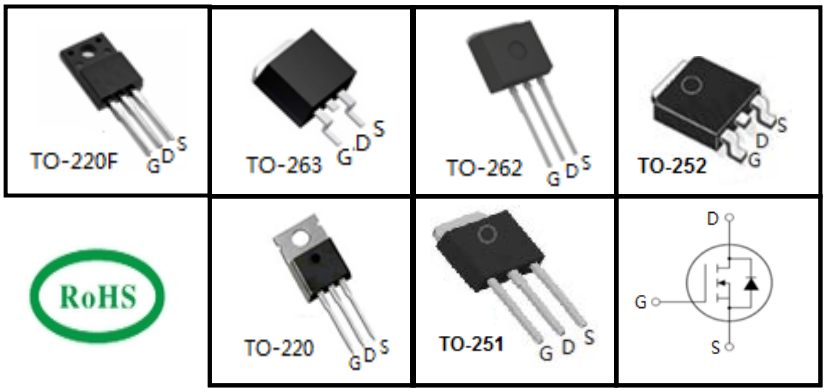
800V Super-Junction Power MOSFET

FEATURES

- Very low FOM $R_{DS(on)} \times Q_g$
- 100% avalanche tested
- RoHS compliant



APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

Device Marking and Package Information

Device	TPA80R2K2C	TPB80R2K2C	TPC80R2K2C	TPD80R2K2C	TPP80R2K2C	TPU80R2K2C
Package	TO-220F	TO-263	TO-262	TO-252	TO-220	TO-251
Marking	80R2K2C	80R2K2C	80R2K2C	80R2K2C	80R2K2C	80R2K2C

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter	Symbol	Value		Unit
		TO-220, TO-251, TO-252 TO-262, TO-263	TO-220F	
Drain-Source Voltage (V_{GS} = 0V)	V_{DSS}	800		V
Continuous Drain Current	I_D	2		A
Pulsed Drain Current (note1)	I_{DM}	6		A
Gate-Source Voltage	V_{GSS}	±30		V
Single Pulse Avalanche Energy (note2)	E_{AS}	52.8		mJ
Avalanche Current (note1)	I_{AR}	0.8		A
Repetitive Avalanche Energy (note1)	E_{AR}	0.09		mJ
MOSFET dv/dt Ruggedness(V_{DS} = 0 … 480V)	dv/dt	50		V/ns
Power Dissipation (T_C = 25ºC)	P_D	28	23	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150		ºC

Thermal Resistance

Parameter	Symbol	Value		Unit
		TO-220, TO-251, TO-252 TO-262, TO-263	TO-220F	
Thermal Resistance, Junction-to-Case	R_{thJC}	4.4	5.5	ºC/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62	80	

Specifications T_J = 25ºC, unless otherwise noted

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	800	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 800V, V_{GS} = 0V, T_J = 25ºC	--	--	1	μA
		V_{DS} = 800V, V_{GS} = 0V, T_J = 150ºC	--	--	100	
Gate-Source Leakage	I_{GSS}	V_{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5	--	4.5	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	V_{GS} = 10V, I_D = 1A	--	1.8	2.2	Ω
Forward Transconductance (Note3)	g_{fs}	V_{DS} = 10V, I_D = 1A	--	3	--	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 50V, f = 1.0MHz	--	390	--	pF
Output Capacitance	C_{oss}		--	34	--	
Reverse Transfer Capacitance	C_{rss}		--	5.3	--	
Total Gate Charge	Q_g	V_{DD} = 640V, I_D = 2A, V_{GS} = 10V	--	12	--	nC
Gate-Source Charge	Q_{gs}		--	2.5	--	
Gate-Drain Charge	Q_{gd}		--	5	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 400V, I_D = 2A, R_G = 25Ω	--	36	--	ns
Turn-on Rise Time	t_r		--	27	--	
Turn-off Delay Time	$t_{d(off)}$		--	79	--	
Turn-off Fall Time	t_f		--	29	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	2	A
Pulsed Diode Forward Current	I_{SM}		--	--	6	
Reverse Diode dv/dt	dv/dt	V_{DS} = 0 … 400V, I_{SD} ≤ I_D	--	--	15	V/ns
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = 2A, V_{GS} = 0V	--	0.9	1.2	V
Reverse Recovery Time	t_{rr}	V_R = 400V, I_F = I_S, di_F/dt = 100A/μs	--	220	--	ns
Reverse Recovery Charge	Q_{rr}		--	0.9	--	μC
Peak Reverse Recovery Current	I_{rrm}		--	8	--	A

Notes

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2. I_{AS} = 0.8A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1%

Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

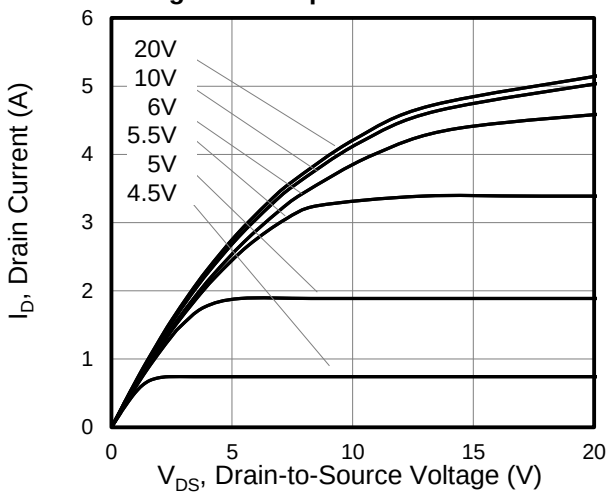


Figure 2. Transfer Characteristics

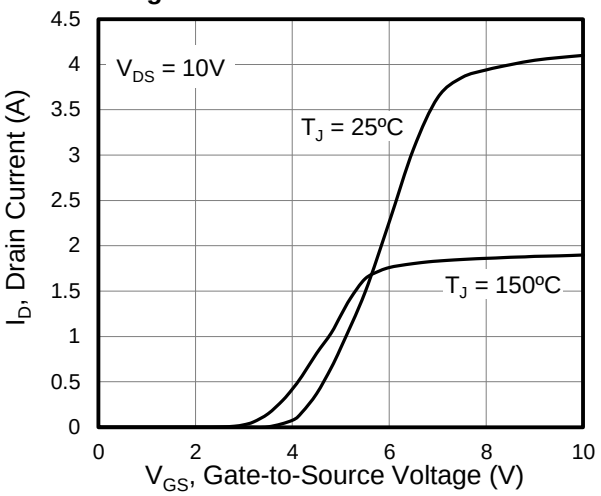


Figure 3. On-Resistance vs. Drain Current

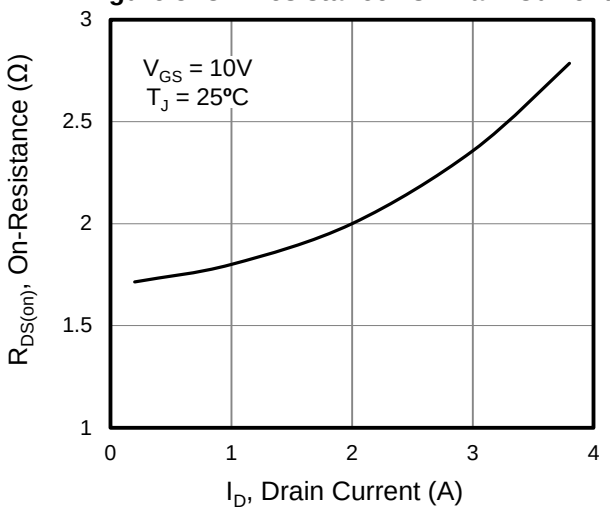


Figure 4. Capacitance

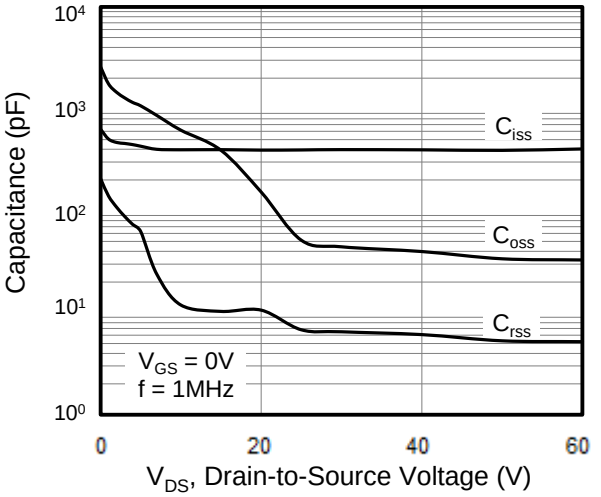


Figure 5. Gate Charge

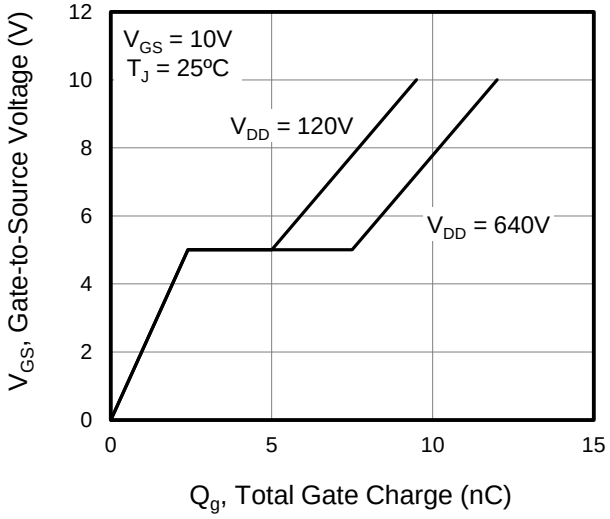
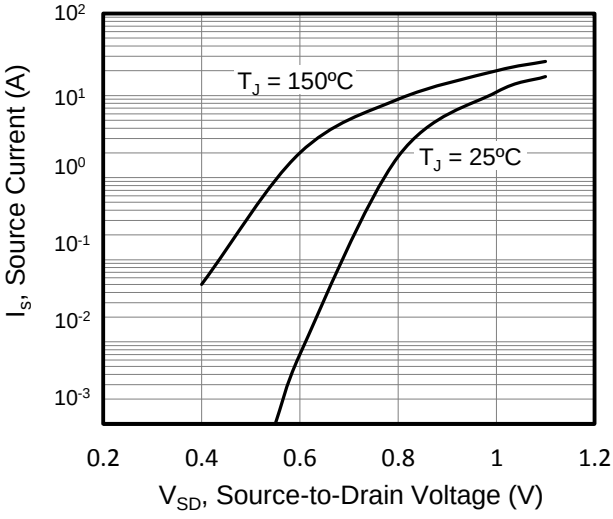


