

650V N-Channel Super Junction Power MOSFET

Features

- Fast switching
- Low reverse transfer capacitances
- Low gate charge and Low on-resistance
- 100% avalanche tested

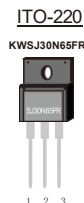
Mechanical Data

- Case: TO-220, TO-263, ITO-220 Package

Application

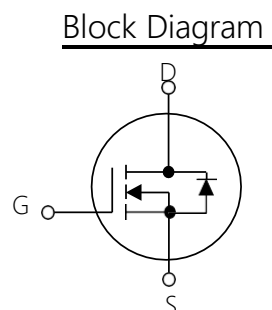
- SMPS
- Adapter
- LED Lighting
- TV Power Supply

Product Summary			
V _{DS}	R _{DS(on)} (Ω) Typ	I _D (A)	Q _g (Typ)
650V	141 @ 10V 6A	30	17.5nc



Pin Definition:

1. Gate
2. Drain
3. Source



Ordering Information

Part No.	Marking.	Package Type	Package	Quality(box)
KWSJ30N65R	SJ30N65R	TO-220	Tube	1000
KWSJ30N65DR	SJ30N65DR	TO-263	Tape & Reel	800
KWSJ30N65FR	SJ30N65FR	ITO-220	Tube	1000

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

Parameter	Symbol	TO-220/TO-263	ITO-220	Unit
Drain-Source Voltage	V _{DS}	650		V
Gate-Source Voltage	V _{GS}	±30		V
Continuous Drain Current	I _D	30	30 [※]	A
		19	19 [※]	
Pulsed Drain Current (Note 1)	I _{DM}	74		A
Single Pulse Avalanche Energy(Note 2)	E _{AS}	281.2		mJ
Avalanche Current(Note 2)	I _{AR}	7.5		A
Power Dissipation T _C =25°C	P _D	125	43	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	ITO-220	Unit
Thermal resistance Junction to Ambient Typ.	$R_{\theta JA}$	60	60	$^{\circ}\text{C/W}$
Thermal resistance Junction to Case Typ.	$R_{\theta JC}$	1.0	2.9	$^{\circ}\text{C/W}$

Table 3. Electrical Characteristics ($T_C=25^{\circ}\text{C}$, 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	650	-	-	V
Drain-Source Leakage Current		I _{DSS}	V _D =650V,V _{GS} =0V	-	-	5	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V,V _D =0V	-	-	100	nA
	Reverse		V _{GS} =-30V,V _D =0V	-	-	-100	nA
On Characteristics(Note 3)							
Gate Threshold Voltage		V _{GS(TH)}	V _D =V _{GS} ,I _D =250μA	3.2	-	4.6	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V,I _D =6A	-	141	169	mΩ
Dynamic Characteristics(Note 4)							
Input Capacitance		C _{ISS}	V _D =50V,V _{GS} =0V,f=1MHz	-	1340	-	pF
Output Capacitance		C _{OSS}		-	110	-	pF
Reverse Transfer Capacitance		C _{RSS}		-	2	-	pF
Switching Characteristics (Note 4)							
Turn-On Delay Time		t _{d(on)}	V _{DD} =400V,I _D =15A V _{GS} =10V,R _G =5Ω,	-	43	-	ns
Turn-On Rise Time		t _r		-	21	-	ns
Turn-Off Delay Time		t _{d(off)}		-	50	-	ns
Turn-Off Fall Time		t _f		-	15.5	-	ns
Total Gate Charge		Q _G	V _{DD} =400V,I _D =15A, V _{GS} =10V	-	17.5	-	nC
Gate-Source Charge		Q _{GS}		-	7	-	nC
Gate-Drain Charge		Q _{GD}		-	7.5	-	nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V,I _S =15A	-	-	1.2	V
Reverse Recovery Time		t _{rr}	V _{DD} =400V,I _F =15A dI _F /dt=100A/μs(Note 1)	-	120	-	ns
Reverse Recovery Charge		Q _R		-	1.6	-	μC
Reverse Recovery Current		I _{RRM}		-	20	-	μC

