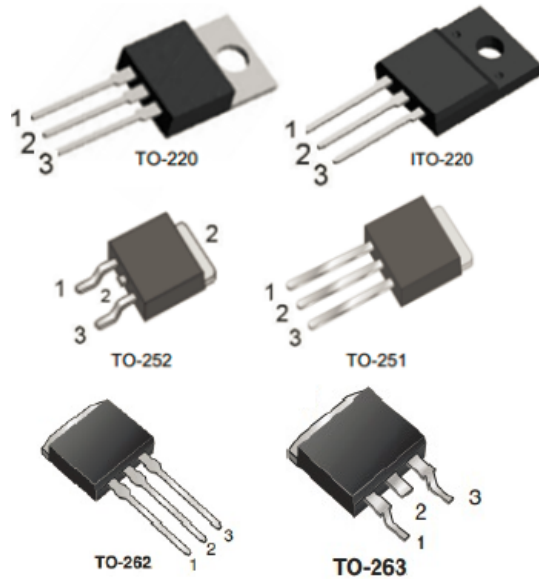


Features

- $R_{DS(ON)} < 2.6\Omega$ @ $V_{GS} = 10V$
- Fast switching capability
- Lead free in compliance with EU RoHS directive.
- Green molding compound

Mechanical Data

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



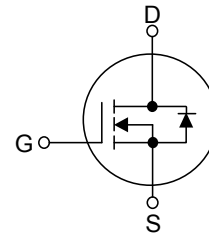
Pin Definition:

1. Gate
2. Drain
3. Source

Ordering Information

Part No.	Package	Packing
4N65P	TO-251	75pcs / Tube
4N65D	TO-252	75pcs / Tube
4N65T	TO-220	50pcs / Tube
4N65F	ITO-220	50pcs / Tube
4N65K	TO-262	50pcs / Tube
4N65G	TO-263	50pcs / Tube

Block Diagram



Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise specified

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	650	V
Gate-Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current		I_D	4.0	A
Pulsed Drain Current (Note 2)		I_{DM}	16	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	260	mJ
Power Dissipation	TO-220/TO-262/TO-263	P_D	106	W
	ITO-220		35	W
	TO-251/TO-252		50	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Operating Temperature		T_{OPR}	-55 ~ +150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55 ~ +150	$^\circ\text{C}$

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. $L = 30\text{mH}$, $I_{AS} = 3.6\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$



