RU4099

N-Channel Advanced HV Power MOSFET

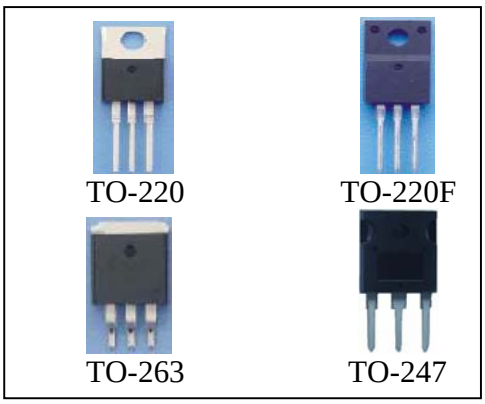
Features

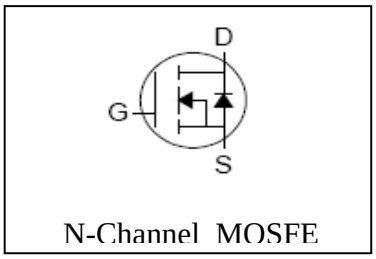
- 40V/200A
  $R_{DS\ (ON)}$=2.8 mΩ(Typ.) @ V_{GS}=10V
- Avalanche Rated
- Reliable and Rugged
- Lead Free and Green Devices Available

Applications

- Automotive applications and a wide variety of other applications
- High Efficiency Synchronous in SMPS
- High Speed Power Switching

Pin Description





N-Channel MOSFE

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (T_A=25°C Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		40	V
V_{GSS}	Gate-Source Voltage		±25	
T_J	Maximum Junction Temperature		175	°C
T_{STG}	Storage Temperature Range		-55 to 175	°C
I_S	Diode Continuous Forward Current	T_C=25°C	200	A
Mounted on Large Heat Sink				
I_{DP}	300μs Pulsed Drain Current Tested	T_C=25°C	800 [a]	A
I_D	Continue Drain Current	T_C=25°C	200 [b]	
		T_C=100°C	140	
P_D	Maximum Power Dissipation	T_C=25°C	400	W
		T_C=100°C	230	
$R_{\theta JC}$	Thermal Resistance -Junction to Case		0.45	°C/W
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		62.5	
Drain-Source Avalanche Ratings				
E_{AS}	Avalanche Energy ,Single Pulsed	L=0.5mH	1400	mJ

Note：a： Pulse width limited by safe operating area. b: Current limited by package(Limitation Current is 75A)

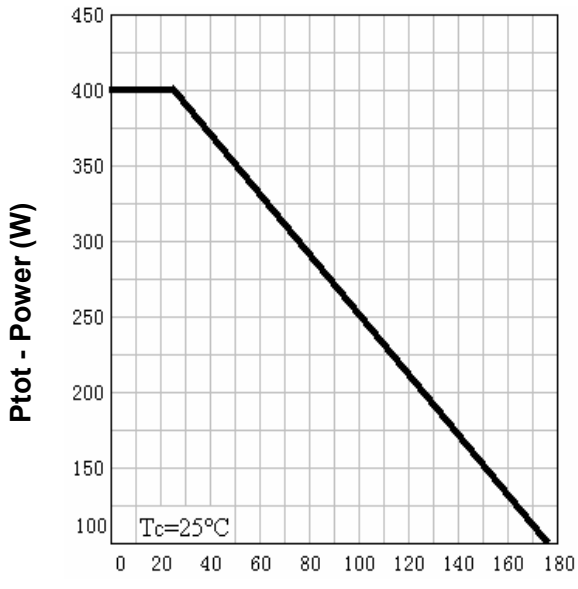
Electrical Characteristics (T_A=25°C Unless Otherwise Noted)

	Parameter	Test Condition	RU4099			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=-250μA	40			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}= 60V, V_{GS}=0V			1	μA
		T_J=85°C			30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=-250μA	2	3	4	V
I_{GSS}	Gate Leakage Current	V_{GS}=±25V, V_{DS}=0V			±100	nA
$R_{DS(ON)}$ [c]	Drain-Source On-state Resistance	V_{GS}= 10V, I_{DS}=40A		2.8	3.5	mΩ
Diode Characteristics						
V_{SD} [c]	Diode Forward Voltage	I_{SD}=40 A, V_{GS}=0V		0.81	1.2	V
t_{rr}	Reverse Recovery Time	I_{SD}=40A, dI_{SD}/dt=100A/μs		74		ns
q_{rr}	Reverse Recovery Charge			148		nC
Dynamic Characteristics [d]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz		1.4		Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}= 30V, Frequency=1.0MHz		5750		pF
C_{oss}	Output Capacitance			1400		
C_{rss}	Reverse Transfer Capacitance			480		
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=35V, R_L=35Ω, I_{DS}= 1A, V_{GEN}= 10V, R_G=6Ω		21	40	ns
t_r	Turn-on Rise Time			37	69	
$t_{d(OFF)}$	Turn-off Delay Time			75	136	
t_f	Turn-off Fall Time			115	208	
Gate Charge Characteristics [d]						
Q_g	Total Gate Charge	V_{DS}=30V, V_{GS}= 10V, I_{DS}=40A		154	218	nC
Q_{gs}	Gate-Source Charge			44		
Q_{gd}	Gate-Drain Charge			47		

