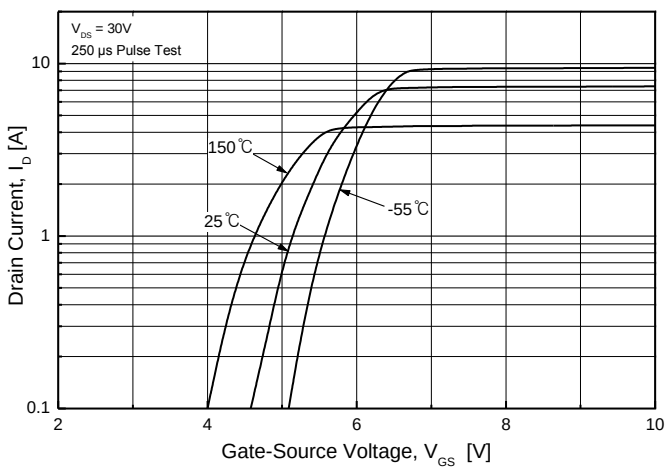
Parameter	Symbol	TMP4N60AZ(G)	TMPF4N60AZ(G)	Unit
Maximum Thermal resistance, Junction-to-Case	$R_{\theta JC}$	1.45	4.1	℃/W
Maximum Thermal resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	62.5	℃/W

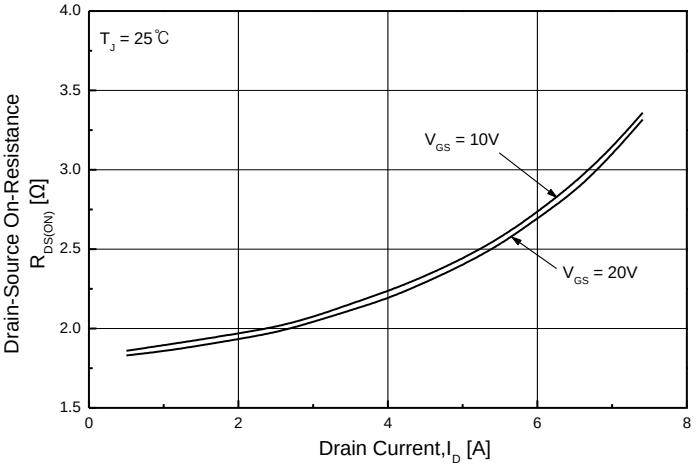
Electrical Characteristics : T_C=25℃, unless otherwise noted

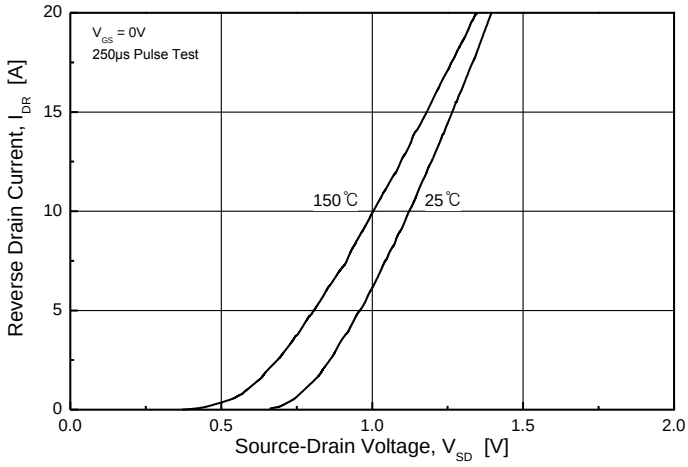
Parameter	Symbol	Test condition	Min	Typ	Max	Units
OFF						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0 V, I_D = 250 μA	600	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 600 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 480 V, T_C = 125°C	--	--	10	μA
Forward Gate-Source Leakage Current	I_{GSSF}	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	μA
Reverse Gate-Source Leakage Current	I_{GSSR}	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	μA
ON						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	3	--	5	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 2.0 A	--	2.0	2.5	Ω
Forward Transconductance (Note 4)	g_{FS}	V_{DS} = 30 V, I_D = 2.0 A	--	6	--	S
DYNAMIC						
Input Capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	545	--	pF
Output Capacitance	C_{oss}		--	61	--	pF
Reverse Transfer Capacitance	C_{rss}		--	10	--	pF
SWITCHING						
Turn-On Delay Time (Note 4,5)	$t_{d(on)}$	V_{DD} = 300 V, I_D = 4.0 A, R_G = 25 Ω, V_{GS} = 10 V	--	18	--	ns
Turn-On Rise Time (Note 4,5)	t_r		--	27	--	ns
Turn-Off Delay Time (Note 4,5)	$t_{d(off)}$		--	47	--	ns
Turn-Off Fall Time (Note 4,5)	t_f		--	21	--	ns
Total Gate Charge (Note 4,5)	Q_g	V_{DS} = 480 V, I_D = 4.0 A, V_{GS} = 10 V	--	12	--	nC
Gate-Source Charge (Note 4,5)	Q_{gs}		--	3	--	nC
Gate-Drain Charge (Note 4,5)	Q_{gd}		--	6	--	nC
SOURCE DRAIN DIODE						
Maximum Continuous Drain-Source Diode Forward Current	I_S	----	--	--	4	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}	----	--	--	16	A
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS} = 0 V, I_S = 4.0 A	--	--	1.5	V
Reverse Recovery Time (Note 4)	t_{rr}	V_{GS} = 0 V, I_S = 4.0 A, dI_F / dt = 100 A/μs	--	316	--	ns
Reverse Recovery Charge (Note 4)	Q_{rr}		--	1.2	--	μC

