SEMICONDUCTOR

Features

· Excellent gate charge x $R_{DS(on)}$ product(FOM)
· High Reliability Capability
· 100% avalanche tested
· Rohs compliant

Mechanical Data

· Case:TO-220,ITO-220,TO-263,TO-261,TO-252,TO-251 Package

Application

· Charger
· DC/DC converter
· Ideal for high-frequency switching and synchronous rectification

Product Summary

V_{DS}	$R_{DS(on)}$(mΩ)Typ	I_D(A)	Qg(Typ)
150V	9.7 @ 10V,60A	105	141nc

TO-220 D105N15   **ITO-220** D105N15F   **TO-263** D105N15D

TO-262 D105N15E   **TO-251** D105N15N   **TO-252** D105N15M

Ordering Information

Part No.	Package Type	Package	Quality(box)
D105N15	TO-220	Tube	1000
D105N15F	ITO-220	Tube	1000
D105N15D	TO-263	Tape & Reel	800
D105N15E	TO-262	Tube	1000
D105N15N	TO-251	Tube	1000
D105N15M	TO-252	Tape & Reel	2500
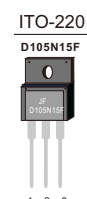
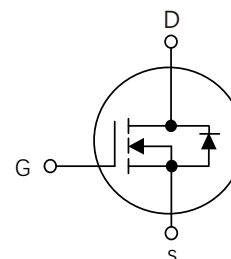## Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

Table1 Absolute Maximum Ratings   (Tc=25℃, unless otherwise specified)

Parameters	Symbol		D105N15/D105N15D/D105N15E D105N15M/D105N15N	D105N15F	Unit
Drain-Source Voltage	V_{DS}		150		V
Gate-Source Voltage	V_{GS}		±20		V
Contionous (Note 5) Drain Current	I_D	Tc=25°C	105	105*	A
		Tc=100°C	70	70*	
Pulsed Drain Current (Note 1)	I_{DM}		420		A
Single Pulse Avalanche Energy(Note 2)	EAS		506		mJ
Power Dissipation Tc=25°C	P_D		313	45	W
Operating Junction and Storage Temperature	T_J/T_{STG}		-55 ~ +150		℃

※ limited by maximum junction temperature

Table 2.Thermal Characteristics

Parameters	Symbol	D105N15/D105N15D/ D105N15M/D105N15N D105N15E	D105N15F	Unit
Thermal resistance Junction to Ambient,Max	$R_{\theta JA}$	62.5	62.5	℃/W
Thermal resistance Junction to Case,Max	$R_{\theta JC}$	0.4	2.8	℃/W

Table 3. Electrical Chatacteristics   (T_J=25℃, unless otherwise specified)

Parameters		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V,I_D=250μA	150			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=150V,V_{GS}=0V			1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=20V,V_{DS}=0V			100	nA
	Reverse		V_{GS}=-20V,V_{DS}=0V			-100	nA
On Characteristics(Note 3)							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=250μA	2.0	3.0	4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V,I_D=60A		9.7	11	mΩ
Dynamic Characteristics(Note 4)							
Input Capacitance		C_{ISS}	V_{DS}=40V,V_{GS}=0V,f=1MHz		2322		pF
Output Capacitance		C_{OSS}			312		pF
Reverse Transfer Capacitance		C_{RSS}			21		pF
Switching Characteristics (Note 4)							
Turn-On Delay Time		td(on)	V_{DS}=75V,I_D=60A, V_{GS}=10V,R_L=3Ω		45		ns
Turn-On Rise Time		tr			208		ns
Turn-Off Delay Time		td(off)			84		ns
Turn-Off Fall Time		tf			30		ns
Total Gate Charge		Q_G	V_{DS}=75V,I_D=60A, V_{GS}=10V		141		nC
Gate-Source Charge		Q_{GS}			43		nC
Gate-Drain Charge		Q_{GD}			50		nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V,I_S=60A			1.2	V
Maximum Continuous Drain-Source Diode Forward Current(Note 3)		I_S				105	A
Reverse Recovery Time		trr	I_F=60A dI$_F$/dt=100A/μs		85		ns
Reverse Recovery Charge		Q_{RR}	I_F=60A dI$_F$/dt=100A/μs		453		nC

Notes:　1 Repetitive Rating:Pulse width limited by maximum junction temperature
　　　　2 L=0.5mH, R_g=25Ω,Starting TJ=25°C
　　　　3 Pulse Test: Pulse width ≤300μS,Duty cycle≤2%
　　　　4 Guaranteed by design,not subject to production
　　　　5 The maximum current is limited by the package.

