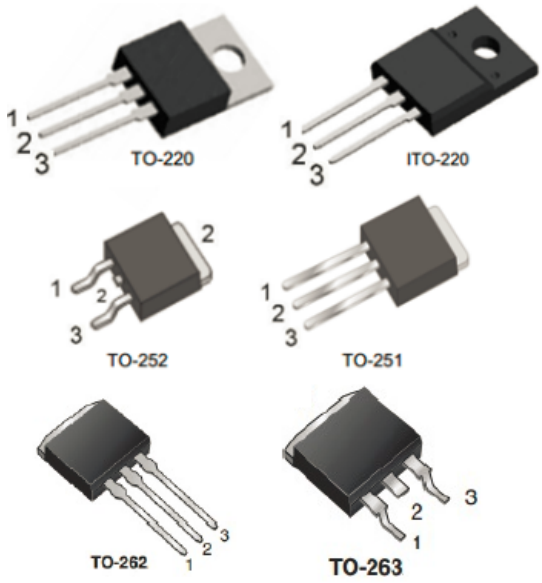
2N60 Series

N-CHANNEL POWER MOSFET

Features

- RDS(ON) < 4.4Ω@ VGS = 10V, ID =1A
- Fast switching capability
- Lead free in compliance with EU RoHS directive.
- Improved dv/dt capability, high ruggedness



Pin Definition:

1. Gate
2. Drain
3. Source

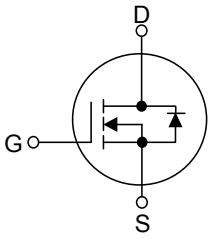
Mechanical Data

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

Ordering Information

Part No.	Package	Packing
2N60P	TO-251	75pcs / Tube
2N60D	TO-252	75pcs / Tube
2N60T	TO-220	50pcs / Tube
2N60F	ITO-220	50pcs / Tube
2N60K	TO-262	50pcs / Tube
2N60G	TO-263	50pcs / Tube

Block Diagram



Maximum Ratings T_A = 25°C unless otherwise specified

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage		V_{GSS}	±30	V
Avalanche Current (Note 2)		I_{AR}	2.0	A
Continuous Drain Current		I_D	2.0	A
Pulsed Drain Current (Note 2)		I_{DM}	8.0	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	115	mJ
Power Dissipation	TO-220/TO-262/TO-263	P_D	44	W
	ITO-220		23	W
	TO-251/TO-252		34	W
Junction Temperature		T_J	+150	°C
Operating Temperature		T_{OPR}	-55 ~ +150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating : Pulse width limited by maximum junction temperature
3. L = 30mH, I_{AS} = 2.7A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C

THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ITO-220 TO-262/TO-263	θ_{JA}	62.5	°C/W
	TO-251/ TO-252		110	
Junction to Case	TO-220/ITO-220 TO-262/TO-263	θ_{JC}	2.35	°C/W
	ITO-220		5.5	
	TO-251/ TO-252		2.9	

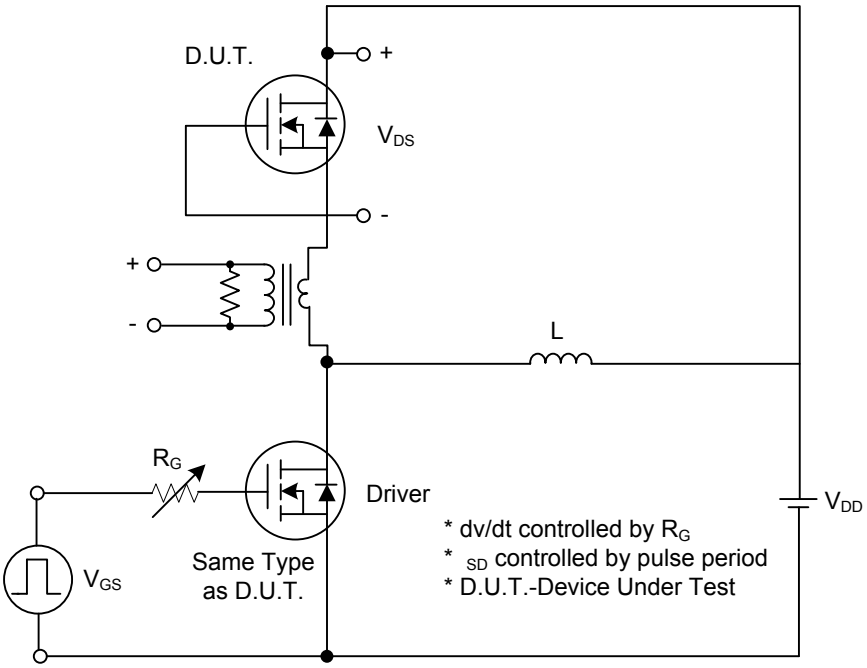
ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

