

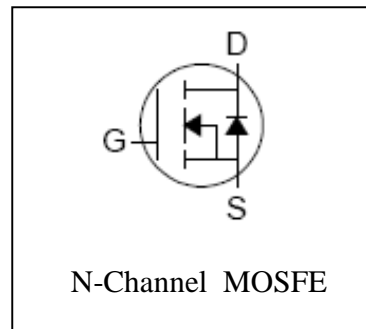
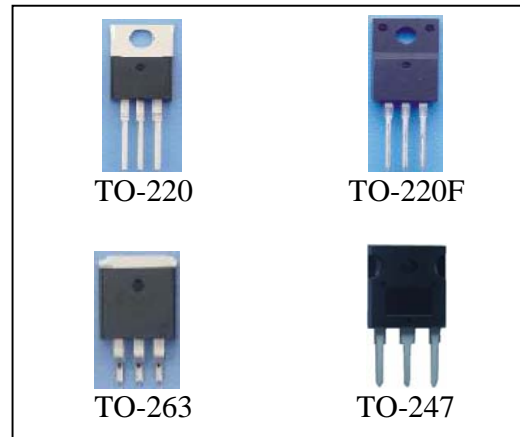
Features

- 60V/120A,
 $R_{DS(ON)}=6m\Omega$ (Type) $V_{GS}=10V$ $I_{DS}=40A$
- Ultra Low On-Resistance
- Exceptional dv/dt capability
- Fast Switching and Fully Avalanche Rated
- 100% avalanche tested
- 175°C Operating Temperature
- Lead Free and Green Available

Applications

- Switching Application Systems
- Inverter Systems

Pin Description



Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
Common Ratings ($T_A=25^\circ\text{C}$ Unless Otherwise Noted)			
V_{DSS}	Drain-Source Voltage	60	V
V_{GSS}	Gate-Source Voltage	± 20	
T_J	Maximum Junction Temperature	175	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 175	$^\circ\text{C}$
I_S	Diode Continuous Forward Current	$T_C=25^\circ\text{C}$ 120(Max)	A
Mounted on Large Heat Sink			
I_{DP}	300 μs Pulse Drain Current Tested	$T_C=25^\circ\text{C}$ 380	A
I_D	Continuous Drain Current	$T_C=25^\circ\text{C}$ 120*	A
		$T_C=100^\circ\text{C}$ 90	
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$ 200	W
		$T_C=100^\circ\text{C}$ 150	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	0.8	$^\circ\text{C/W}$
Drain-Source Avalanche Ratings			
E_{AS}	Avalanche Energy, Single Pulsed ($L=1\text{mH}$)	1000	mJ

