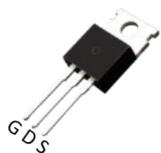


650V N-Channel Power MOSFET

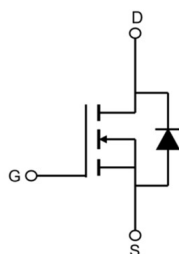
MPR20N65CT
TO-220



MPR20N65CTF
TO-220F



MPR20N65PT
TO-247



V_{DS}	650	V
$R_{DS(on),TYP@ V_{GS}=10V}$	0.42	Ω
I_D	20	A

Features

- 1、Low on – resistance
- 2、TrenchFET Power MOSFET

Applications

- 1、Power factor correction.
- 2、Switched mode power supplies.
- 3、LED driver.

Maximum ratings, at $T_A = 25^\circ\text{C}$, unless otherwise specified

Symbol	Parameter	Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage	650	V
V_{GS}	Gate-Source voltage	± 30	V
I_S	Diode continuous forward current	$T_C = 25^\circ\text{C}$ 20	A
I_D	Continuous drain current @ $V_{GS}=10V$	$T_C = 25^\circ\text{C}$ 20	A
		$T_C = 100^\circ\text{C}$ 12.5	A
I_{DM}	Pulse drain current tested ①	$T_C = 25^\circ\text{C}$ 80	A
E_{AS}	Avalanche energy, single pulsed ②	720	mJ
PD	Power Dissipation TO-220F ($T_C = 25^\circ\text{C}$)	45	W
	Derating Factor above 25°C	0.36	W/ $^\circ\text{C}$
	Power Dissipation TO-247/TO-220 ($T_C = 25^\circ\text{C}$)	250	W
	Derating Factor above 25°C	2	W/ $^\circ\text{C}$
T_{STG}, T_J	Storage and Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typical		Unit
		TO-220F	TO-220/TO-247	
R _{θJC}	Thermal Resistance, Junction-to-Case	2.78	0.5	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	62.5	40	°C/W

Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
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Static Electrical Characteristics @ T_j=25°C (unless otherwise stated)

V(BR)DSS	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	650	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =650V, V _{GS} =0V	--	--	1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±30V, V _{DS} =0V	--	--	±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	2.0	--	4.0	V
R _{DS(on)}	Drain-Source On-State Resistance ④	V _{GS} =10V, I _D =10A	--	0.42	0.50	Ω

Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated)

C _{iss}	Input Capacitance	V _{DS} =25V, V _{GS} =0V, f=1MHz	--	2962	--	pF
C _{oss}	Output Capacitance		--	266	--	pF
C _{rss}	Reverse Transfer Capacitance		--	18	--	pF
Q _g	Total Gate Charge	V _{DS} =520V, I _D =10A, V _{GS} =0 to 10V	--	58.3	--	nC
Q _{gs}	Gate-Source Charge		--	16.7	--	nC
Q _{gd}	Gate-Drain Charge		--	19.3	--	nC

Switching Characteristics

Td(on)	Turn-on Delay Time	V _{DD} =325V, I _D =20A, V _{GS} =15V, R _G =10Ω, T _j =25°C	--	18.8	--	ns
Tr	Turn-on Rise Time		--	43.4	--	ns
Td(off)	Turn-Off Delay Time		--	98.2	--	ns
Tf	Turn-Off Fall Time		--	16.9	--	ns

Source- Drain Diode Characteristics@ T_j = 25°C (unless otherwise stated)

I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		--	--	80	A
VSD	Forward on voltage	IF=20A,V _{GS} =0V	--	--	1.5	V
Trr	Reverse Recovery Time	IF= 20A, VR=325V, di/dt=100A/μs	--	492.8	--	ns
Qrr	Reverse Recovery Charge		--	7.46	--	uC
Irr	Peak reverse recovery current		--	30.3	--	A

NOTE: ① Repetitive rating; pulse width limited by max junction temperature.

② Limited by T_{Jmax}, starting T_J = 25°C, L = 10mH, I_{AS} = 12A. Part not recommended for use above this value.