Figure 6. Body Diode Forward Voltage



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. On-Resistance vs. Junction Temperature

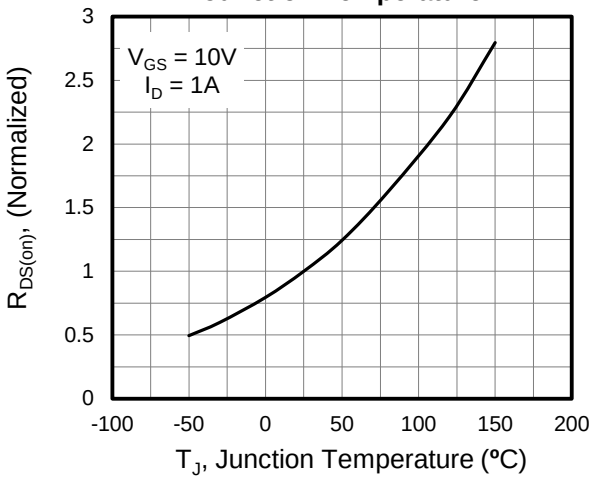


Figure 8. Threshold Voltage vs. Junction Temperature

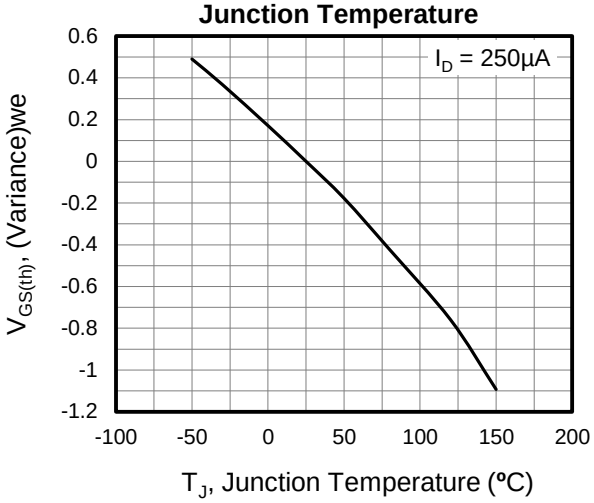


Figure 9. Transient Thermal Impedance TO-220,TO-251,TO-252,TO-262,TO-263

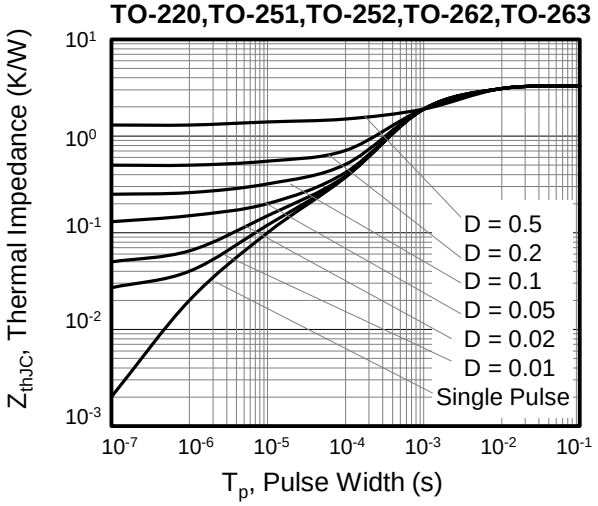