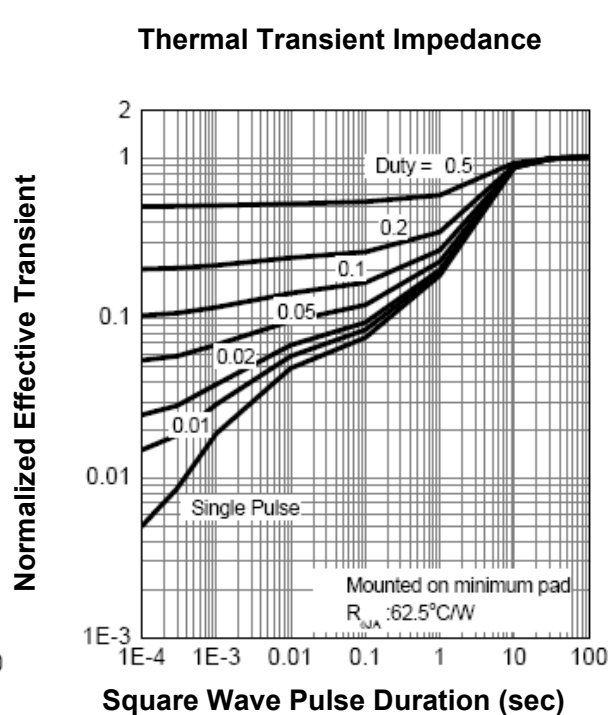
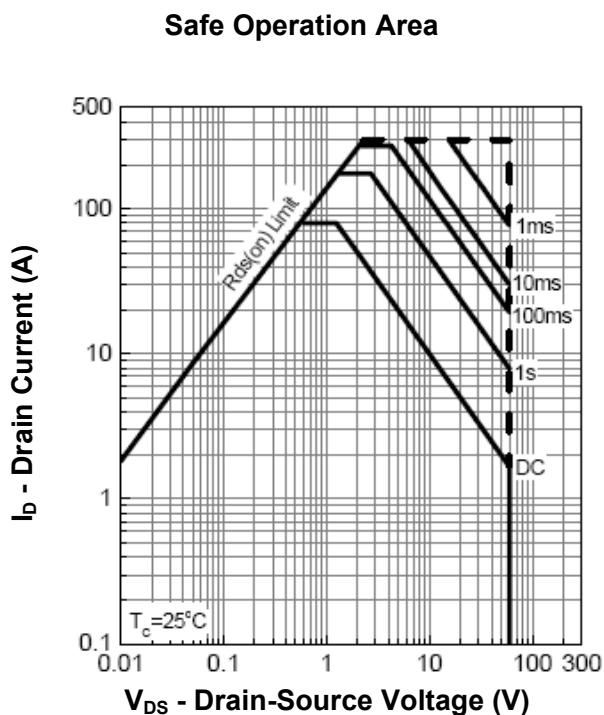
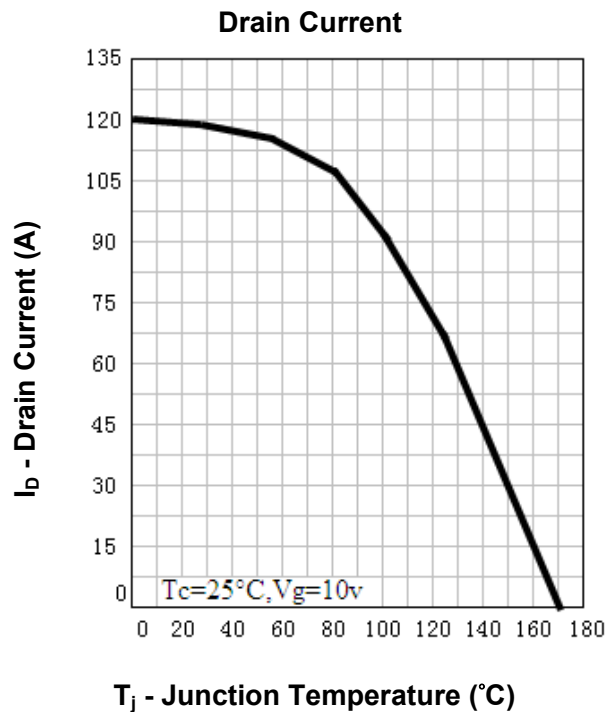
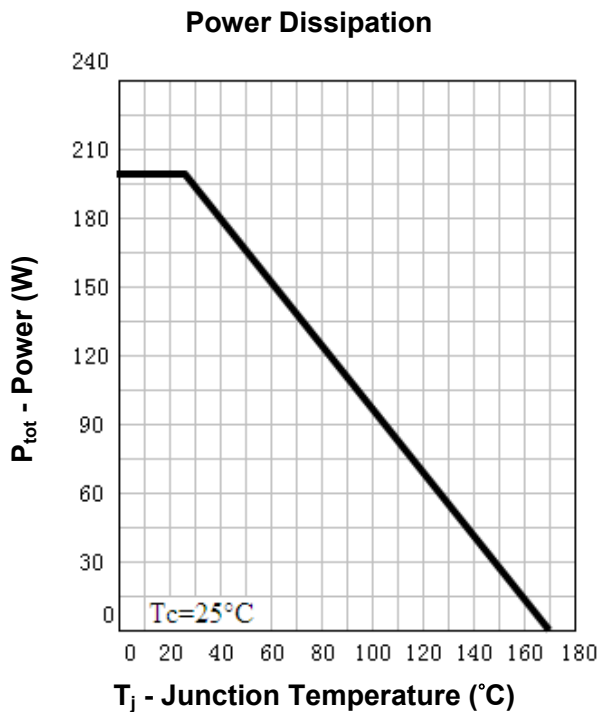
Note : * Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.