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

2 $L=10\text{mH}$, $I_{AS}=7.5A, V_{DD}=100V, V_{GS}=10V$, Starting $T_J=25^{\circ}\text{C}$

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

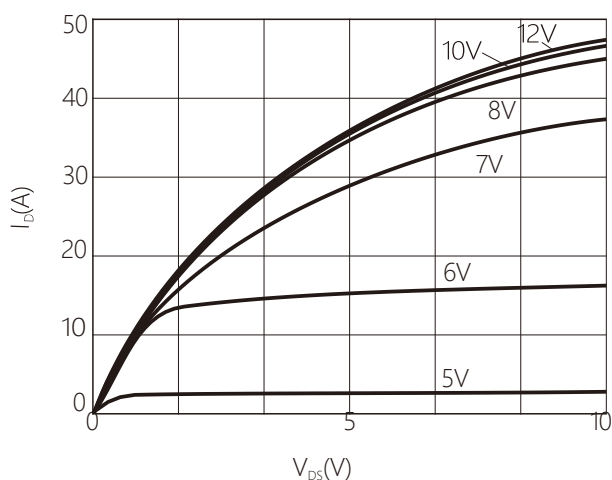


Figure 2. Transfer Characteristics

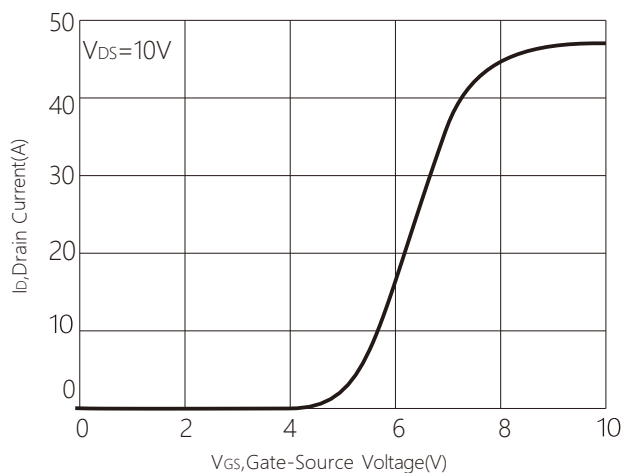


Figure 3. Maximum Drain Current vs. Temperature

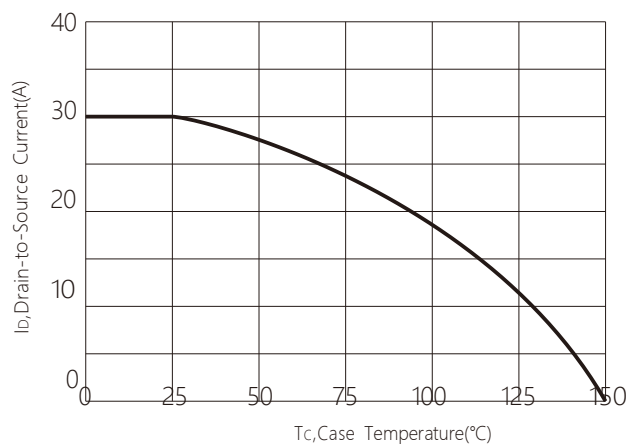