③ The power dissipation P_{DSM} is based on R_{θJA} and the maximum allowed junction temperature of 150°C.

④ Pulse width ≤ 380μs; duty cycle ≤ 2%.

Typical Characteristics

Figure 1. Output Characteristics

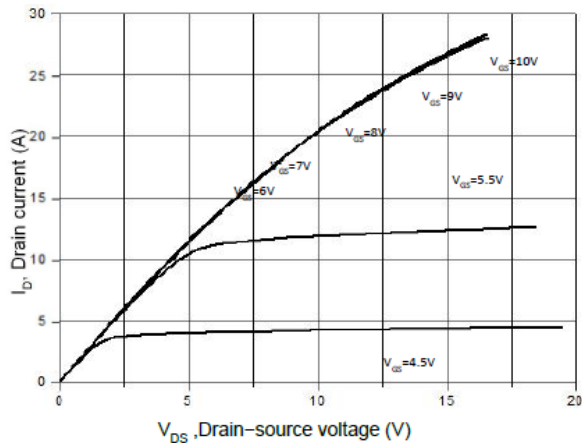


Figure 2. Typical Transfer Characteristics

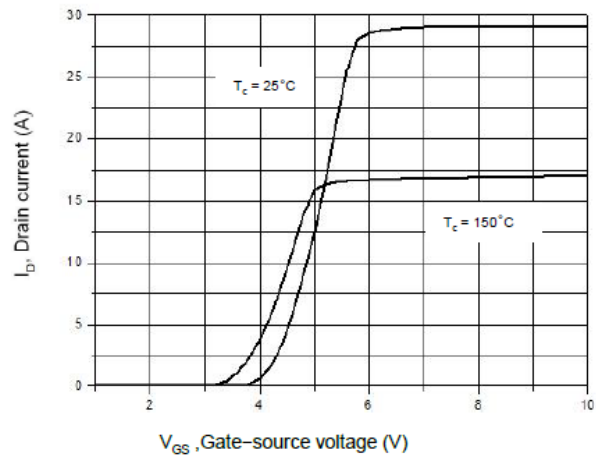