Typical Characteristics Diagrams
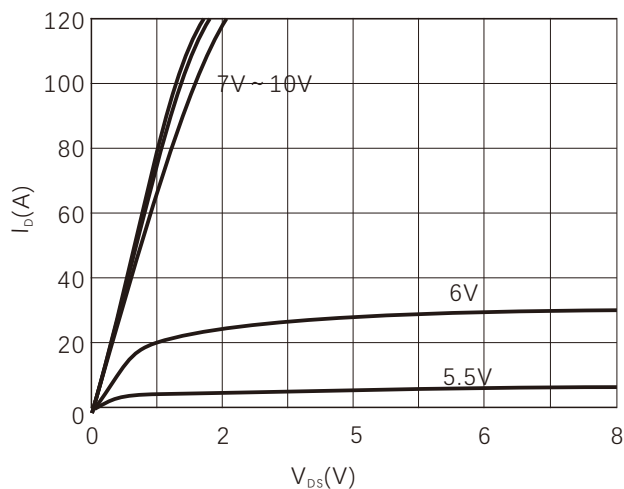
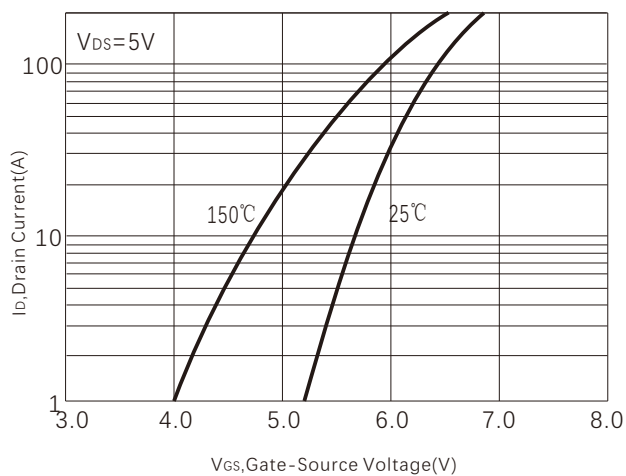### Figure 1.Output Characteristics

Figure 2. Transfer Characteristics

Figure 3. BV$_{DSS}$ vs Junction Temperature
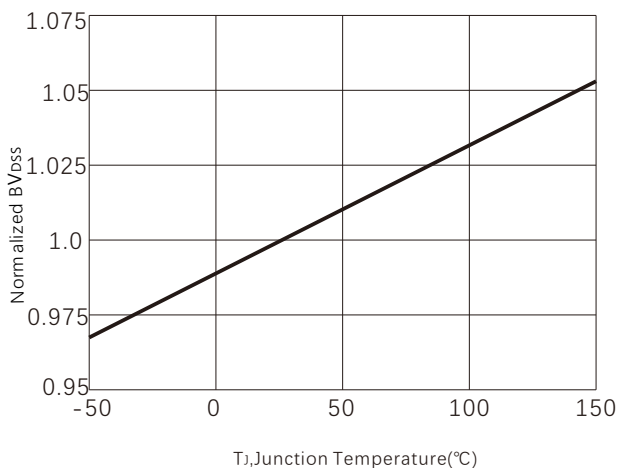

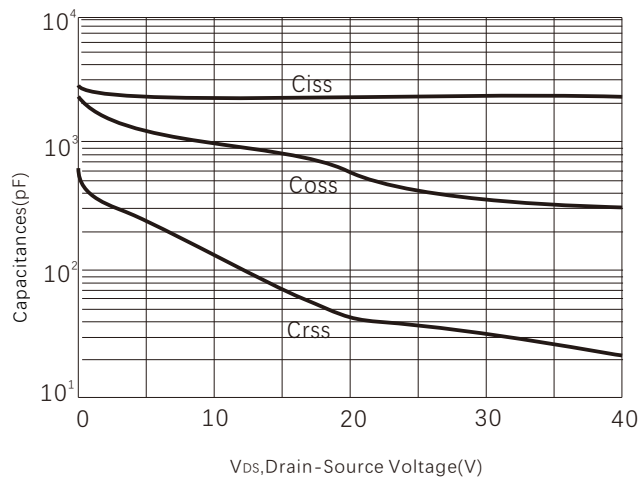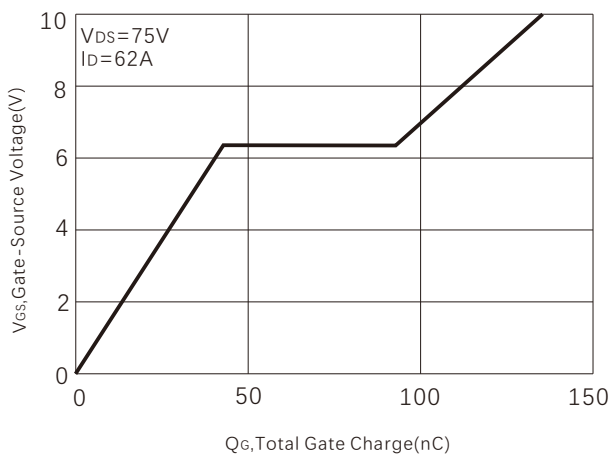### Figure 4. Capacitance