Figure 10. Transient Thermal Impedance TO-220F

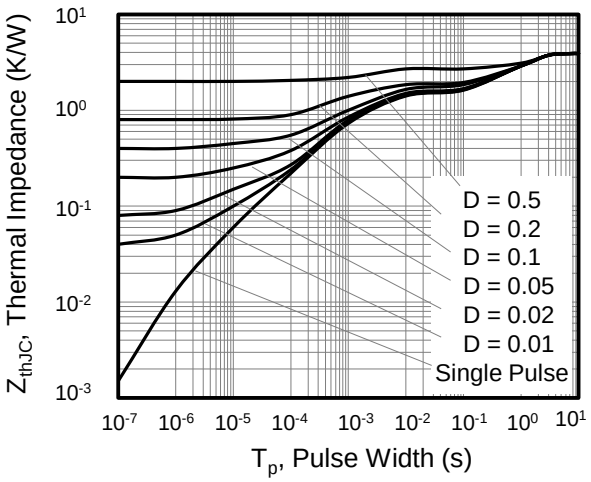


Figure A：Gate Charge Test Circuit and Waveform

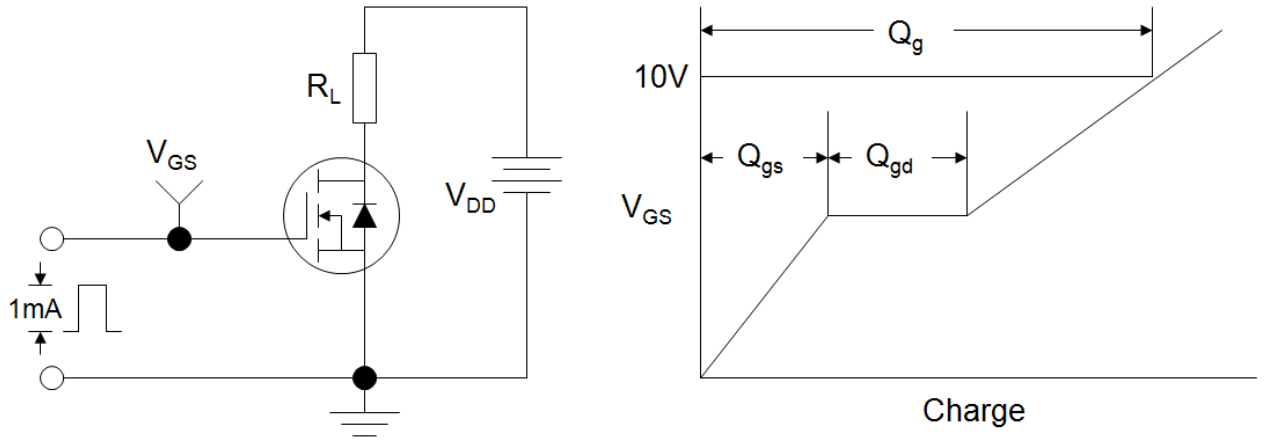


Figure B：Resistive Switching Test Circuit and Waveform

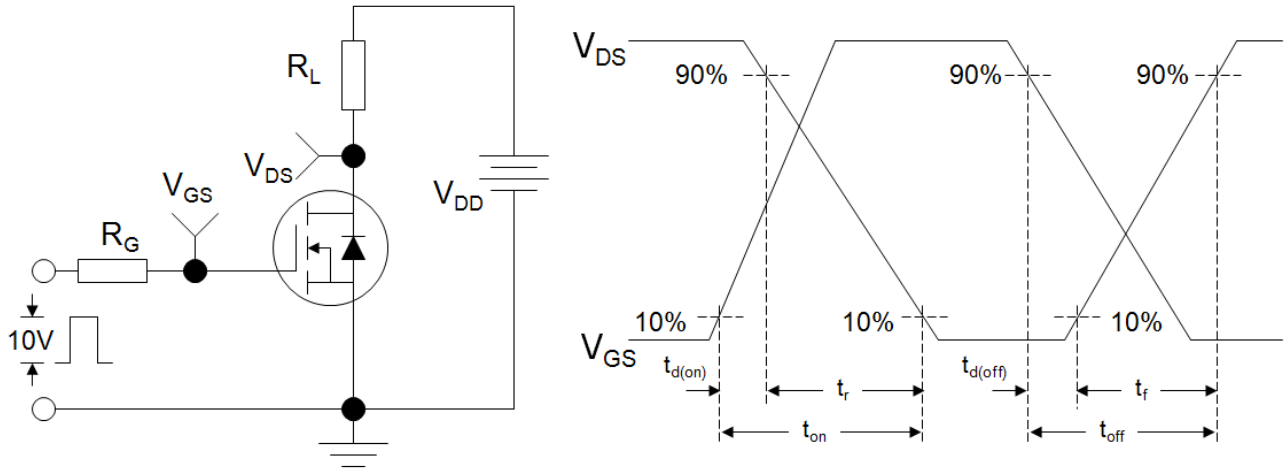
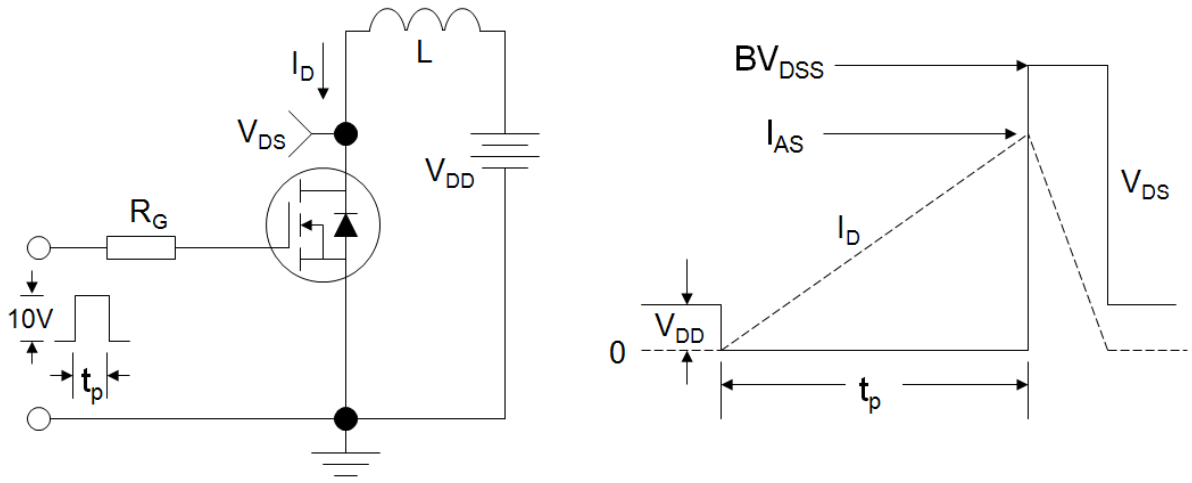
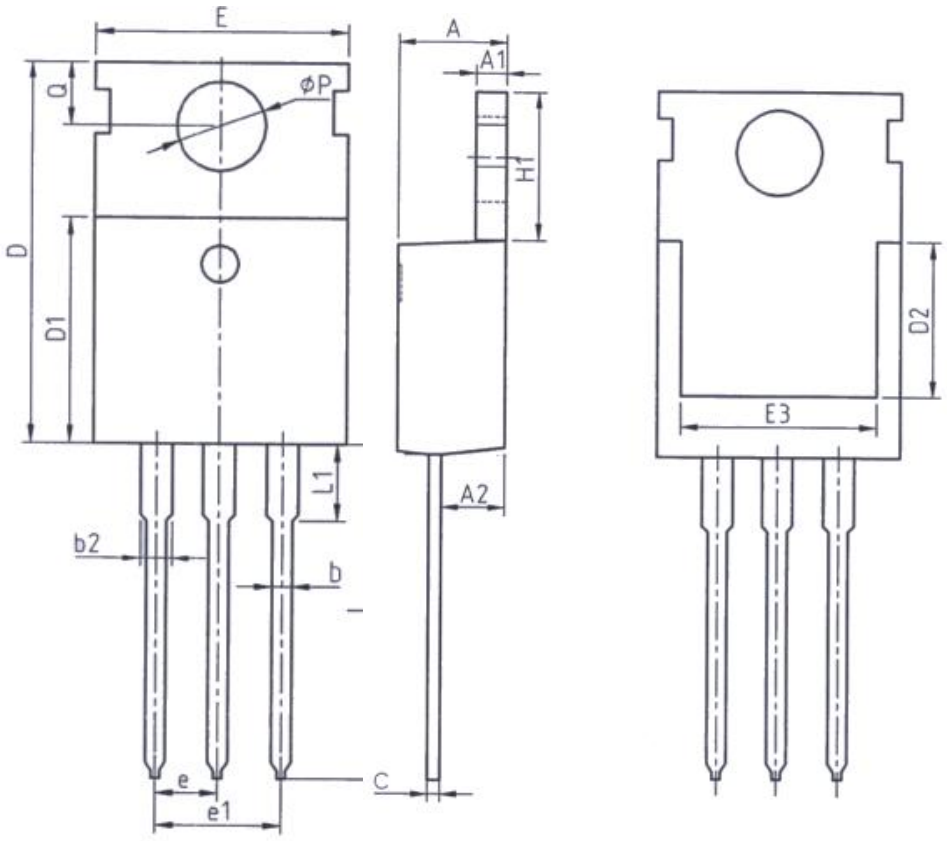