Figure 3. On-Resistance Variation vs. Drain Current

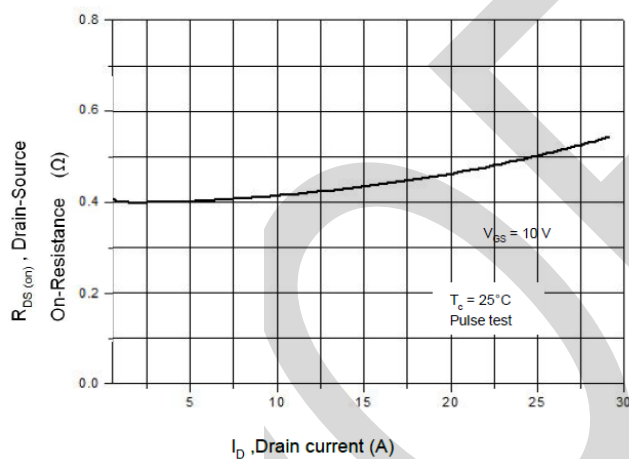


Figure 4. Threshold Voltage vs. Temperature

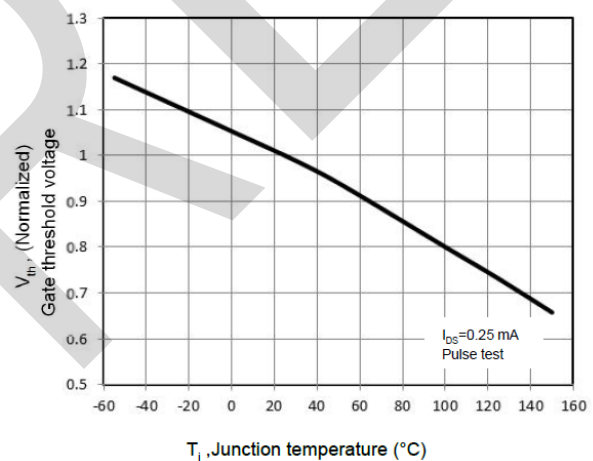


Figure 5. Breakdown Voltage vs. Temperature

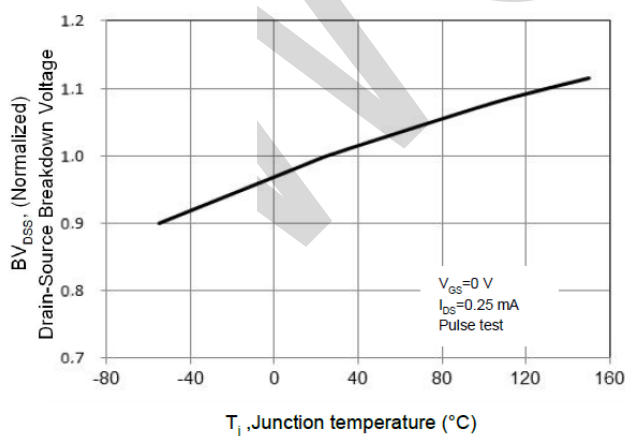
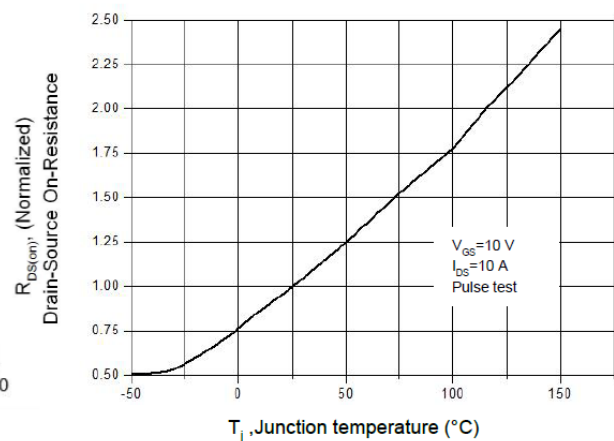