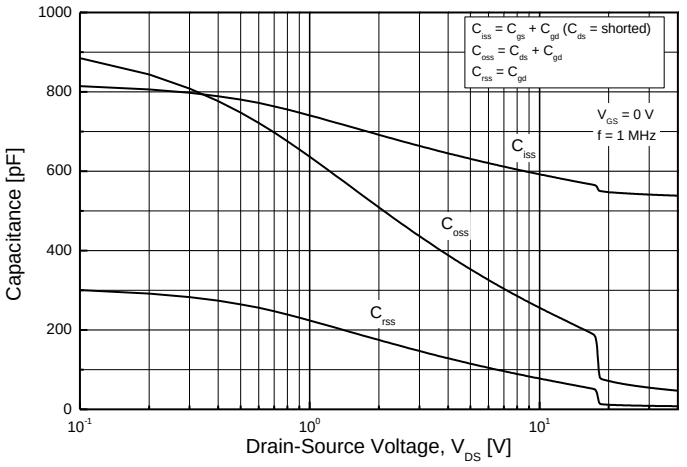
Note :
1. Repeated rating : Pulse width limited by safe operating area
2. L=22mH, I_{AS} = 4.0A, V_{DD} = 50V, R_G = 25Ω, Starting T_J= 25 ℃
3 I_{SD} ≤ 4.0A, di/dt ≤ 200A/μs , V_{DD} ≤ BV_{DS}, Starting T_J= 25 ℃
4. Pulse Test :Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

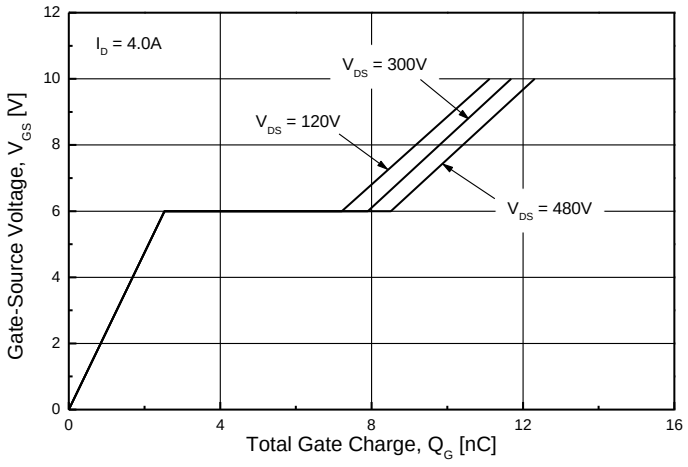

Top V_GS=15.0V
10.0V
9.0V
8.0V
7.0V
6.0V
Bottom 5.5V
1. T_C = 25℃
2. 250μs Pulse Test
Drain Current, I_D [A]
Drain-Source Voltage, V_DS [V]