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			10	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							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} = 10V, I_D =1A		4	4.4	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz		300	-	pF
Output Capacitance		C_{OSS}			45	-	pF
Reverse Transfer Capacitance		C_{RSS}			2	-	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	V_{DD} =300V, I_D =2A, R_G=25Ω (Note 1, 2)		10	-	ns
Turn-On Rise Time		t_R			25	-	ns
Turn-Off Delay Time		$t_{D(OFF)}$			20	-	ns
Turn-Off Fall Time		t_F			25	-	ns
Total Gate Charge		Q_G	V_{DS}= 480V,I_D= 2.4A, V_{GS}= 10V (Note 1, 2)		5.7	-	nC
Gate-Source Charge		Q_{GS}			1.8	-	nC
Gate-Drain Charge		Q_{GD}			2	-	nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS} = 0 V, I_{SD} = 2.0 A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I_S				2.0	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				8.0	A
Reverse Recovery Time		t_{rr}	V_{GS} = 0 V, I_S = 2A, dI_F/dt = 100 A/μs (Note 1)		357		ns
Reverse Recovery Charge		Q_{RR}			2		μC

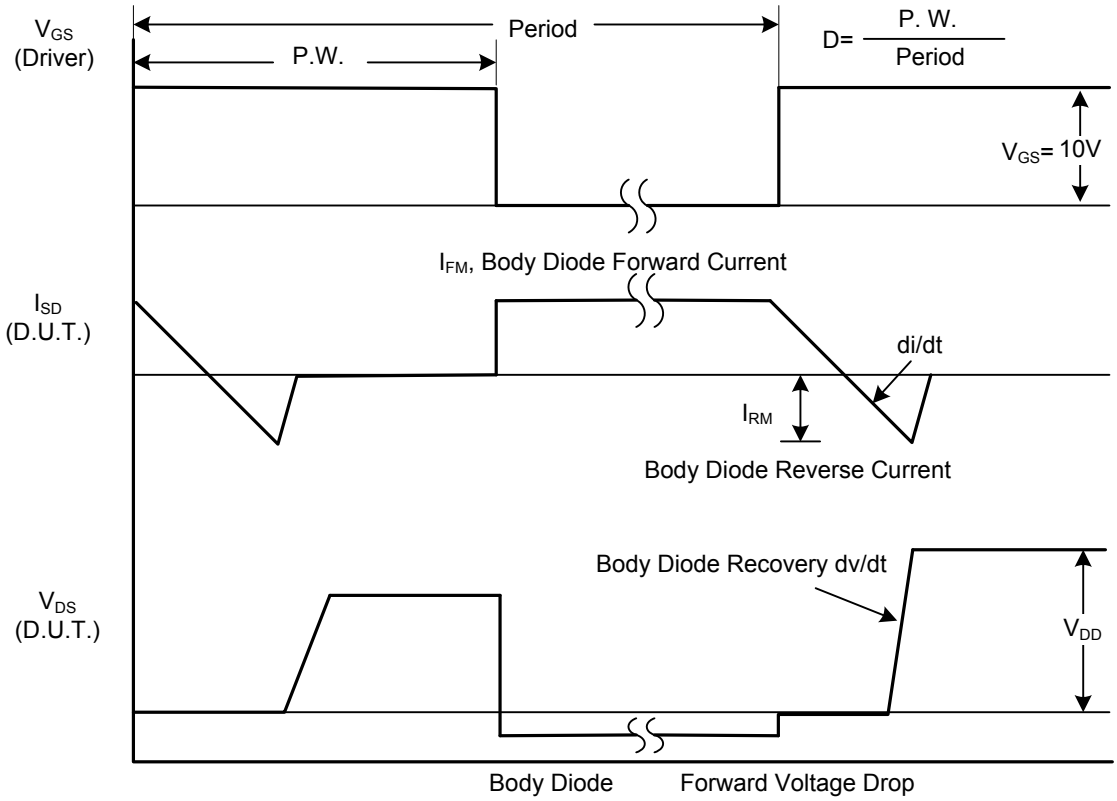
Notes: 1. Pulse Test: Pulse width≤300μs, Duty cycle≤2%