Figure 6. On-Resistance vs. Temperature



Typical Characteristics

Figure 7. Capacitance Characteristics

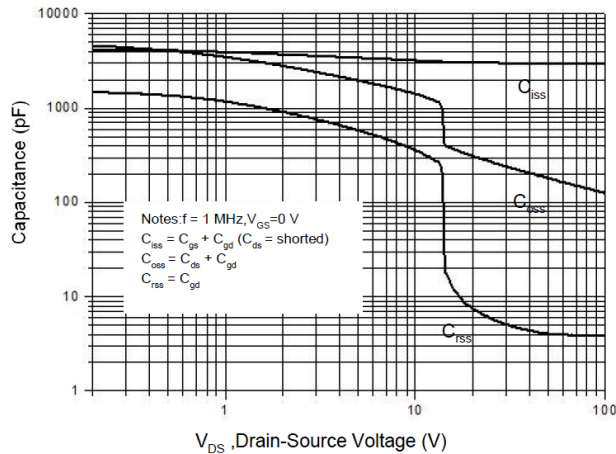


Figure 8. Gate Charge Characteristics

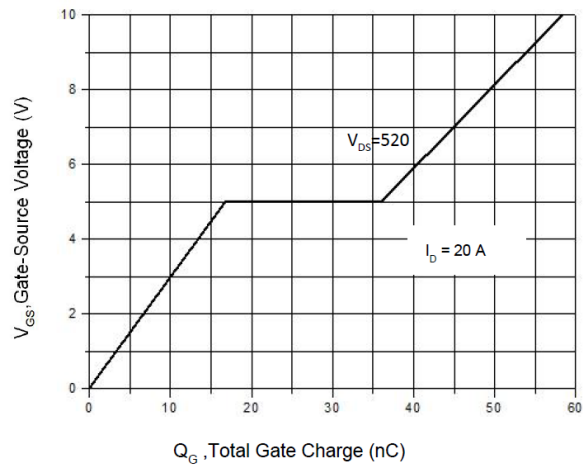


Figure 9. Maximum Safe Operating Area
TO-220F

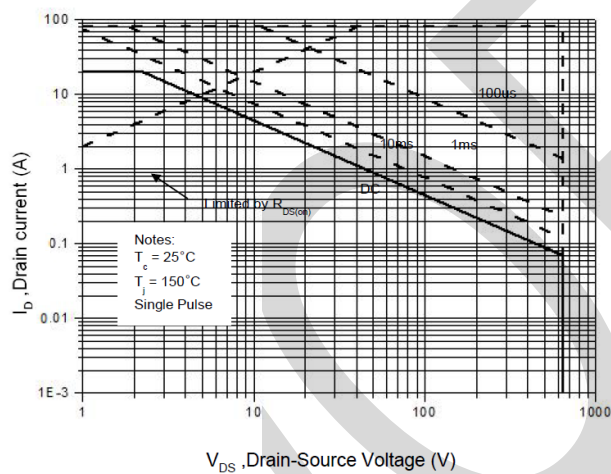


Figure 10. Maximum Safe Operating Area
TO-247/TO-220

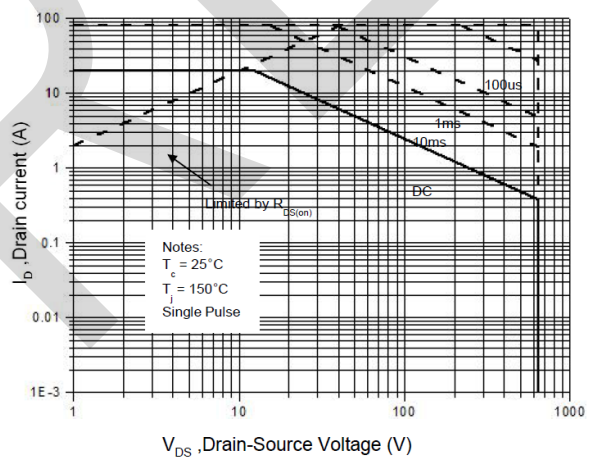


Figure 11. Power Dissipation vs. Temperature
TO-220F

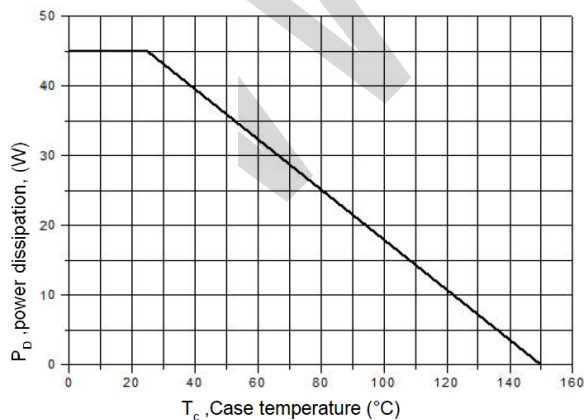
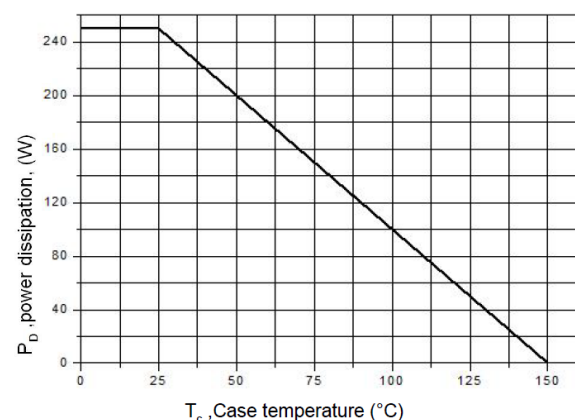