Electrical Characteristics ($T_A=25^{\circ}\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Test Condition	RU6099			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=-250\mu A$	60			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=70V, V_{GS}=0V$ $T_J=85^{\circ}\text{C}$			1 30	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=-250\mu A$	2	3	4	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 25V, V_{DS}=0V$			± 100	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=40A$		6.0	7.0	$m\Omega$
Diode Characteristics						
V_{SD}^a	Diode Forward Voltage	$I_{SD}=20A, V_{GS}=0V$		0.83	1.1	V
t_{rr}	Reverse Recovery Time	$I_{SD}=40A, dI_{SD}/dt=100A/\mu s$		50		ns
Q_{rr}	Reverse Recovery Charge			95		nC
Dynamic Characteristics^b						
R_G	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$		1.3		Ω
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=30V,$ Frequency=1.0MHz		3000		pF
C_{oss}	Output Capacitance			430		
C_{rss}	Reverse Transfer Capacitance			240		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=30V, R_L=30\Omega,$ $I_{DS}=1A, V_{GEN}=10V,$ $R_G=8\Omega$		14	27	ns
t_r	Turn-on Rise Time			17	31	
$t_{d(OFF)}$	Turn-off Delay Time			40	68	
t_f	Turn-off Fall Time			62	95	
Gate Charge Characteristics^b						
Q_g	Total Gate Charge	$V_{DS}=30V, V_{GS}=10V,$ $I_{DS}=40A$		72	105	nC
Q_{gs}	Gate-Source Charge			13		
Q_{gd}	Gate-Drain Charge			24		

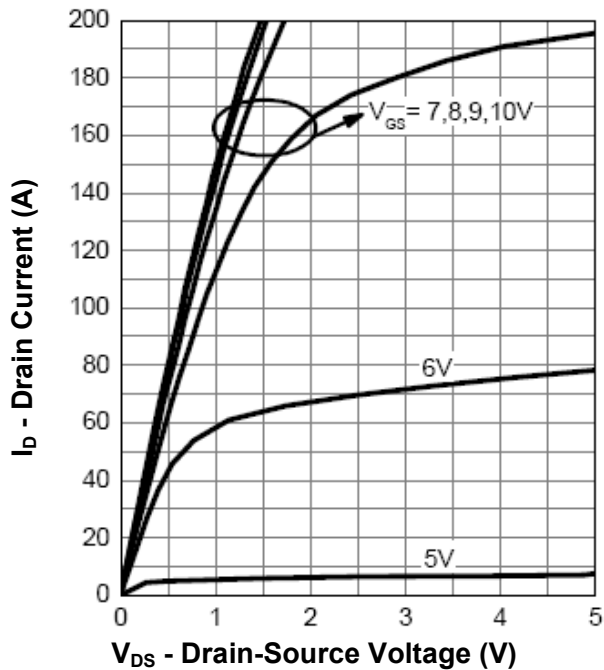
Notes: a、Pulse test ; Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
b、Guaranteed by design, not subject to production testing.