2. Essentially independent of operating temperature

TEST CIRCUITS AND WAVEFORMS

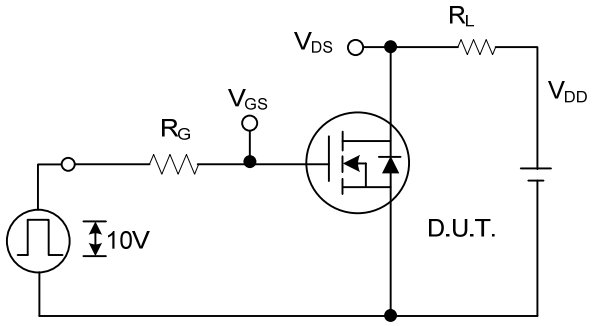


Peak Diode Recovery dv/dt Test Circuit

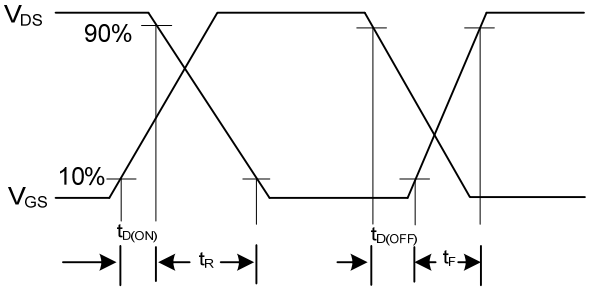


Peak Diode Recovery dv/dt Waveforms

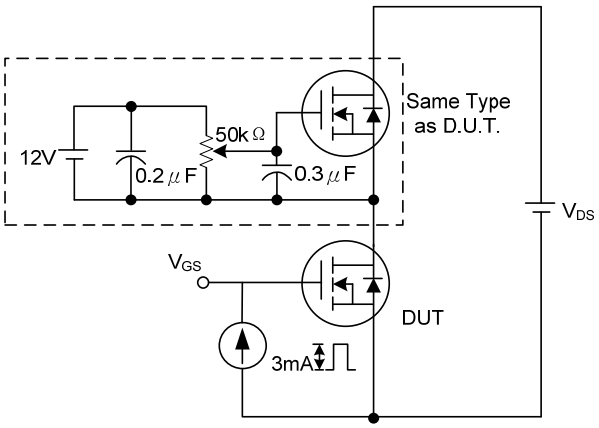
TEST CIRCUITS AND WAVEFORMS(Cont.)



