

Features

- Low gate charge and improved dv/dt capacitance
- Multi-Epi Process
- Ultra-fast body diode
- Fast Recovery Body Diode
- Proprietary New Super-Junction Technology

Mechanical Data

- Case:TO-220,ITO-220,TO-263, TO-247,TO-3P Packag

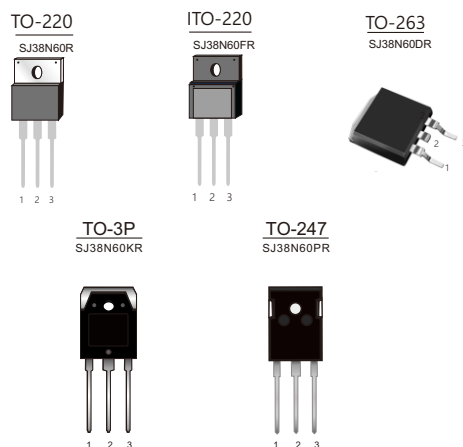
Application

- Adaptor
- Charger
- SMPS Standby Power

Ordering Information

Part No.	Marking.	Package Type	Package	Quantity(box)
SJ38N60R	SJ38N60R	TO-220	Tube	1000
SJ38N60FR	SJ38N60FR	ITO-220	Tube	1000
SJ38N60DR	SJ38N60DR	TO-263	Tape & Reel	800
SJ38N60PR	SJ38N60PR	TO-247	Tube	360
SJ38N60KR	SJ38N60KR	TO-3P	Tube	360

Product Summary			
V _{DS}	R _{DS(on)} (mΩ) Typ	I _D (A)	Q _g (Typ)
600V	89 @ 10V 15.3A	38	60nc



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

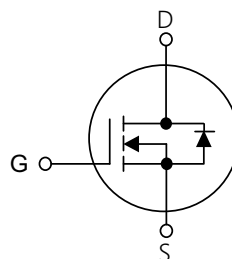


Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

Parameter	Symbol	TO-220/TO-263	TO-247/TO-3P	ITO-220	Unit
Drain-Source Voltage	V _{DS}	600			V
Gate-Source Voltage	V _{GS}	±30			V
Continuous Drain Current	T _C =25°C	38		38 [*]	A
	T _C =100°C	24		24 [*]	
Pulsed Drain Current (Note 1)	I _{DM}	152			A
Single Pulse Avalanche Energy(Note 2)	E _{AS}	605			mJ
Avalanche Current(Note 1)	I _{AR}	24.4			A
Power Dissipation T _C =25°C	P _D	320	219	68	W
Operating Junction and Storage Temperature	T _J /T _{STG}	-55 ~ +150			°C

*limited by maximum junction temperature

Table 2. Thermal Characteristics

Parameter	Symbol	TO-220 TO-263	TO-247 TO-3P	ITO-220	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62	50	100	$^{\circ}\text{C}/\text{W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.39	0.57	1.84	$^{\circ}\text{C}/\text{W}$

Table 3. Electrical Characteristics ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V,I _D =250μA	600	-	-	V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =600V,V _{GS} =0V	-	-	1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V,V _{DS} =0V	-	-	10	μA
	Reverse		V _{GS} =-30V,V _{DS} =0V	-	-	-10	μA
On Characteristics(Note 3)							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} ,I _D =250μA	3.0	-	5.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V,I _D =15.3A	-	89	110	mΩ
Dynamic Characteristics(Note 4)							
Input Capacitance		C _{ISS}	V _{DS} =100V,V _{GS} =0V,f=100KHz	-	2162	-	pF
Output Capacitance		C _{OSS}		-	99	-	pF
Reverse Transfer Capacitance		C _{RSS}		-	1.4	-	pF
Switching Characteristics (Note 4)							
Turn-On Delay Time		td(on)	V _{DD} =480V,V _{GS} =10V R _G =10Ω,I _D =38A	-	102	-	ns
Turn-On Rise Time		t _R		-	26	-	ns
Turn-Off Delay Time		td(off)		-	55	-	ns
Turn-Off Fall Time		t _f		-	19	-	ns
Total Gate Charge		Q _G	V _{DD} =480V,I _D =38A, V _{GS} =10V	-	60	-	nC
Gate-Source Charge		Q _{GS}		-	14	-	nC
Gate-Drain Charge		Q _{GD}		-	30	-	nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =38A	-	-	1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I _S		-	-	38	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}		-	-	152	A
Reverse Recovery Time		trr	V _{GS} =0V, I _S =38A	-	128	-	ns
Reverse Recovery Charge		Q _{RR}	dIF/dt=100A/μs (Note 1)	-	738	-	nC