Typical Characteristics

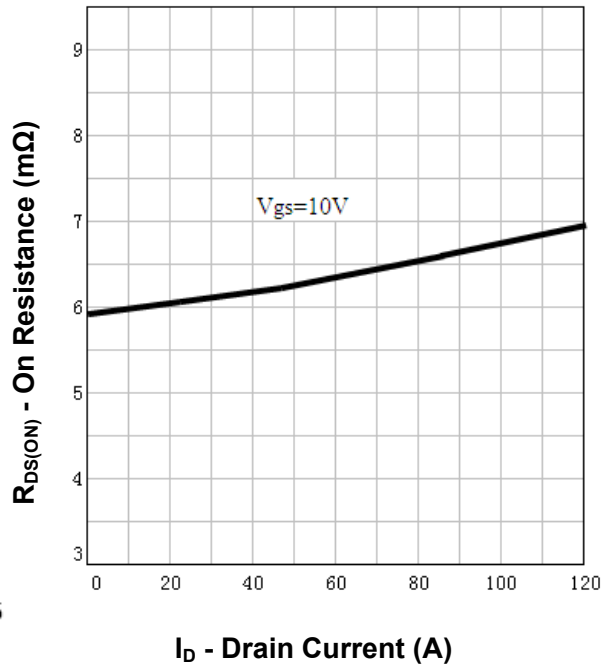


Typical Characteristics

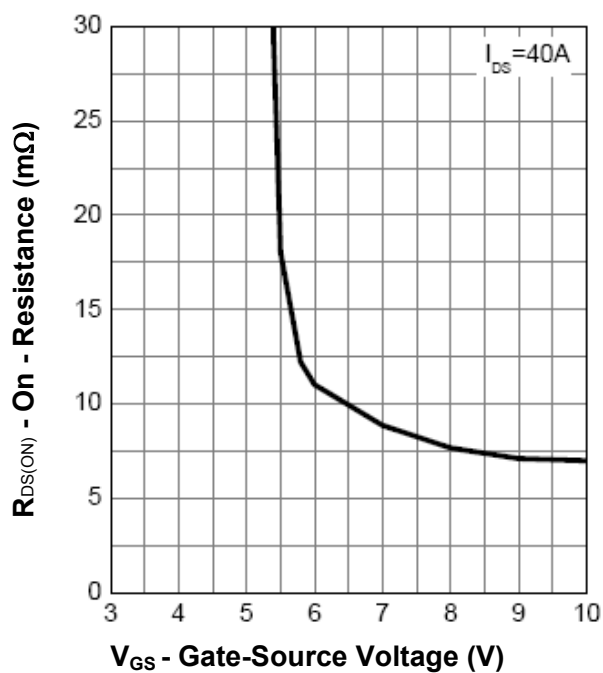
Output Characteristics



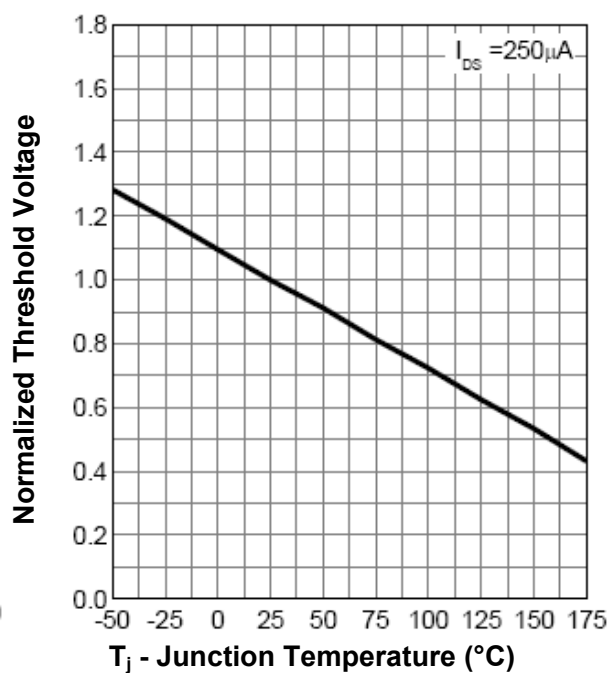
Drain-Source On Resistance



Drain-Source On Resistance

