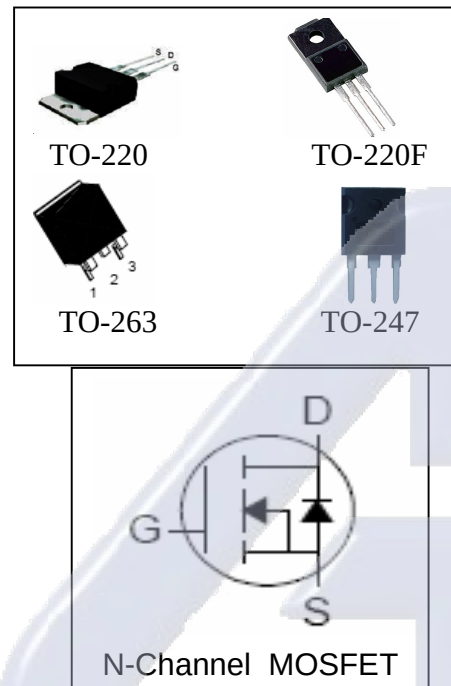


RU4099**N-Channel Advanced Power MOSFET****Features**

- 40V/200A
 $R_{DS(ON)}=2.8\text{ m}\Omega(\text{Typ.}) @ V_{GS}=10\text{V}$
- 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**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 ^①	A
I _D	Continue Drain Current	T _C =25°C	200 ^②	
		T _C =100°C	140	
P _D	Maximum Power Dissipation	T _C =25°C	400	W
		T _C =100°C	230	
R _{θJC}	Thermal Resistance -Junction to Case		0.45	°C/W
R _{θJA}	Thermal Resistance-Junction to Ambient		62.5	
Drain-Source Avalanche Ratings				
E _{AS}	Avalanche Energy ,Single Pulsed		1400	mJ

RU4099

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

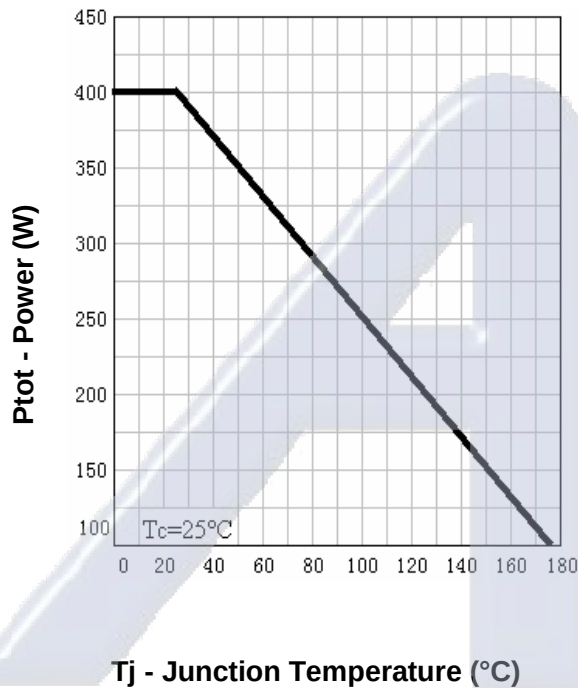
	Parameter	Test Condition	RU4099			Unit	
			Min.	Typ.	Max.		
Static Characteristics							
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	40			V	
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 40V, V _{GS} =0V			1	μA	
		T _J =85°C			30		
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =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)} ^③	Drain-Source On-state Resistance	V _{GS} = 10V, I _{DS} =40A		2.8	3.5	mΩ	
Diode Characteristics							
V _{SD} ^③	Diode Forward Voltage	I _{SD} =40 A, V _{GS} =0V		0.77	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 ^④							
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 ^④							
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: ① Pulse width limited by safe operating area.
 ② Current limited by package(Limitation Current is 75A)
 ③ Pulse test ; Pulse width≤300μs, duty cycle≤2%.
 ④ Guaranteed by design, not subject to production testing.