Notes: 1 Repetitive Rating: Pulse width limited by maximum junction temperature

2 EAS condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=50V$, $V_G=10V$, $L=10\text{mH}$, $I_D=11A$

3 Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

4 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

Figure 1. Output Characteristics

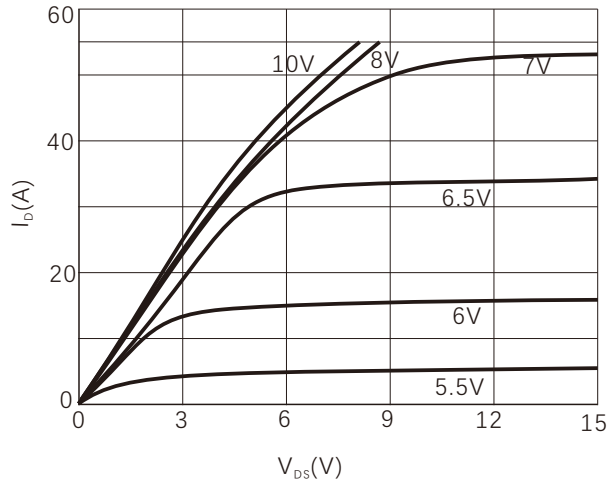


Figure 2. Transfer Characteristics

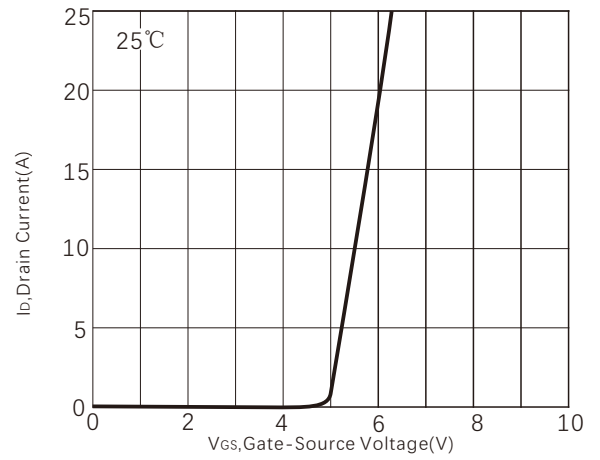


Figure 3. Source-Drain Diode Forward Voltage

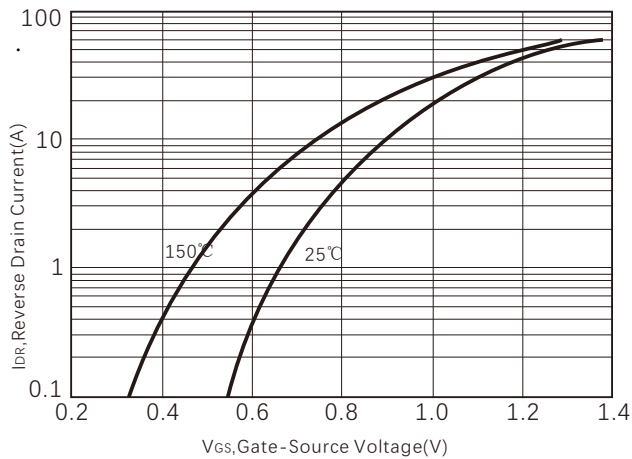


Figure 4. Capacitance

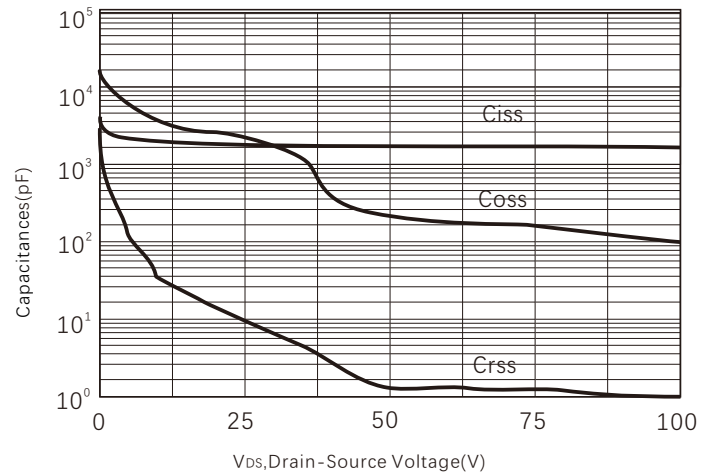


Figure 5. Gate charge

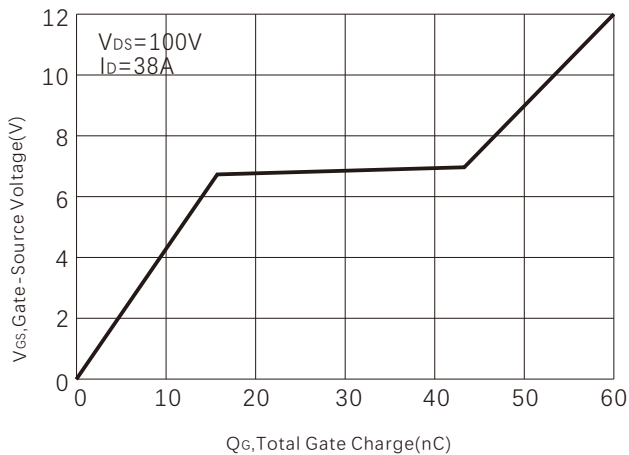


Figure 6. Normalized $R_{DS(on)}$ vs Temperature

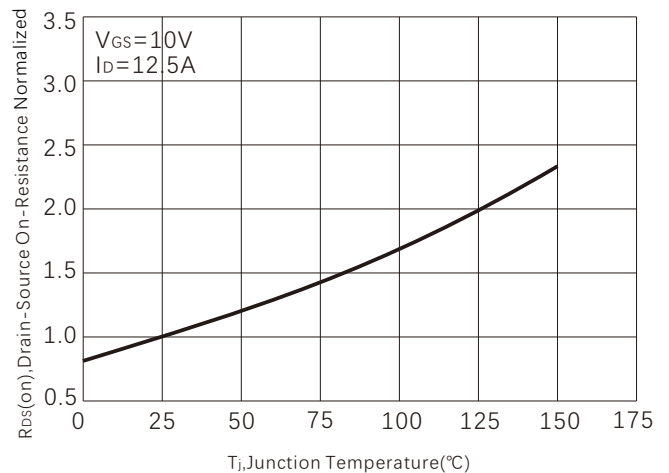


