600V SUPER-JUNCTION Power MOSFET

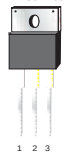
Features:

- $R_{DS(ON)}$<0.58Ω@V_{GS}=10V
- 100% avalanche tested
- RoHS compliant

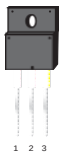
Mechanical Data：

- Case:TO-220,ITO-220,TO-251,TO-252, TO-262, TO-263 package

TO-220 KWSJ7N60

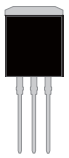


ITO-220 KWSJ7N60F



TO-263 KWSJ7N60D

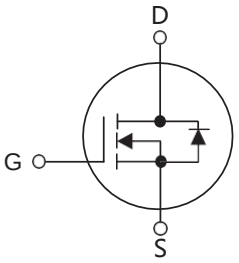
TO-262 KWSJ7N60E



TO-251 KWSJ7N60N

TO-252 KWSJ7N60M

Block Diagram



Pin Definition:

1. Gate
2. Drain
3. Source

Ordering Information

Part No.	Package Type	Package	Quality(box)
KWSJ7N60-TU	TO-220	Tube	1000
KWSJ7N60F-TU	ITO-220	Tube	1000
KWSJ7N60E-TU	TO-262	Tube	1000
KWSJ7N60D-TR	TO-263	Tape & Reel	800
KWSJ7N60N-TU	TO-251	Tube	1000
KWSJ7N60M-TR	TO-252	Tape & Reel	2500

PRODUCT SUMMARY

V_{DS}(V)	$R_{DS(ON)}$(Ω)	I_D(A)
600	0.5@ VGS=10V	7

ABSOLUTE MAXIMUM RATINGS (T_C=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DS}	600	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current		I_D	7	A
Pulsed Drain Current (Note 1)		I_{DM}	21	A
Avalanche Energy(Note 2)		E_{AS}	162	mJ
Power Dissipation	TO-220/TO-263/TO-262 TO-251/TO-252	P_D	63	W
	ITO-220		28	
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-251/TO-252 TO-262/TO-263	θ_{JA}	62	°C/W
	ITO-220		80	
Junction to Case	TO-220/TO-263/TO-262 TO-251/TO-252	θ_{JC}	2.0	°C/W
	ITO-220		4.5	

ELECTRICAL CHARACTERISTICS (T_C=25°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			100	nA
	Reverse		V_{GS}=-30V,V_{DS}=0V			-100	nA
ON CHARACTERISTICS(Note 3)							
Gate Threshold Voltage		$V_{GS\ (TH)}$	V_{DS}=V_{GS},I_D=250μA	2.5		4.0	V
DRAIN-SOURCE ON-RESISTANCE		$R_{DS(ON)}$	V_{GS}=10V,I_D=3A		0.5	0.58	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS}=50V,V_{GS}=0V,f=1MHz		587		pF
Output Capacitance		C_{OSS}			31		pF
Reverse Transfer Capacitance		C_{RSS}			4		pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	V_{DD}=400V,I_D=7A, R_G=25Ω		39		ns
Turn-On Rise Time		t_R			25		ns
Turn-Off Delay Time		$t_{D(OFF)}$			100		ns
Turn-Off Fall Time		t_F			18		ns
Total Gate Charge		Q_G	V_{DS}=480V,I_D=7A, V_{GS}=10V		14.5		nC
Gate-Source Charge		Q_{GS}			3		nC
Gate-Drain Charge		Q_{GD}			5.2		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_S=7A		0.9	1.2	V
Maximum Continuous Drain-Source Diode Forward Current		I_S				7	A
Reverse Recovery Current		I_{RRM}	V_R=480V, I_F=I_S dI_F/dt=100A/μs (Note 1)		16		A
Reverse Recovery Time		t_{rr}			250		ns
Reverse Recovery Charge		Q_{RR}			2.1		μC

