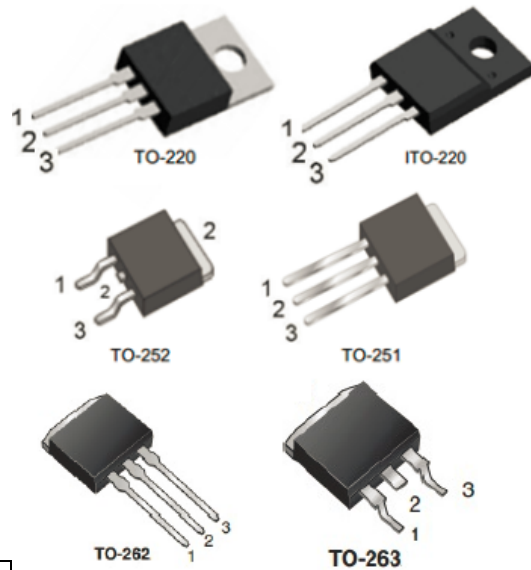


Features

- $R_{DS(ON)} < 1.2\Omega$ @ $V_{GS} = 10V$
- Fast switching capability
- Low gate charge
- Lead free in compliance with EU RoHS directive.
- Green molding compound

Mechanical Data

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



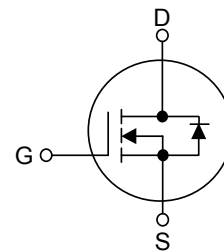
Pin Definition:

1. Gate
2. Drain
3. Source

Ordering Information

Part No.	Package	Packing
8N60T	TO-220	50pcs / Tube
8N60F	ITO-220	50pcs / Tube
8N60K	TO-262	50pcs / Tube
8N60G	TO-263	50pcs / Tube
8N60P	TO-251	75pcs / Tube
8N60D	TO-252	75pcs / Tube

Block Diagram



Maximum Ratings $T_A = 25^\circ C$ 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}	8	A	
Continuous Drain Current	I_D	8	A	
Pulsed Drain Current (Note 2)	I_{DM}	32	A	
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	230	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	ns	
Power Dissipation	TO-220/TO-262/TO-263	P_D	142	W
	ITO-220		48	W
	TO-251/TO-252		62	W
Junction Temperature	T_J	+150	$^\circ C$	
Operating Temperature	T_{OPR}	-55 ~ +150	$^\circ C$	
Storage Temperature	T_{STG}	-55 ~ +150	$^\circ C$	

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 T_J

3. $L = 7.1mH$, $I_{AS} = 8A$, $V_{DD} = 50V$, $R_G = 25\Omega$, Starting $T_J = 25^\circ C$

4. $I_{SD} \leq 7.5A$, $di/dt \leq 200A/\mu s$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ C$