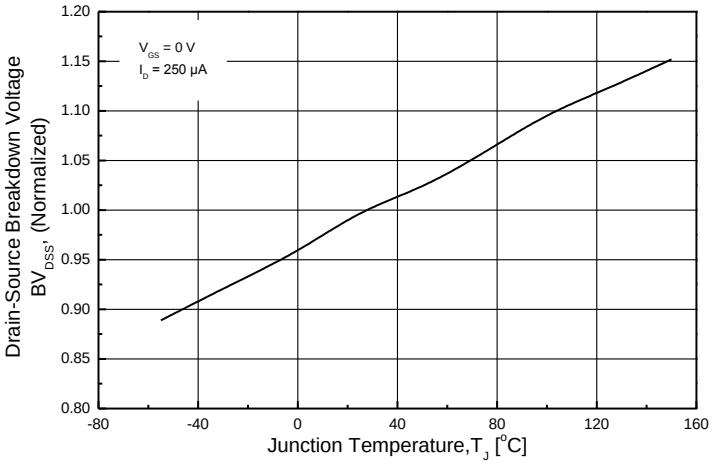

V_DS = 30V
250 μs Pulse Test
150℃
25℃
-55℃
Drain Current, I_D [A]
Gate-Source Voltage, V_GS [V]

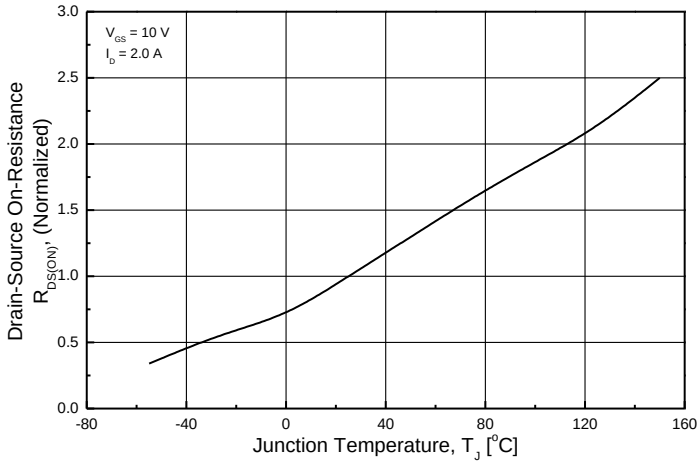

T_J = 25℃
V_GS = 10V
V_GS = 20V
Drain-Source On-Resistance
R_DS(ON) [Ω]
Drain Current,I_D [A]

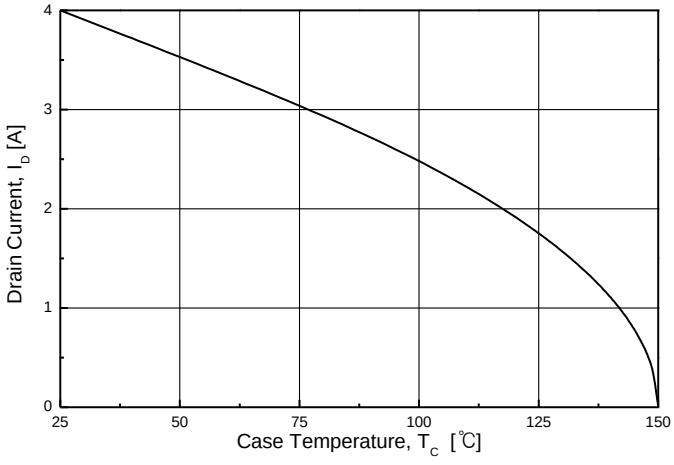

V_GS = 0V
250μs Pulse Test
150℃
25℃
Reverse Drain Current, I_DR [A]
Source-Drain Voltage, V_SD [V]

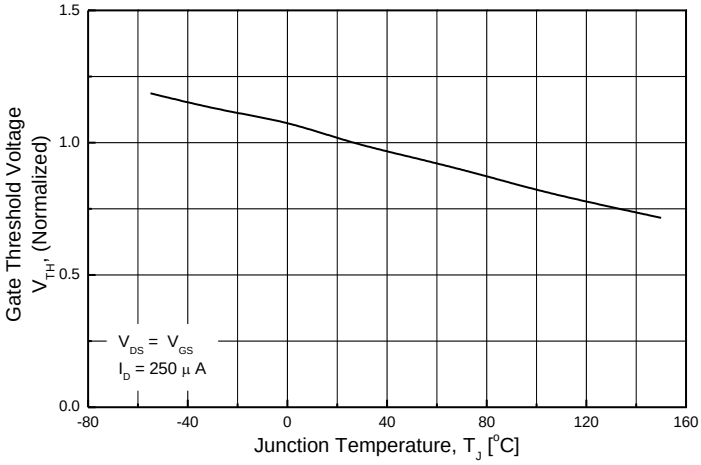

C_iss = C_gs + C_gd (C_ds = shorted)
C_oss = C_ds + C_gd
C_rss = C_gd
V_GS = 0 V
f = 1 MHz
C_iss
C_oss
C_rss
Capacitance [pF]
Drain-Source Voltage, V_DS [V]