Figure 12. Power Dissipation vs. Temperature
TO-247/TO-220



Typical Characteristics

Figure 13. Continuous Drain Current vs. Temperature

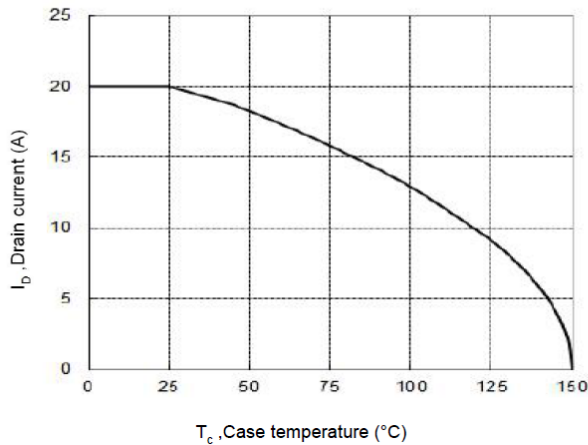


Figure 14. Body Diode Transfer Characteristics

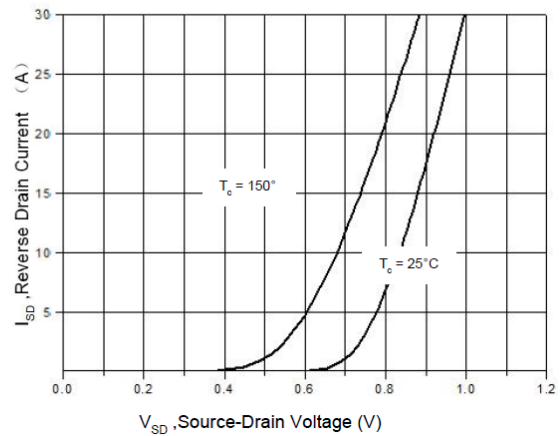


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F

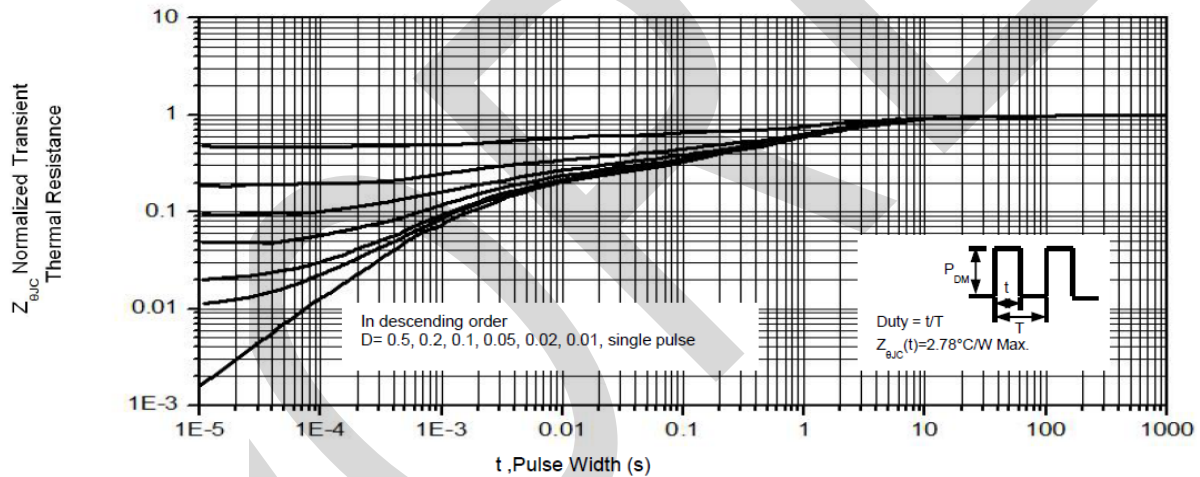
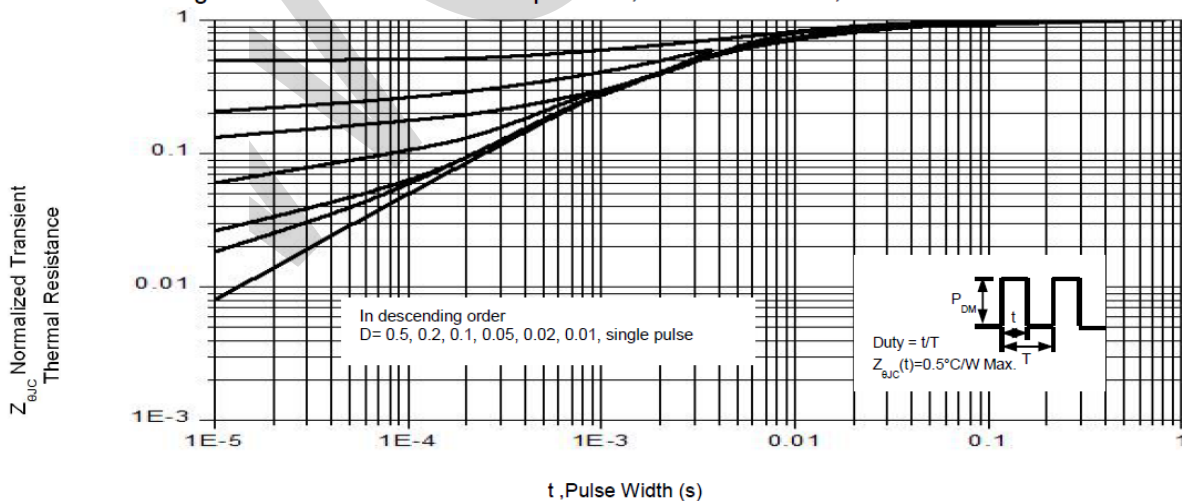