THERMAL DATA

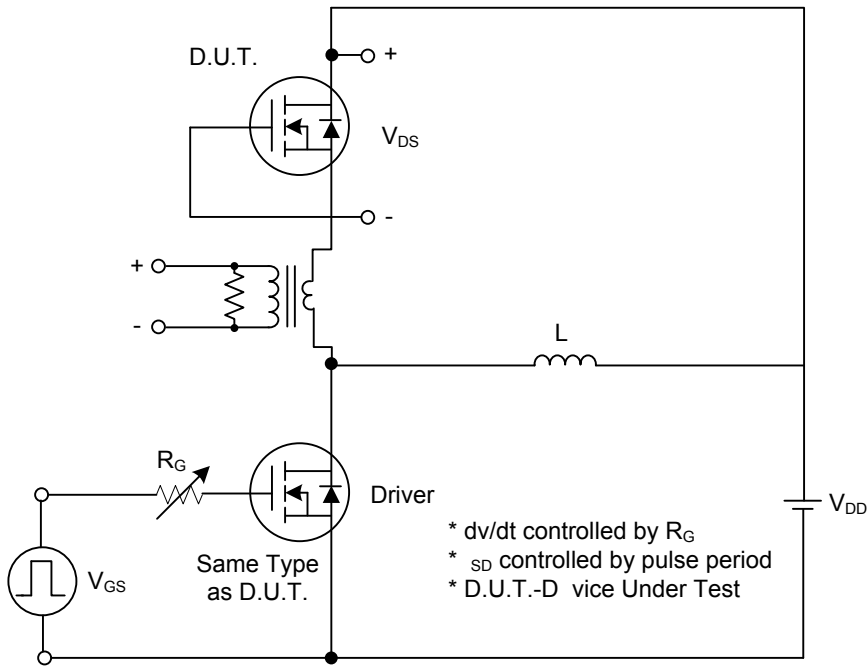
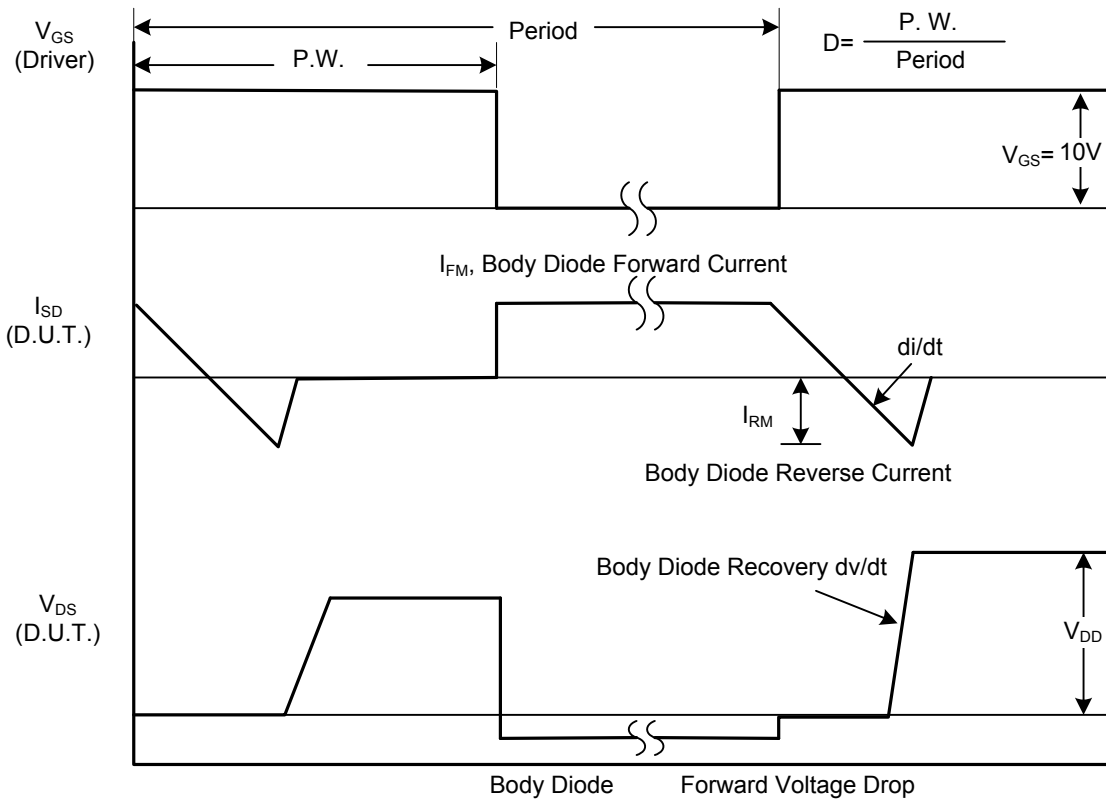
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient		θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220/TO-262/TO-263	θ_{JC}	0.85	$^{\circ}\text{C}/\text{W}$
	ITO-220		2.6	
	TO-251/TO-252		2.0	