I_D = 4.0A
V_DS = 300V
V_DS = 120V
V_DS = 480V
Gate-Source Voltage, V_GS [V]
Total Gate Charge, Q_G [nC]

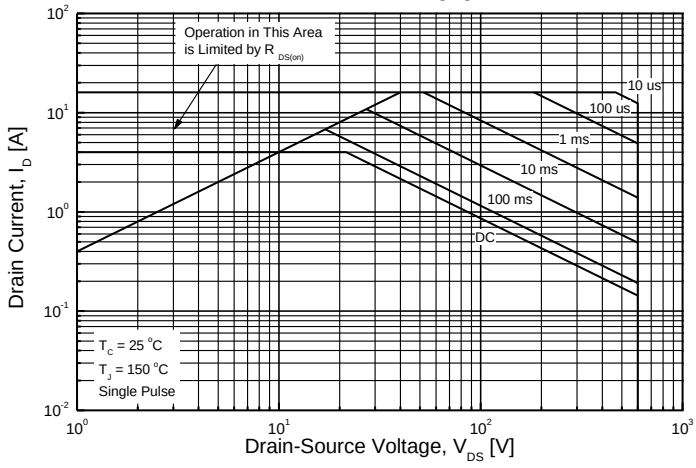








TMP4N60AZ(G)



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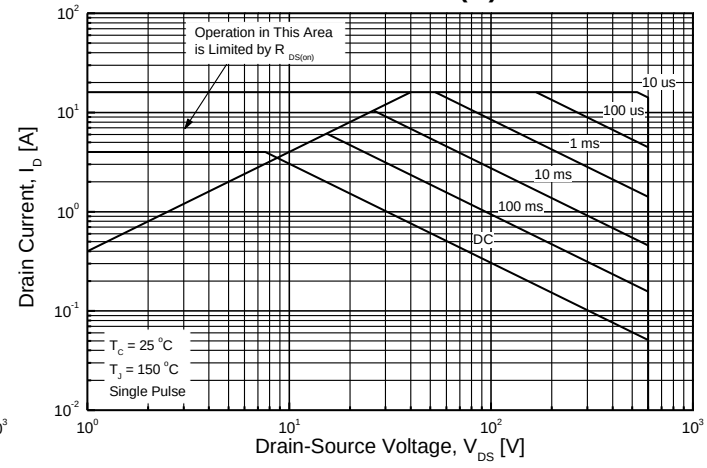
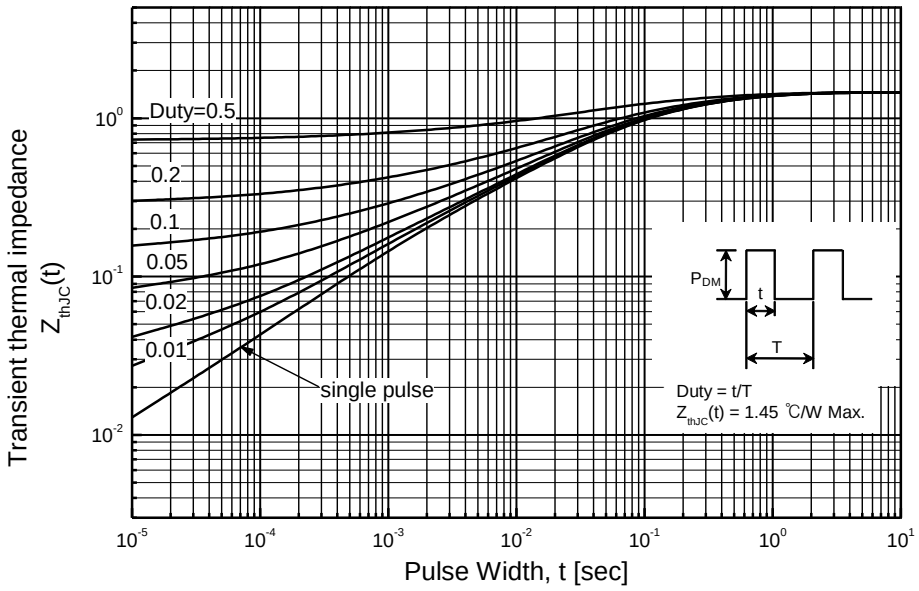