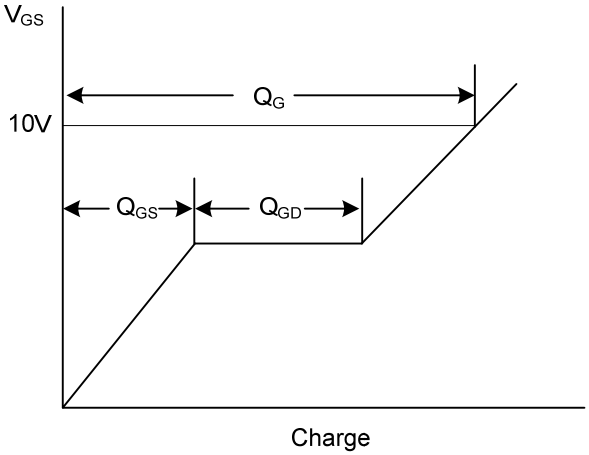
Switching Test Circuit



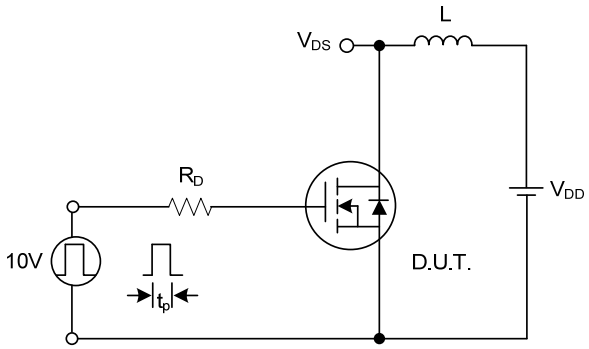
Switching Waveforms



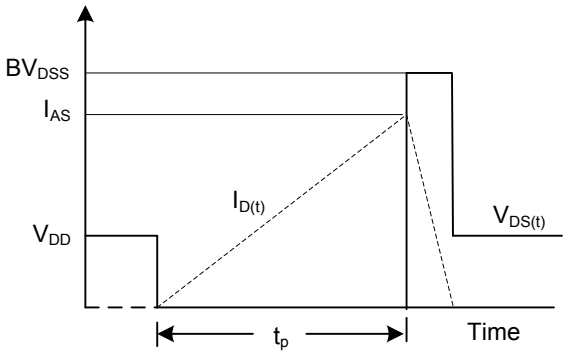
Gate Charge Test Circuit



Gate Charge Waveform

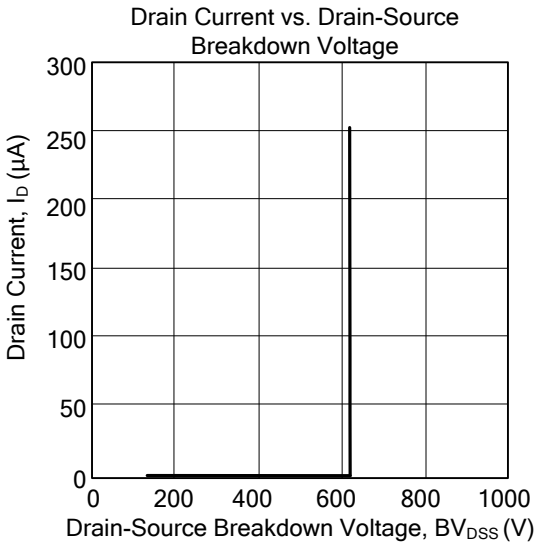


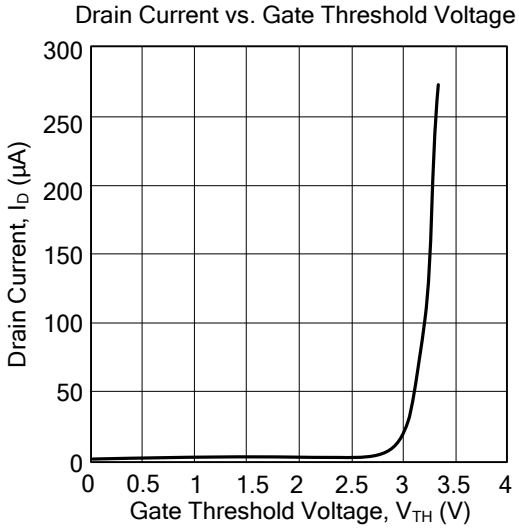
Unclamped Inductive Switching Test Circuit