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



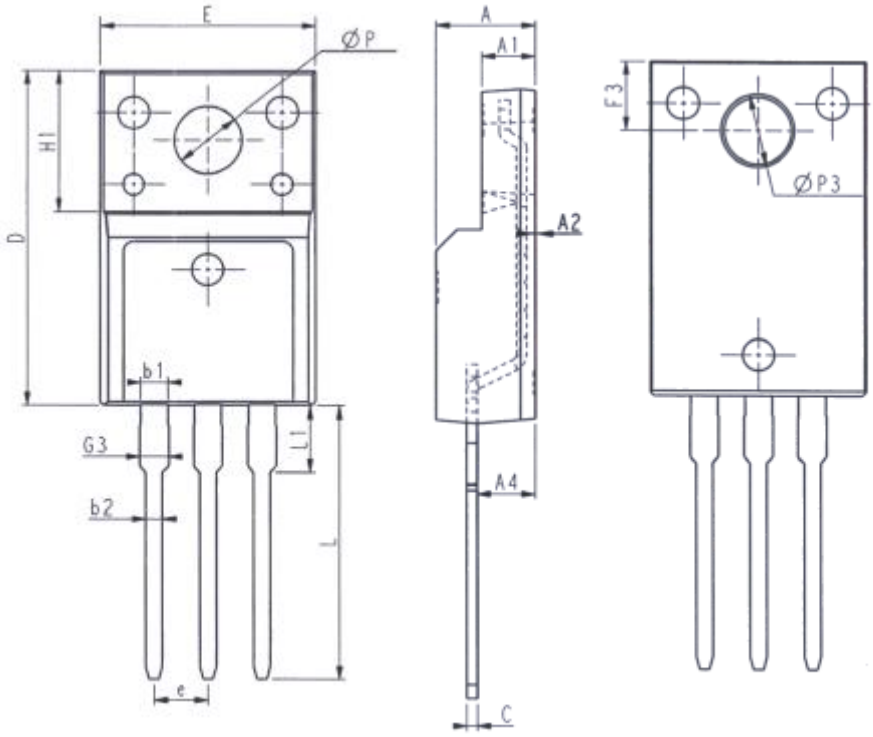
TO-220



Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.25	1.45
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.40
D2	5.50	–

Unit: mm		
Symbol	Min.	Max.
E	9.70	10.30
E3	7.00	–
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	13.80
L1	–	3.40
P	3.40	3.80
Q	2.60	3.00