Note:1. Repetitive Rating : Pulse width limited by maximum junction temperature

2. I_{AS}=1.4A,V_{DD}=50V,R_G=25Ω,Starting T_J=25°C

3. Pulse Test: Pulse width ≤300μS, Duty cycle≤1%.

Typical characteristics Diagrams

Figure 1. Output Characteristics

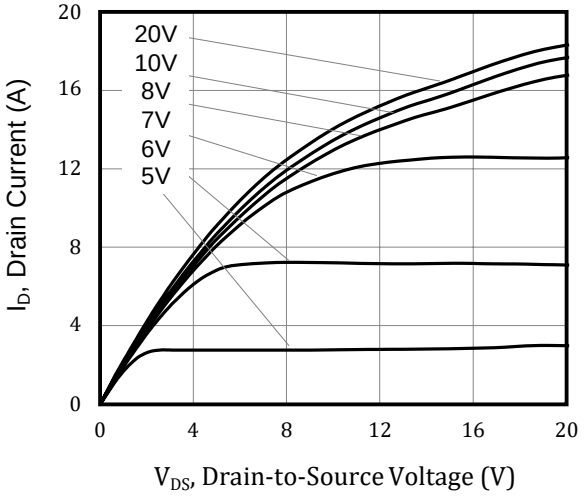


Figure 2. Transfer Characteristics