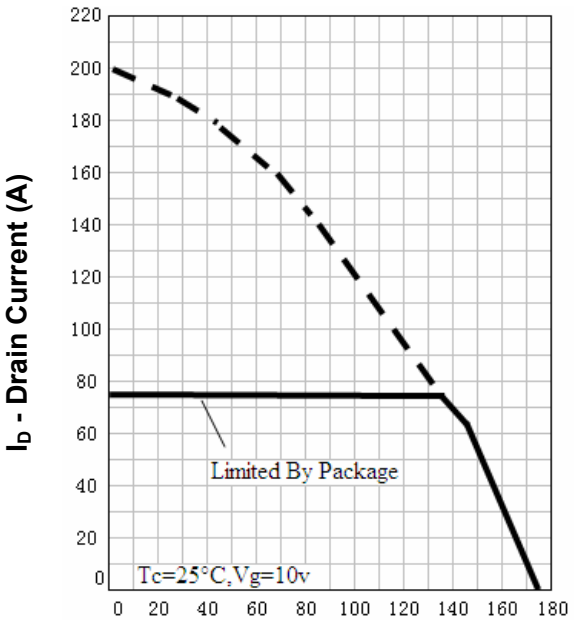
Notes: c 、 Pulse test ; Pulse width≤300μs, duty cycle≤2%.
d 、 Guaranteed by design, not subject to production testing.