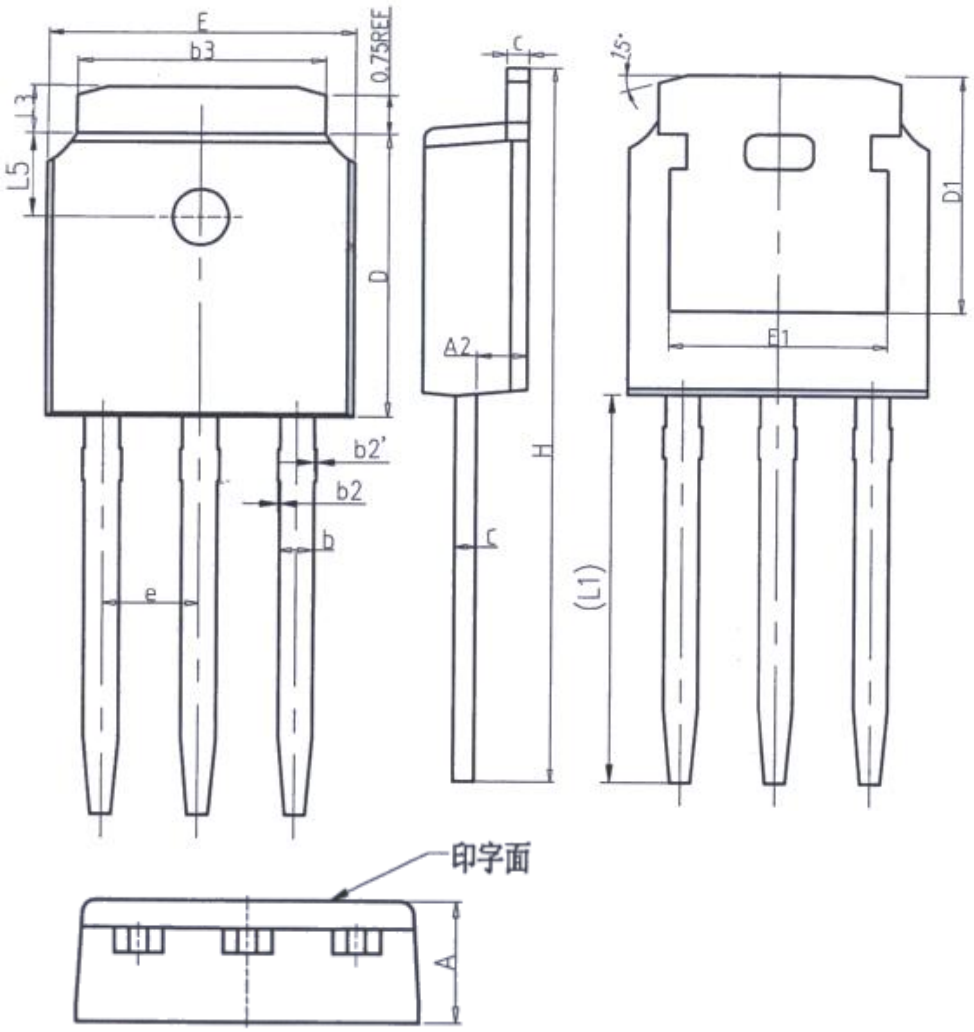
TO-220F



Unit: mm		
Symbol	Min.	Max.
E	9.96	10.36
A	4.50	4.90
A1	2.34	2.74
A2	0.30	0.60
A4	2.56	2.96
c	0.40	0.65
D	15.57	16.17
H1	6.70REF	
e	2.54BSC	

Unit: mm		
Symbol	Min.	Max.
L	12.68	13.28
L1	2.93	3.13
P	3.03	3.38
P3	3.15	3.65
F3	3.15	3.45
G3	1.25	1.55
b1	1.18	1.43
b2	0.70	0.95