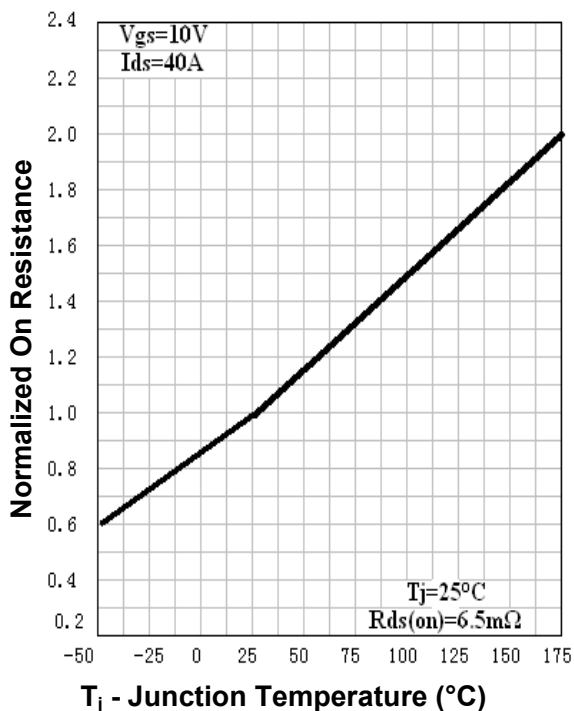


Gate Threshold Voltage

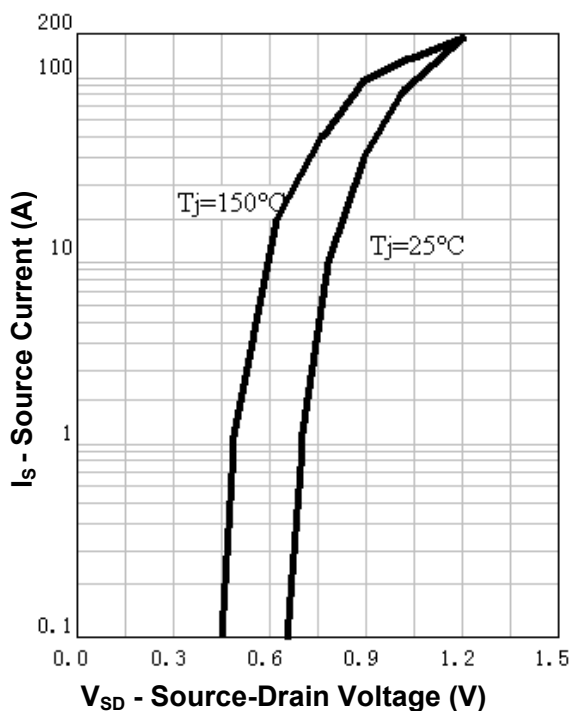


Typical Characteristics

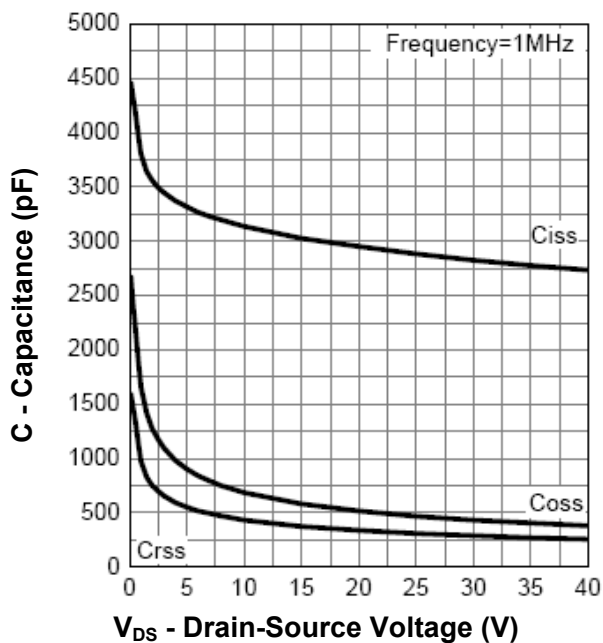
Drain-Source On Resistance



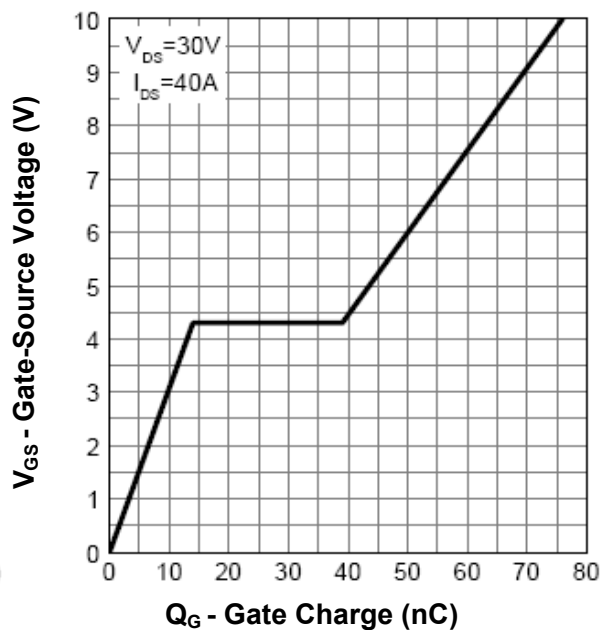
Source-Drain Diode Forward



