POWER™

PFJ60R180 / PFW60R180

N-Channel Super Junction MOSFET

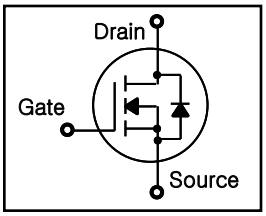
FEATURES

- ❑ New technology for high voltage device
- ❑ Low $R_{DS(on)}$ low conduction losses
- ❑ Small package
- ❑ Ultra low gate charge cause lower driving requirement
- ❑ 100% avalanche tested
- ❑ RoHS

BV_{DSS} = 600 V

$R_{DS(on)}$ = 0.15 Ω

I_D = 21 A



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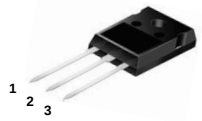
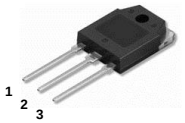


1.Gate 2. Drain 3. Source

TO-3P



1.Gate 2. Drain 3. Source

APPLICATION

- ❑ Power Factor Correction(PFC)
- ❑ Switched mode power supply (SMPS)
- ❑ Uninterruptible Power Supply (UPS)

Absolute Maximum Ratings

T_C=25℃ unless otherwise specified

Symbol	Parameter	Value	Units
V_{DS}	Drain-Source Voltage (V_{GS}=0V)	600	V
I_D	Drain Current – Continuous (T_C = 25℃)	21	A
	Drain Current – Continuous (T_C = 100℃)	13.2	A
$I_{DM(pulse)}$	Drain Current – Pulsed * Note 1	63	A
V_{GS}	Gate-Source Voltage (V_{DS}=0V)	±30	V
E_{AS}	Single Pulsed Avalanche Energy * Note 2	690	mJ
I_{AR}	Avalanche Current * Note 1	7.0	A
E_{AR}	Repetitive Avalanche Energy * Note 1	1.0	mJ
dv/dt	Drain Source Voltage Slope, $V_{DS} \leq 480V$	50	V/ns
	Reverse Diode dv/dt, $V_{DS} \leq 480V$	15	V/ns
P_D	Maximum Power Dissipation (T_C = 25℃)	200	W
	Derate above 25℃	1.6	W/℃
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	℃

* Limited by maximum junction temperature

Thermal Resistance Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Junction-to-Case (Maximum)	0.62	℃/W
$R_{\theta JA}$	Junction-to-Ambient (Maximum)	62.5	

Electrical Characteristics T_A=25 °C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 uA	2.5	3.0	3.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 10.5 A	--	150	180	m.ohm
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 uA	600	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 600 V, V_{GS} = 0 V	--	--	1	uA
		V_{DS} = 600 V, T_C=125 ℃	--	--	100	uA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
Dynamic Characteristics						
g_{FS}	Forward Transconductance	V_{DS} = 20V, I_D = 10.5 A	--	17.5	--	S
R_G	Intrinsic Gate Resistance	f = 1.0 MHz, open drain	--	1.0	--	ohm
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1.0 MHz	--	1950	--	pF
C_{oss}	Output Capacitance		--	150	--	pF
C_{rss}	Reverse Transfer Capacitance		--	5.0	--	pF
Q_g	Total Gate Charge	V_{DS} = 480 V, I_D = 21 A, V_{GS} = 10 V	--	45	70	nC
Q_{gs}	Gate-Source Charge		--	9	--	nC
Q_{gd}	Gate-Drain Charge		--	18	--	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	V_{DS} = 380 V, I_D = 11 A, R_G = 4 Ω, V_{GS} = 10V	--	11	--	ns
t_r	Turn-On Rise Time		--	6	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	61	100	ns
t_f	Turn-Off Fall Time		--	4.5	12	ns
Source-Drain Diode Maximum Ratings and Characteristics						
I_S	Continuous Source-Drain Diode Forward Current		--	--	21	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	63	A
V_{SD}	Source-Drain Diode Forward Voltage	I_S = 21 A, V_{GS} = 0 V	--	0.9	1.3	V
trr	Reverse Recovery Time	I_S = 21 A di/dt = 100 A/μs	--	310	--	ns
Qrr	Reverse Recovery Charge		--	5	--	μC

Notes ;

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. V_{DD}=50V, R_G=25Ω, Starting T_J=25°C