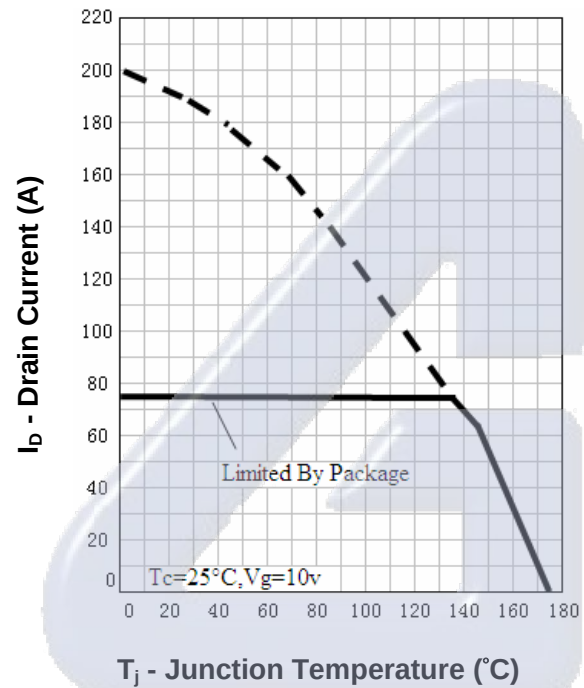
RU4099

Typical Characteristics

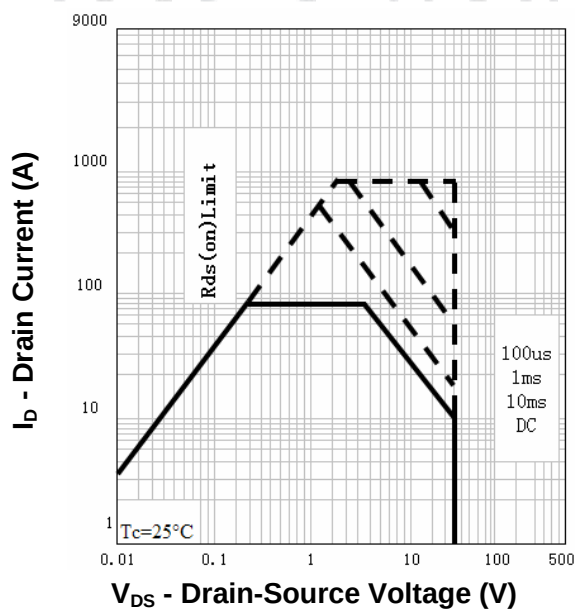
Power Dissipation



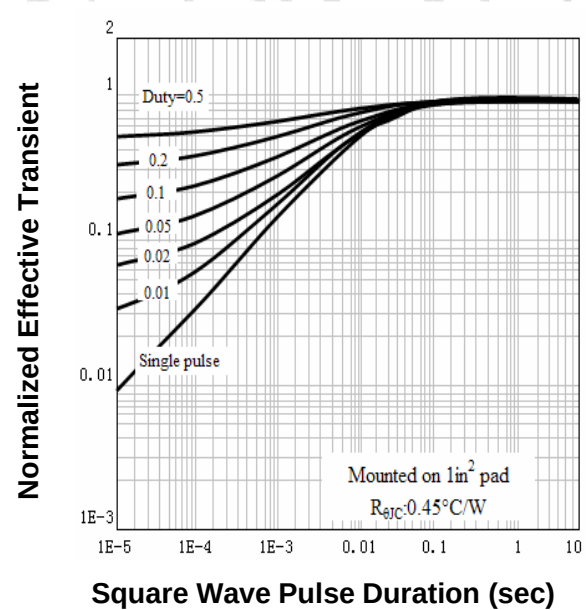
Drain Current



Safe Operation Area