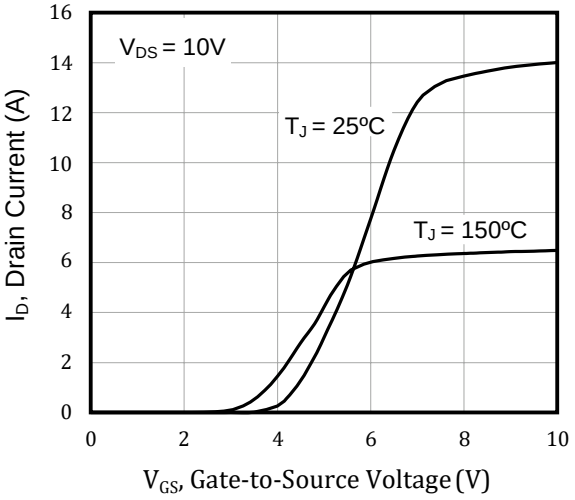


Figure 3. On-Resistance vs. Drain Current

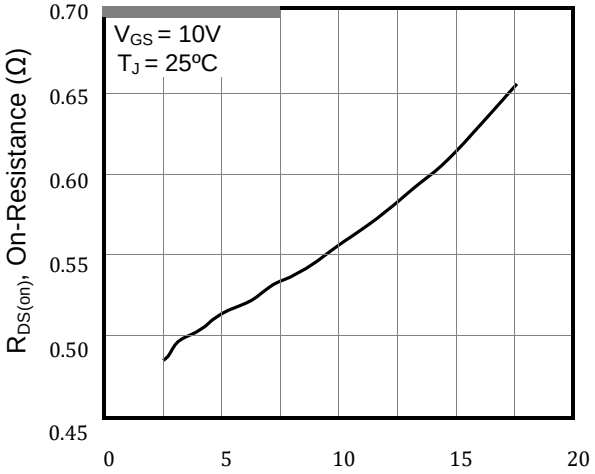


Figure 4. Capacitance

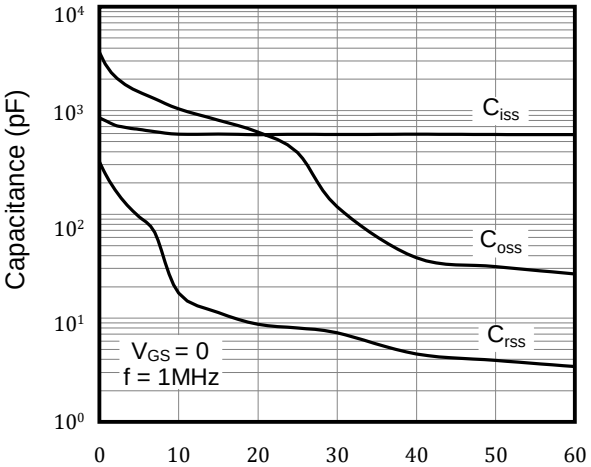


Figure 5. Gate Charge

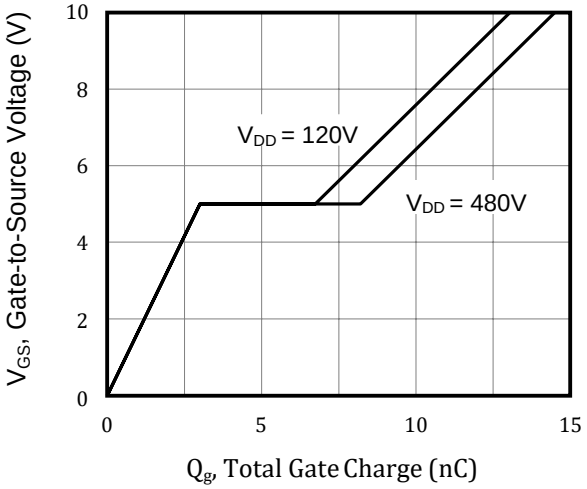
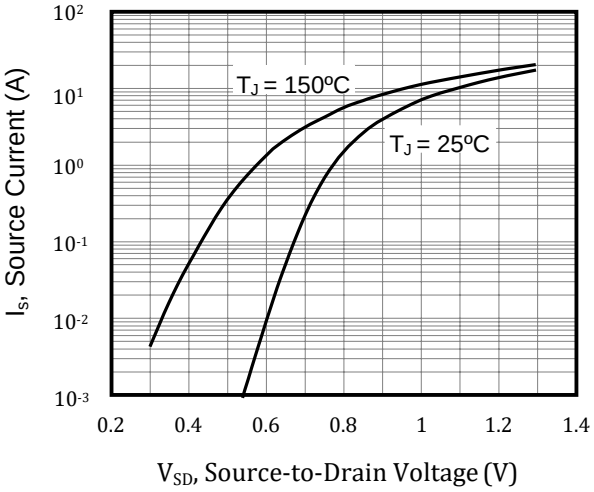