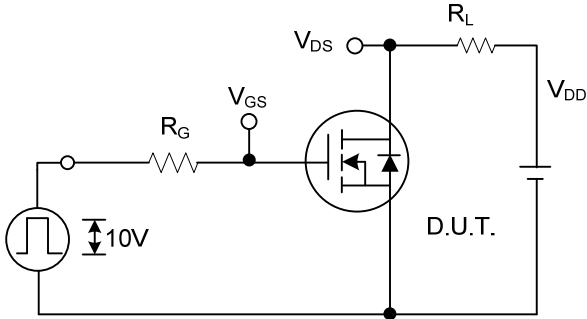
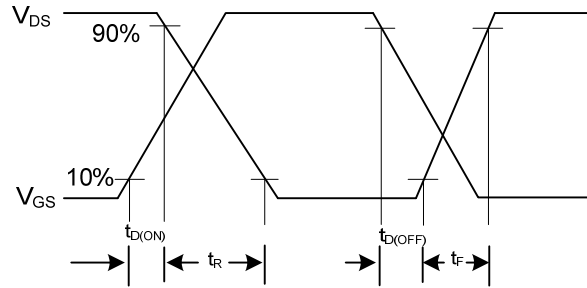
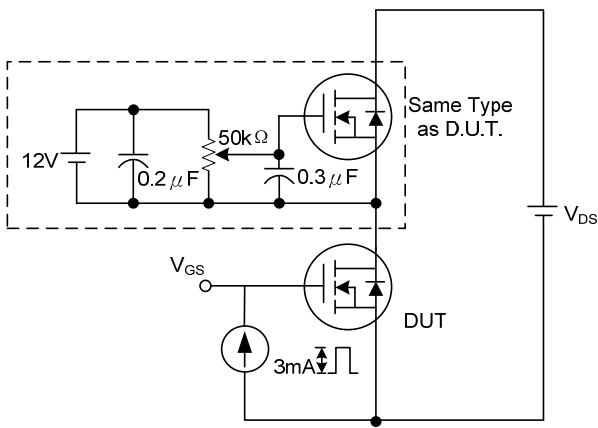
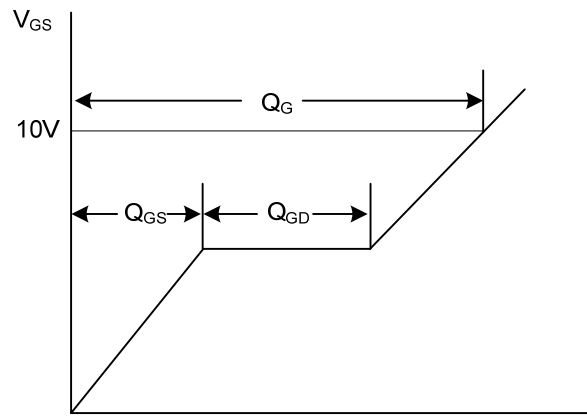
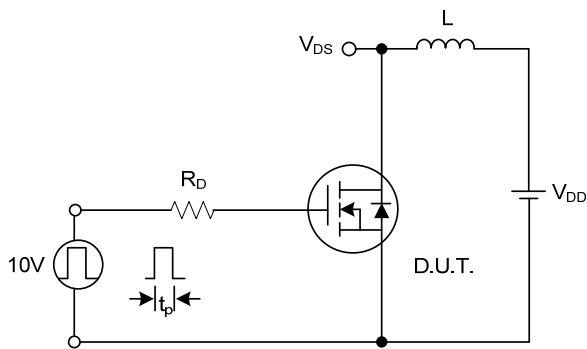
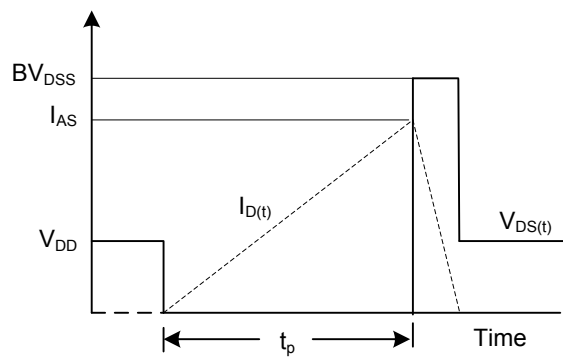
ELECTRICAL CHARACTERISTICS ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$	600			V
Drain-Source Leakage Current		I_{DSS}	$V_{DS}=600\text{V}, V_{GS}=0\text{V}$			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}	$V_G=30\text{V}, V_{DS}=0\text{V}$			100	nA
	Reverse		$V_{GS}=-30\text{V}, V_{DS}=0\text{V}$			-100	nA
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu\text{A}$, Referenced to 25°C		0.7		$\text{V}/^{\circ}\text{C}$
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{V}, I_D = 4\text{A}$		1.0	1.2	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	$V_{DS}=25\text{V}, V_{GS}=0\text{V}, f=1.0\text{ MHz}$		965	1255	pF
Output Capacitance		C_{OSS}			105	135	pF
Reverse Transfer Capacitance		C_{RSS}			12	16	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	$V_{DD} = 300\text{V}, I_D = 8\text{A}, R_G = 25\Omega$ (Note 1, 2)		16.5	45	ns
Turn-On Rise Time		t_R			60.5	130	ns
Turn-Off Delay Time		$t_{D(OFF)}$			81	170	ns
Turn-Off Fall Time		t_F			64.5	140	ns
Total Gate Charge		Q_G	$V_{DS}=480\text{V}, I_D=8\text{A}, V_{GS}=10\text{V}$ (Note 1, 2)		28	36	nC
Gate-Source Charge		Q_{GS}			4.5		nC
Gate-Drain Charge		Q_{GD}			12		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Drain-Source Diode Forward Voltage		V_{SD}	$V_{GS} = 0\text{V}, I_S = 8\text{A}$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I_S				8	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				32	A
Reverse Recovery Time		t_{rr}	$V_{GS}=0\text{V}, I_S=8\text{A},$		365		ns
Reverse Recovery Charge		Q_{RR}	$di_F/dt = 100\text{ A}/\mu\text{s}$ (Note 1)		3.4		μC

Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

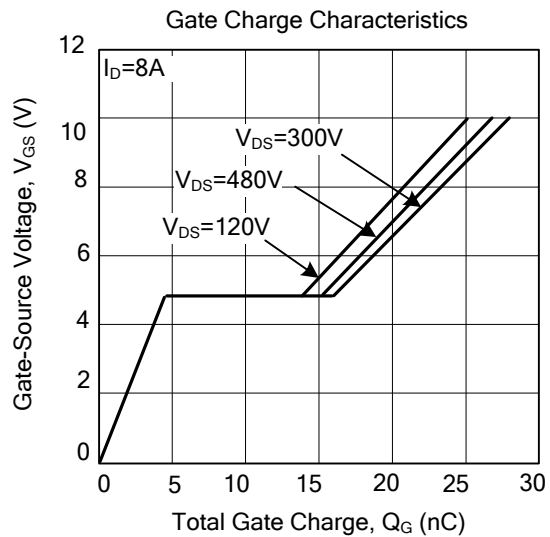
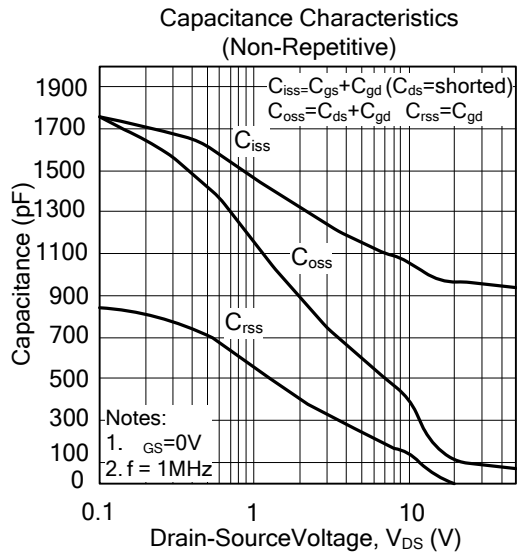
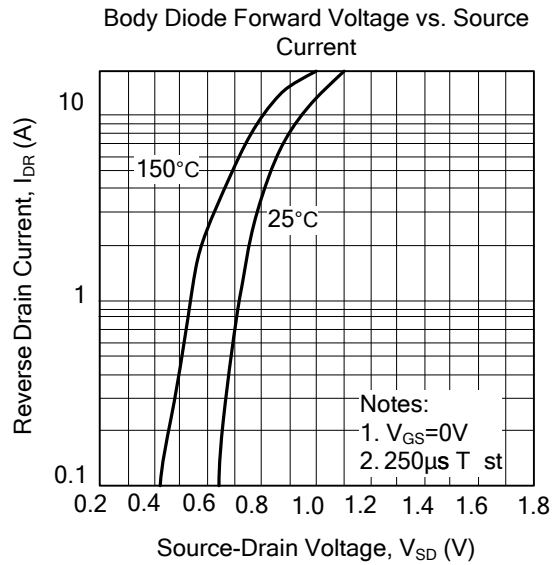
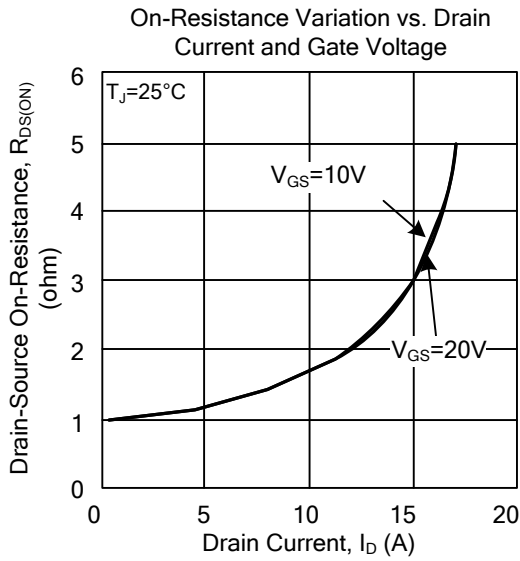
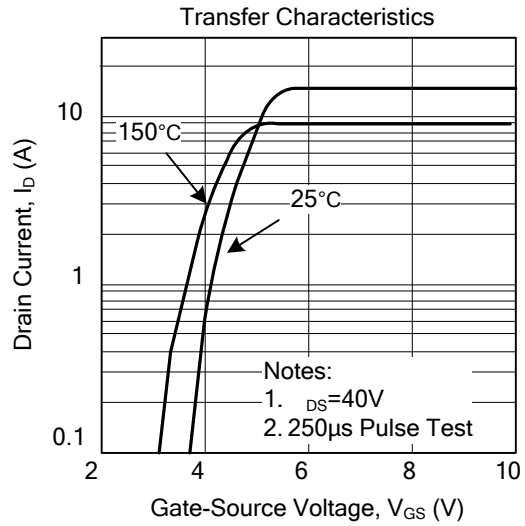
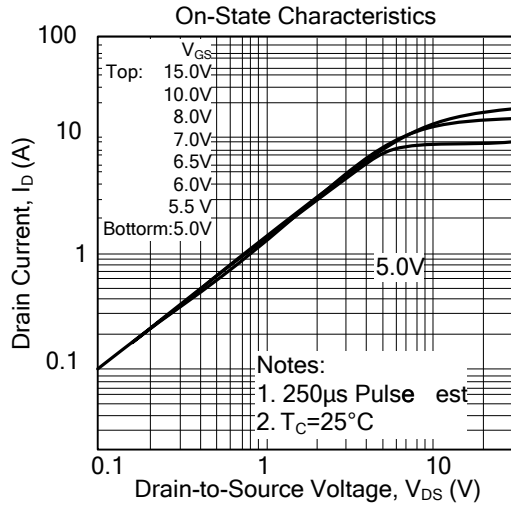
2. Essentially independent of operating temperature.