Figure 5.Gate charge

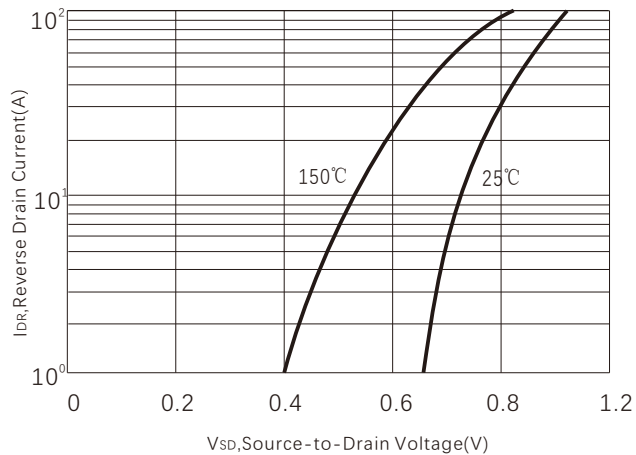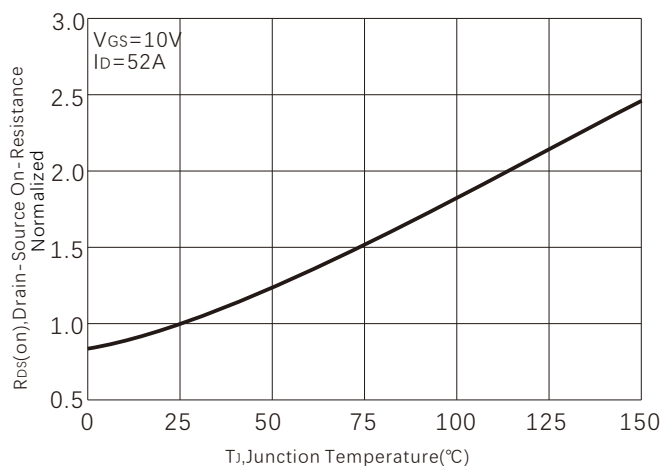### Figure 6.Source-Drain Diode Forward Voltage

Figure7.R$_{DS(ON)}$ vs Junction Temperature

V$_{GS}$=10V
I$_D$=52A

R$_{DS(on)}$,Drain-Source On-Resistance Normalized

T$_J$,Junction Temperature(℃)

Figure8.Maximum Drain Current vs Temperature

I$_D$,Drain-to-Source Current(A)

T$_J$,Junction Temperature(℃)
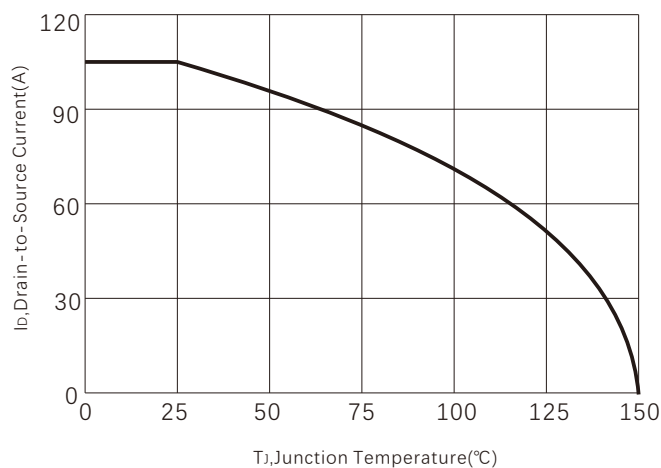
Figure 9.On-Resistance vs.Drain Current
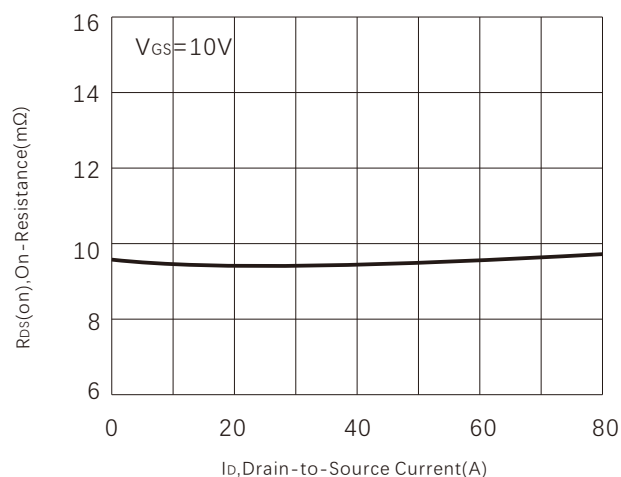