Typical Characteristics

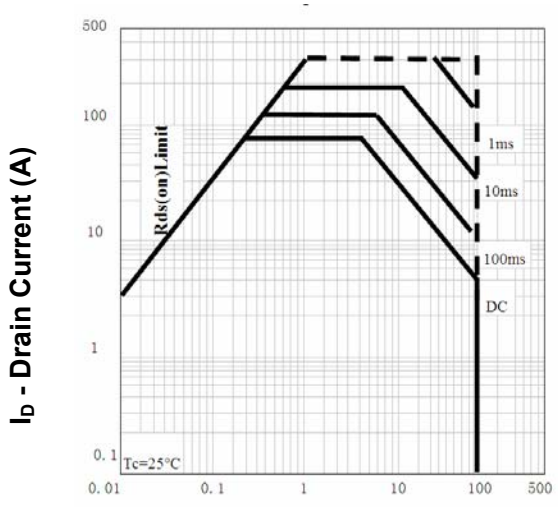
Power Dissipation



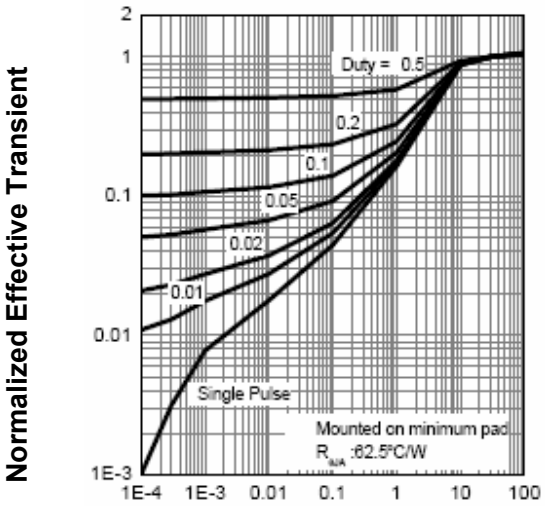
Drain Current



Safe Operation Area

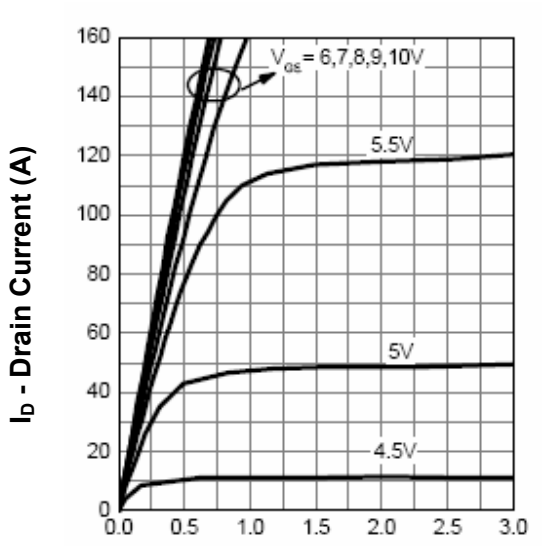


Thermal Transient Impedance



Typical Characteristics

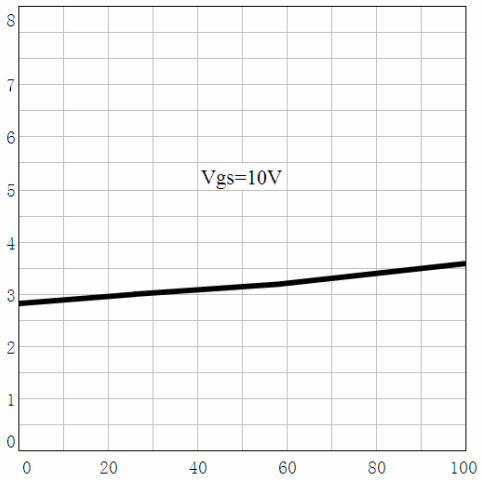
Output Characteristics



I_D - Drain Current (A)

V_{DS} - Drain-Source Voltage (V)

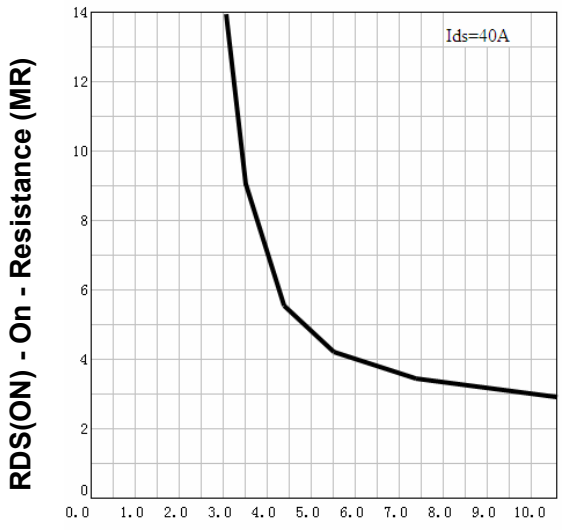