Figure 7. On-Resistance vs. Drain Current

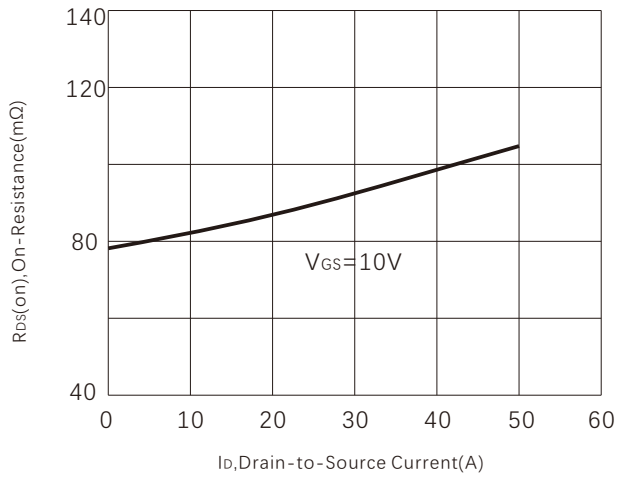


Figure 8. Maximum Drain Current vs Temperature

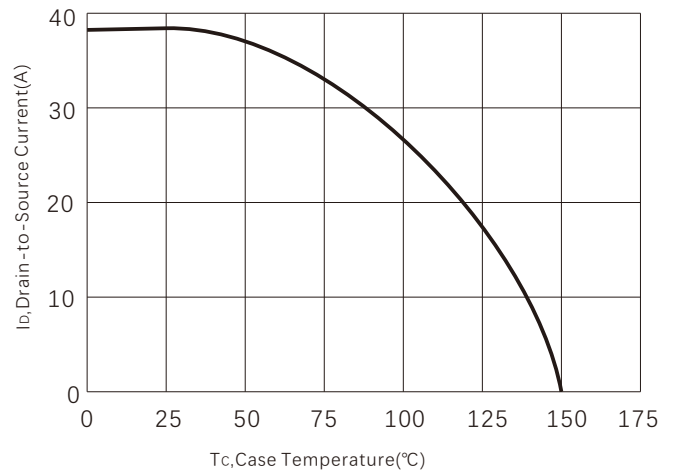


Figure 9. Power dissipation-TO-247

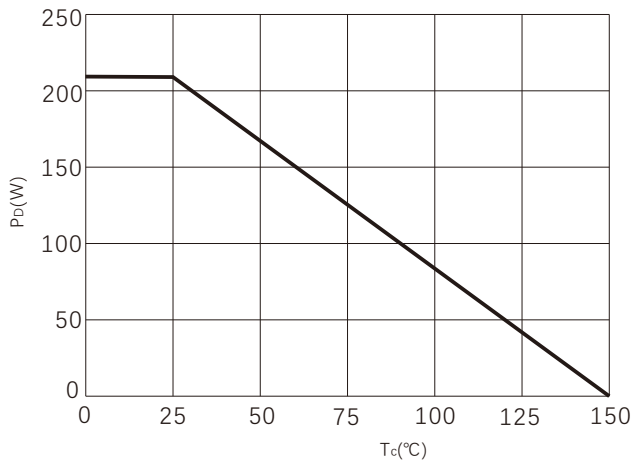


Figure 10. Power dissipation-ITO-220

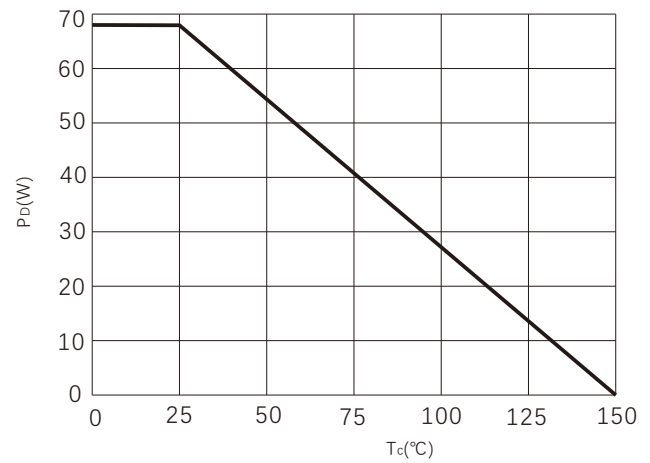
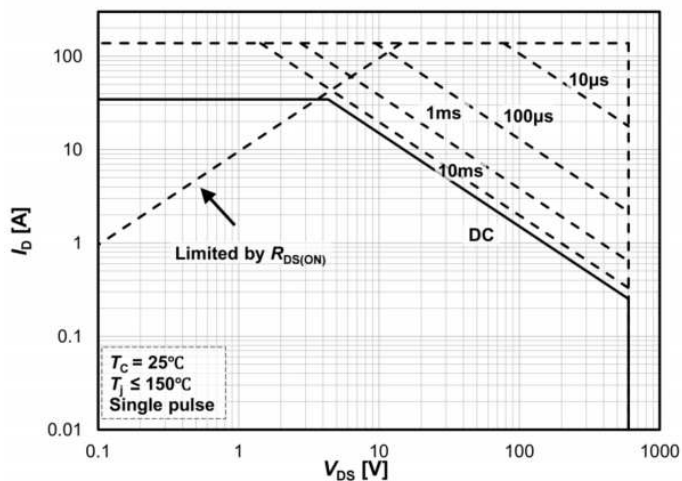
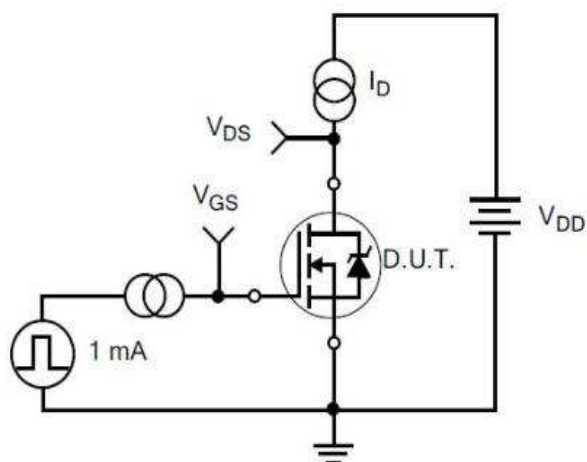