V$_{GS}$=10V

R$_{DS}$(on),On-Resistance(mΩ)

I$_D$,Drain-to-Source Current(A)

Figure 10. Safe operating area

I$_D$,Drain Current(A)

10us
100us
1ms
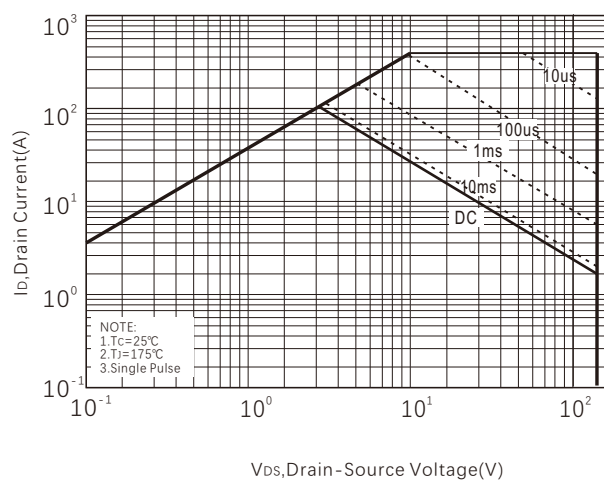10ms
DC

NOTE:
1.Tc=25℃
2.TJ=175℃
3.Single Pulse

V$_{DS}$,Drain-Source Voltage(V)

Figure 11.Normalized Maximum Transient Thermal Impedance

Normalized Thermal Response (R$_{θJA}$)