Figure 4. Capacitance

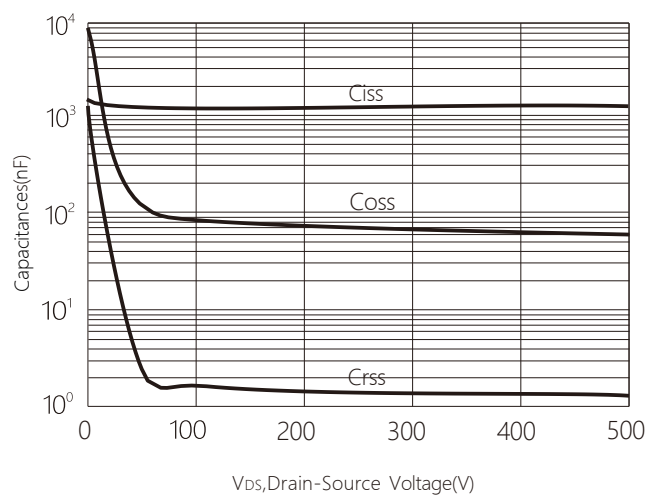


Figure 5. Gate charge

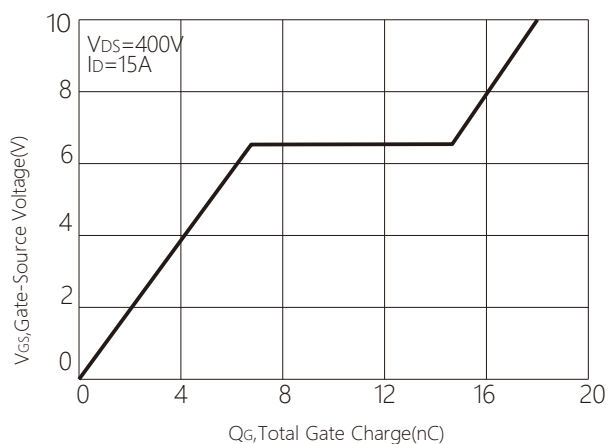


Figure 6. Source-Drain Diode Forward Voltage

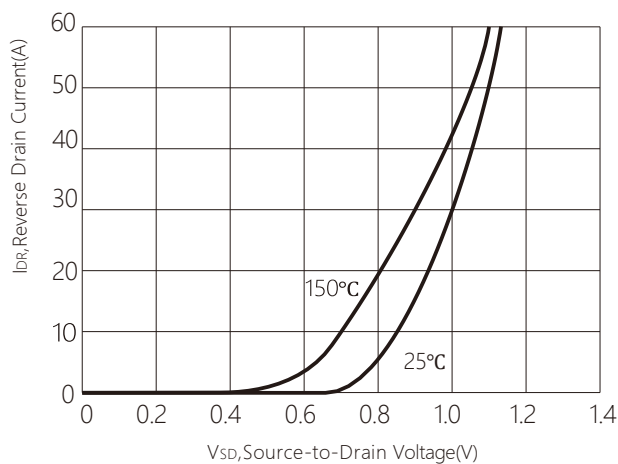


Figure 7. $R_{DS(ON)}$ vs Junction Temperature

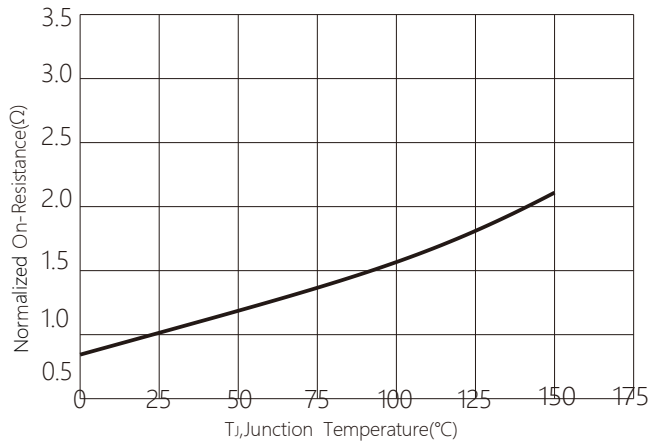


Figure 8. Power dissipation

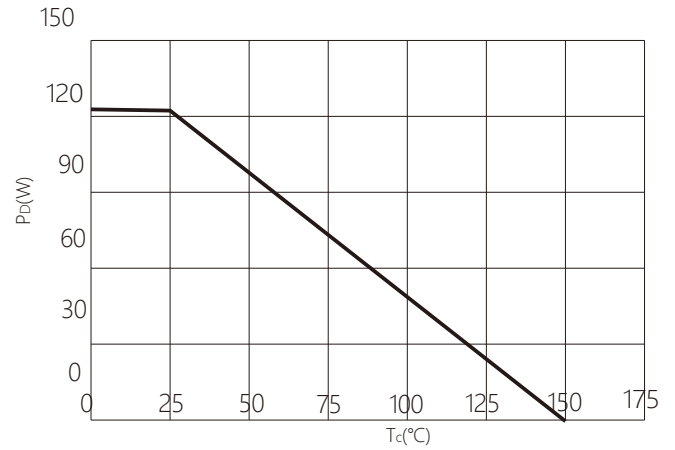


Figure 9.