Drain-Source On Resistance



$R_{DS(ON)}$ - On Resistance (mΩ)

I_D - Drain Current (A)

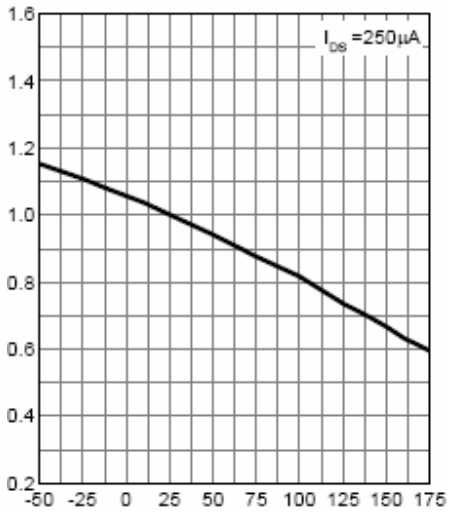
Drain-Source On Resistance



RDS(ON) - On - Resistance (MR)

VGS - Gate - Source Voltage (V)

Gate Threshold Voltage

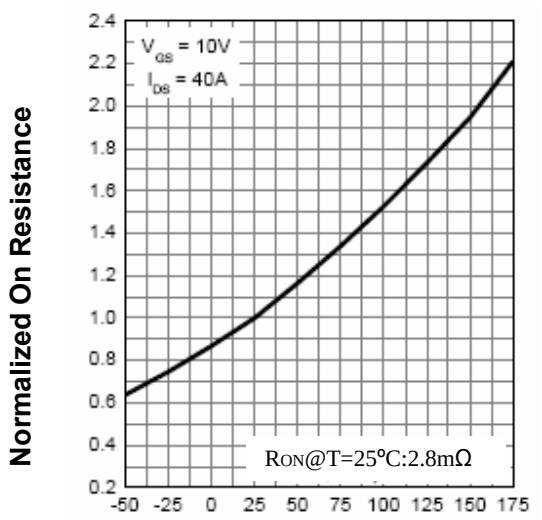


Normalized Threshold Vlotage

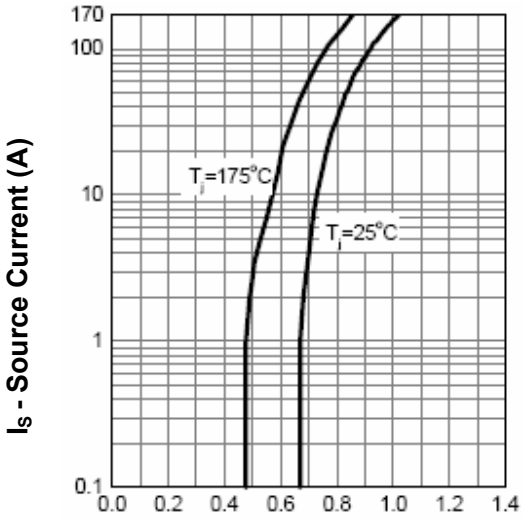
Tj - Junction Temperature (°C)