DUTY=0.5
0.3
0.1
0.05
0.02
0.01
SINGLE

P$_{DM}$
T$_{ON}$
T

D = T$_{ON}$/T
T$_{Jpeak}$ = T$_C$ +P$_{DM}$XRθ$_{JC}$

t , Pulse Width (s)
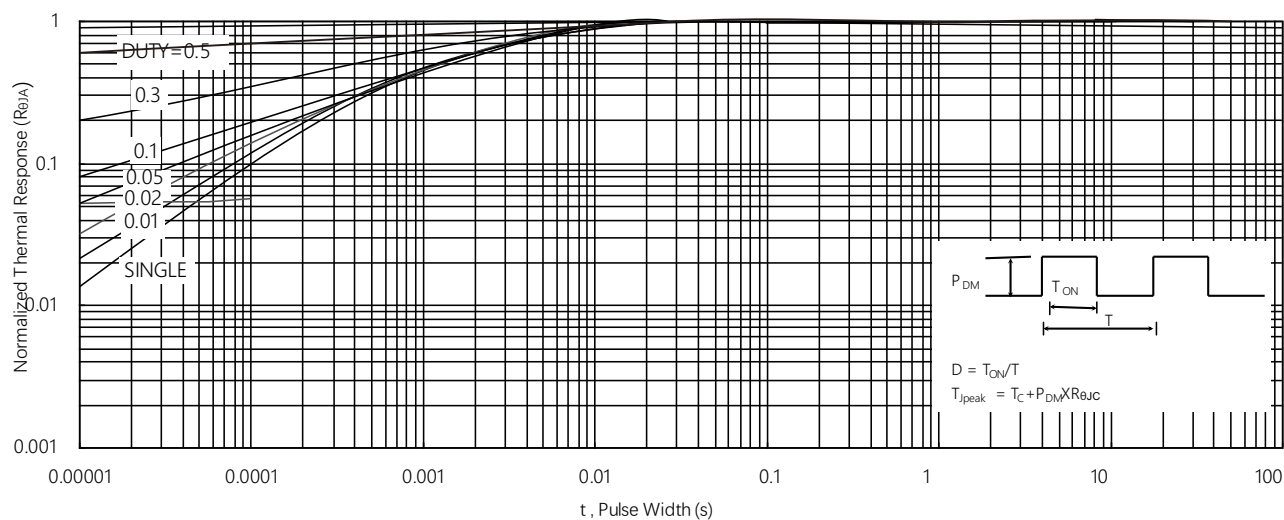
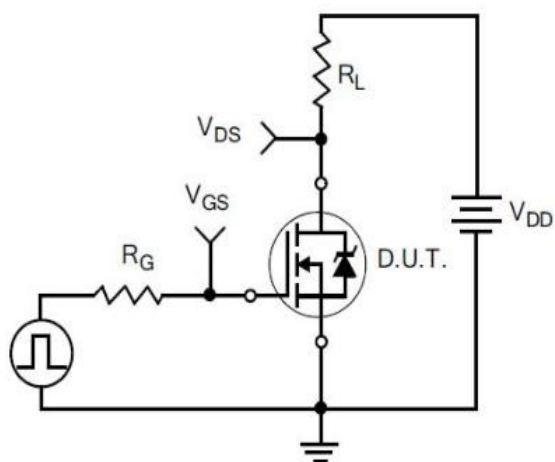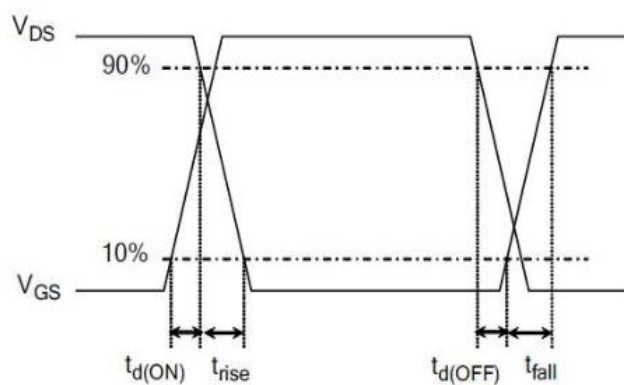Typical Test Circuit
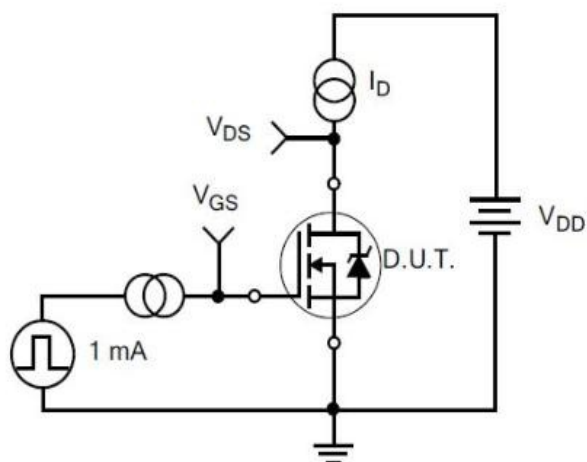
1) Gate Charge Test Circuit
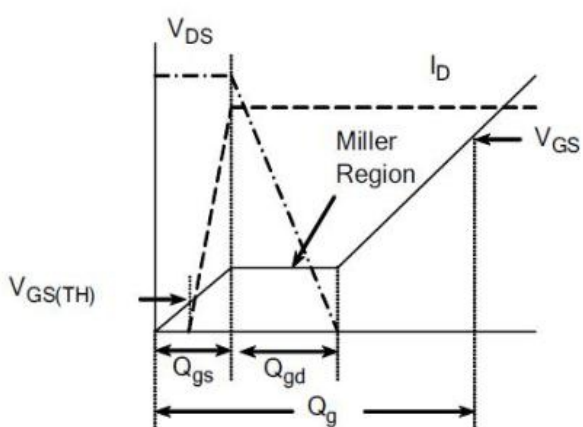
2) . Gate Charge Waveform