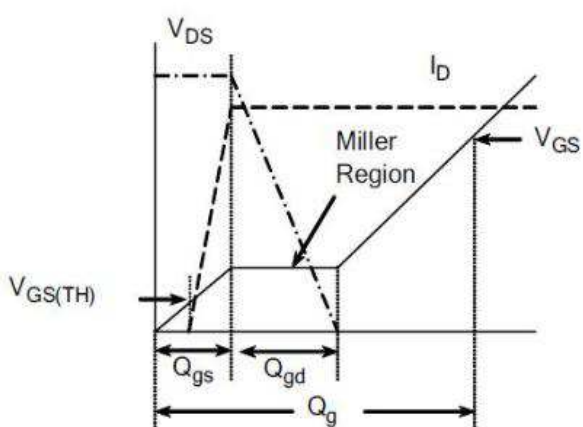
Figure 11. Safe operating area



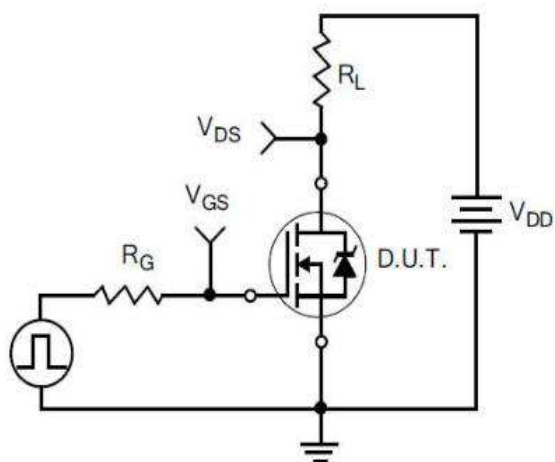
Typical Test Circuit



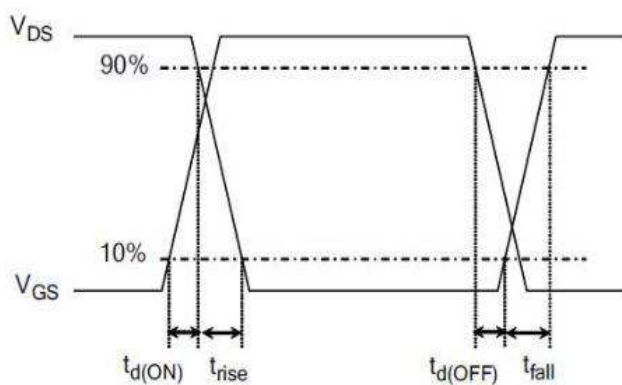
1) Gate Charge Test Circuit



2) . Gate Charge Waveform



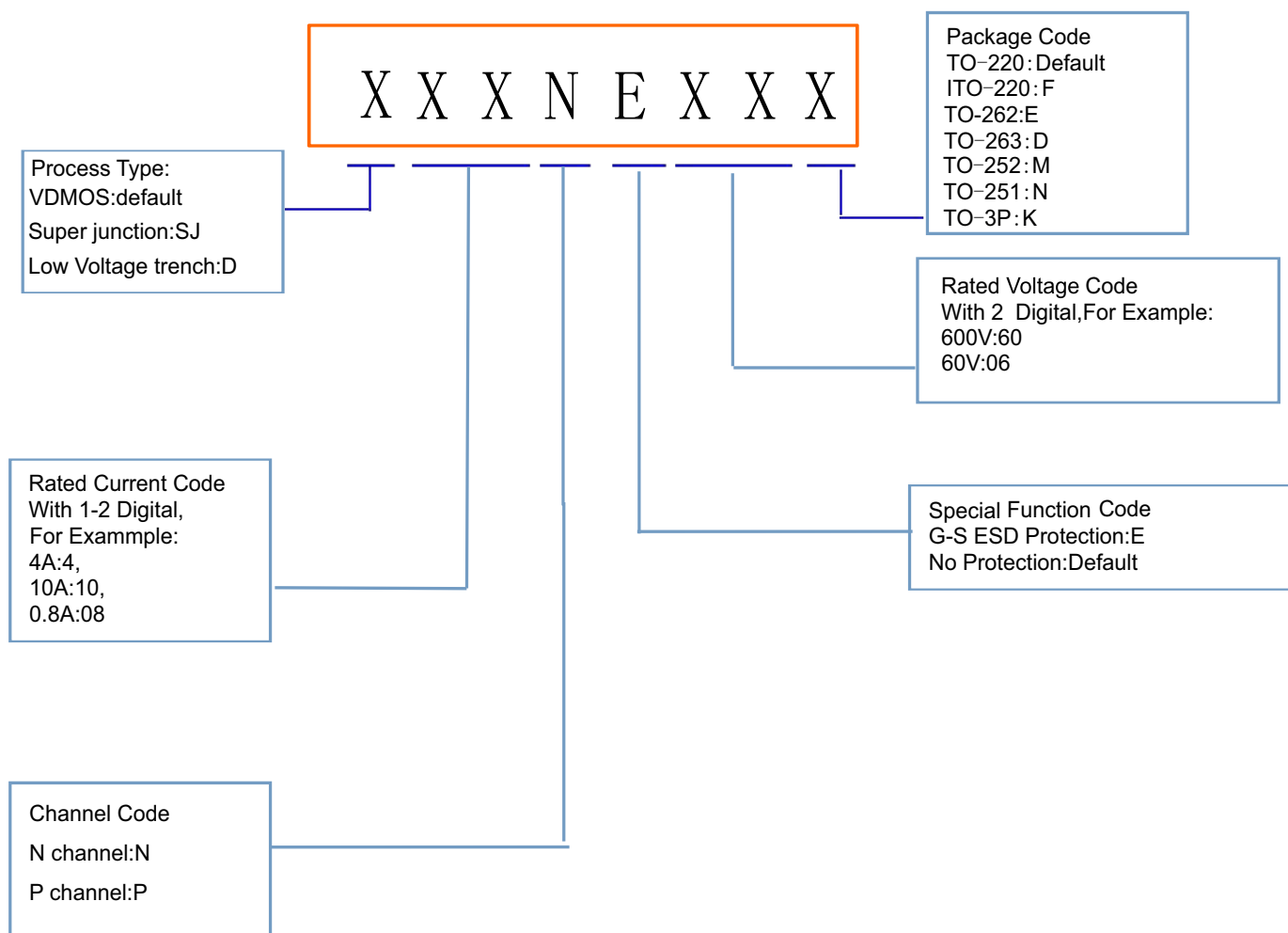
3) Resistive Switching Test Circuit



4) Resistive Switching Waveforms

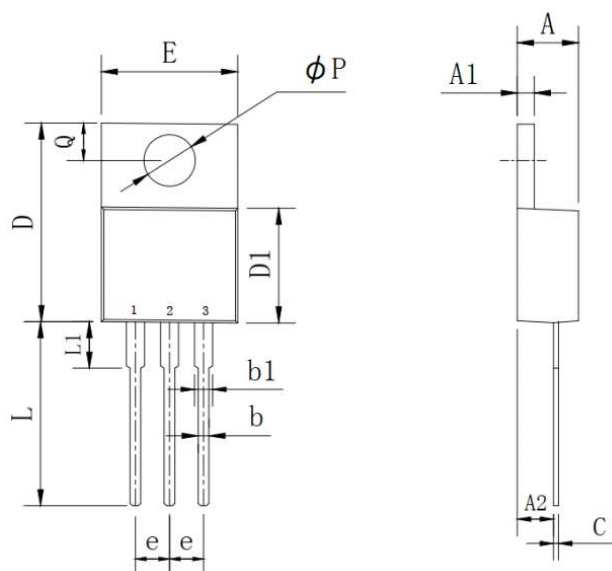


Product Names Rules