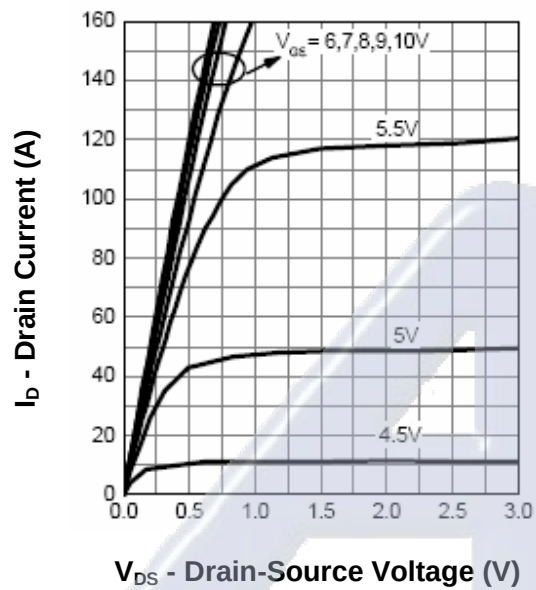
Thermal Transient Impedance



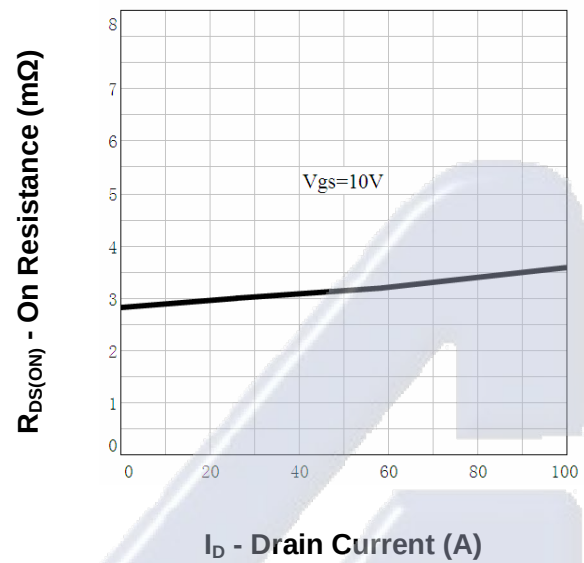
RU4099

Typical Characteristics

Output Characteristics

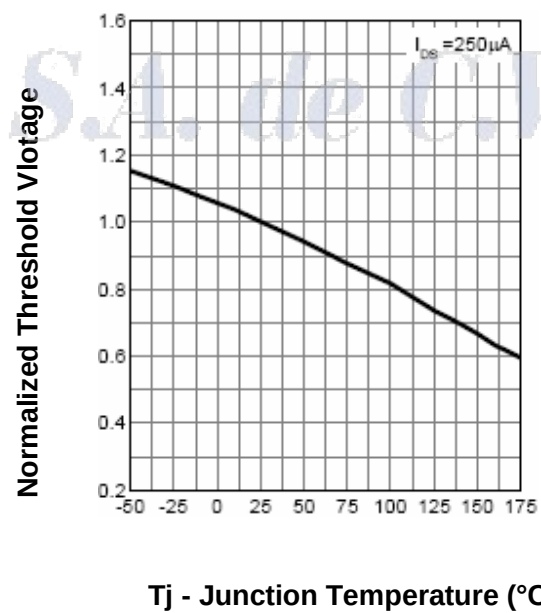
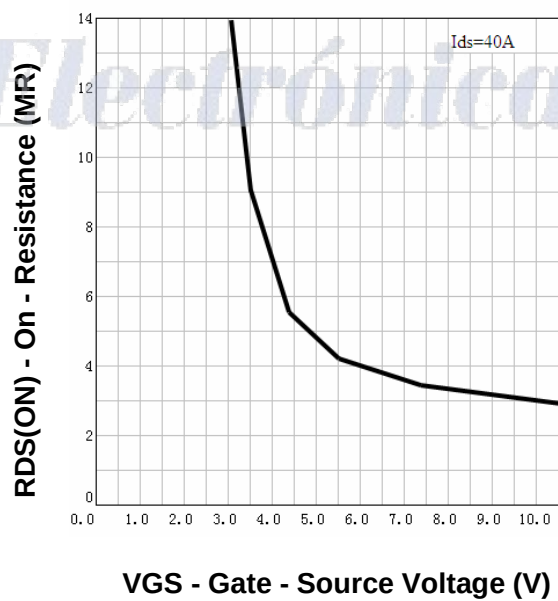