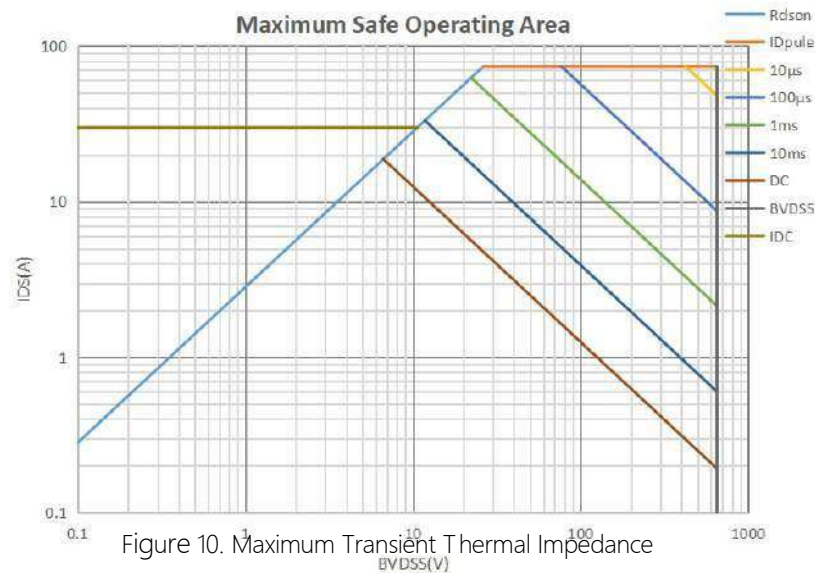
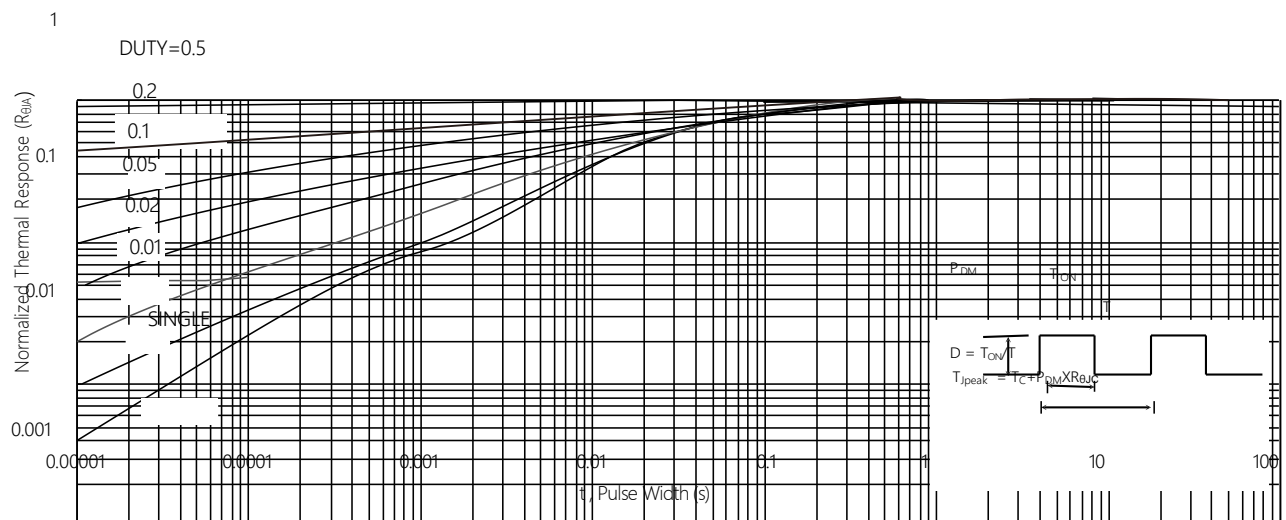
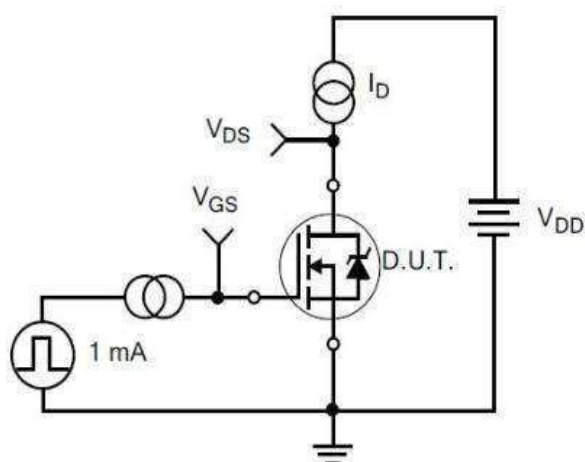