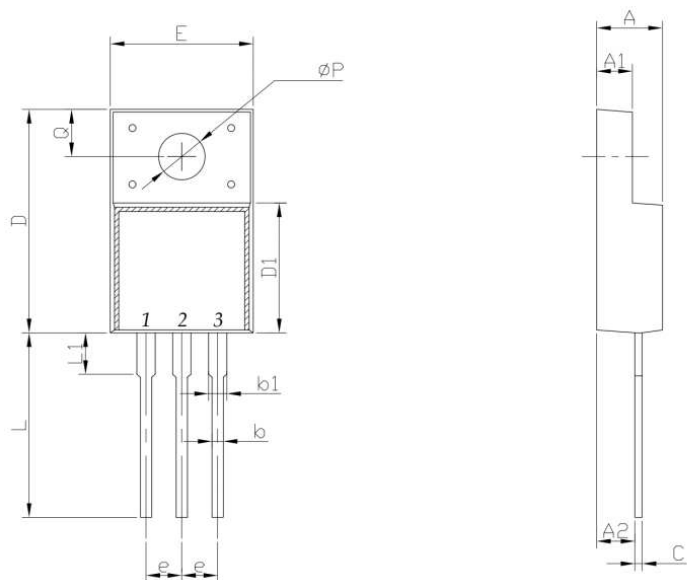
Dimensions

TO-220 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	2.03	2.92	0.080	0.115
b	0.51	1.11	0.020	0.044
b1	0.97	1.6	0.038	0.063
C	0.3	0.7	0.012	0.028
D	14.6	15.9	0.575	0.626
D1	8.04	9.3	0.317	0.366
E	9.57	10.57	0.377	0.416
e	2.34	2.74	0.092	0.108
L	12.58	14.3	0.495	0.563
L1	2.8	4.2	0.110	0.165
P	3.4	4.14	0.134	0.163
Q	2.45	3	0.096	0.118