Typical Characteristics

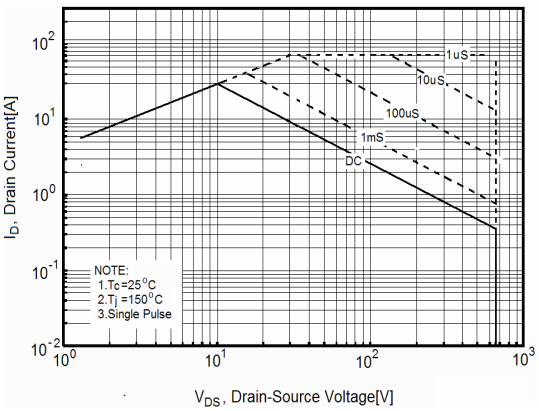


Figure 1. Safe Operating Area(TO-220)

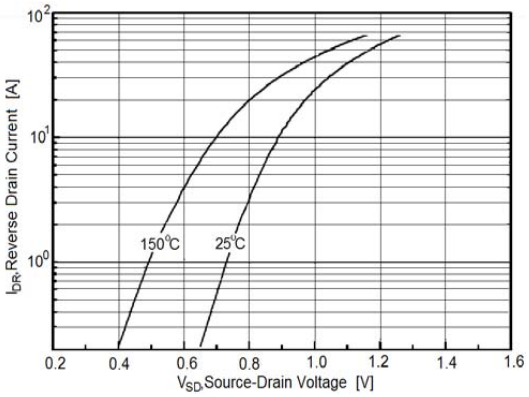


Figure 2. Source Drain Diode Forward Voltage

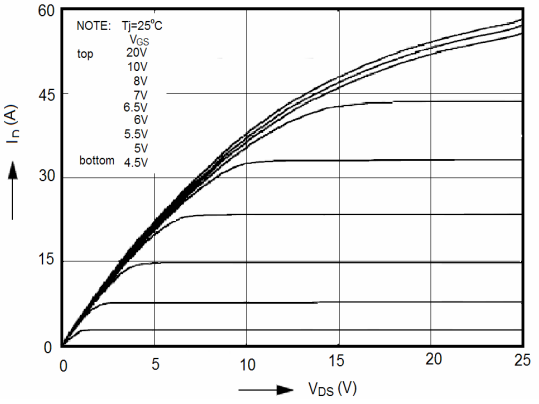


Figure 3. Output Characteristics

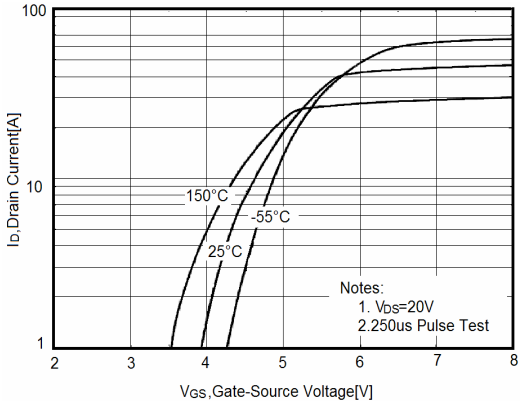


Figure 4. Transfer Characteristics

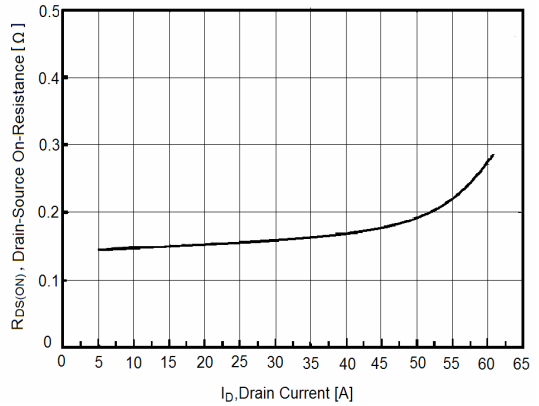


Figure 5. Static Drain-Source On Resistance

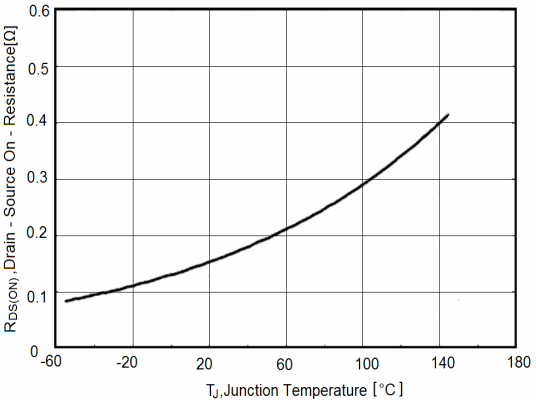


Figure 6. Rds(on) vs. Junction Temperature

Typical Characteristics (continued)