Drain-Source On Resistance



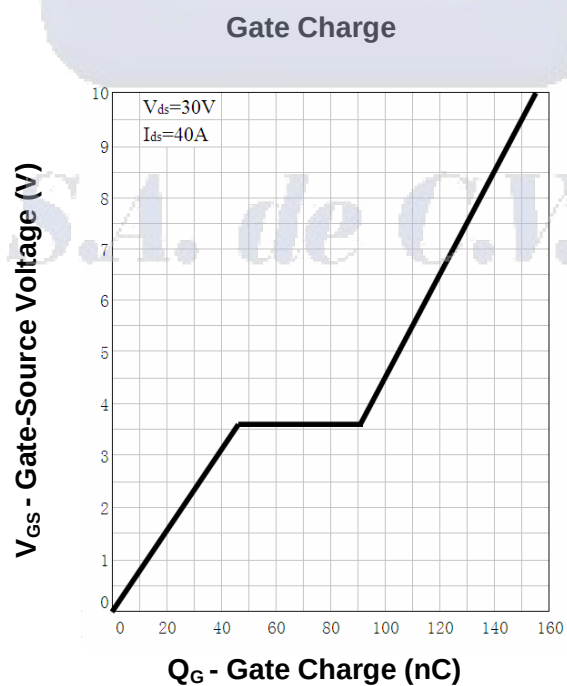
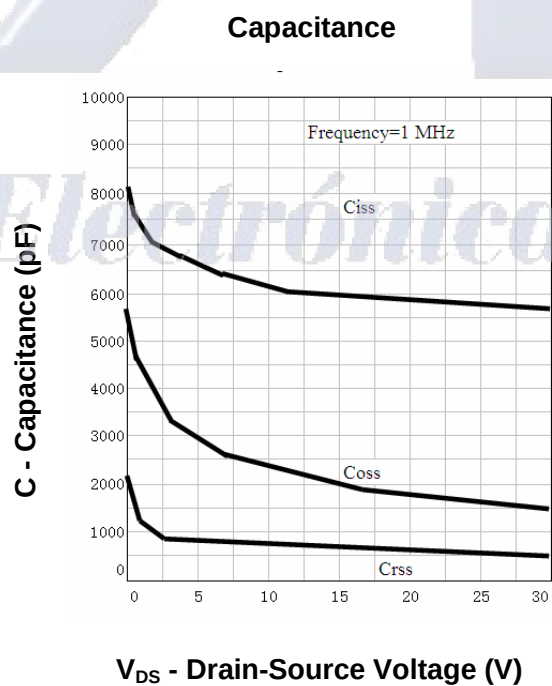
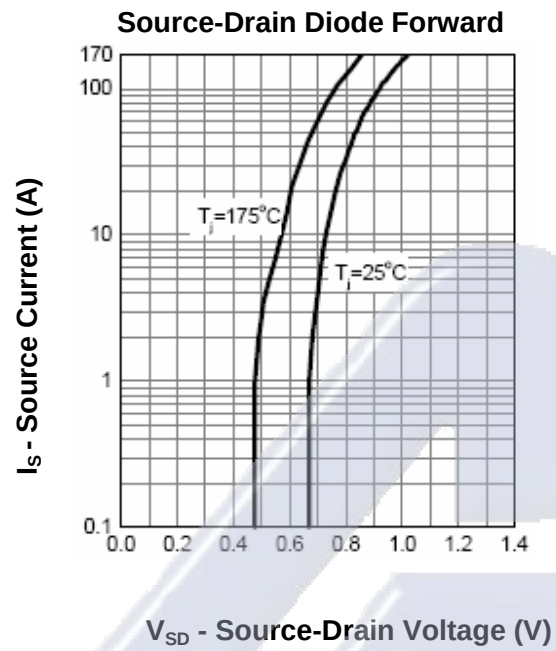
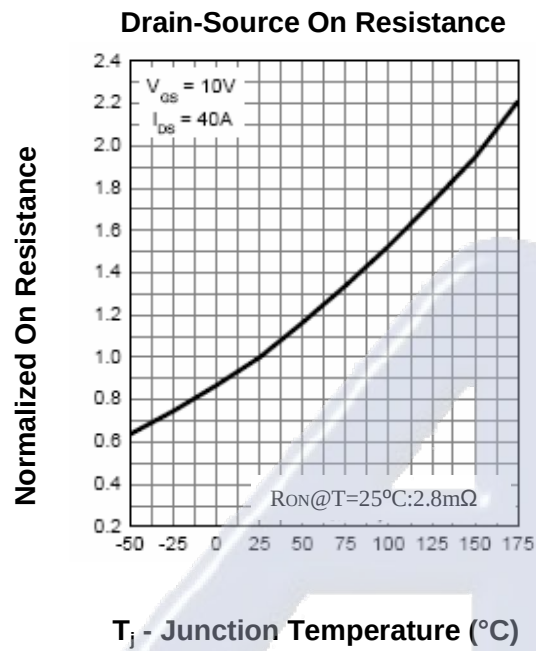
Drain-Source On Resistance