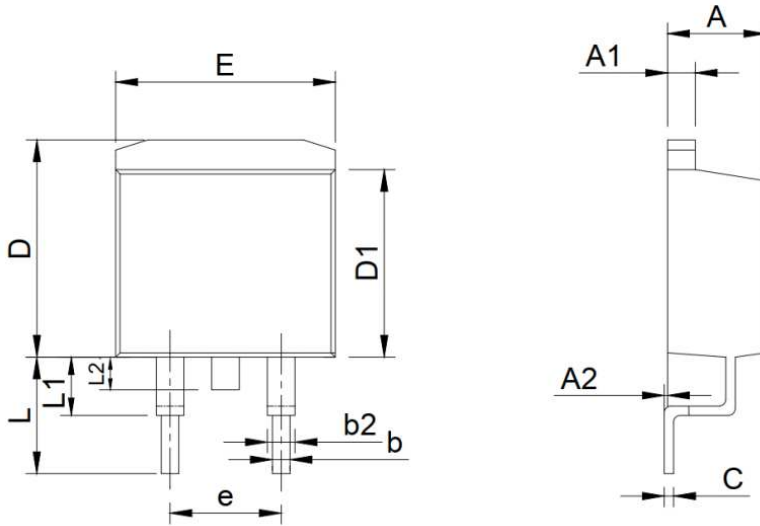
ITO-220 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.24	4.9	0.167	0.193
A1	2.3	2.92	0.091	0.115
A2	2.61	2.81	0.103	0.111
b	0.3	1	0.012	0.039
b1	0.9	1.55	0.035	0.061
C	0.3	0.7	0.012	0.028
D	14.5	16.36	0.571	0.644
D1	8.8	9.41	0.346	0.370
E	9.5	10.5	0.374	0.413
e	2.3	2.75	0.091	0.108
L	12.6	14	0.496	0.551
L1	2.45	4.3	0.096	0.169
P	2.9	3.8	0.114	0.150
Q	2.5	3.55	0.098	0.140