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

Charge Gate Charge Waveform

Unclamped Inductive Switching Test Circuit

Unclamped Inductive Switching Waveforms

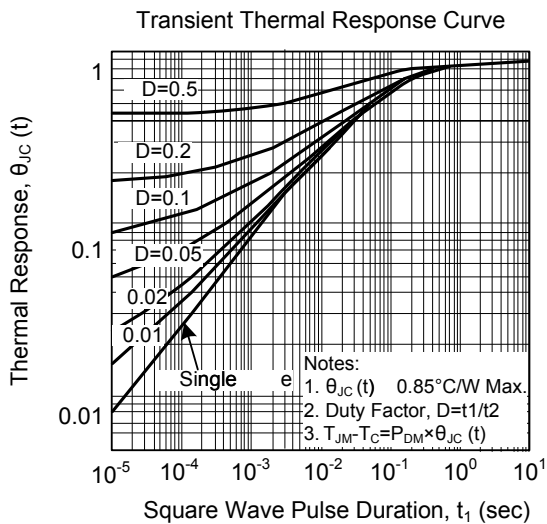
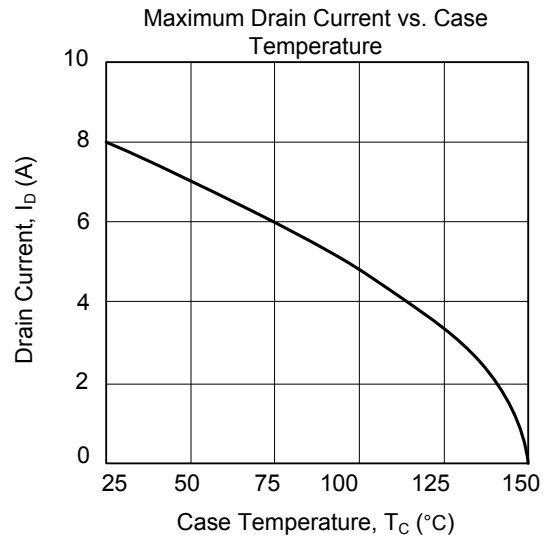
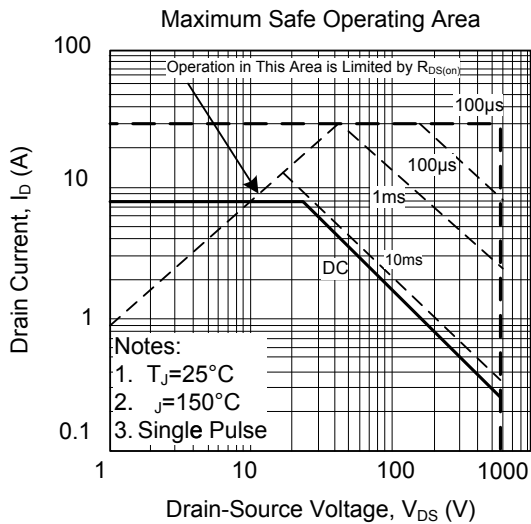
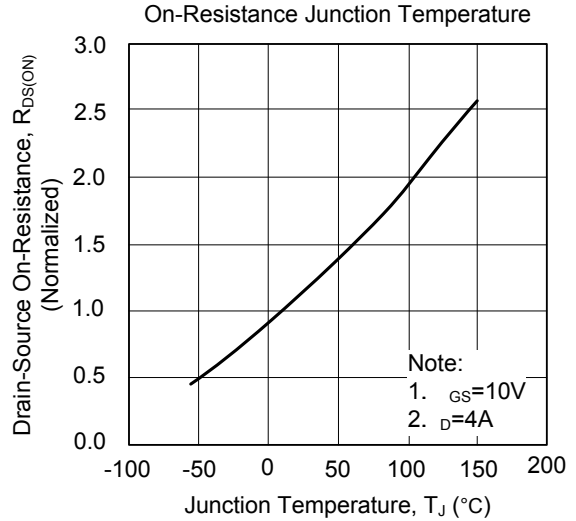
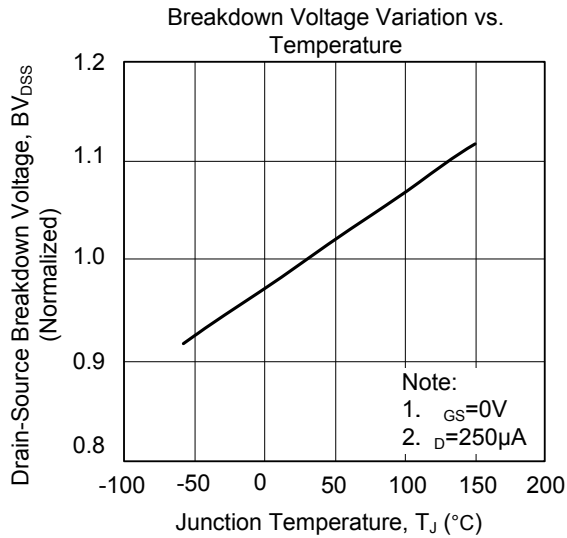