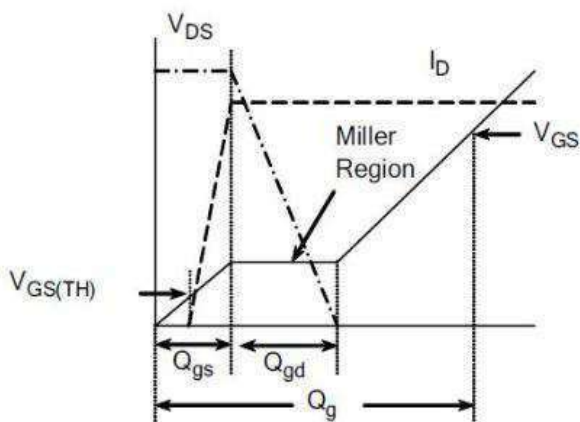
Figure 10. Maximum Transient Thermal Impedance



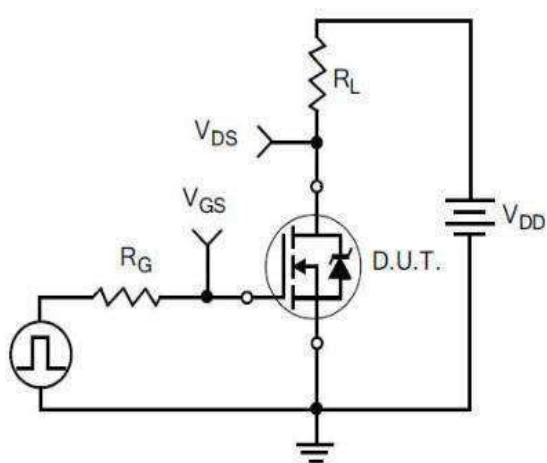
Typical Test Circuit



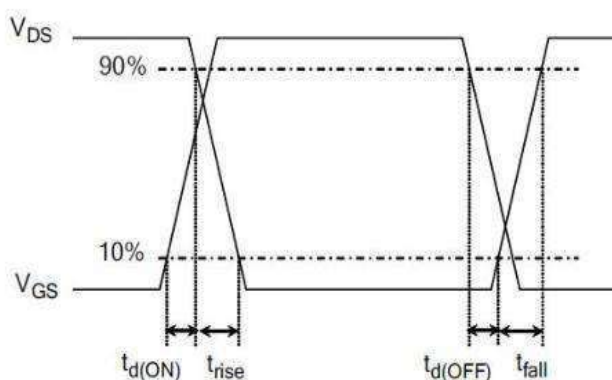
1) Gate Charge Test Circuit



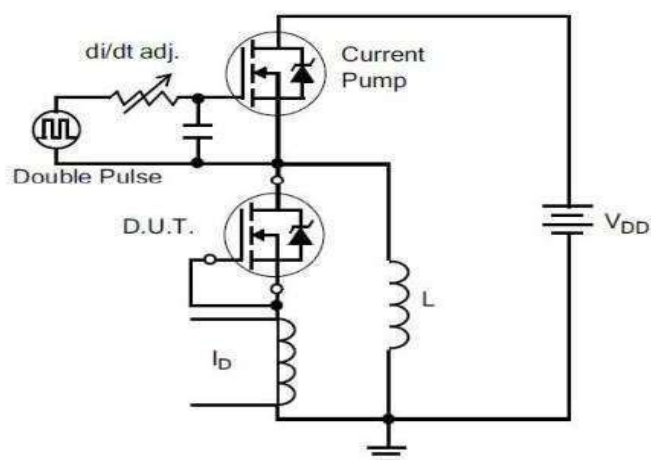