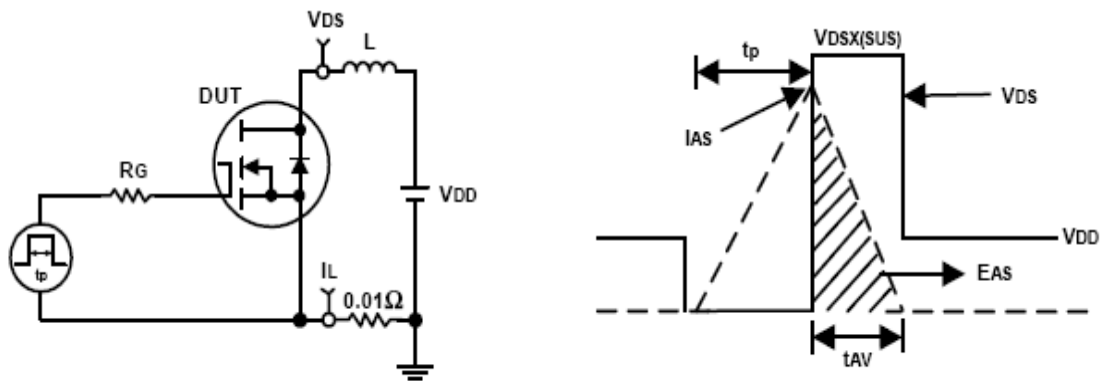
Capacitance



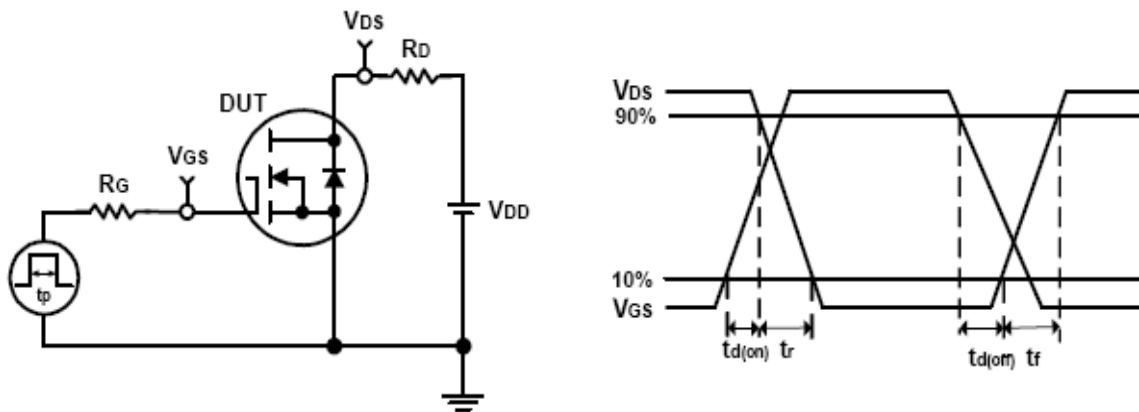
Gate Charge



Avalanche Test Circuit and Waveforms



Switching Time Test Circuit and Waveforms



Ordering and Marking Information

RU6099

Package (Available)