TMP4N60AZ(G)



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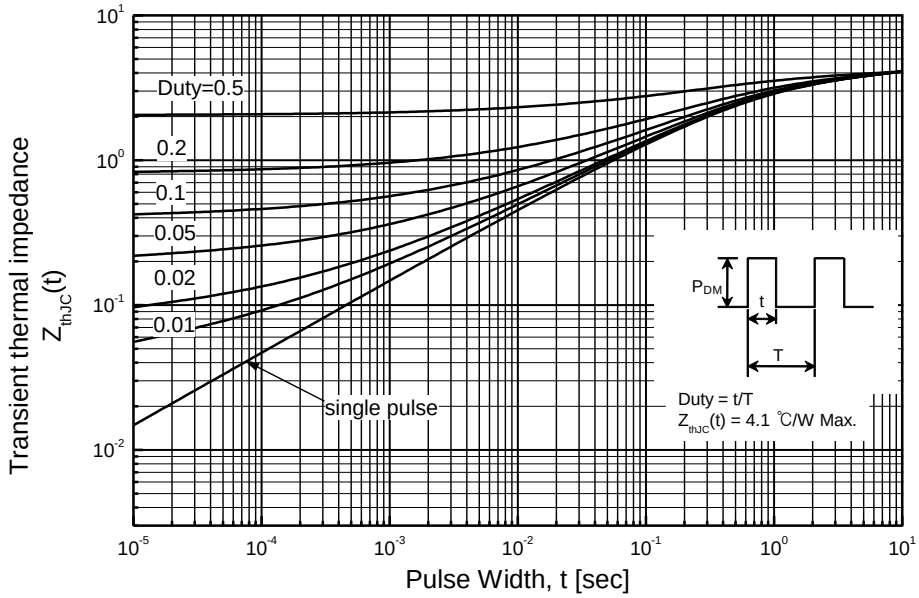
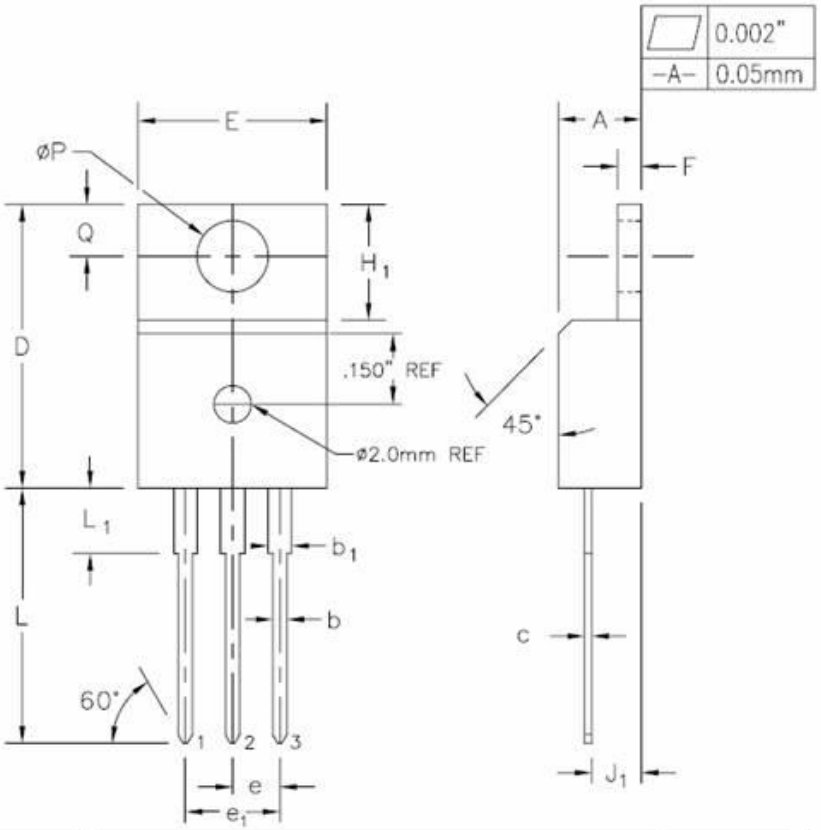
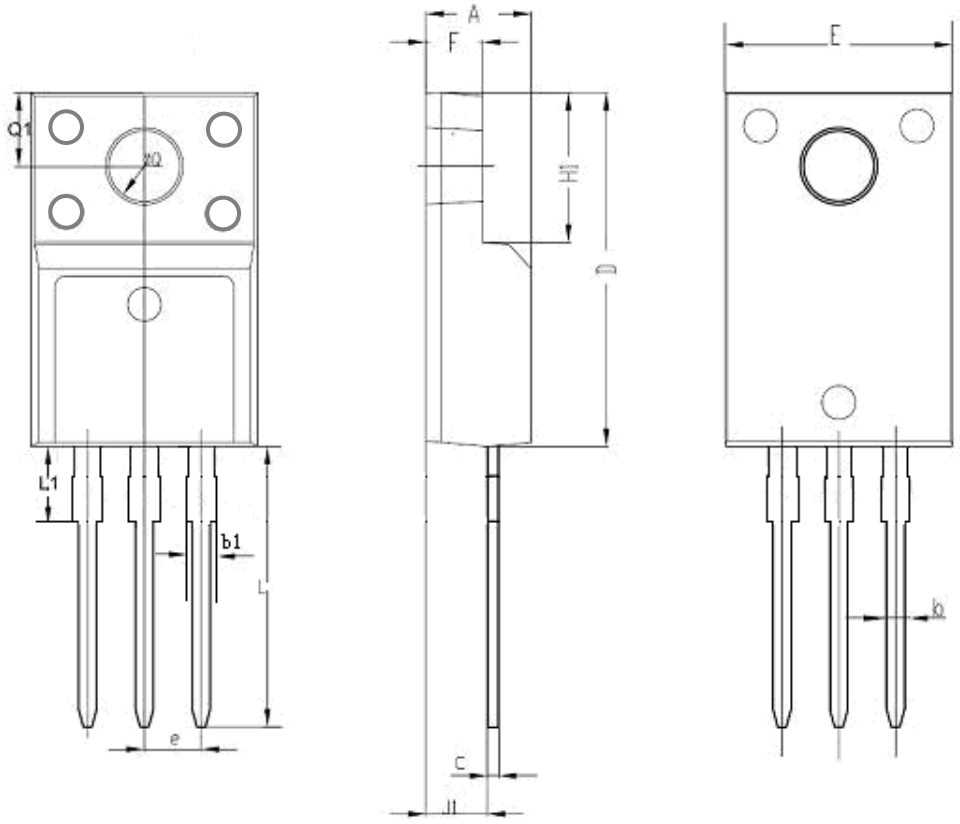