Gate Threshold Voltage



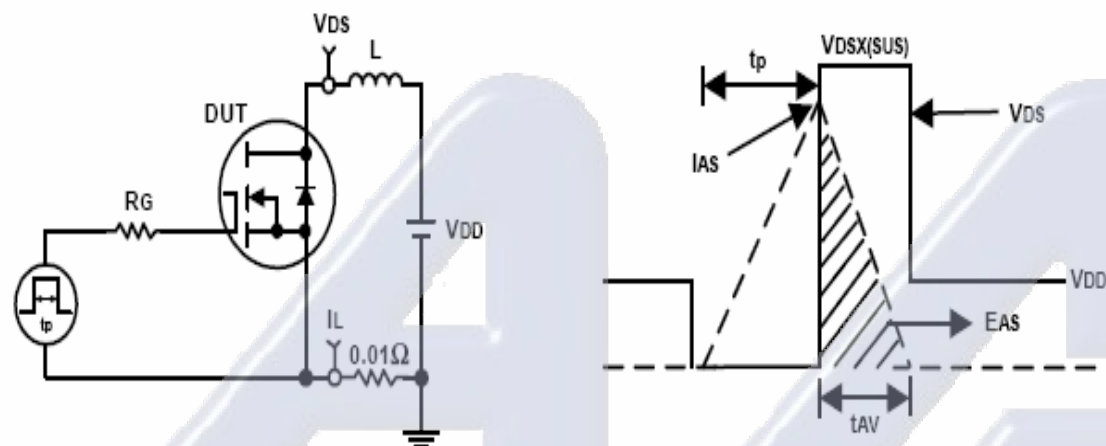
RU4099

Typical Characteristics

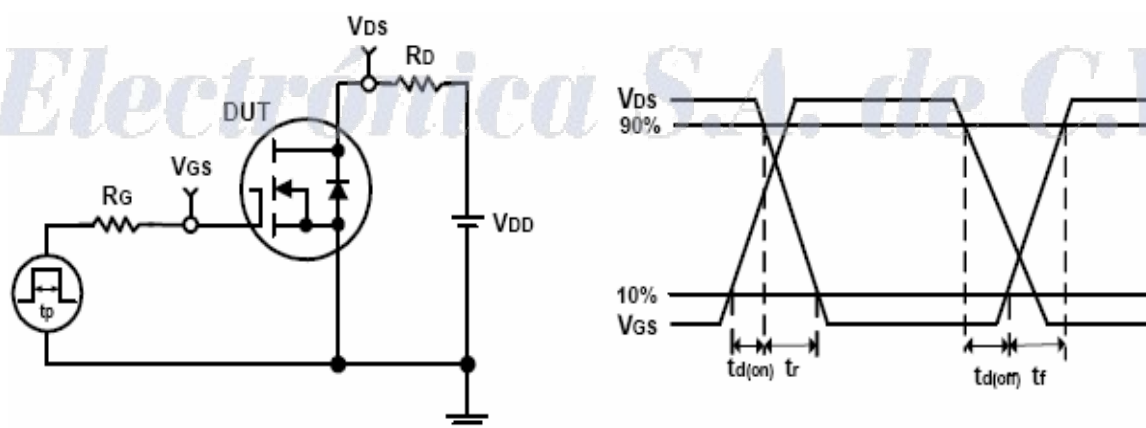


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Avalanche Test Circuit and Waveforms



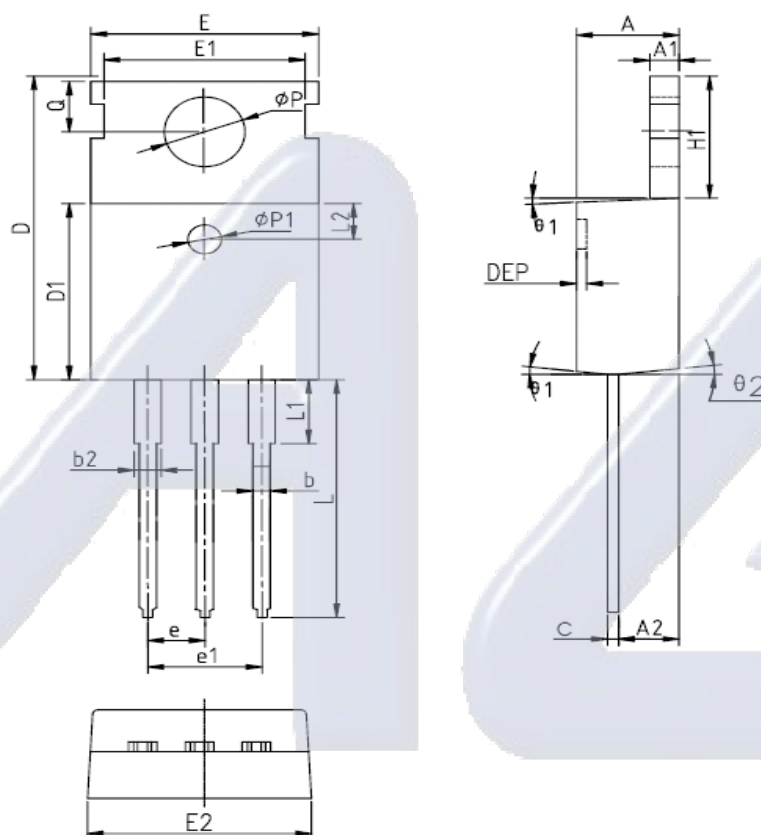
Switching Time Test Circuit and Waveforms