Typical Characteristics

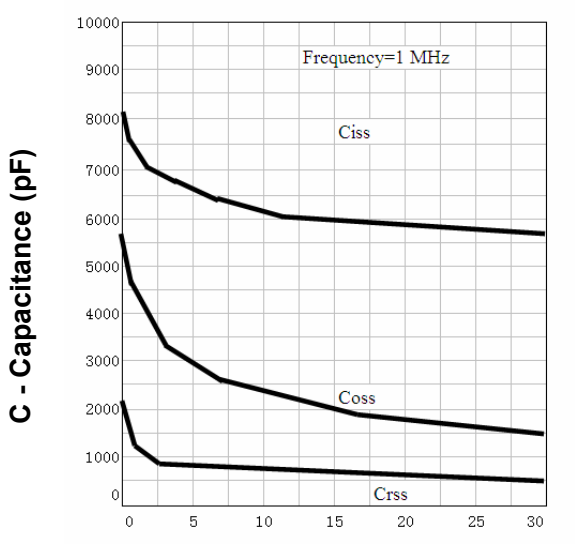
Drain-Source On Resistance



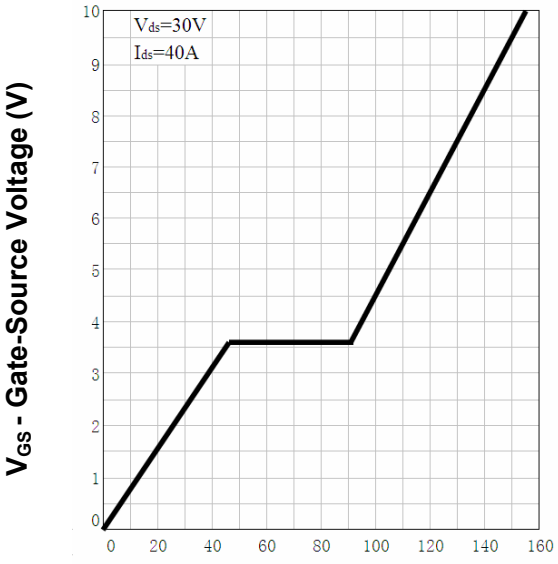
Source-Drain Diode Forward



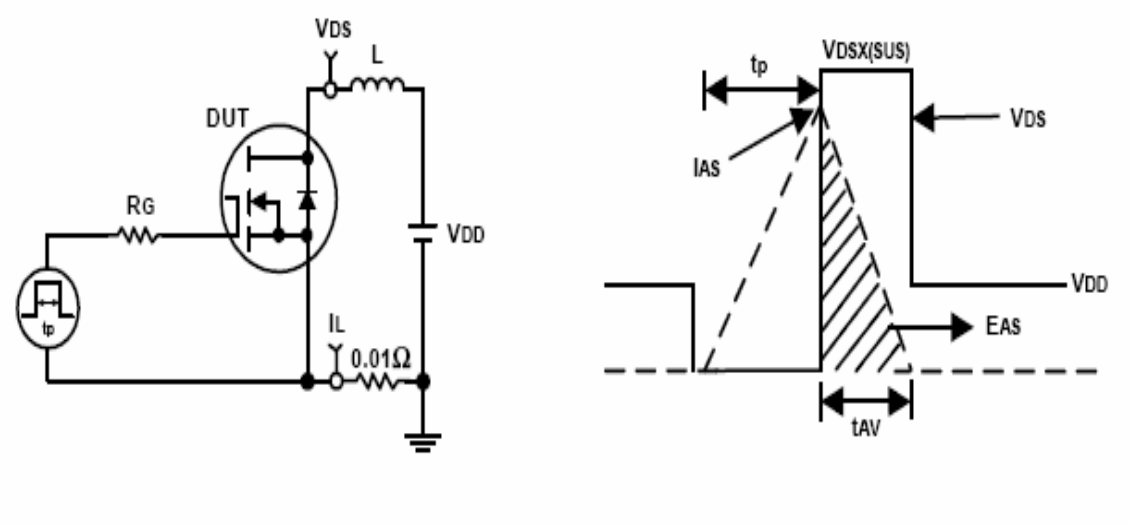
Capacitance



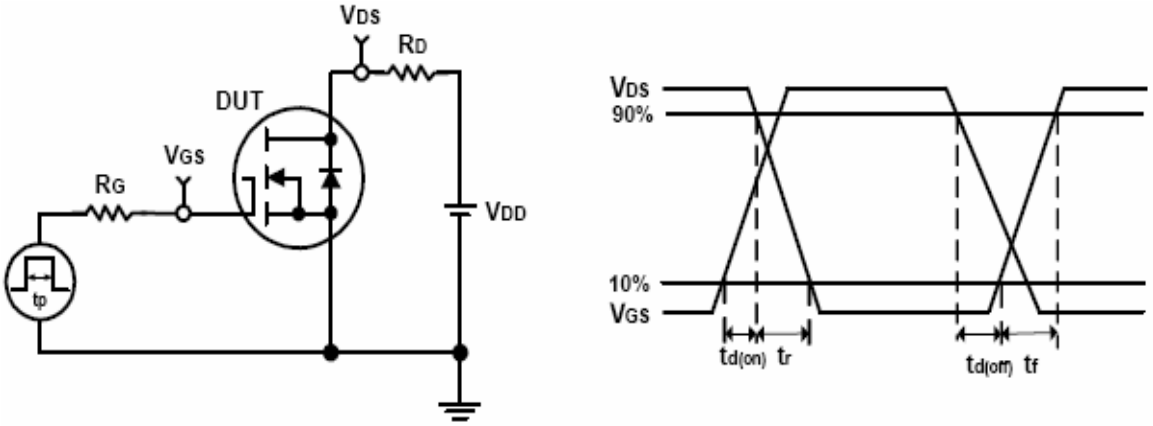
Gate Charge



Avalanche Test Circuit and Waveforms



Switching Time Test Circuit and Waveforms



Ordering and Marking Information

RU4099

Package (Available)