TO-220AB-3L MECHANICAL DATA



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	0.170	0.180	4.32	4.57	
b	0.028	0.036	0.71	0.91	
b_1	0.045	0.055	1.15	1.39	
c	0.014	0.021	0.36	0.53	
D	0.590	0.610	14.99	15.49	
E	0.395	0.410	10.04	10.41	
e	0.100 TYP.		2.54 TYP.		
e_1	0.200 BSC		5.08 BSC		
F	0.048	0.054	1.22	1.37	
H_1	0.235	0.255	5.97	6.47	
J_1	0.100	0.110	2.54	2.79	
L	0.530	0.550	13.47	13.97	
L_1	0.130	0.150	3.31	3.81	2
øP	0.149	0.153	3.79	3.88	
Q	0.102	0.112	2.60	2.84	

TO-220F-3L MECHANICAL DATA



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.178	0.194	4.53	4.93	
b	0.028	0.036	0.71	0.91	
C	0.018	0.024	0.45	0.60	
D	0.617	0.633	15.67	16.07	
E	0.392	0.408	9.96	10.36	
e	0.100 TYP.		2.54TYP.		
H1	0.256	0.272	6.50	6.90	
J1	0.101	0.117	2.56	2.96	
L	0.503	0.519	12.78	13.18	
φQ	0.117	0.133	2.98	3.38	
b1	0.045	0.055	1.15	1.39	
L1	0.114	0.130	2.9	3.3	
Q1	0.122	0.138	3.10	3.50	
F	0.092	0.108	2.34	2.74	