R : TO-220; S: TO-263 ; P: TO-220F

Operating Temperature Range

C : -55 to 175 °C

Assembly Material

G : Green & Lead Free

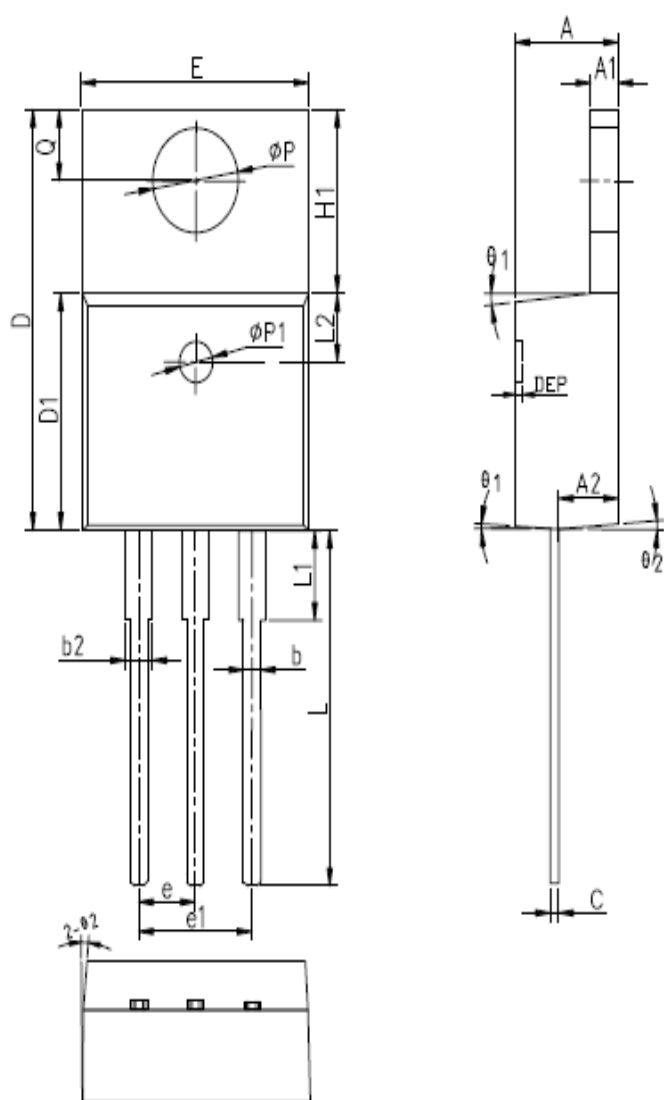
Packaging

T : TUBE

TR : Tape & Reel

Package Information

T0-220AB-3L

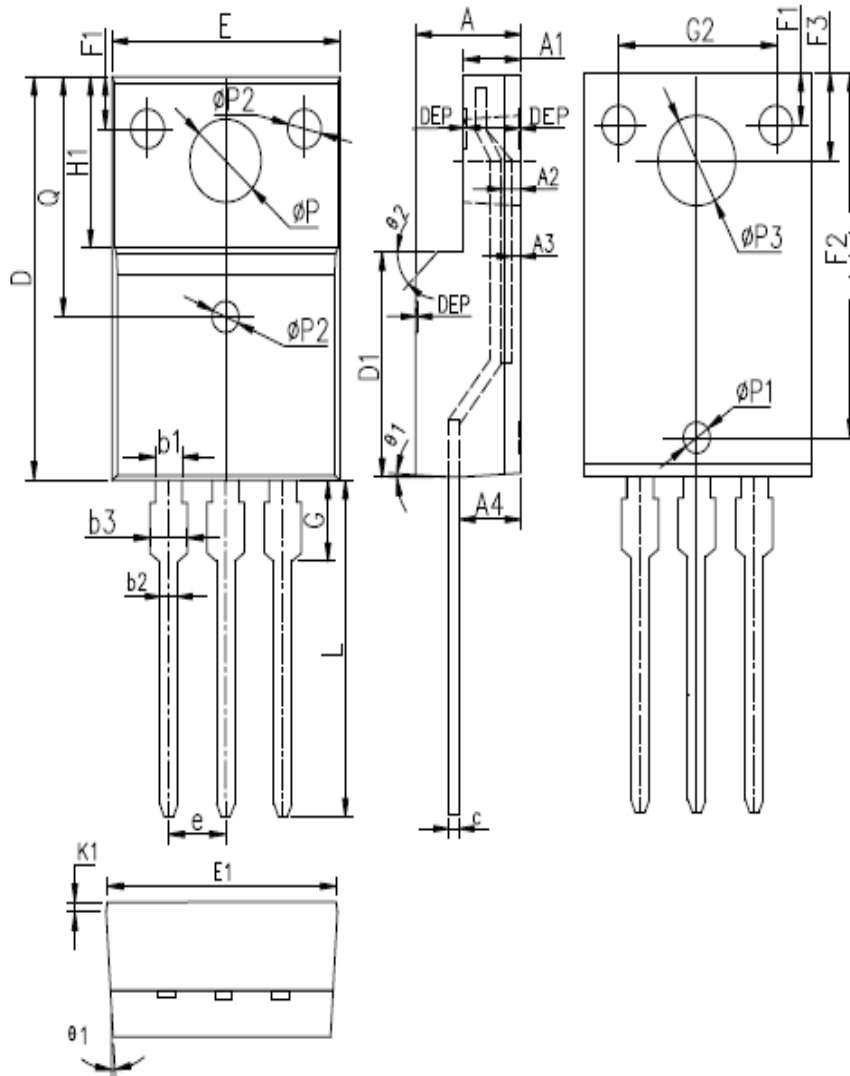


COMMON DIMENSIONS

SYMBOL	MM			INCH		
	MIN	NDM	MAX	MIN	NDM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.22	-	1.32	0.048	-	0.052
A2	2.59	2.69	2.79	0.102	0.106	0.110
b	0.77	-	0.90	0.030	-	0.035
b2	1.23	-	1.36	0.048	-	0.054
c	0.34	-	0.47	0.013	-	0.019
D	14.70	15.00	15.30	0.579	0.591	0.602
D1	8.60	8.70	8.80	0.338	0.343	0.346
E	10.06	10.16	10.26	0.396	0.400	0.404
e	2.54BSC			0.1BSC		
e1	5.08BSC			0.2BSC		
H1	6.10	6.30	6.50	0.240	0.248	0.256
L	13.15	-	13.57	0.518	-	0.534
L1	-	-	4.35	-	-	0.171
L2	2.50REF			0.098REF		
phi p	3.80	3.84	3.88	0.149	0.151	0.153
q	2.60	-	2.90	0.102	-	0.114
theta 1	5°	7°	9°	5°	7°	9°
theta 2	1°	3°	5°	1°	3°	5°
DEP	0.05	0.1	0.2	0.002	0.004	0.008
phi p1	1.4	1.5	1.6	0.055	0.059	0.063