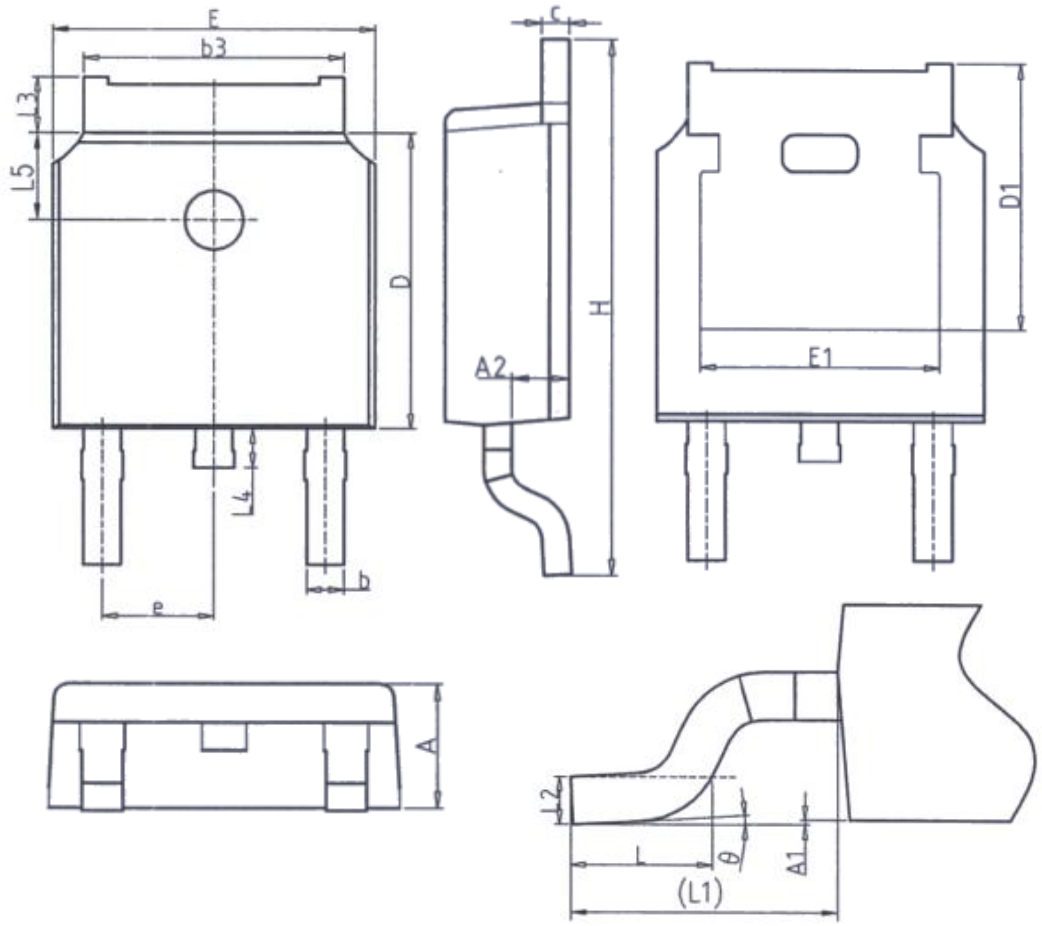
TO-251



Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A2	0.97	1.17
b	0.68	0.90
b2	0.00	0.10
b2′	0.00	0.10
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22

Unit: mm		
Symbol	Min.	Max.
D1	5.30REF	
E	6.40	6.80
E1	4.63	-
e	2.286BSC	
H	16.22	16.82
L1	9.15	9.65
L3	0.88	1.28
L5	1.65	1.95

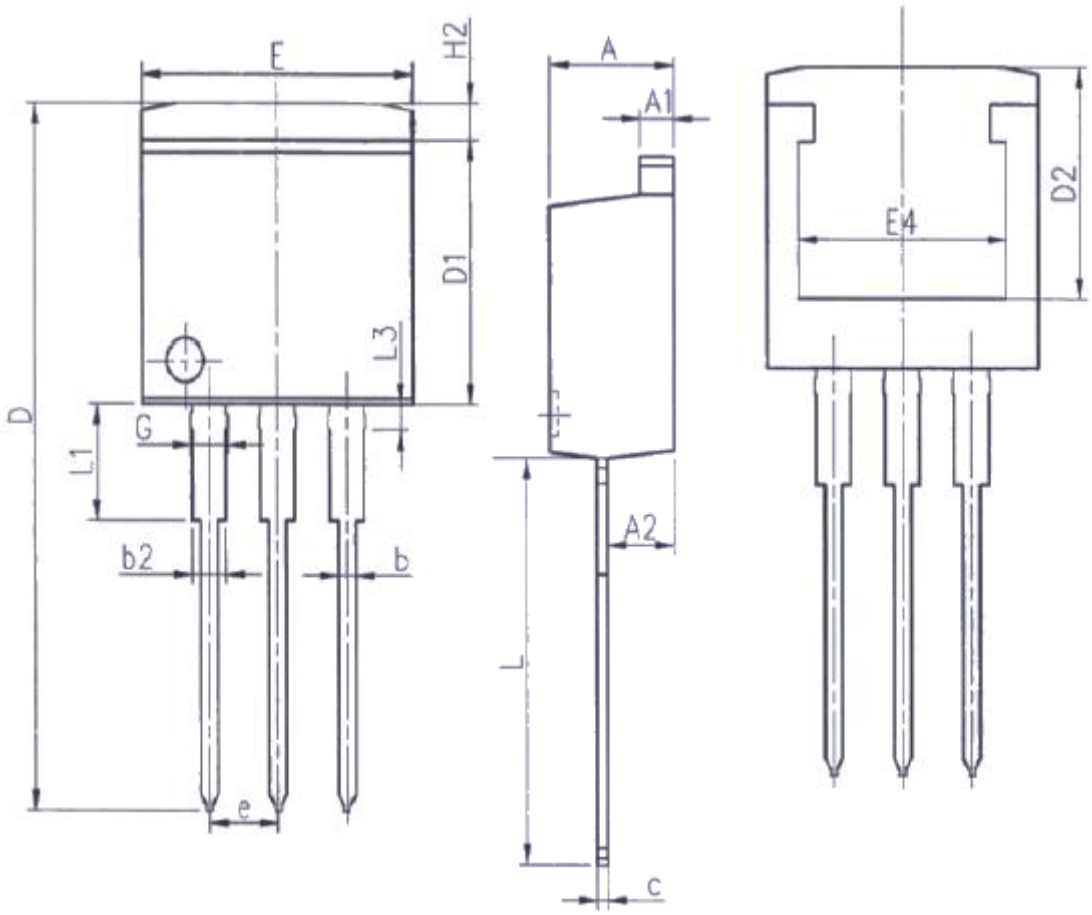
TO-252



Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A1	0.00	0.20
A2	0.97	1.17
b	0.68	0.90
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22
D1	5.30REF	
E	6.40	6.80
E1	4.63	–