RU4099

Package Information

TO-220FB-3L

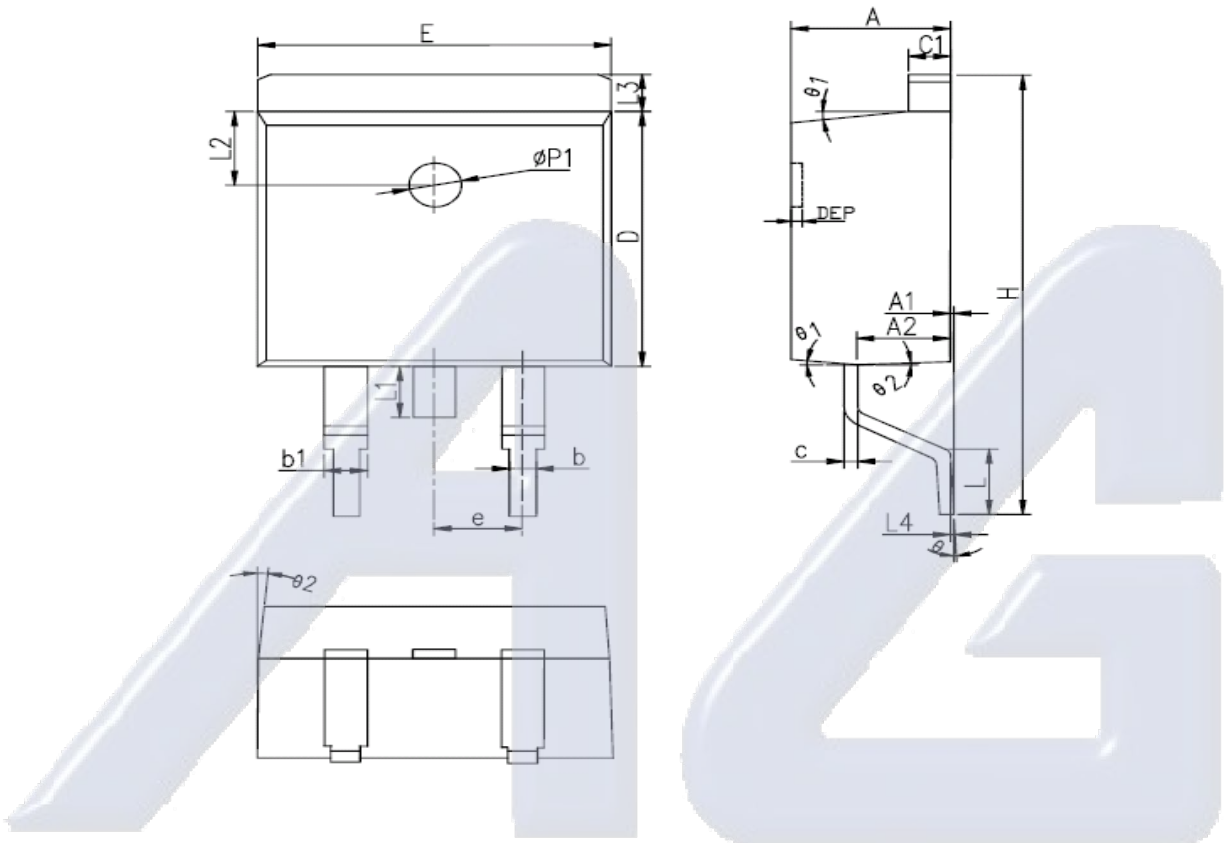


SYMBOL	MM			INCH			SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX		MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185	$\phi p1$	1.40	1.50	1.60	0.055	0.059	0.063
A1	1.27	1.30	1.33	0.050	0.051	0.052	e	2.54BSC			0.1BSC		
A2	2.35	2.40	2.50	0.093	0.094	0.098	e1	5.08BSC			0.2BSC		
b	0.77	-	0.90	0.030	-	0.035	H1	6.40	6.50	6.60	0.252	0.256	0.260
b2	1.23	-	1.36	0.048	-	0.054	L	12.75	-	13.17	0.502	-	0.519
C	0.48	0.50	0.52	0.019	0.020	0.021	L1	-	-	3.95	-	-	0.156
D	15.40	15.60	15.80	0.606	0.614	0.622	L2	2.50REF.			0.098REF.		
D1	9.00	9.10	9.20	0.354	0.358	0.362	ϕp	3.57	3.60	3.63	0.141	0.142	0.143
DEP	0.05	0.10	0.20	0.002	0.004	0.008	Q	2.73	2.80	2.87	0.107	0.110	0.113
E	9.70	9.90	10.10	0.382	0.389	0.398	$\theta 1$	5°	7°	9°	5°	7°	9°
E1	-	8.70	-	-	0.343	-	$\theta 2$	1°	3°	5°	1°	3°	5°
E2	9.80	10.00	10.20	0.386	0.394	0.401							