Figure 6. Body Diode Forward Voltage



Typical characteristics Diagrams

Figure 7. On-Resistance vs. Junction Temperature

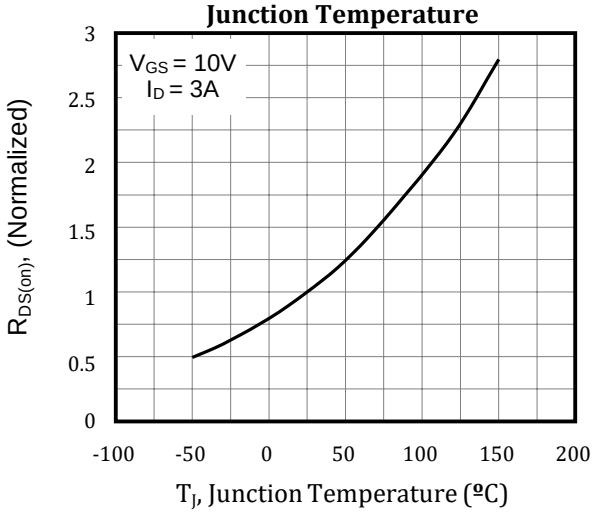


Figure 8. Threshold Voltage vs. Junction Temperature

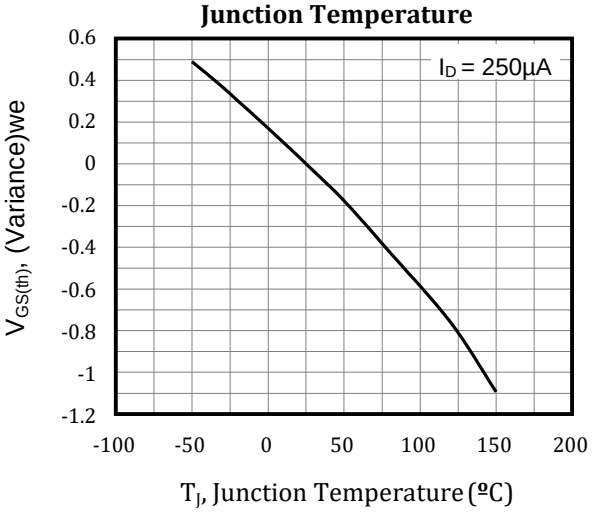


Figure 9. Transient Thermal Impedance TO-220,TO-251,TO-252,TO-262,TO-263

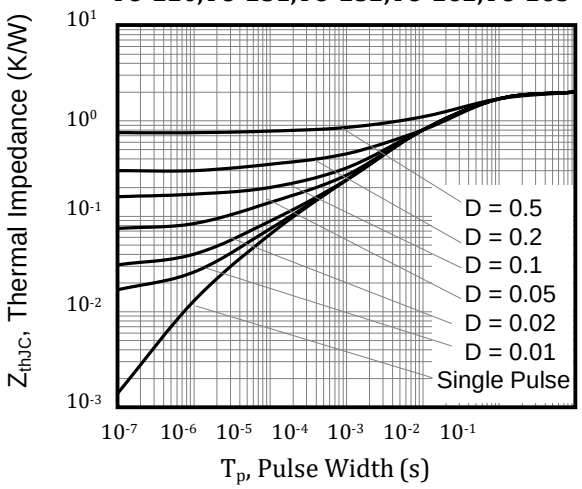
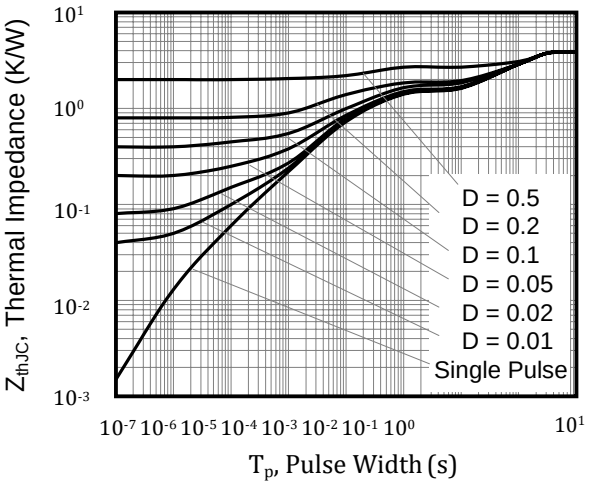