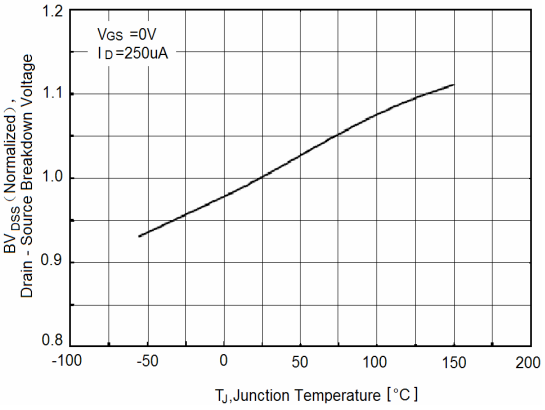


Figure 7. BVdss vs. Junction Temperature

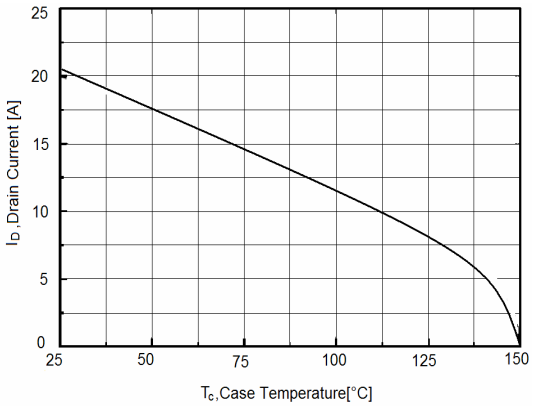


Figure 8. Maximum ID vs. Junction Temperature

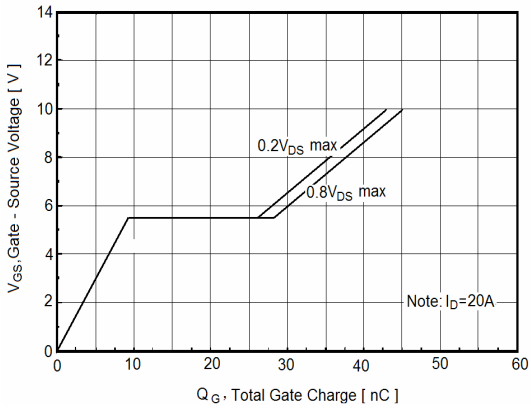