3) Resistive Switching Test Circuit

4) Resistive Switching Waveforms

Typical Test Circuit

5) Diode Reverse Recovery Test Circuit

di/dt = 100A/μA
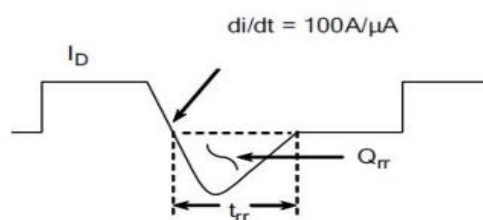
6) Diode Reverse Recovery Waveform
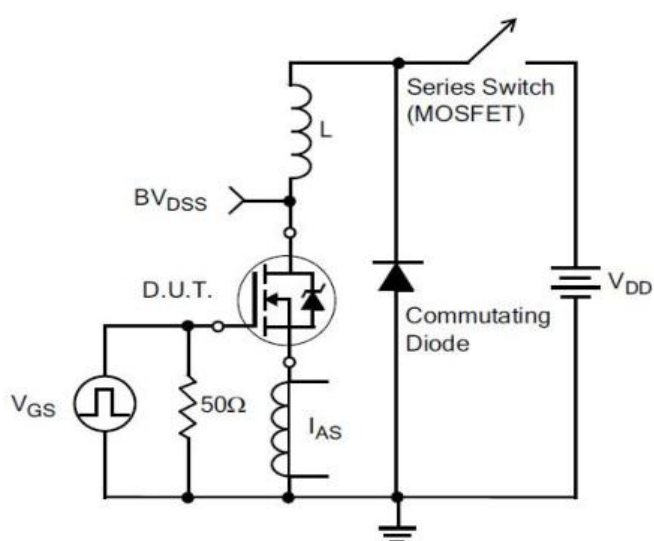
7). Unclamped Inductive Switching Test Circuit

$$E_{AS} = \frac{I_{AS}^2 L}{2}$$
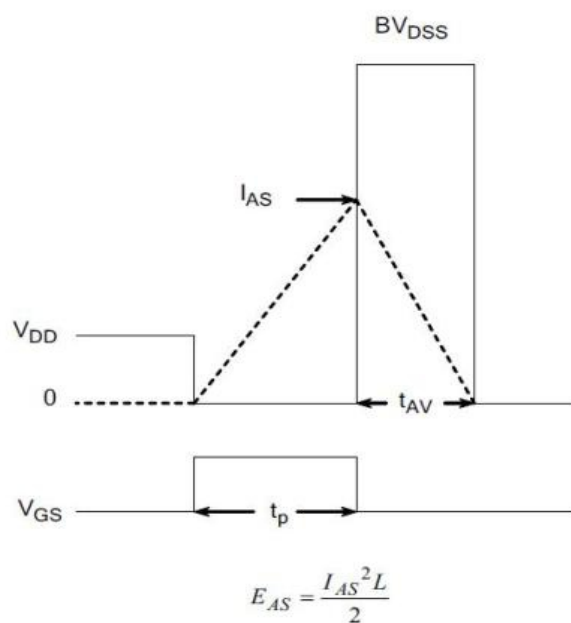
8) Unclamped Inductive Switching Waveforms