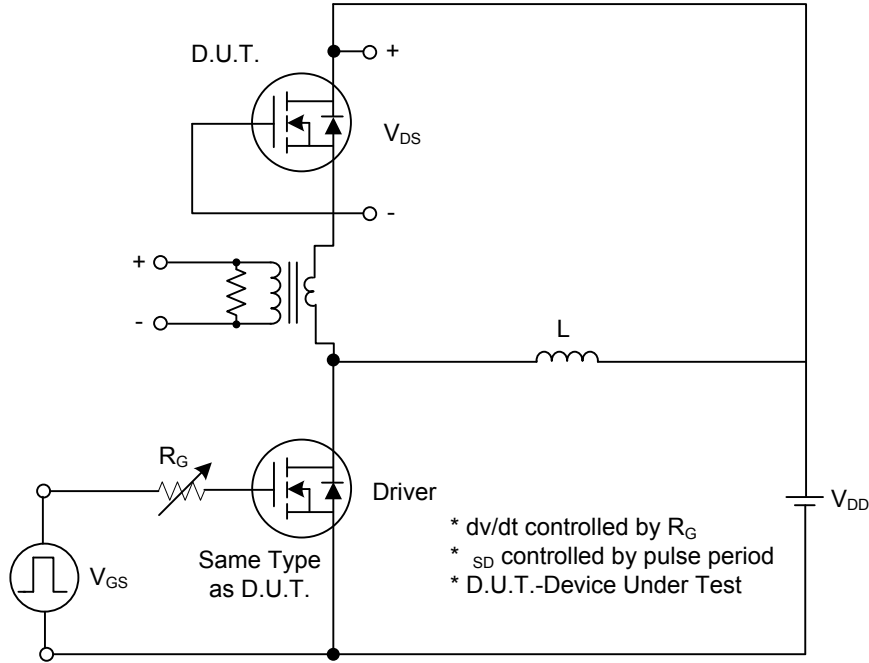
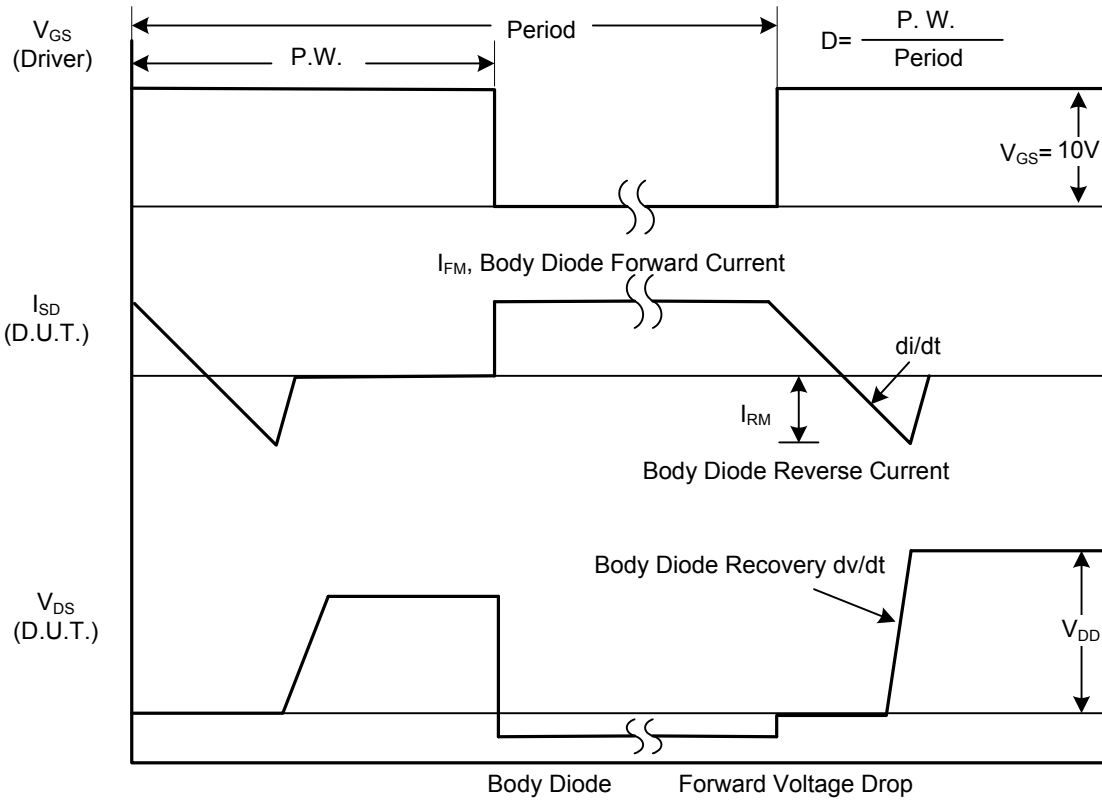
THERMAL DATA