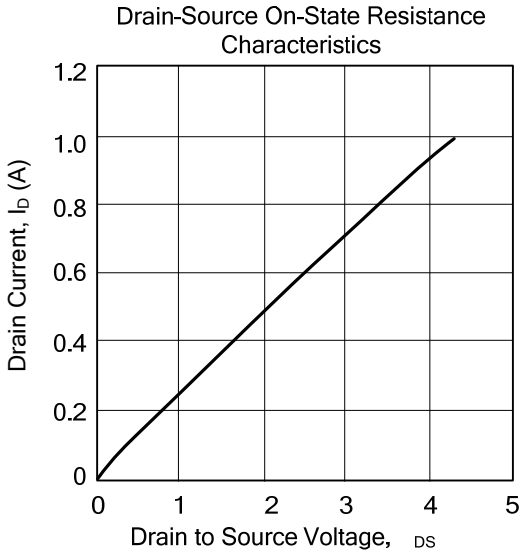


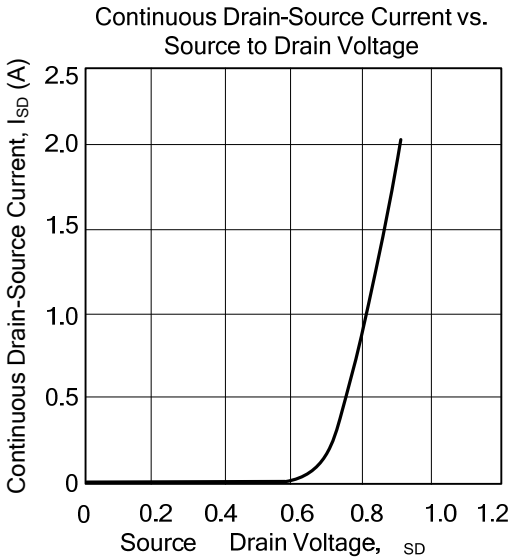
Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS

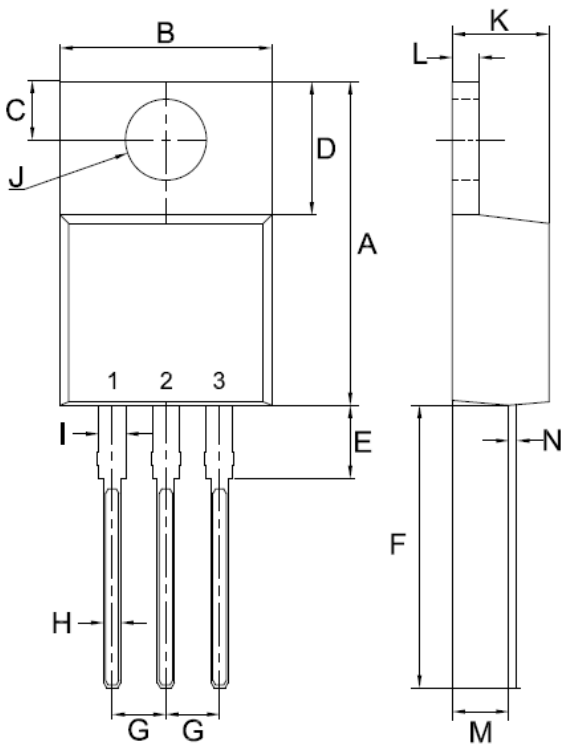






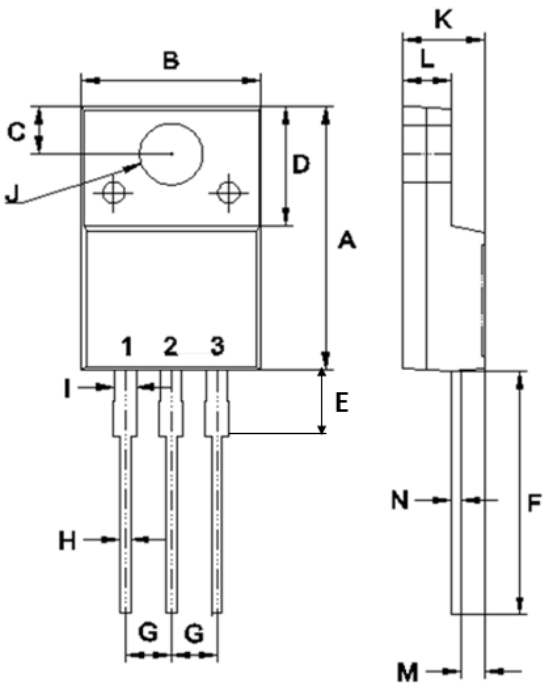


TO-220 Mechanical Drawing



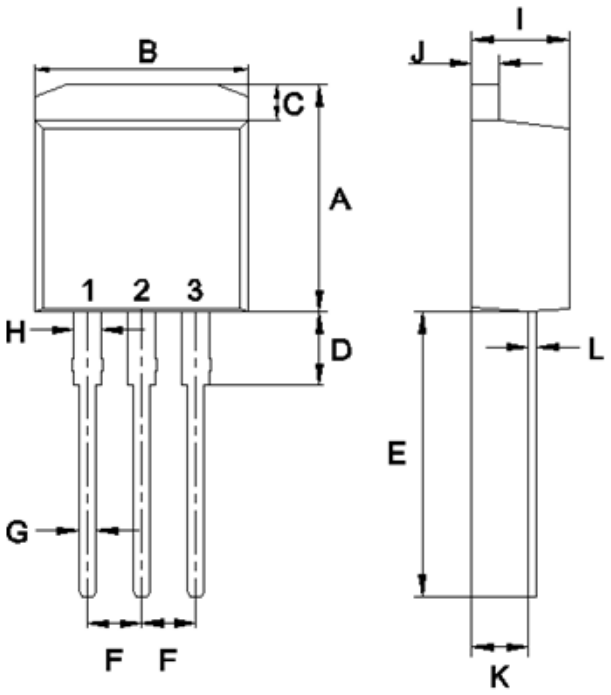
TO-220AB Unit:mm		
DIM	MIN	MAX
A	14.80	15.80
B	9.57	10.57
C	2.54	2.94
D	5.80	6.80
E	2.95	3.95
F	12.70	13.40
G	2.34	2.74
H	0.51	1.11
I	0.97	1.57
J	3.54ϕ	4.14ϕ
K	4.27	4.87
L	1.07	1.47
M	2.03	2.92
N	0.30	0.64

ITO-220 Mechanical Drawing



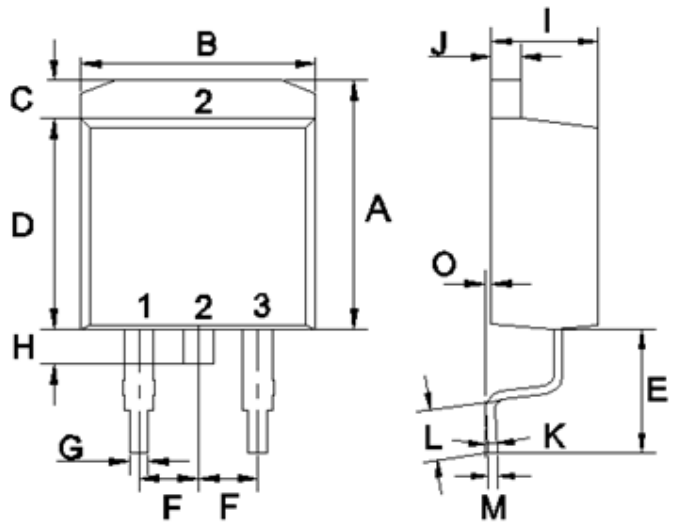
ITO-220AB Unit:mm		
DIM	MIN	MAX
A	14.50	15.50
B	9.50	10.50
C	2.50	2.90
D	6.30	7.30
E	3.30	4.30
F	13.00	14.00
G	2.35	2.75
H	0.30	0.90
I	0.90	1.50
J	3.20	3.80
K	4.24	4.84
L	2.52	2.92
M	1.09	1.49
N	0.47	0.64