Q:TO-247 ; R: TO-220 ; S: TO-263

Operating Temperature Range

C : -55 to 175 ºC

Assembly Material

G : Green & Lead Free Device

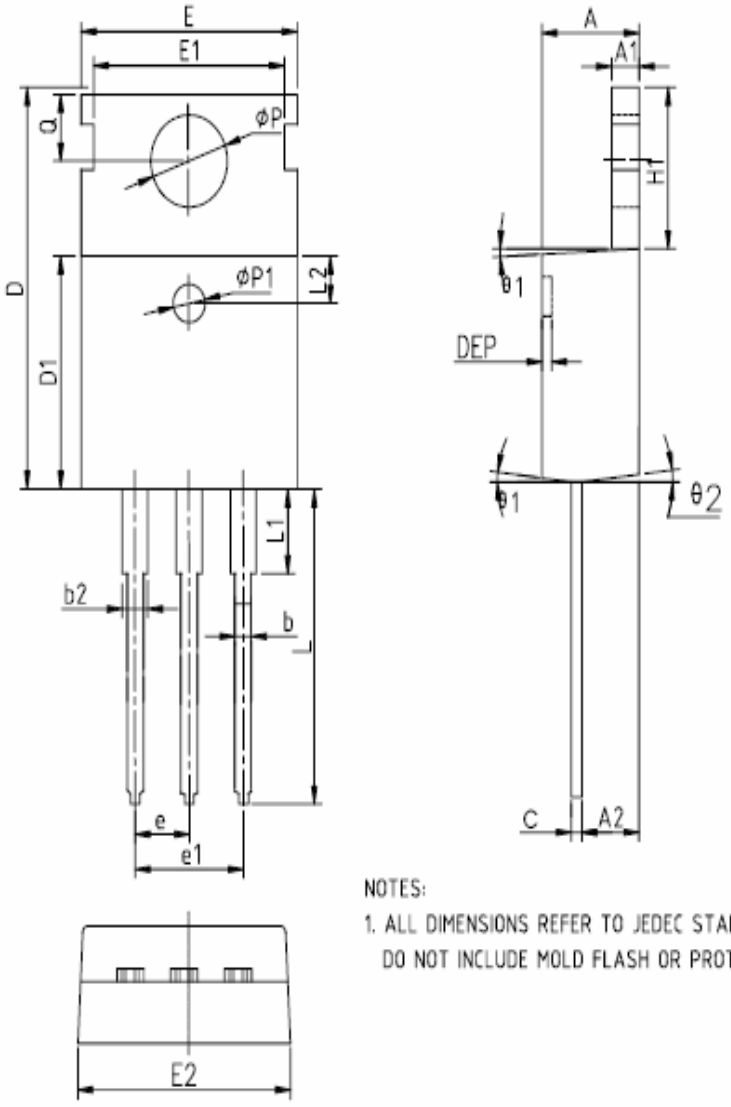
Packaging

T : TUBE

TR : Tape & Reel

Package Information

TO-220FB-3L

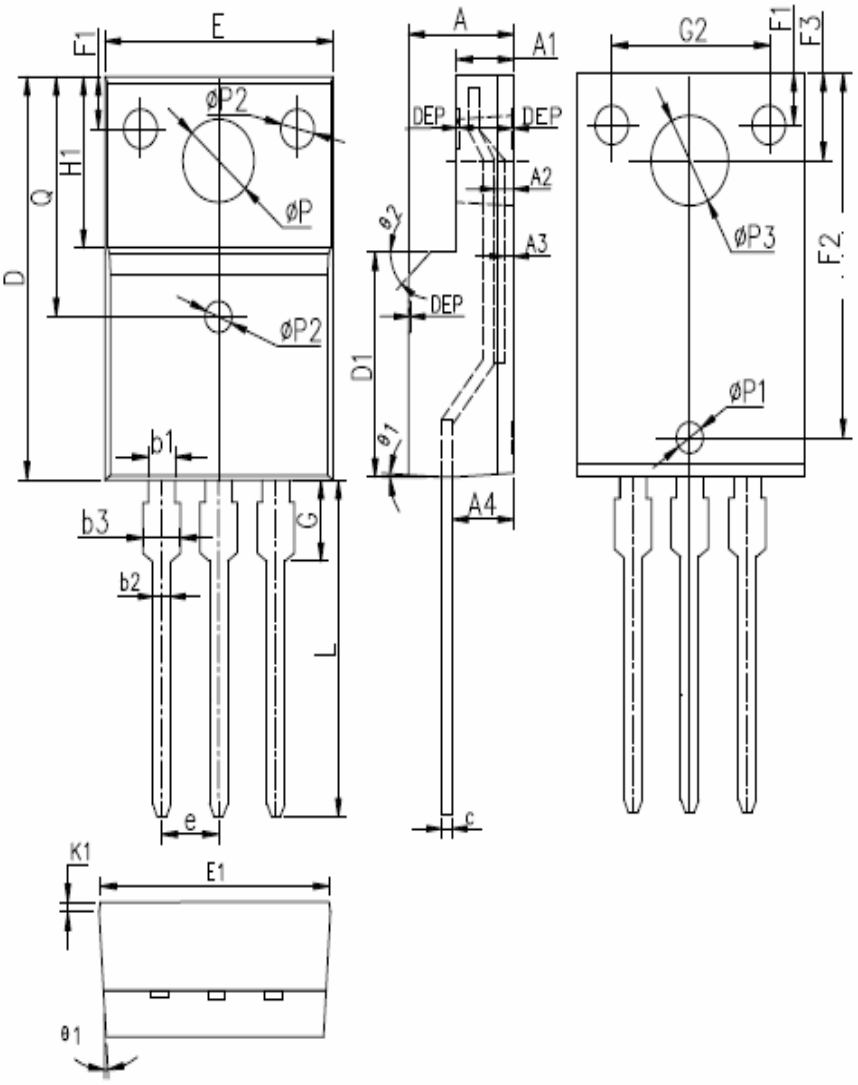


COMMON DIMENSIONS

SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.27	1.30	1.33	0.050	0.051	0.052
A2	2.35	2.40	2.50	0.093	0.094	0.098
b	0.77	-	0.90	0.030	-	0.035
b2	1.23	-	1.36	0.048	-	0.054
c	0.48	0.50	0.52	0.019	0.020	0.021
D	15.40	15.60	15.80	0.606	0.614	0.622
D1	9.00	9.10	9.20	0.354	0.358	0.362
DEP	0.05	0.10	0.20	0.002	0.004	0.008
E	9.70	9.90	10.10	0.382	0.389	0.398
E1	-	8.70	-	-	0.343	-
E2	9.80	10.00	10.20	0.386	0.394	0.401
ΦP1	1.40	1.50	1.60	0.055	0.059	0.063
e	2.54BSC			0.1BSC		
e1	5.08BSC			0.2BSC		
H1	6.40	6.50	6.60	0.252	0.256	0.260
L	12.75	-	13.17	0.502	-	0.519
L1	-	-	3.95	-	-	0.156
L2	2.50REF			0.098REF		
ΦP	3.57	3.60	3.63	0.141	0.142	0.143
Q	2.73	2.80	2.87	0.107	0.110	0.113
θ1	5°	7°	9°	5°	7°	9°
θ2	1°	3°	5°	1°	3°	5°

NOTES:
1. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-220AB
   DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