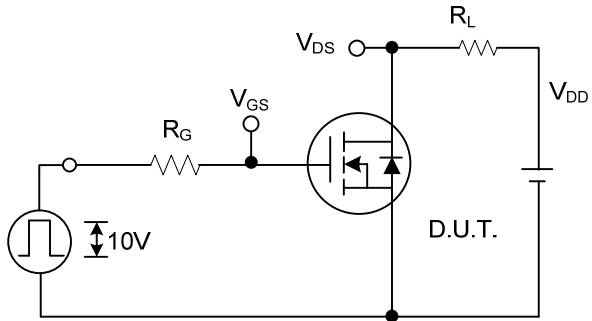
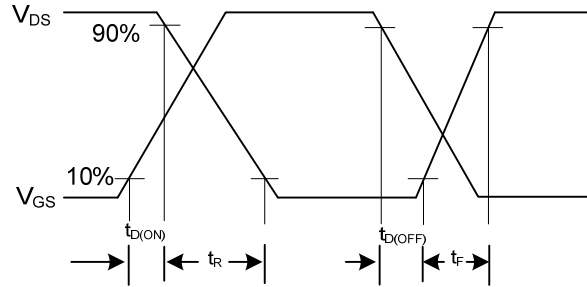
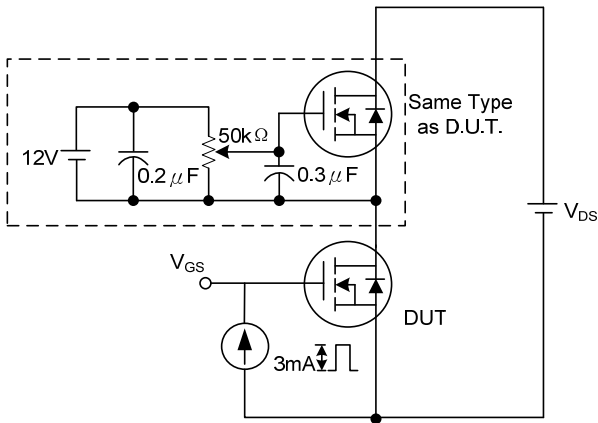
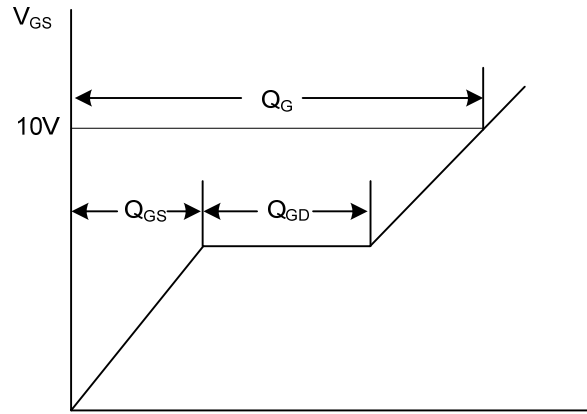
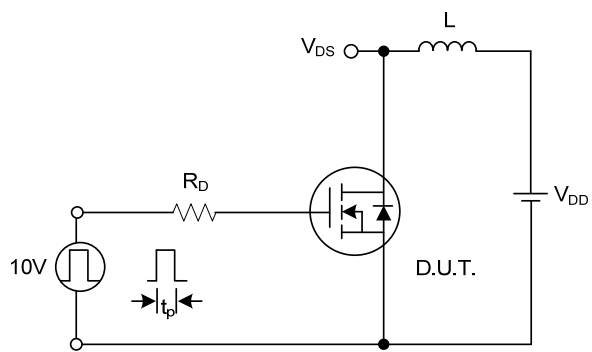
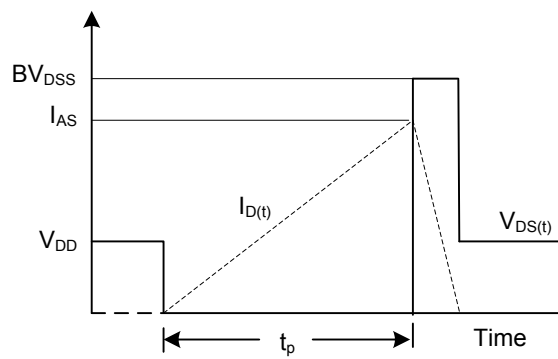
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ITO-220 TO-262/TO-263	θ_{JA}	62.5	°C/W
	TO-251/ TO-252		110	
Junction to Case	TO-220 TO-262/TO-263	θ_{JC}	2.35	°C/W
	ITO-220		5.5	
	TO-251/ TO-252		2.9	