TO-262 Mechanical Drawing



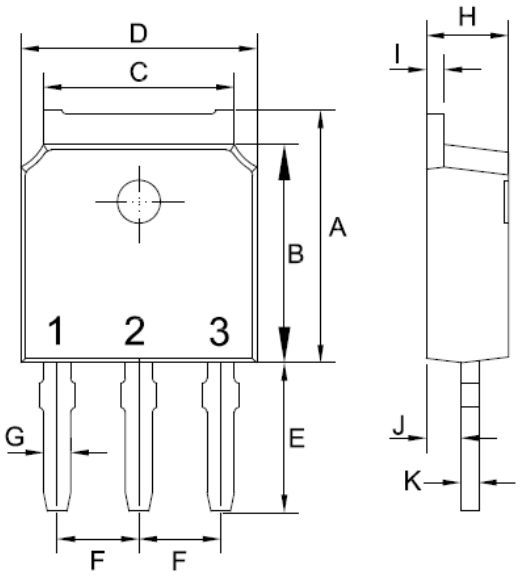
TO-262(I²PAK) Unit:mm		
DIM	MIN	MAX
A	10.14	11.14
B	9.57	10.57
C	1.44	1.84
D	2.95	3.95
E	12.70	13.40
F	2.34	2.74
G	0.51	1.11
H	0.97	1.57
I	4.27	4.87
J	1.07	1.47
K	2.03	2.92
L	0.30	0.46

TO-263 Mechanical Drawing



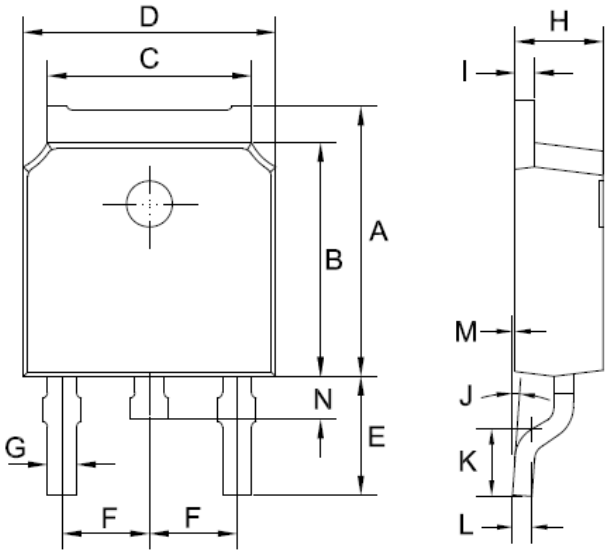
TO-263 (D² PAK) Unit:mm		
DIM	MIN	MAX
A	10.44	10.84
B	9.81	10.21
C	1.44	1.84
D	8.80	9.20
E	4.46	4.66
F	2.44	2.64
G	0.61	1.01
H	0.70	1.30
I	4.27	4.87
J	1.07	1.47
K	0°	8°
L	2.10	2.50
M	0.30	0.46
0	0	0.25

TO-251 Mechanical Drawing



TO-251 (IPAK) Unit:mm		
DIM	MIN	MAX
A	6.85	7.25
B	5.90	6.30
C	5.13	5.53
D	6.40	6.80
E	3.95	4.35
F	2.19	2.39
G	0.45	0.85
H	2.20	2.40
I	0.41	0.61
J	0.71	1.31
K	0.41	0.61

TO-252 Mechanical Drawing



TO-252 (DPAK) Unit:mm		
DIM	MIN	MAX
A	6.85	7.25
B	5.90	6.30
C	5.13	5.53
D	6.40	6.80
E	2.90	3.30
F	2.19	2.39
G	0.45	0.85
H	2.20	2.40
I	0.41	0.61
J	0°	8°
K	1.45	1.85
L	0.41	0.61
M	0.00	0.12
N	0.60	1.00