Figure 9. Gate Charge Waveforms

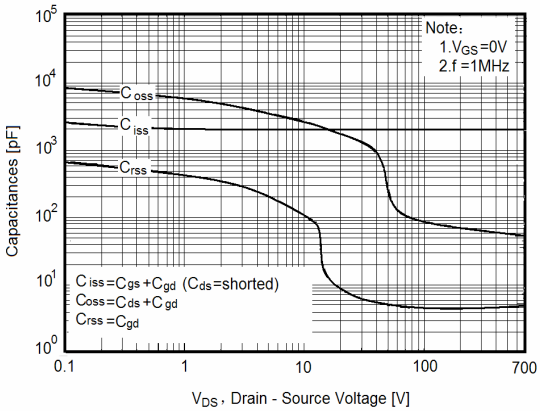


Figure 10. Capacitance

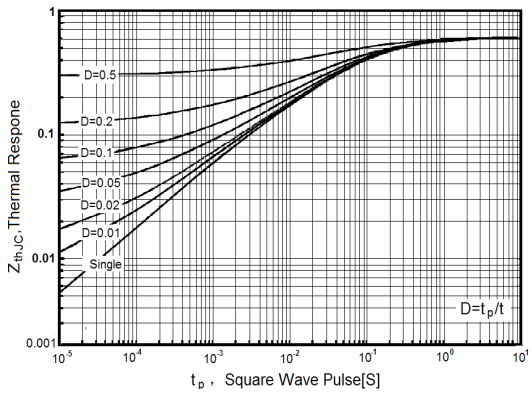
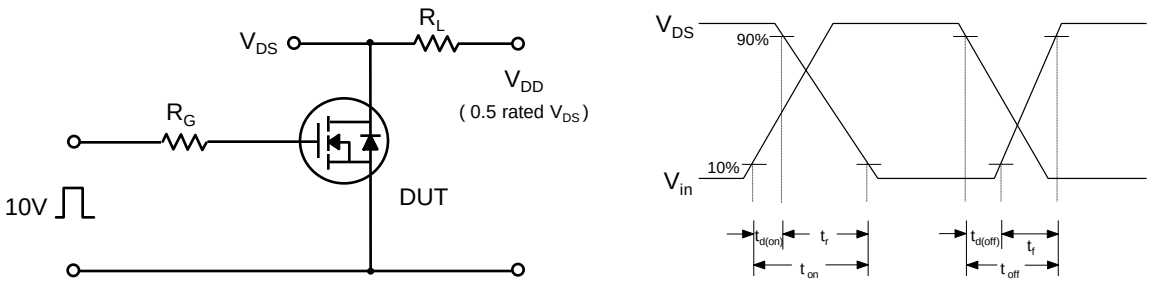
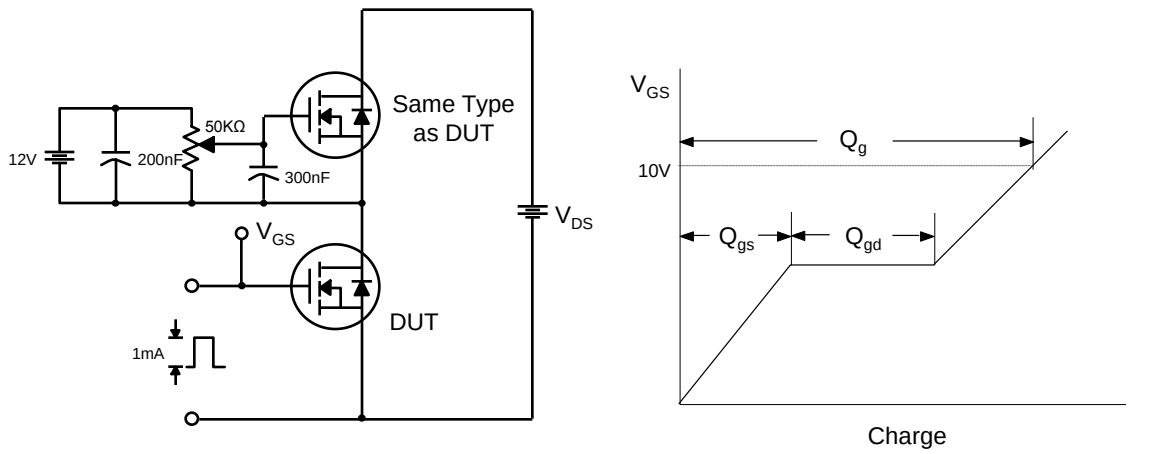