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}	$V_{GS} = 0V, I_D = 250\mu A$	650			V
Drain-Source Leakage Current		I_{DSS}	$V_{DS} = 650V, V_{GS} = 0V$			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							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 2A$		2.3	2.6	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1MHz$		670		pF
Output Capacitance		C_{OSS}			70		pF
Reverse Transfer Capacitance		C_{RSS}			23		pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	$V_{DD} = 325V, I_D = 4.0A,$ $R_G = 25\Omega$ (Note 1, 2)		45		ns
Turn-On Rise Time		t_R			100		ns
Turn-Off Delay Time		$t_{D(OFF)}$			200		ns
Turn-Off Fall Time		t_F			130		ns
Total Gate Charge		Q_G	$V_{DS} = 520V, I_D = 4.0A,$ $V_{GS} = 10V$ (Note 1, 2)		100		nC
Gate-Source Charge		Q_{GS}			17		nC
Gate-Drain Charge		Q_{GD}			20		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Drain-Source Diode Forward Voltage		V_{SD}	$V_{GS} = 0V, I_S = 4A$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I_S				4	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				16	A
Reverse Recovery Time		t_{rr}	$V_{GS} = 0V, I_S = 4A,$		260		ns
Reverse Recovery Charge		Q_{RR}	$dI_F/dt = 100A/\mu s$ (Note 1)		2.5		μC

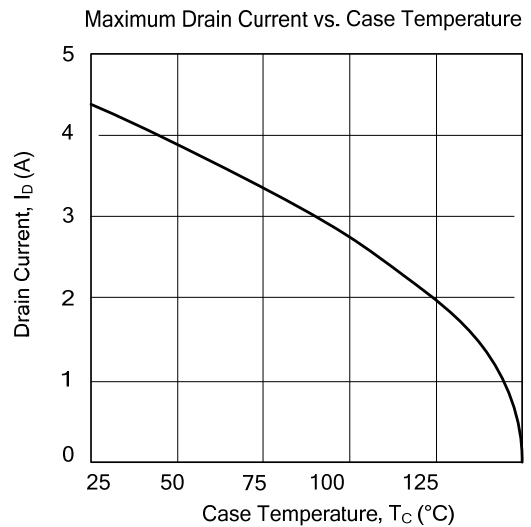
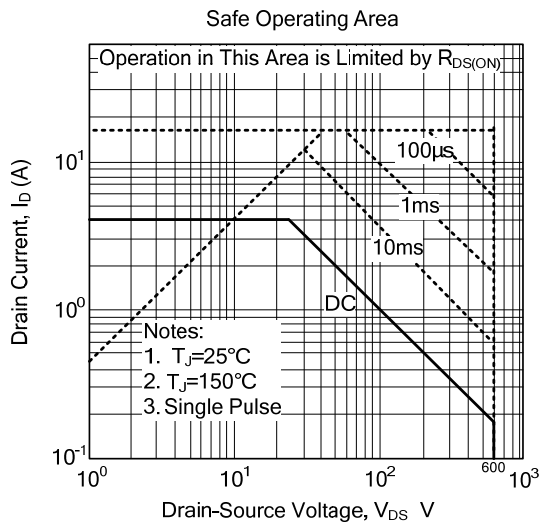
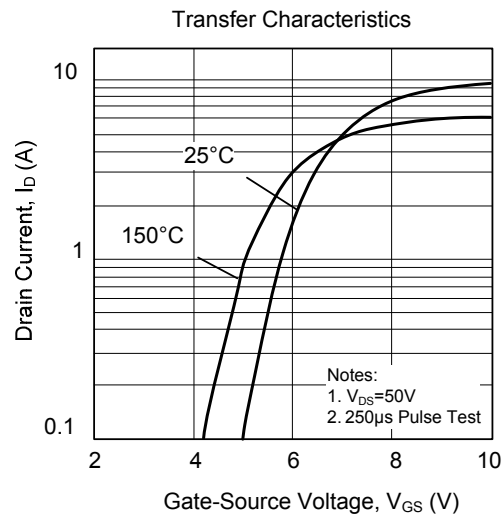
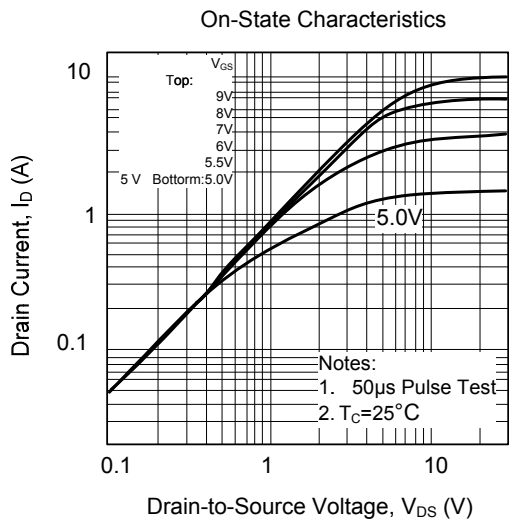
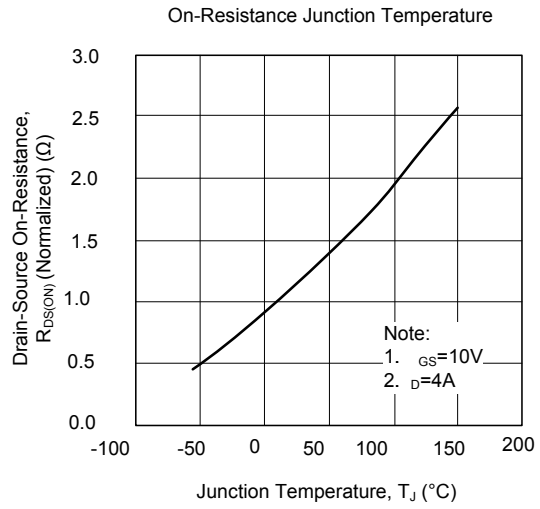
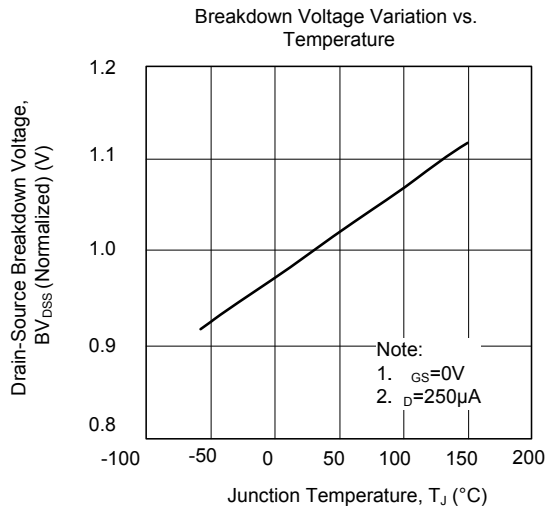
- Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
 2. Essentially independent of operating temperature