TYPICAL CHARACTERISTICS

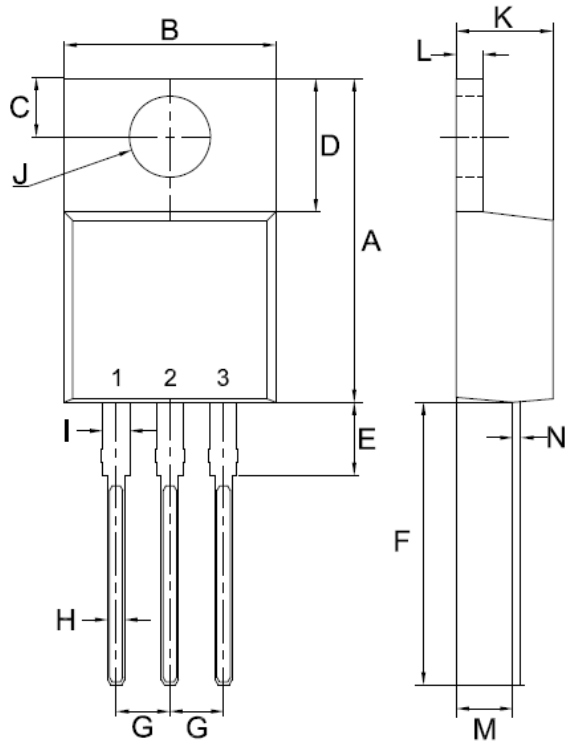




TYPICAL CHARACTERISTICS

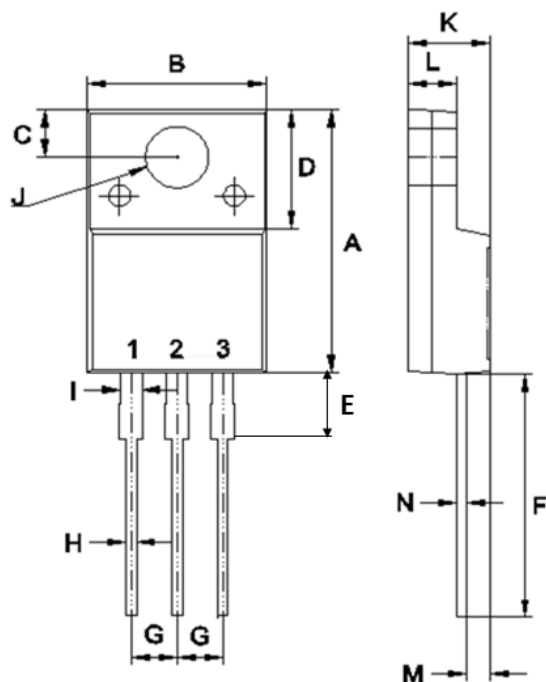


TO-220 Mechanical Drawing



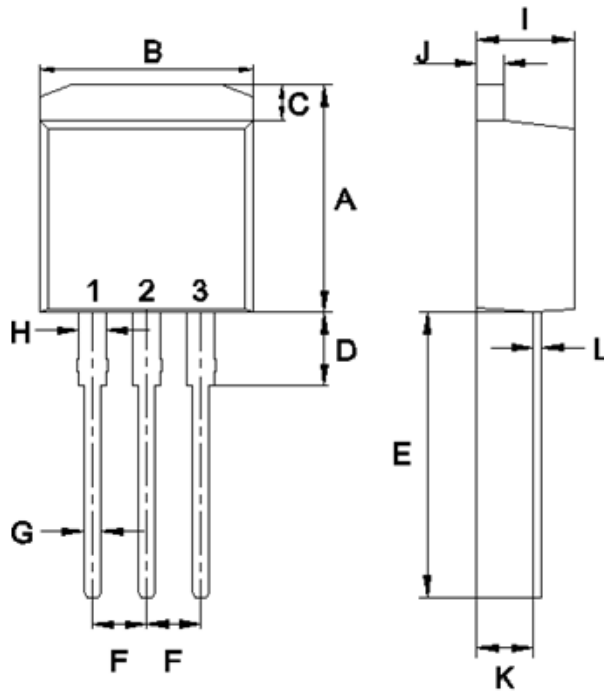
TO-220AB		
Unit:mm		
DIM	MIN	MAX
A	14.80	15.80
B	9.57	10.57
C	2.54	2.94
D	5.80	6.80
E	2.95	3.95
F	12.70	13.40
G	2.34	2.74
H	0.51	1.11
I	0.97	1.57
J	3.54 ϕ	4.14 ϕ
K	4.27	4.87
L	1.07	1.47
M	2.03	2.92
N	0.30	0.64