Unit: mm		
Symbol	Min.	Max.
e	2.286BSC	
H	9.40	10.50
L	1.38	1.75
L1	2.90REF	
L2	0.51BSC	
L3	0.88	1.28
L4	–	1.00
L5	1.65	1.95
θ	0°	8°

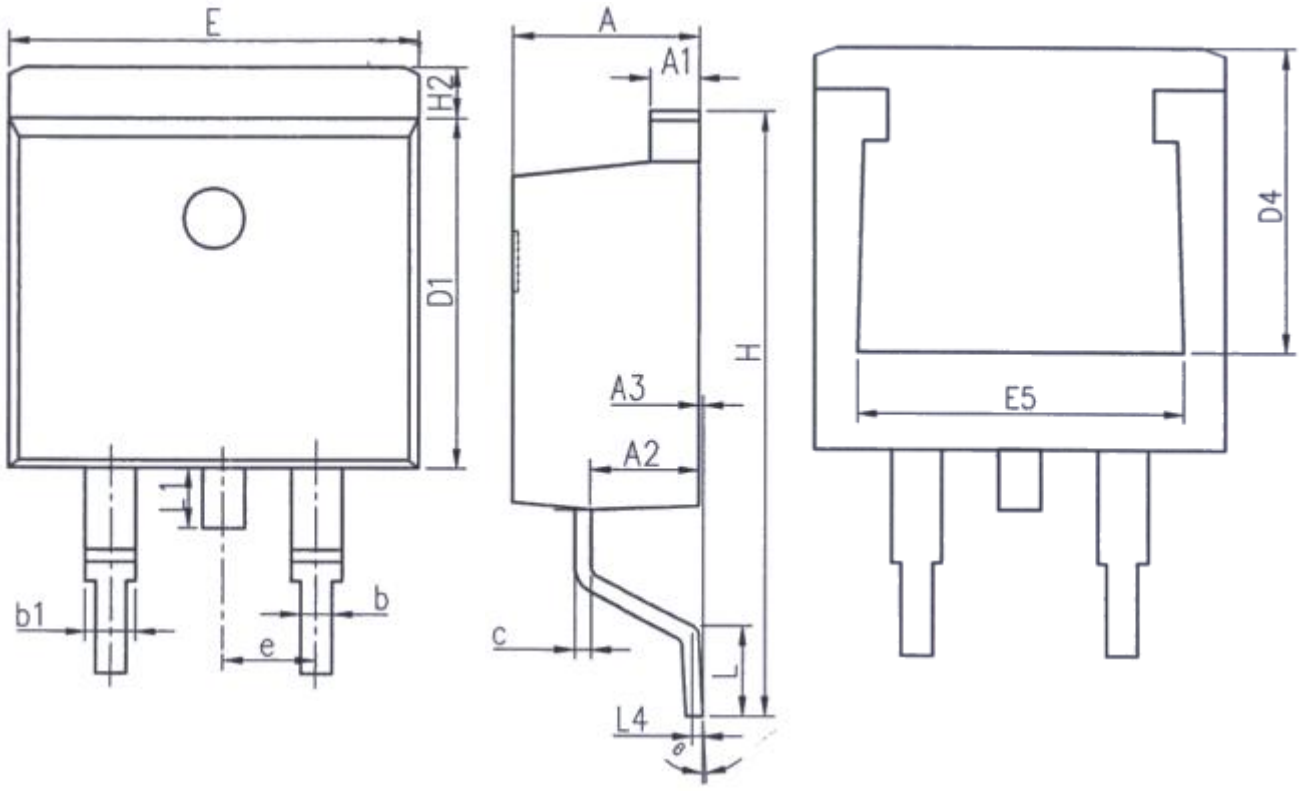
TO-262



Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.22	1.42
A2	2.47	2.87
b	0.70	0.97
b2	1.17	1.42
c	0.28	0.53
D	23.20	24.02
D1	8.38	8.90
D2	6.00	-

Unit: mm		
Symbol	Min.	Max.
E	9.90	10.39
E4	7.30	-
e	2.54BSC	
G	1.25	1.50
H2	-	1.31
L	13.34	14.10
L1	3.30	4.06
L3	0.95	1.15

TO-263



Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.22	1.42
A2	2.49	2.89
A3	0.00	0.25
b	0.70	0.96
b1	1.17	1.47
c	0.30	0.53
D1	8.50	8.90
D4	6.60	-

Unit: mm		
Symbol	Min.	Max.
E	9.86	10.36
E5	7.06	-
e	2.54BSC	
H	14.70	15.50
H2	1.07	1.47
L	2.00	2.60
L1	1.40	1.70
L4	0.25BSC	
θ	0°	9°

Disclaimer

All product specifications and data are subject to change without notice.

For documents and material available from this datasheet, Wuxi Unigroup does not warrant or assume any legal liability or responsibility for the accuracy, completeness of any product or technology disclosed hereunder.

No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document or by any conduct of Wuxi Unigroup.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling Wuxi Unigroup products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Wuxi Unigroup for any damages arising or resulting from such use or sale.

Wuxi Unigroup disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Wuxi Unigroup's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

Wuxi Unigroup Microelectronics CO., LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

In the event that any or all Wuxi Unigroup products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

Information (including circuit diagrams and circuit parameters) herein is for example only. It is not guaranteed for volume production. Wuxi Unigroup believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.