Figure 11. Transient Thermal Response Curve

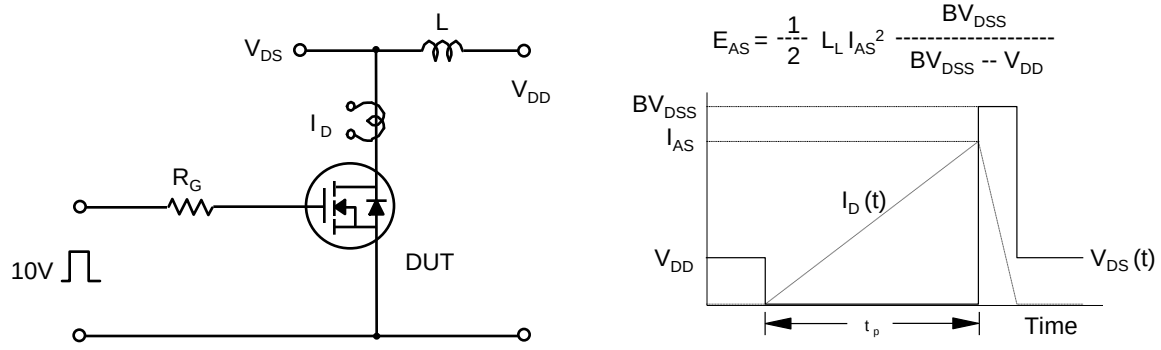
Characteristics Test Circuit & Waveform



Switching Time Test Circuit & Waveforms

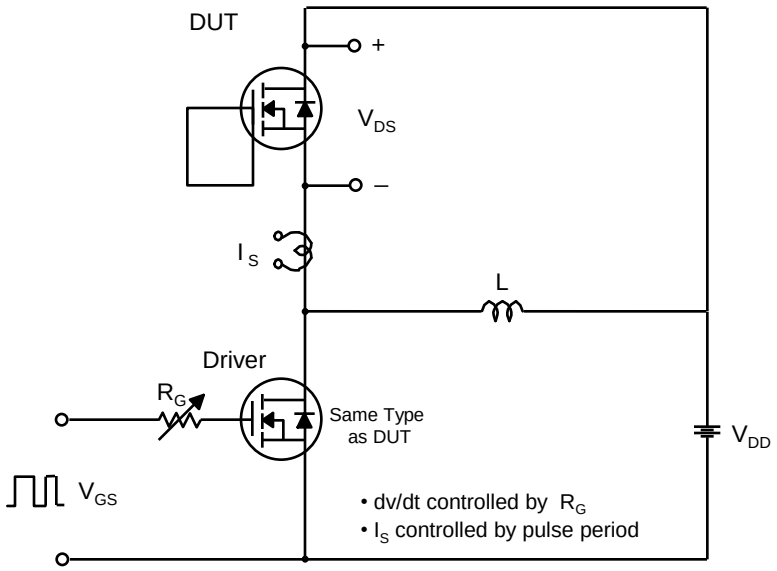


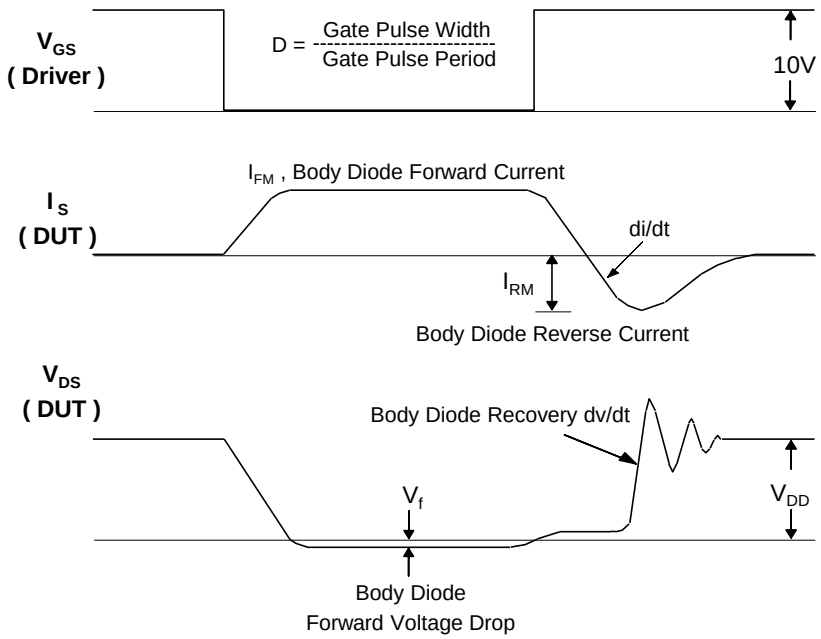
Gate Charge Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveforms

Characteristics Test Circuit & Waveform (continued)