Product Names Rules

X X X N E X X X

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

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

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

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

Channel Code
N channel:N
P channel:P

Dimensions

TO-220 PACKAGE OUTLINE DIMENSIONS
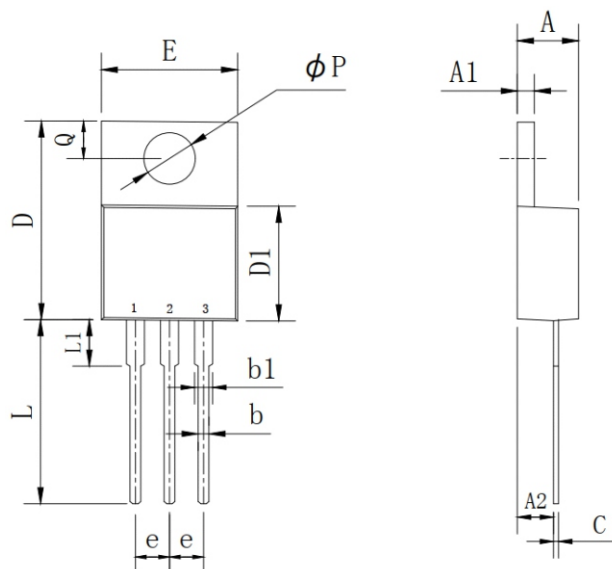
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	2.03	2.92	0.080	0.115
b	0.51	1.11	0.020	0.044
b1	0.97	1.6	0.038	0.063
C	0.3	0.7	0.012	0.028
D	14.6	15.9	0.575	0.626
D1	8.04	9.3	0.317	0.366
E	9.57	10.57	0.377	0.416
e	2.34	2.74	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
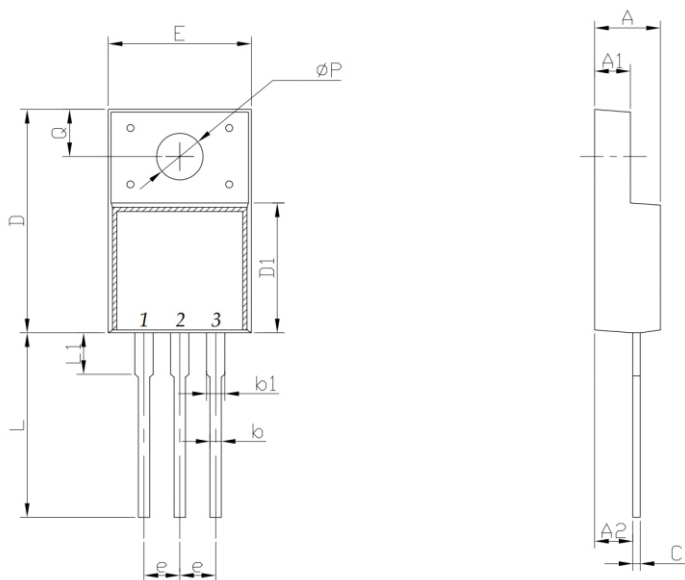
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.24	4.9	0.167	0.193
A1	2.3	2.92	0.091	0.115
A2	2.61	2.81	0.103	0.111
b	0.3	1	0.012	0.039
b1	0.9	1.55	0.035	0.061
C	0.3	0.7	0.012	0.028
D	14.5	16.36	0.571	0.644
D1	8.8	9.41	0.346	0.370
E	9.5	10.5	0.374	0.413
e	2.3	2.75	0.091	0.108
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

TO-263 PACKAGE OUTLINE DIMENSIONS
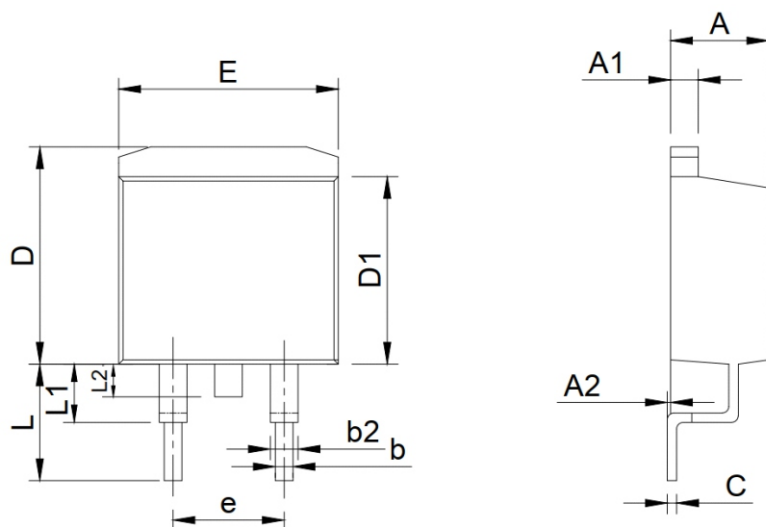
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	0	0.25	0.000	0.010
b	0.61	1.01	0.024	0.040
b1	1.2	1.34	0.047	0.053
C	0.3	0.6	0.012	0.024
D	9.48	10.84	0.373	0.427
D1	8.49	9.3	0.334	0.366
E	9.7	10.31	0.382	0.406
e	4.88	5.28	0.192	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