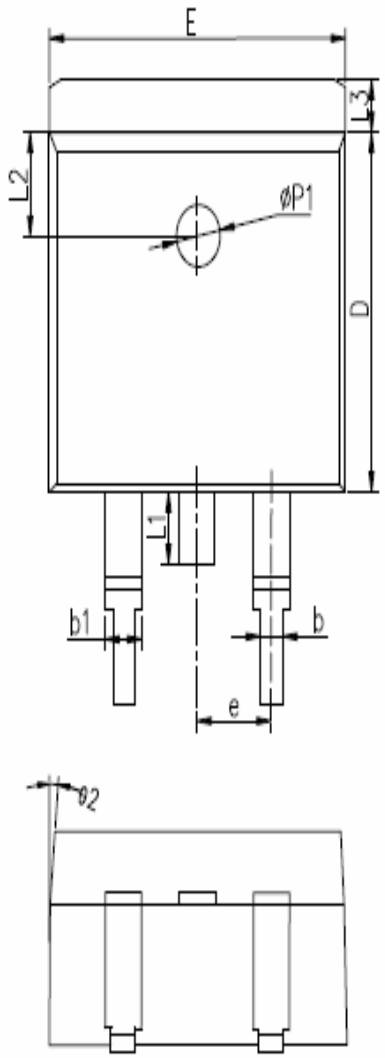
TO-220F-3L

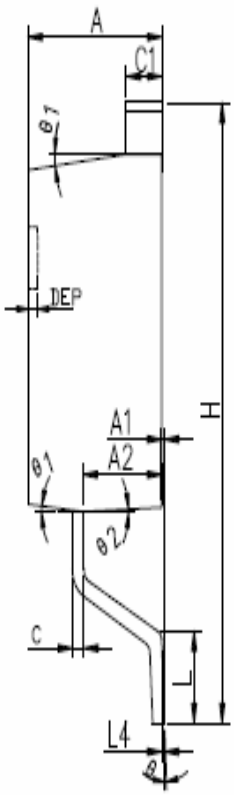


COMMON DIMENSIONS

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	0.95	1.05	1.15	0.037	0.041	0.045
A3	0.42	0.52	0.62	0.017	0.020	0.024
A4	2.65	2.75	2.85	0.104	0.108	0.112
c	-	0.50	-	-	0.020	-
D	15.67	15.87	16.07	0.617	0.625	0.633
Q	8.80	9.00	9.20	0.364	0.354	0.362
H1	6.48	6.68	6.88	0.255	0.263	0.271
e	2.54BSC			0.1BSC		
øP	-	3.183	-	-	0.125	-
L	12.78	12.98	13.18	0.503	0.511	0.519
D1	8.99	9.19	9.39	0.354	0.362	0.370
øP1	1.40	1.50	1.60	0.055	0.059	0.063
øP2	1.15	1.20	1.25	0.045	0.047	0.049
øP3	-	3.450	-	0.136	-	-
θ1	5°	7°	9°	5°	7°	9°
θ2	-	45°	-	-	45°	-
DEP	0.05	0.10	0.15	0.002	0.004	0.006
F1	1.90	2.00	2.10	0.075	0.079	0.083
F2	13.61	13.81	14.01	0.536	0.544	0.552
F3	3.20	3.30	3.40	0.126	0.130	0.134
G	3.25	3.45	3.65	0.128	0.136	0.144
G1	5.90	6.00	6.10	0.232	0.236	0.240
G2	6.90	7.00	7.10	0.272	0.276	0.280
b1	1.17	1.20	1.24	0.046	0.047	0.048
b2	0.77	0.8	0.85	0.030	0.031	0.033
b3	1.10	1.30	1.50	0.043	0.051	0.059
E1	9.8	10.00	10.20	0.386	0.394	0.412
K1	0.75	0.8	0.85	0.030	0.031	0.033