Figure 10. Transient Thermal Impedance TO-220F



TYPICAL TEST CIRCUIT

Figure A: Gate Charge Test Circuit and Waveform

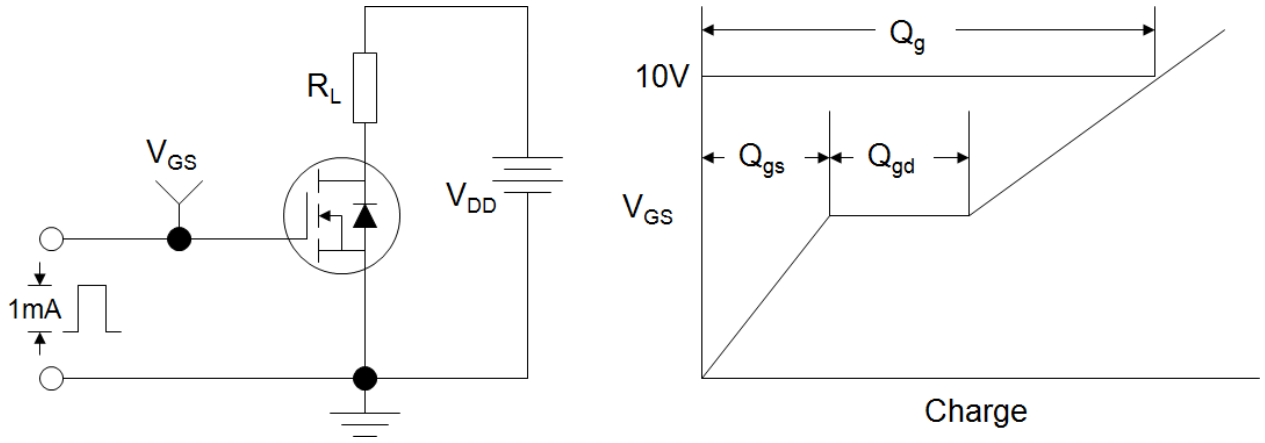