Dimensions

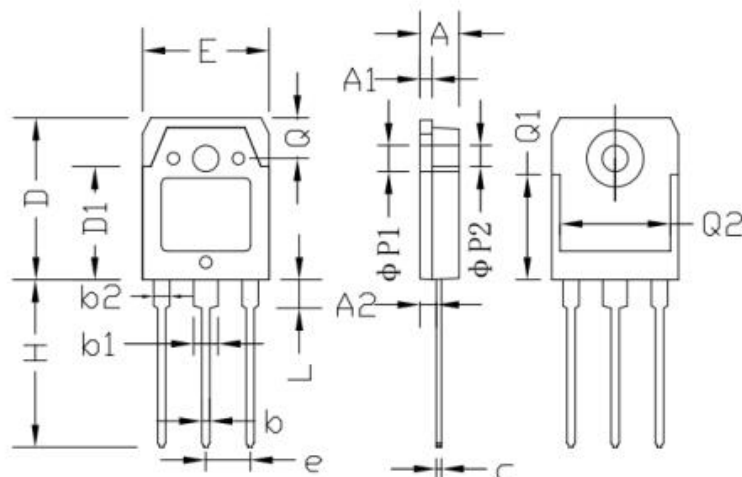
TO-263 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	0	0.25	0.000	0.010
b	0.61	1.01	0.024	0.040
b1	1.2	1.34	0.047	0.053
C	0.3	0.6	0.012	0.024
D	9.48	10.84	0.373	0.427
D1	8.49	9.3	0.334	0.366
E	9.7	10.31	0.382	0.406
e	4.88	5.28	0.192	0.208
L	4.46	5.85	0.176	0.230
L1	1.33	2.33	0.052	0.092
L2	0	2.2	0.000	0.087

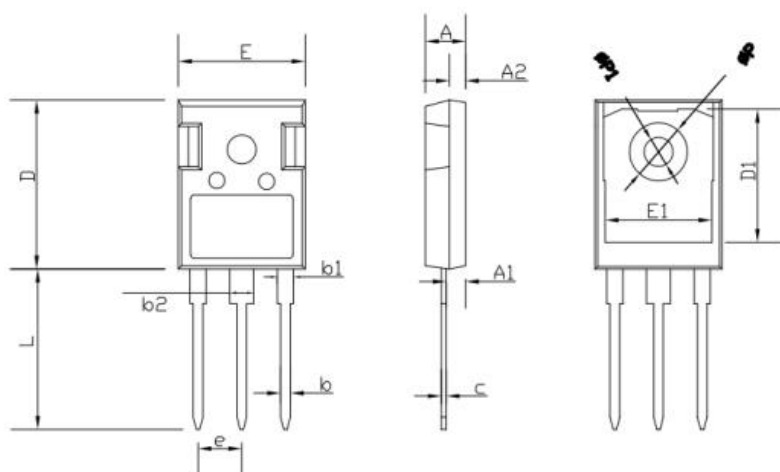
Dimensions

TO-3P PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	4.60	5.00	0.181	0.197
A1	1.45	1.65	0.057	0.065
A2	2.20	2.60	0.087	0.102
b	0.80	1.20	0.032	0.047
b1	2.80	3.20	0.110	0.126
b2	1.80	2.20	0.071	0.087
C	0.55	0.75	0.022	0.030
D	19.20	19.70	0.756	0.776
D1	13.10	14.70	0.516	0.578
E	15.40	15.80	0.607	0.623
e	5.45 TYP		0.215 TYP	
H	19.80	20.20	0.780	0.826
L	3.30	3.70	0.130	0.146
ΦP1	3.20 TYP		0.126 TYP	
ΦP2	3.50 TYP		0.138 TYP	
Q	5.00 TYP		0.197 TYP	
Q1	12.40 TYP		0.488 TYP	
Q2	12.6	-	0.496	-

TO-247 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	4.90	5.10	0.193	0.201
A1	2.31	2.51	0.091	0.099
A2	1.90	2.10	0.075	0.083
b	1.16	1.26	0.046	0.050
b1	1.96	2.06	0.0772	0.0812
b2	2.96	3.06	0.117	0.121
c	0.59	0.66	0.0232	0.0260
D	20.90	21.10	0.8235	0.8313
D1	16.25	16.85	0.6403	0.6639
E	15.70	15.90	0.6186	0.6265
E1	13.10	13.50	0.5161	0.5319
e	5.44		0.2143	
L	19.80	20.10	0.7801	0.7919
ΦP	3.50	3.70	0.1379	0.1458
ΦP1	0	7.30	0	0.2876

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