TO-263-2L



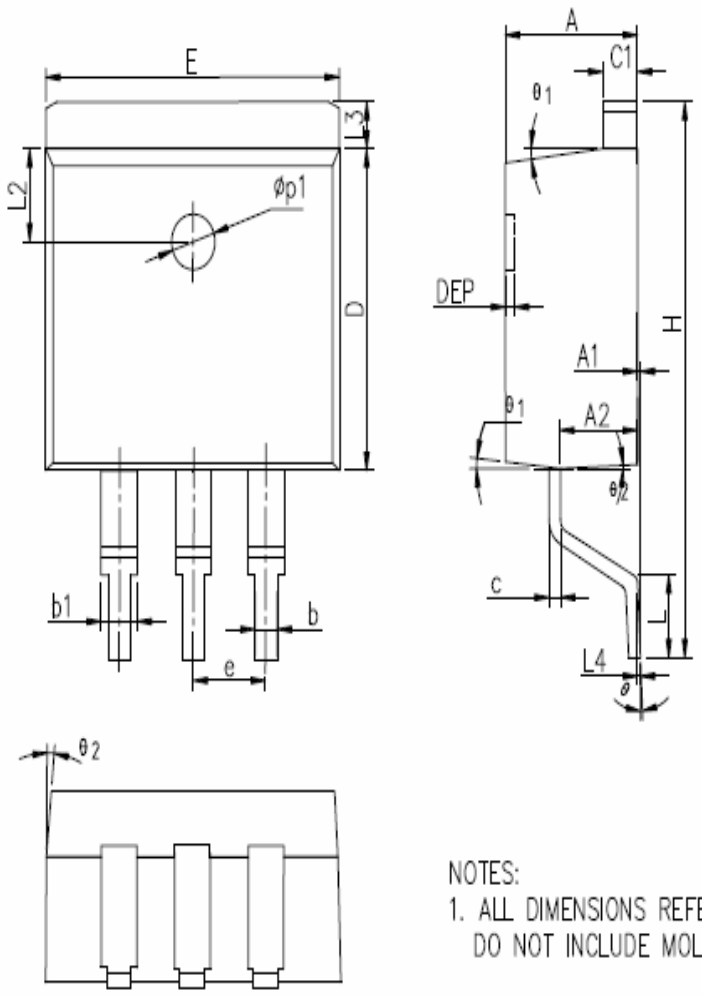


COMMON DIMENSIONS

SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	0	0.10	0.25	0	0.004	0.010
A2	2.59	2.69	2.79	0.102	0.106	0.110
b	0.77	-	0.90	0.030	-	0.035
b1	1.23	-	1.36	0.048	-	0.054
c	0.34	-	0.47	0.013	-	0.019
C1	1.22	-	1.32	0.048	-	0.052
D	8.60	8.70	8.80	0.338	0.343	0.346
E	10.00	10.16	10.26	0.394	0.4	0.404
e	2.54BSC			0.1BSC		
H	14.70	15.10	15.50	0.579	0.594	0.610
L	2.00	2.30	2.60	0.079	0.090	0.102
L3	1.17	1.27	1.40	0.046	0.050	0.055
L1	-	-	1.70	-	-	0.067
L4	0.25BSC			0.01BSC		
L2	2.50REF			0.098REF		
θ	0°	-	8°	0°	-	8°
θ1	5°	7°	9°	5°	7°	9°
θ2	1°	3°	5°	1°	3°	5°
DEP	0.05	0.10	0.20	0.002	0.004	0.008
Φp1	1.40	1.50	1.60	0.055	0.059	0.063

NOTES:
1.ALL DIMENSIONS REFER TO JEDEC STANDARD TO263-2L
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS

TO-263-3L



COMMON DIMENSIONS

SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	0	0.10	0.25	0	0.004	0.010
A2	2.59	2.69	2.79	0.102	0.106	0.110
b	0.77	–	0.90	0.030	–	0.035
b1	1.23	–	1.36	0.048	–	0.054
c	0.34	–	0.47	0.013	–	0.019
c1	1.22	–	1.32	0.048	–	0.052
D	8.60	8.70	8.80	0.338	0.343	0.346
E	10.00	10.16	10.26	0.394	0.4	0.404
e	2.54BSC			0.1BSC		
H	14.70	15.10	15.50	0.579	0.594	0.610
L	2.00	2.30	2.60	0.079	0.090	0.102
L3	1.17	1.27	1.40	0.046	0.050	0.055
L4	0.25BSC			0.01BSC		
L2	2.50REF			0.098REF		
θ	0°	–	8°	0°	–	8°
θ1	5°	7°	9°	5°	7°	9°
θ2	1°	3°	5°	1°	3°	5°
DEP	0.05	0.10	0.20	0.002	0.004	0.008
φp1	1.40	1.50	1.60	0.055	0.059	0.063

NOTES:
1. ALL DIMENSIONS REFER TO JEDEC STANDARD TO263-3L
   DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

Devices per Unit

Package Type	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Boxes/Carton Box	Units/Carton Box
TO-220FB-3L	50	20	1000	6	6000
TO-220F-3L	50	20	1000	6	6000
TO-263-2L	50	20	1000	6	6000
TO-263-3L	50	20	1000	6	6000

Package Type	Units/Reel	Reels/ Inner Box	Units/Carton Box
TO-263-2L	800	5	4000
TO-263-3L	800	5	4000

Reliability Test Program

Test Item	Reference Standard	Test Condition
MSL3	JESD22-020C	Baking:125℃， 24 hrs Moisture Soak: 60℃/60 %RH 40 hrs Reflow Tp: 260 -5/+0℃
PCT	JESD22-A102	21℃ 100%RH 205Kpa 168hrs
TCT	JESD22-A104	65℃~+150℃ 500cycles
THT	JESD22-A101	85℃/85%RH 500hrs
HTST	JESD22-A103	50℃ 500hrs

Customer Service

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