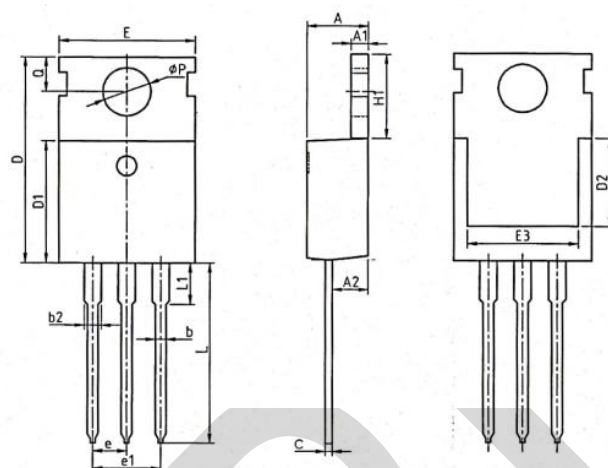
Figure 16. Transient Thermal Impedance, Junction to Case, TO-247/TO-220



PACKAGE OUTLINE DIMENSIONS

Note:unit mm

TO-220

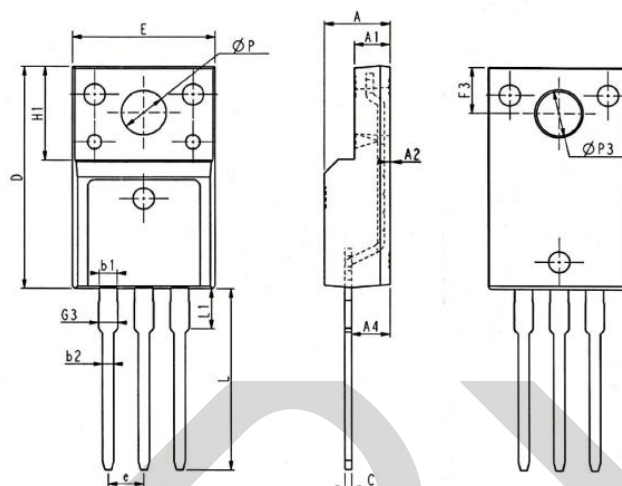


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.37	4.57	4.70	0.172	0.180	0.185
A1	1.25	1.30	1.40	0.049	0.051	0.055
A2	2.20	2.40	2.60	0.087	0.094	0.102
b	0.70	0.80	0.95	0.028	0.031	0.037
b2	1.17	1.27	1.47	0.046	0.050	0.058
c	0.45	0.50	0.60	0.018	0.020	0.024
D	15.10	15.60	16.10	0.594	0.614	0.634
D1	8.80	9.10	9.40	0.346	0.358	0.370
D2	5.50	—	—	0.217	—	—
E	9.70	10.00	10.30	0.382	0.394	0.406
E3	7.00	—	—	0.276	—	—
e	2.54BSC			0.1BSC		
e1	5.08BSC			0.2BSC		
H1	6.25	6.50	6.85	0.246	0.256	0.270
L	12.75	13.50	13.80	0.502	0.531	0.543
L1	—	3.10	3.40	—	0.122	0.134
Øp	3.40	3.60	3.80	0.134	0.142	0.150
Q	2.60	2.80	3.00	0.102	0.110	0.118

PACKAGE OUTLINE DIMENSIONS

Note:unit mm

TO-220F

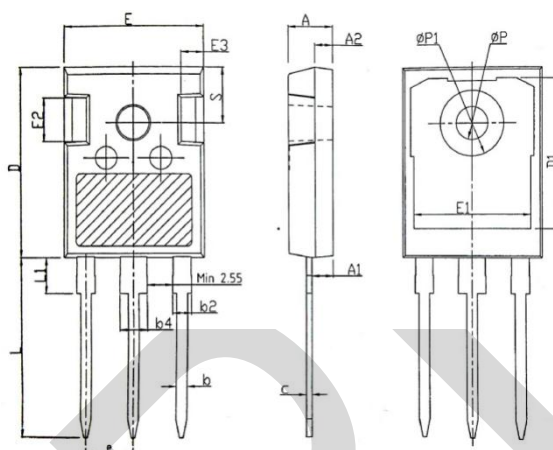


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
E	9.96	10.16	10.36	0.392	0.400	0.408
A	4.50	4.70	4.90	0.177	0.185	0.193
A1	2.34	2.54	2.74	0.092	0.100	0.108
A2	0.30	0.45	0.60	0.012	0.002	0.024
A4	2.65	2.76	2.96	0.104	0.109	0.117