Figure B: Resistive Switching Test Circuit and Waveform

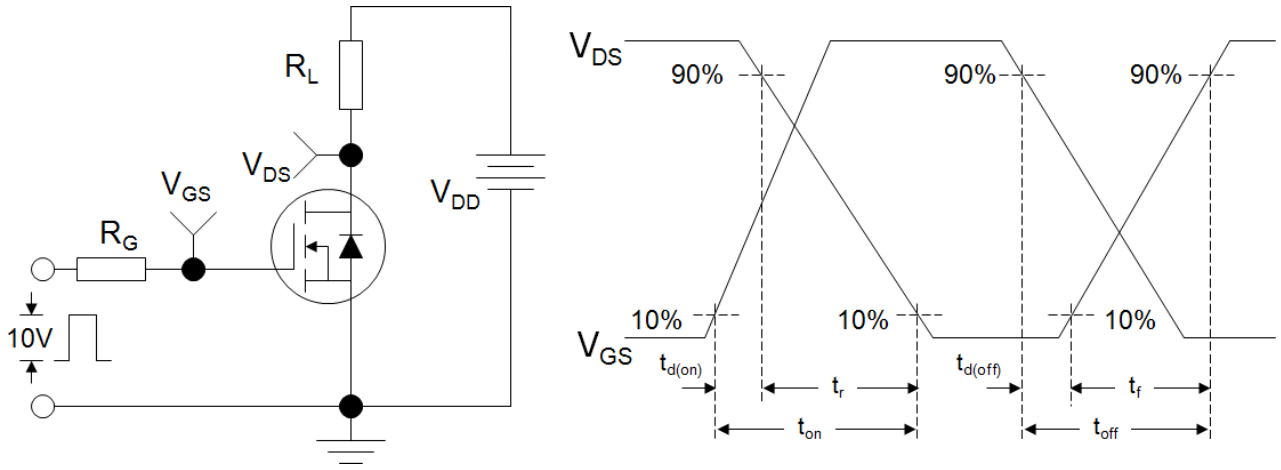
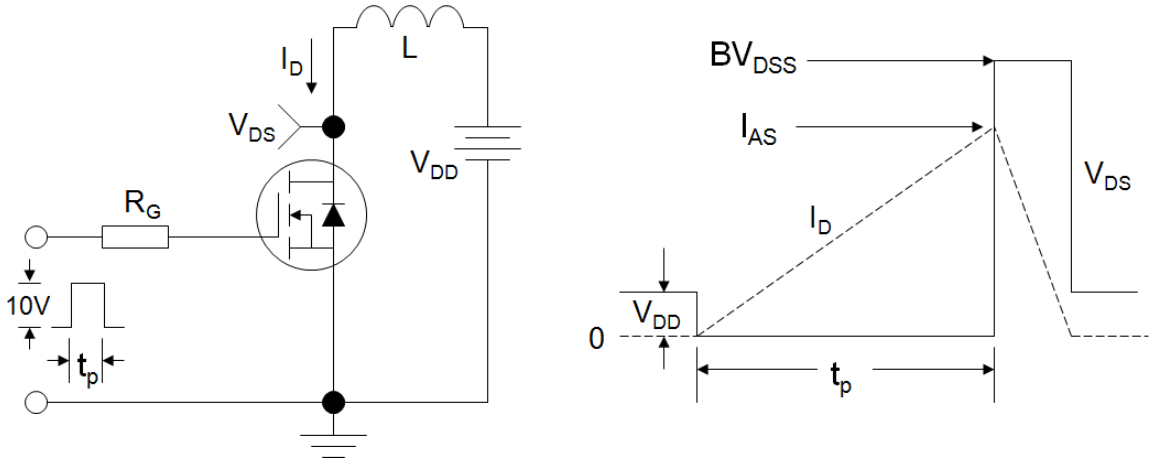
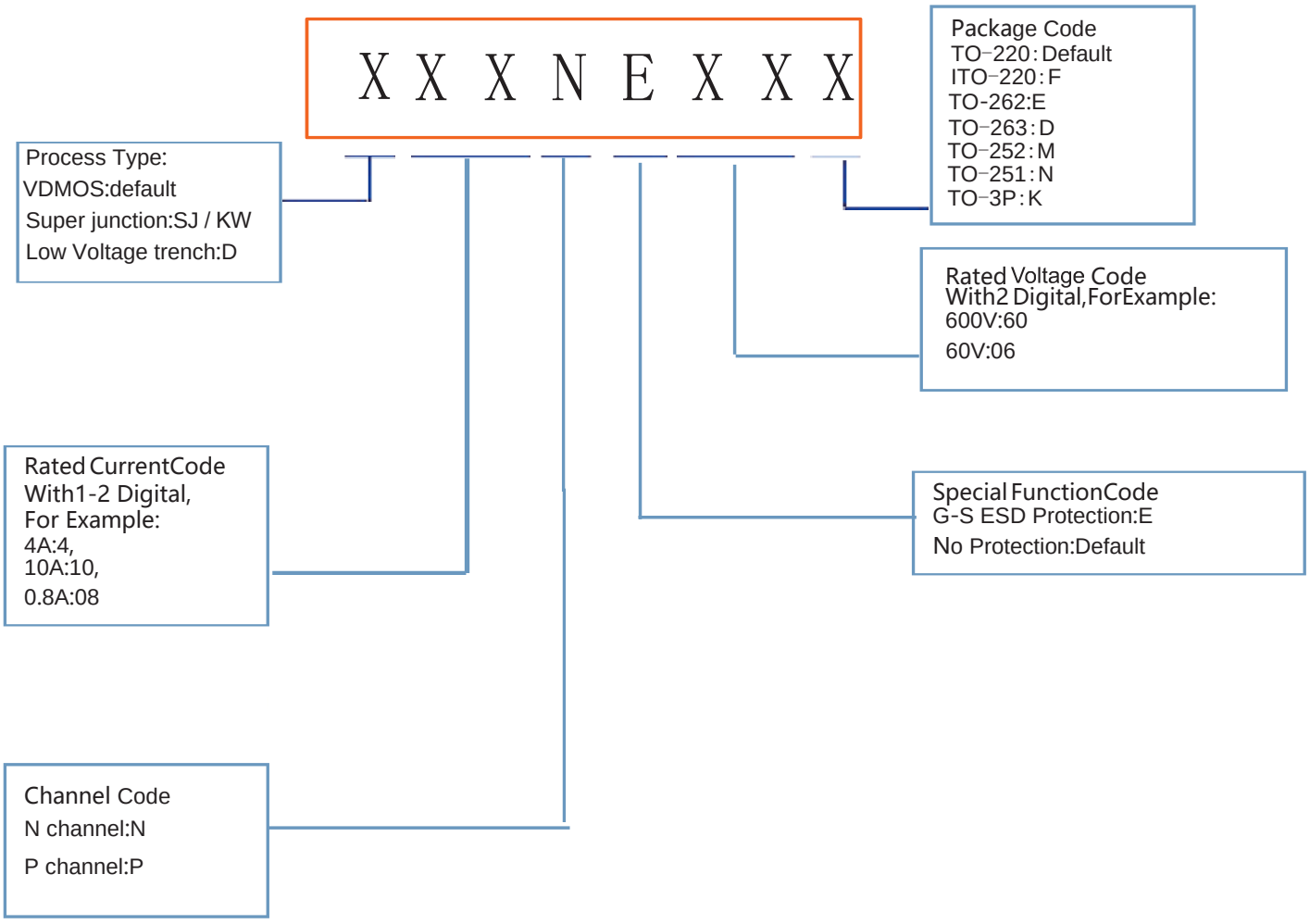