2) Gate Charge Waveform



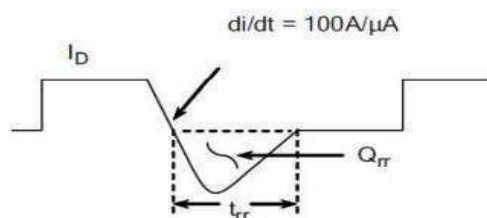
3) Resistive Switching Test Circuit



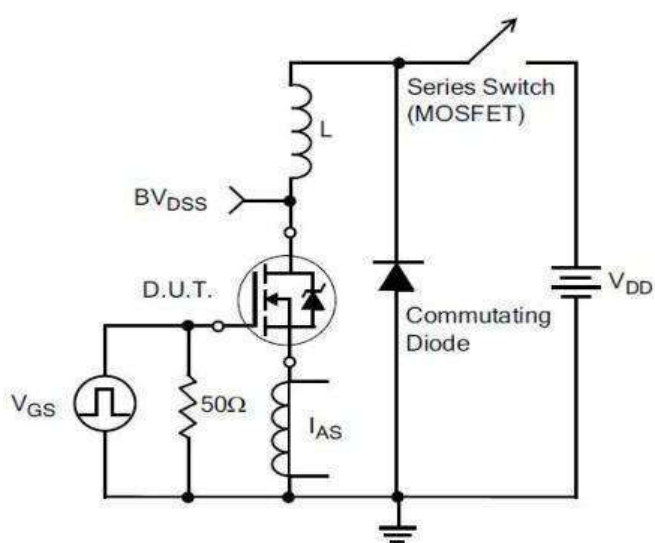
4) Resistive Switching Waveforms



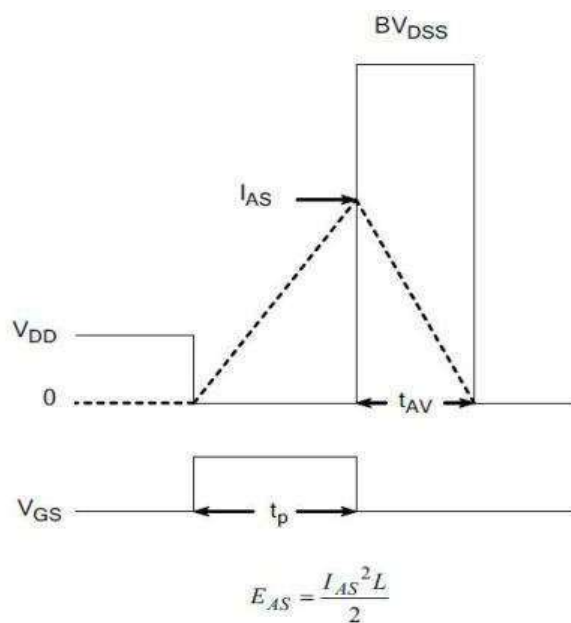
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