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TO-263-2L

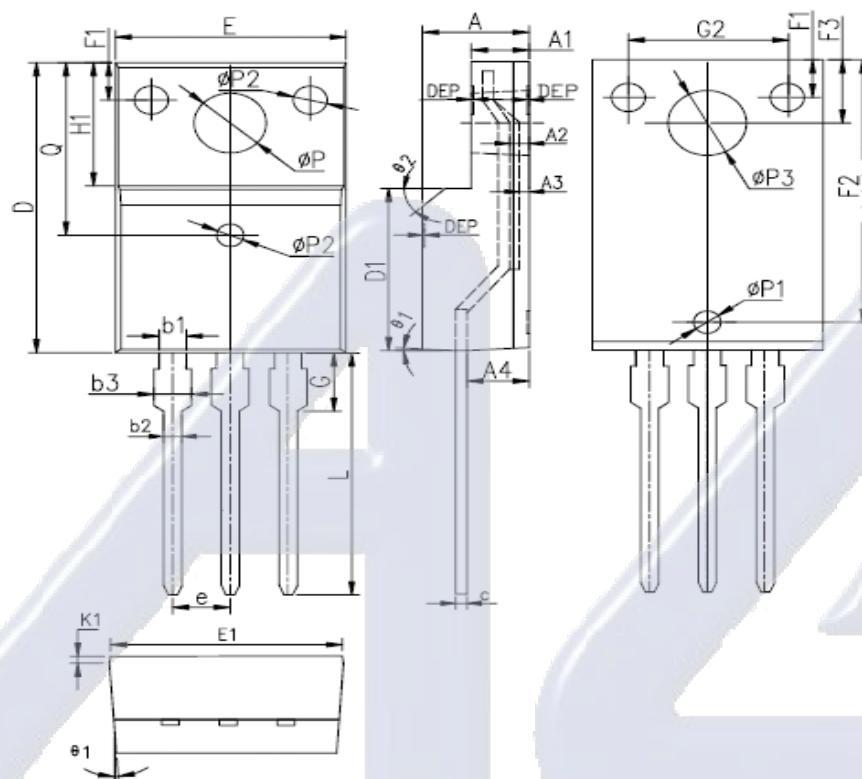


SYMBOL	MM			INCH			SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX		MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185	L	2.00	2.30	2.60	0.079	0.090	0.102
A1	0	0.10	0.25	0	0.004	0.010	L3	1.17	1.27	1.40	0.046	0.050	0.055
A2	2.59	2.69	2.79	0.102	0.106	0.110	L1	-	-	1.70	-	-	0.067
b	0.77	-	0.90	0.030	-	0.035	L4	0.25BSC			0.01BSC		
b1	1.23	-	1.36	0.048	-	0.052	L2	2.50REF.			0.098REF.		
c	0.34	-	0.47	0.013	-	0.019	θ	0°	-	8°	0°	-	8°
C1	1.22	-	1.32	0.048	-	0.052	θ 1	5°	7°	9°	5°	7°	9°
D	8.60	8.70	8.80	0.338	0.343	0.346	θ 2	1°	3°	5°	1°	3°	5°
E	10.00	10.16	10.26	0.394	0.4	0.404	DEP	0.05	0.10	0.20	0.002	0.004	0.008
e	2.54BSC			0.1BSC			Øp1	1.40	1.50	1.60	0.055	0.059	0.063
H	14.70	15.10	15.50	0.579	0.594	0.610							