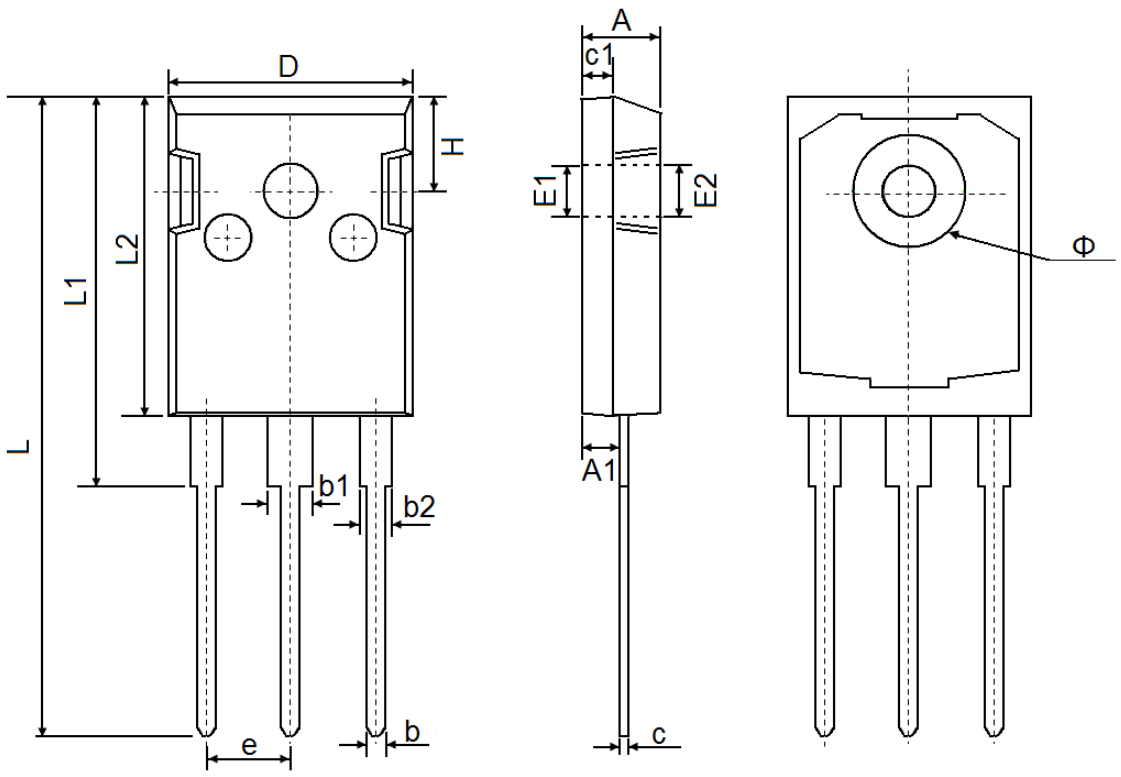




Peak Diode Recovery dv/dt Test Circuit & Waveforms

Package Dimension

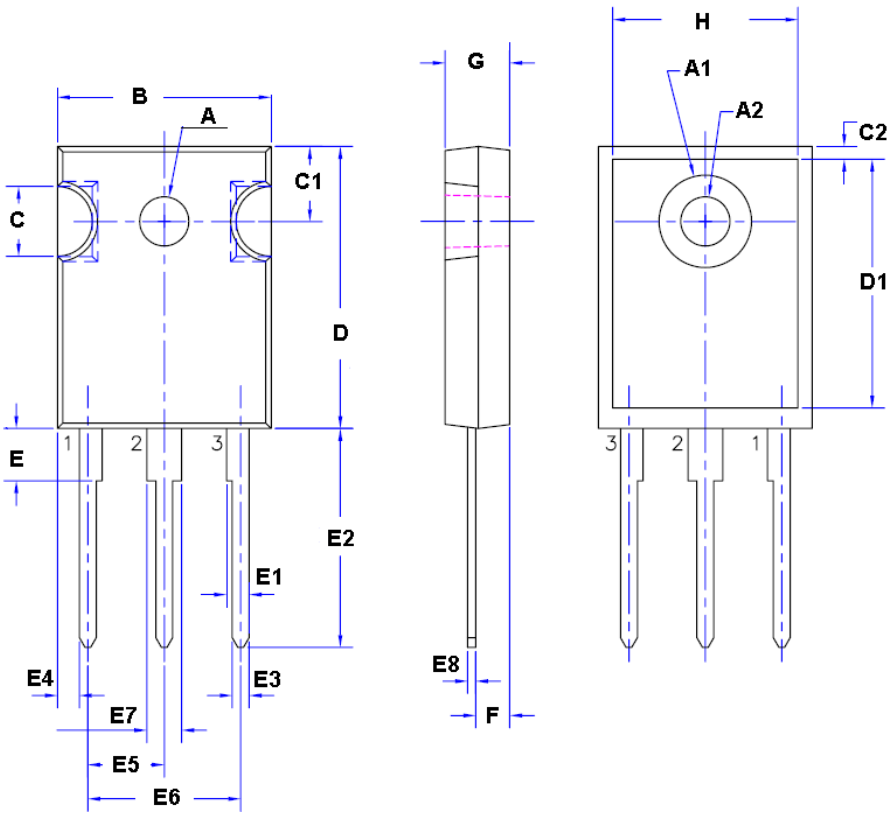
TO-247



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Φ	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	

Package Dimension

TO-247

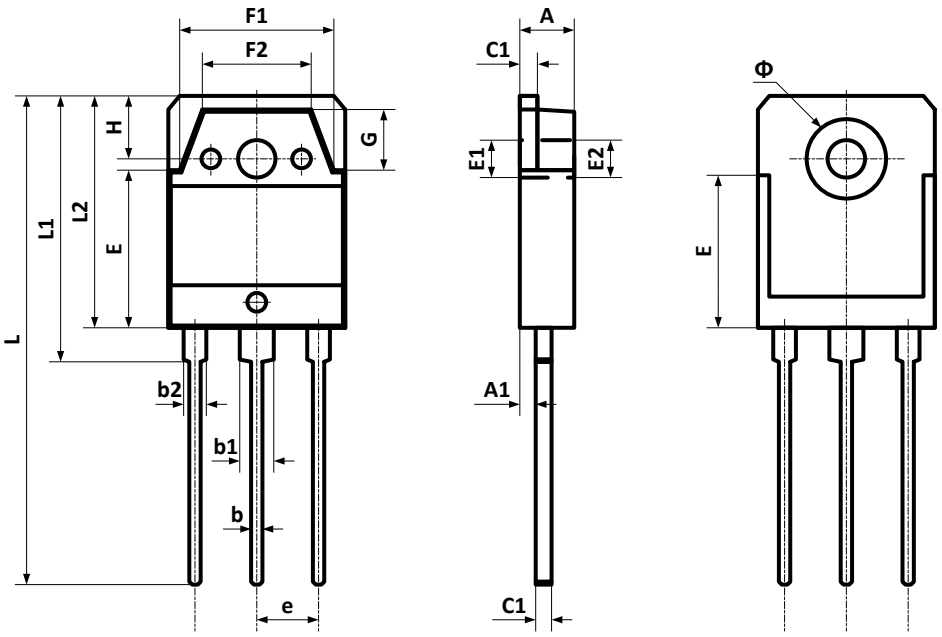


Unit : mm

	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max
A ϕ	3.51		3.65	D	20.32		20.82	E5	(5.56)		
A1 ϕ	6.61		6.85	D1	13.08			E6	(11.12)		
A2 ϕ	3.51		3.65	E	3.69		3.93	E7	2.42		2.66
B	15.37		15.87	E1	1.53		1.77	E8	0.51		0.71
C	4.96		5.2	E2	15.75		16.25	F	2.29		2.66
C1	5.34		5.58	E3	1.17		1.35	G	4.58		4.82
C2	0.51		1.35	E4	(1.6)			H	12.81		

Package Dimension

TO-3P



Symbol	Dimension in Millimeters		Dimension in Inches	
	Min	Max	Min	Max
A	4.600	5.000	0.181	0.197
A1	1.200	1.600	0.047	0.063
b	0.800	1.200	0.031	0.047
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.450	1.650	0.057	0.065
D	15.45	15.85	0.606	0.622
E	13.70	14.10	0.539	0.555
E1	3.200 REF		0.126 REF	
E2	3.300 REF		0.130 REF	
E3	13.45 REF		0.530 REF	
F1	13.40	13.80	0.528	0.543
F2	9.400	9.800	0.370	0.386
L	39.90	40.30	1.571	1.587
L1	23.20	23.60	0.913	0.929
L2	20.30	20.60	0.799	0.811
Φ	6.900	7.100	0.272	0.280
G	5.150	5.550	0.203	0.219
e	5.450 TYP		0.215 TYP	
H	5.000 REF		0.197 REF	
h	0.000	0.300	0.000	0.012

Package Dimension

TO-3P