ITO-220 Mechanical Drawing



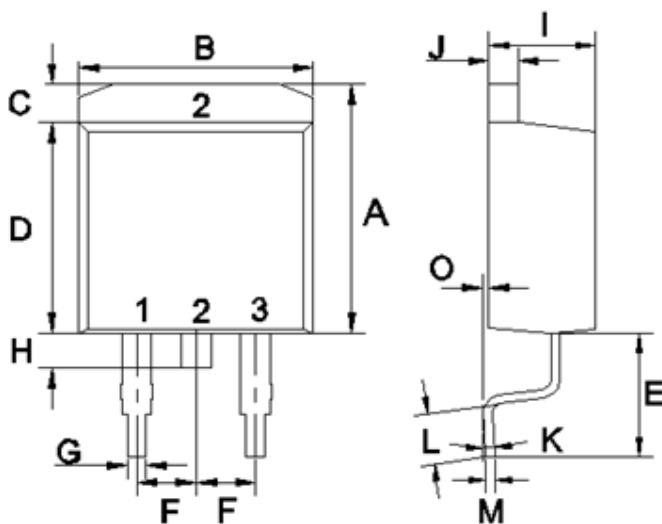
ITO-220AB Unit:mm		
DIM	MIN	MAX
A	14.50	15.50
B	9.50	10.50
C	2.50	2.90
D	6.30	7.30
E	3.30	4.30
F	13.00	14.00
G	2.35	2.75
H	0.30	0.90
I	0.90	1.50
J	3.20	3.80
K	4.24	4.84
L	2.52	2.92
M	1.09	1.49
N	0.47	0.64

TO-262 Mechanical Drawing



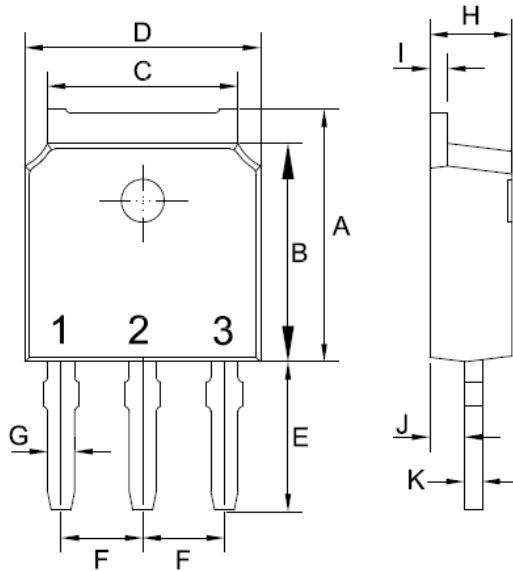
TO-262(I ² PAK)		
Unit:mm		
DIM	MIN	MAX
A	10.14	11.14
B	9.57	10.57
C	1.44	1.84
D	2.95	3.95
E	12.70	13.40
F	2.34	2.74
G	0.51	1.11
H	0.97	1.57
I	4.27	4.87
J	1.07	1.47
K	2.03	2.92
L	0.30	0.46

TO-263 Mechanical Drawing



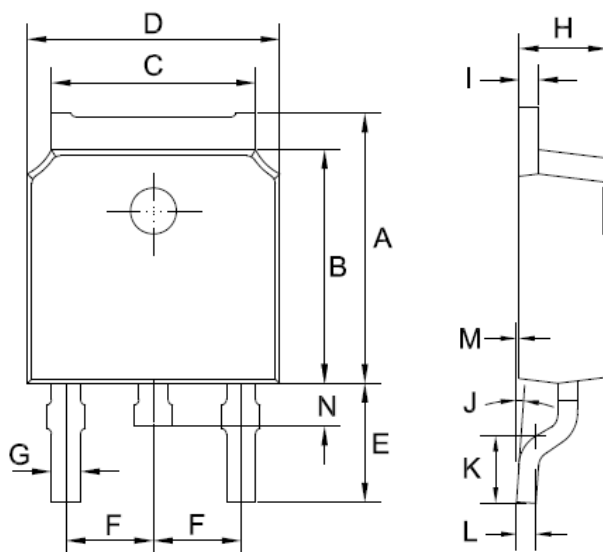
TO-263 (D ² PAK)		
Unit:mm		
DIM	MIN	MAX
A	10.44	10.84
B	9.81	10.21
C	1.44	1.84
D	8.80	9.20
E	4.46	4.66
F	2.44	2.64
G	0.61	1.01
H	0.70	1.30
I	4.27	4.87
J	1.07	1.47
K	0°	8°
L	2.10	2.50
M	0.30	0.46
O	0	0.25

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