NOTES:
 1. ALL DIMENSIONS REFER TO JEDEC STANDARD T0-220AB, DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

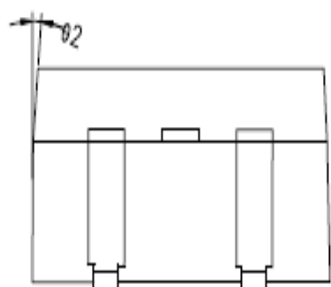
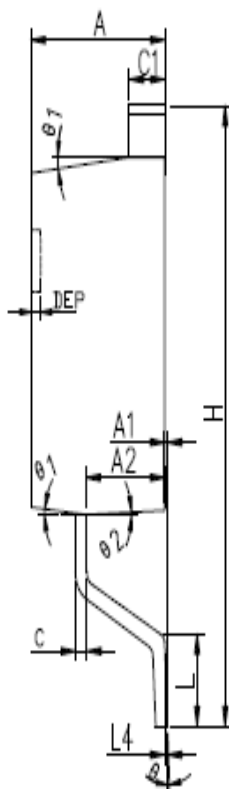
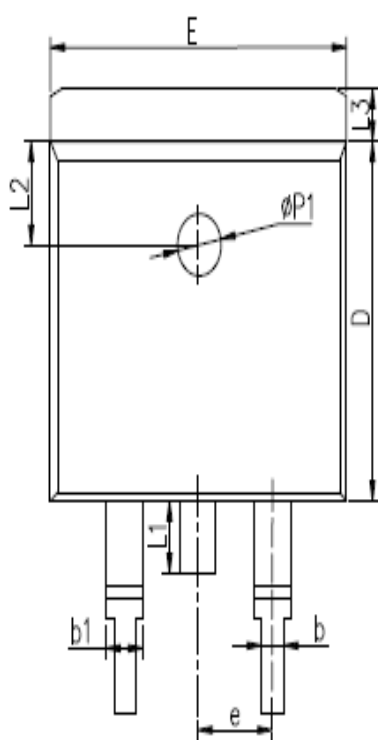
T0-220F-3L



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	-
b	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		
φP	-	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
φP1	1.40	1.50	1.60	0.055	0.059	0.063
φP2	1.15	1.20	1.25	0.045	0.047	0.049
φP3	-	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

T0-263-2L



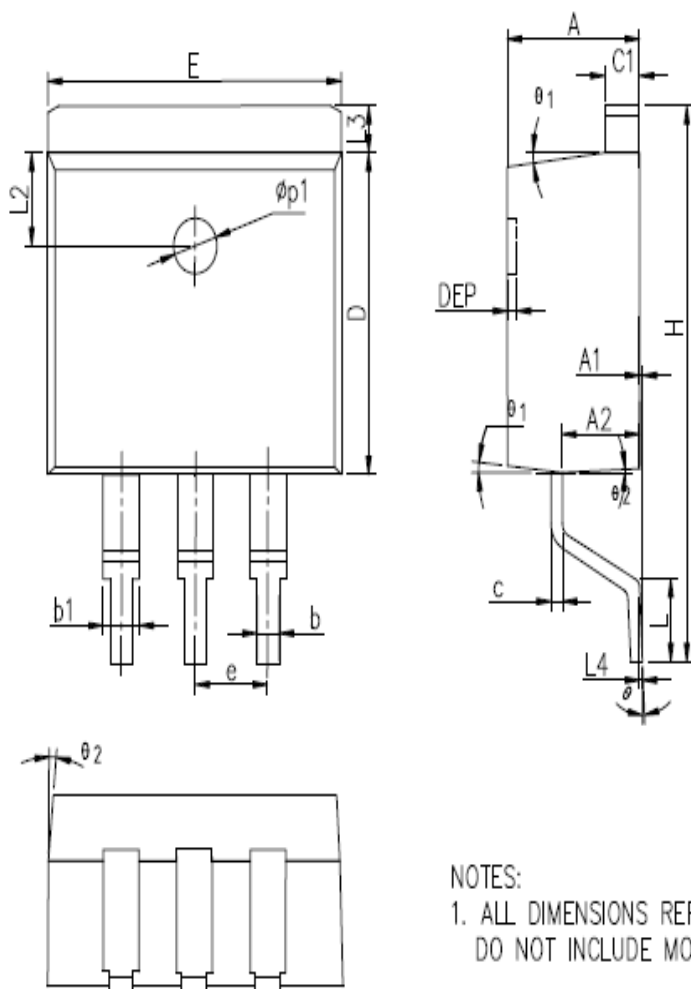
COMMON DIMENSIONS

SYMBOL	MM			INCH		
	MIN	NDM	MAX	MIN	NDM	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°
$\theta 1$	5°	7°	9°	5°	7°	9°
$\theta 2$	1°	3°	5°	1°	3°	5°
DEP	0.05	0.10	0.20	0.002	0.004	0.008
$\phi p1$	1.40	1.50	1.60	0.055	0.059	0.063

NOTES:

1. ALL DIMENSIONS REFER TO JEDEC STANDARD T0263-2L
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS

T0-263-3L



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
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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 T0263-3L
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-220AB-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°C, 24 hrs Moisture Soak: 60°C/60 %RH 40 hrs Reflow Tp: 260 -5/+0°C
PCT	JESD22-A102	21°C 100%RH 205Kpa 168hrs
TCT	JESD22-A104	65°C~+150°C 500cycles
THT	JESD22-A101	85°C/85%RH 500hrs
HTST	JESD22-A103	50°C 500hrs

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