Figure C: Unclamped Inductive Switching Test Circuit and Waveform

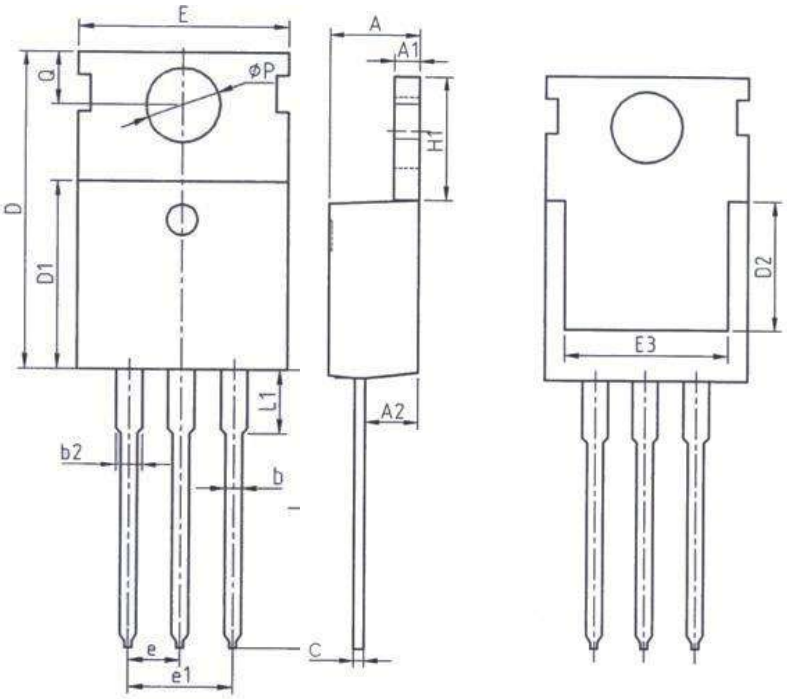


Product Names Rules



Dimensions

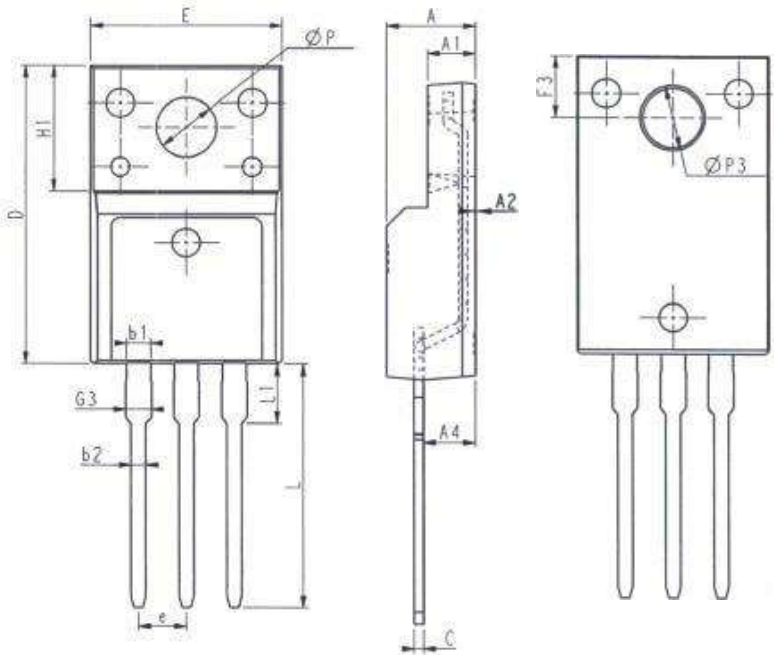
TO-220



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

ITO-220

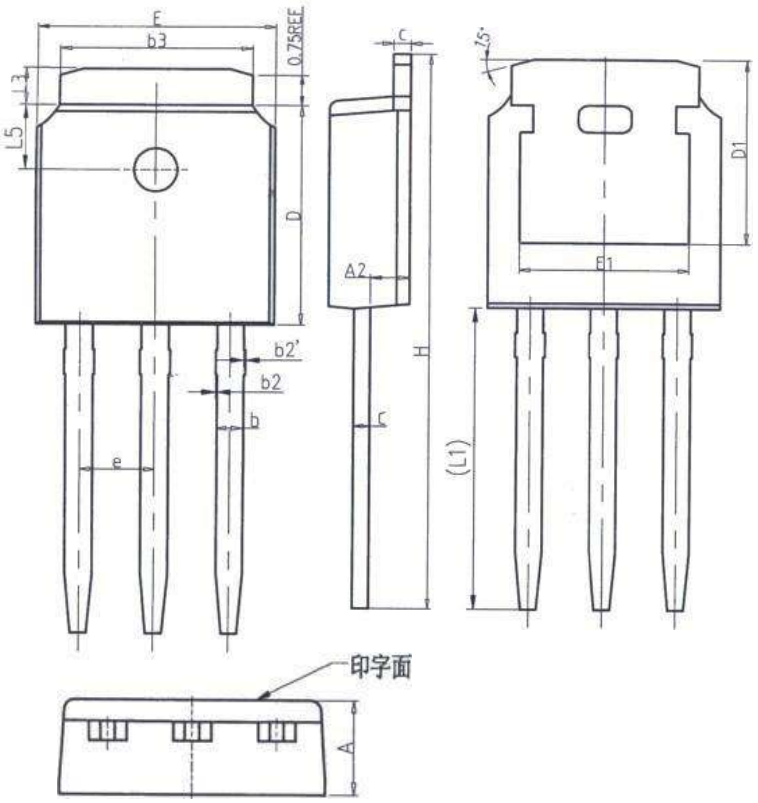


Unit: mm		
Symbol	Min.	Max.
E	9.96	10.36
A	4.50	4.90
A1	2.34	2.74
A2	0.30	0.60
A4	2.56	2.96
c	0.40	0.65
D	15.57	16.17
H1	6.70REF	
e	2.54BSC	