Product Names Rules

X X X N E X X X

Process Type:
VDMOS:default
Super junction:SJ
Low Voltage trench:D

Rated Current Code
With 1-2 Digital,
For Ex ample:
4A:4,
10A:10,
0.8A:08

Channel Code
N channel:N
P channel:P

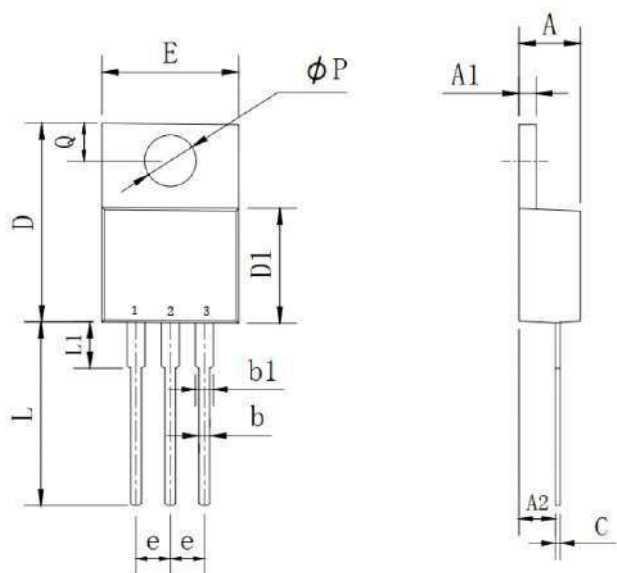
Package Code
TO-220:Default
ITO-220:F
TO-262:E
TO-263:D
TO-252:M
TO-251:N
TO-263-7L:D7

Rated Voltage Code
With 2 Digital,For Example:
600V:60
60V:06

Special Function Code
G-S ESD Protection:E
No Protection:Default

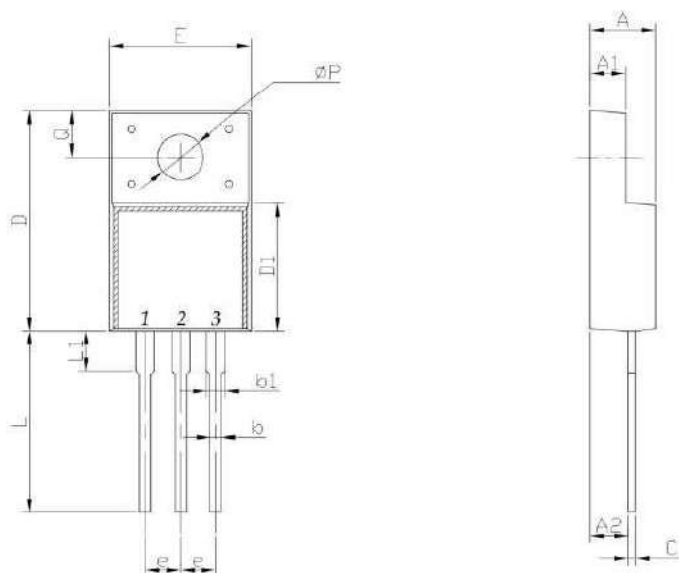
Dimensions

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

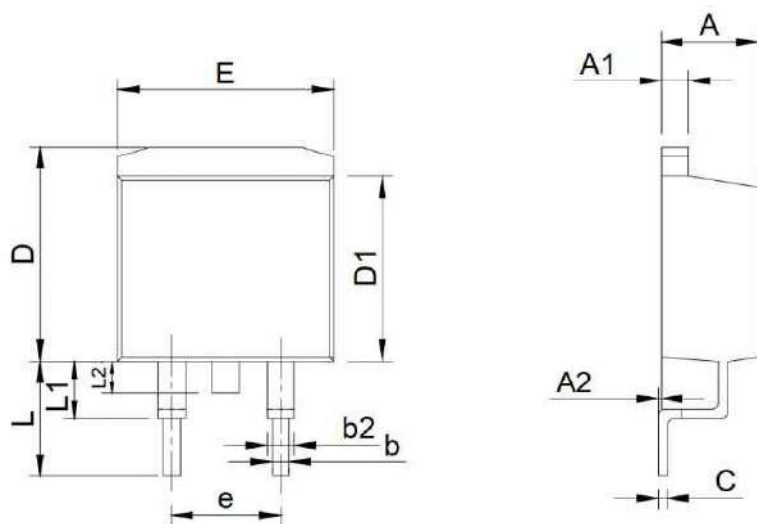
ITO-220 PACKAGE OUTLINE DIMENSIONS



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