C	0.40	0.50	0.65	0.016	0.020	0.026
D	15.57	15.87	16.17	0.613	0.625	0.637
H1	6.70REF			0.264REF		
e	2.54BSC			0.1BSC		
ØP	3.03	3.18	3.38	0.119	0.125	0.133
L	12.68	12.98	13.28	0.499	0.511	0.523
L1	2.88	3.03	3.18	0.113	0.119	0.125
ØP3	3.15REF			0.124REF		
F3	3.15	3.30	3.45	0.124	0.130	0.136
G3	1.25	1.35	1.55	0.049	0.053	0.061
b1	1.18	1.28	1.43	0.046	0.050	0.056
b2	0.70	0.80	0.95	0.028	0.031	0.037

PACKAGE OUTLINE DIMENSIONS

Note:unit mm

TO-247



SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.80	5.00	5.20	0.189	0.197	0.205
A1	2.21	2.41	2.59	0.087	0.095	1.102
A2	1.85	2.00	2.15	0.073	0.079	0.085
b	1.11	1.21	1.36	0.044	0.048	0.054
b2	1.91	2.01	2.21	0.075	0.079	0.087
b4	2.91	3.01	3.21	0.115	0.119	0.126
c	0.51	0.61	0.75	0.020	0.024	0.030
D	20.80	21.00	21.30	0.819	0.827	0.839
D1	16.25	16.55	16.85	0.640	0.652	0.663
E	15.50	15.80	16.10	0.610	0.622	0.634
E1	13.00	13.30	13.60	0.512	0.524	0.535
E2	4.80	5.00	5.20	0.189	0.197	0.205
E3	2.30	2.50	2.70	0.090	0.098	0.107
e	5.44BSC			0.214BSC		
L	19.82	19.92	20.22	0.780	0.784	0.796
L1	—	—	4.30	—	—	0.169
ØP	3.40	3.60	3.80	0.134	0.142	0.150
ØP1	—	—	7.30	—	—	0.288
S	6.15BSC			0.242BSC		