TO-262 PACKAGE OUTLINE DIMENSIONS
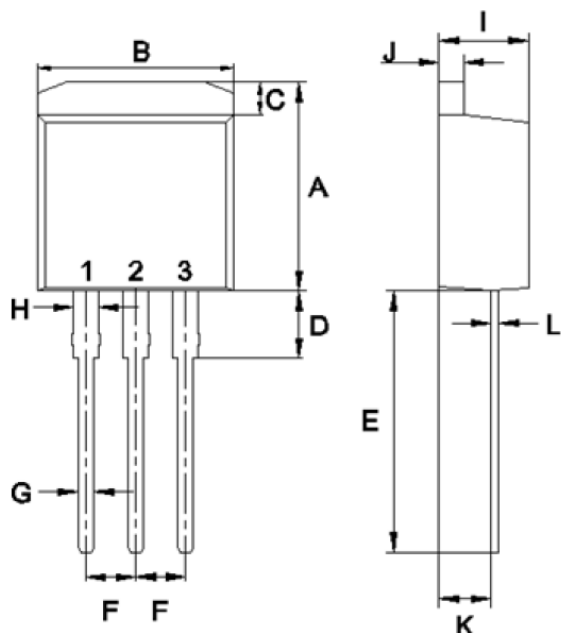
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	10.14	11.14	0.399	0.439
B	9.57	10.57	0.377	0.416
C	1.15	1.84	0.045	0.072
D	2.95	3.95	0.116	0.156
E	12.25	13.75	0.482	0.541
F	2.34	2.74	0.092	0.108
G	0.51	1.11	0.020	0.044
H	0.97	1.57	0.038	0.062
I	4.25	4.87	0.167	0.192
J	1.07	1.47	0.042	0.058
K	2.03	2.92	0.080	0.115
L	0.3	0.6	0.012	0.024

TO-251 PACKAGE OUTLINE DIMENSIONS
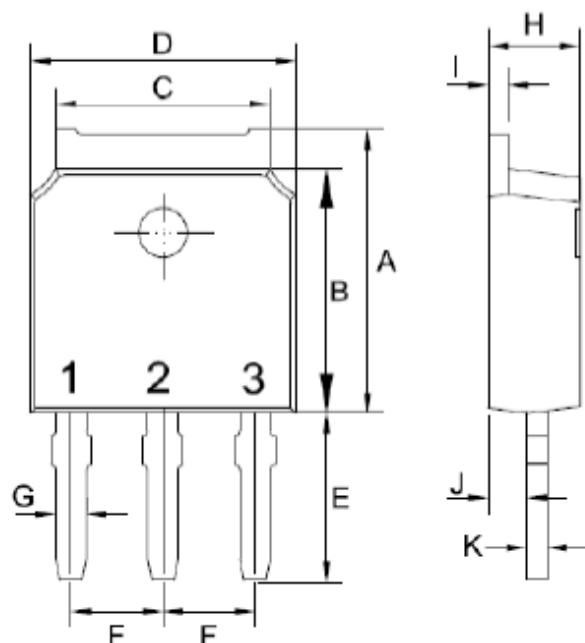
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	6.85	7.25	0.270	0.285
B	5.8	6.3	0.228	0.248
C	5	5.53	0.197	0.218
D	6.3	6.8	0.248	0.268
E	3.5	4.35	0.138	0.171
F	2.19	2.39	0.086	0.094
G	0.45	0.85	0.018	0.033
H	2.2	2.4	0.087	0.094
I	0.41	0.61	0.016	0.024
J	0.71	1.31	0.028	0.052
K	0.41	0.61	0.016	0.024

TO-252 PACKAGE OUTLINE DIMENSIONS
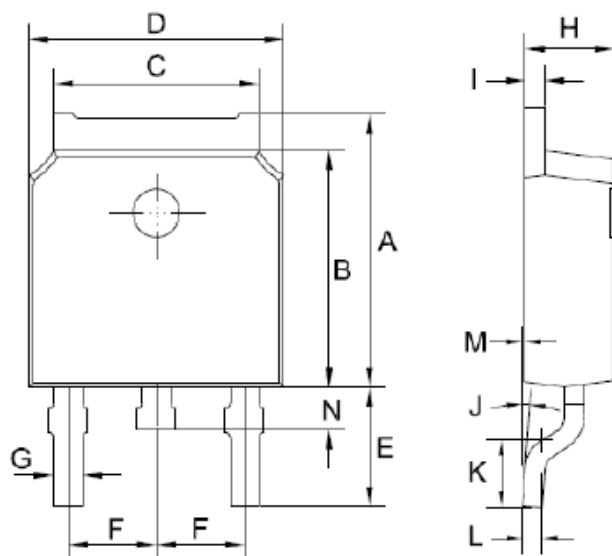
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	6.85	7.25	0.270	0.285
B	5.8	6.3	0.228	0.248
C	5	5.53	0.197	0.218
D	6.3	6.8	0.248	0.268
E	2.6	3.3	0.102	0.130
F	2.19	2.39	0.086	0.094
G	0.45	0.85	0.018	0.033
H	2.2	2.4	0.087	0.094
I	0.41	0.61	0.016	0.024
J	0°	8°	0°	8°
K	1.45	1.85	0.057	0.073
L	0.41	0.61	0.016	0.024
M	0	0.12	0.000	0.005
P	0.6	1	0.024	0.039

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