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TO-220F-3L

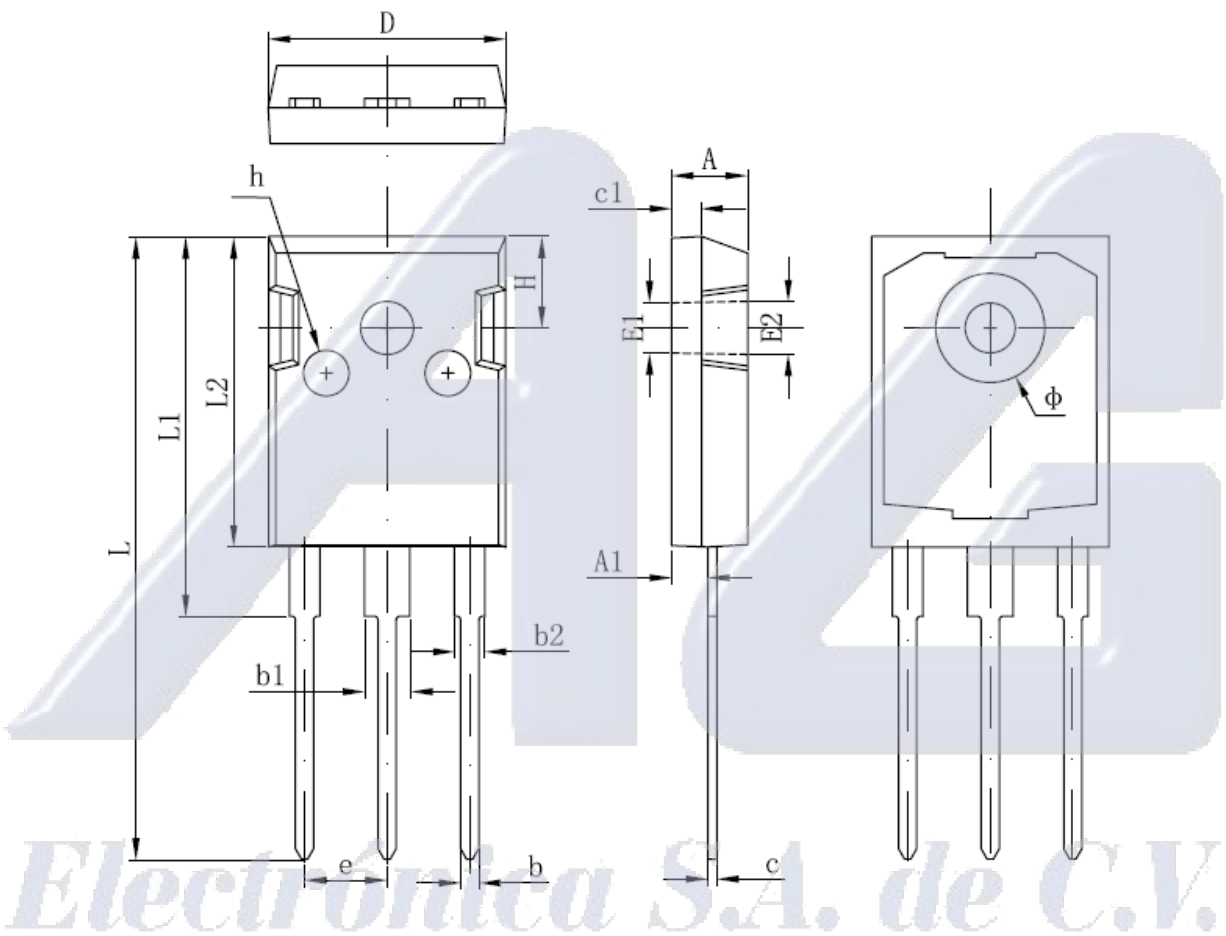


SYMBOL	MM			INCH			SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX		MIN	NOM	MAX	MIN	NOM	MAX
E	9.96	10.16	10.36	0.392	0.400	0.408	$\phi P3$	-	3.450	-	-	0.136	-
A	4.50	4.70	4.90	0.177	0.185	0.193	$\theta 1$	5°	7°	9°	5°	7°	9°
A1	2.34	2.54	2.74	0.092	0.100	0.108	$\theta 2$	-	45°	-	-	45°	-
A2	0.95	1.05	1.15	0.037	0.041	0.045	DEP	0.05	0.10	0.15	0.002	0.004	0.006
A3	0.42	0.52	0.62	0.017	0.020	0.024	F1	1.90	2.00	2.10	0.075	0.079	0.083
A4	2.65	2.75	2.85	0.104	0.108	0.112	F2	13.61	13.81	14.01	0.536	0.544	0.552
c	-	0.50	-	-	0.020	-	F3	3.20	3.30	3.40	0.126	0.130	0.134
D	15.67	15.87	16.07	0.617	0.625	0.633	G	3.25	3.45	3.65	0.128	0.136	0.144
Q	8.80	9.00	9.20	0.346	0.354	0.362	G1	5.90	6.00	6.10	0.232	0.236	0.240
H1	6.48	6.68	6.88	0.255	0.263	0.271	G2	6.90	7.00	7.10	0.272	0.276	0.280
e	2.54BSC			0.1BSC			b1	1.17	1.20	1.24	0.046	0.047	0.048
ϕp	-	3.183	-	-	0.125	-	b2	0.77	0.8	0.85	0.030	0.031	0.033
L	12.78	12.98	13.18	0.503	0.511	0.519	b3	1.10	1.30	1.50	0.043	0.051	0.059
D1	8.99	9.19	9.39	0.354	0.362	0.370	E1	9.8	10.00	10.20	0.386	0.394	0.412
$\phi p1$	1.40	1.50	1.60	0.055	0.059	0.063	K1	0.75	0.8	0.85	0.030	0.031	0.033
$\phi p2$	1.15	1.20	1.25	0.045	0.047	0.049							

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RU4099

TO-247



SYMBOL	MM		INCH		SYMBOL	MM		INCH	
	MIN	MAX	MIN	MAX		MIN	MAX	MIN	MAX
A	4.850	5.150	0,191	0.200	E2	3.600 REF		0.142 REF	
A1	2.200	2.600	0.087	0.102	L	40.900	41.300	1.610	1.626
B	1.000	1.400	0.039	0.055	L1	24.800	25.100	0.976	0.988
b1	2.800	3.200	0.110	0.126	L2	20.300	20.600	0.799	0.811
b2	1.800	2.200	0.071	0.087	Φ	7.100	7.300	0.280	0.287
c	0.500	0.700	0.020	0.028	e	5.450 TYP		0.215 TYP	
c1	1.900	2.100	0.075	0.083	H	5.980 REF.		0.235 REF.	
D	15.450	15.750	0.608	0.620	h	0.000	0.300	0.000	0.012
E1	3.500 REF.		0.138 REF.						

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