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

Dimensions

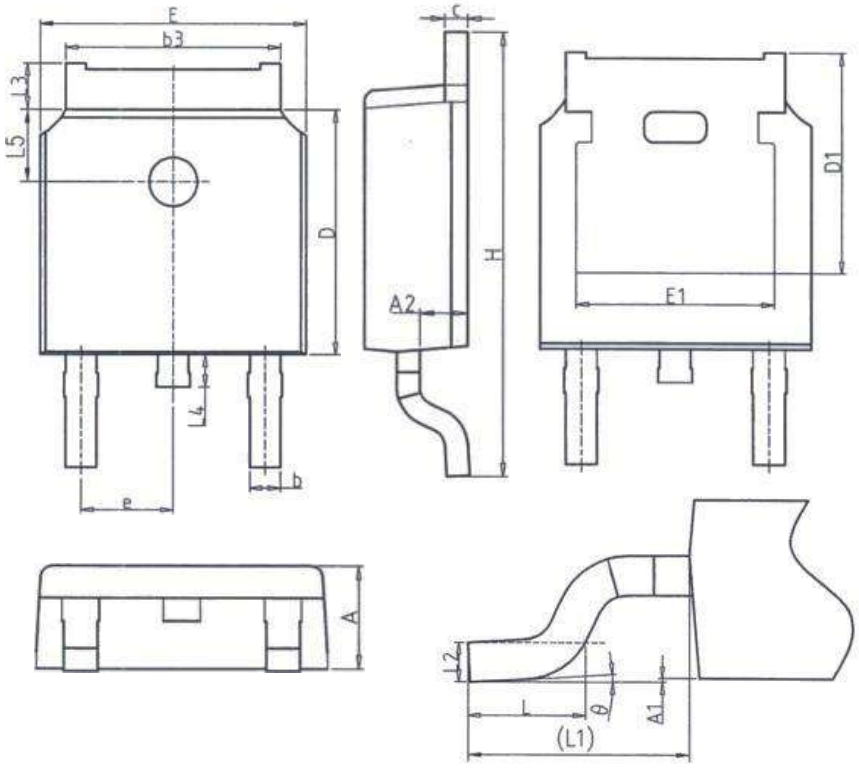
TO-251



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

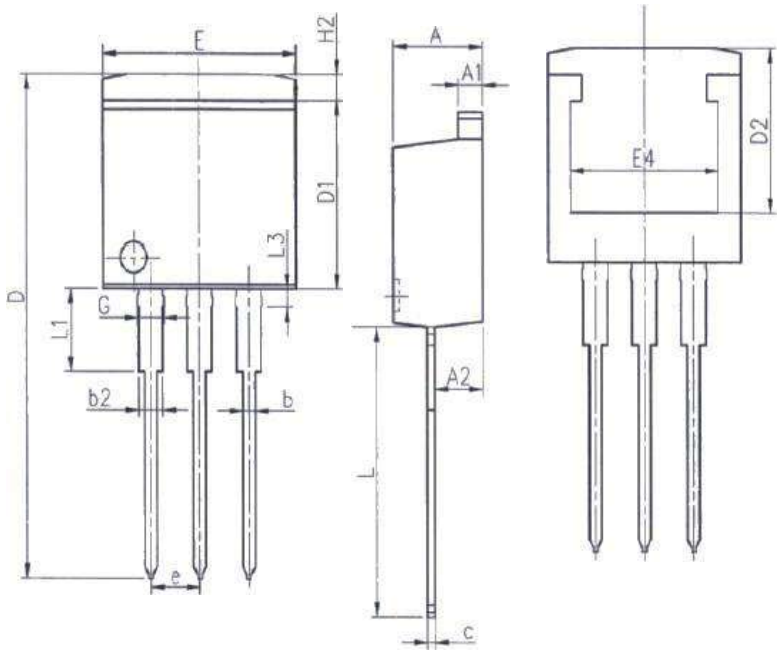


Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A1	0.00	0.20
A2	0.97	1.17
b	0.68	0.90
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22
D1	5.30REF	
E	6.40	6.80
E1	4.63	–

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°

Dimensions

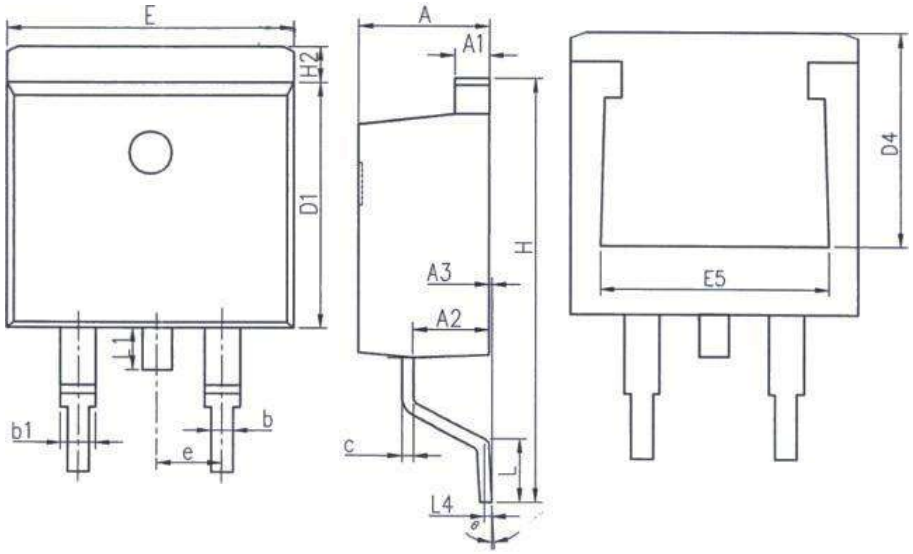
TO-262



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°