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

Gate Charge Waveform

Unclamped Inductive Switching Test Circuit

Unclamped Inductive Switching Waveforms

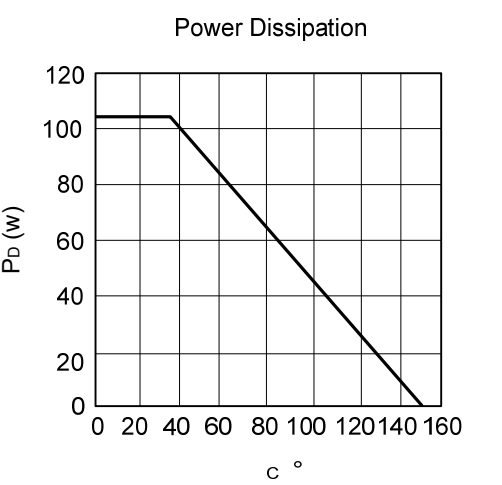
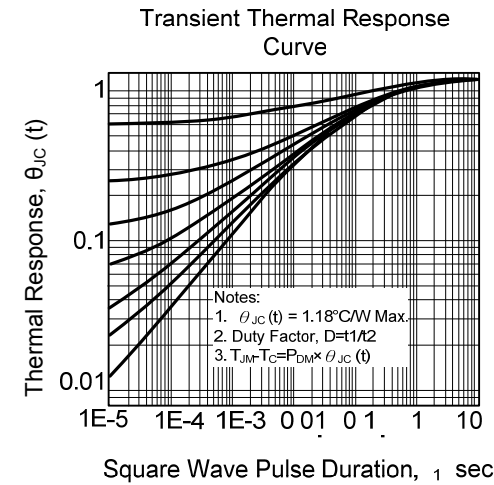
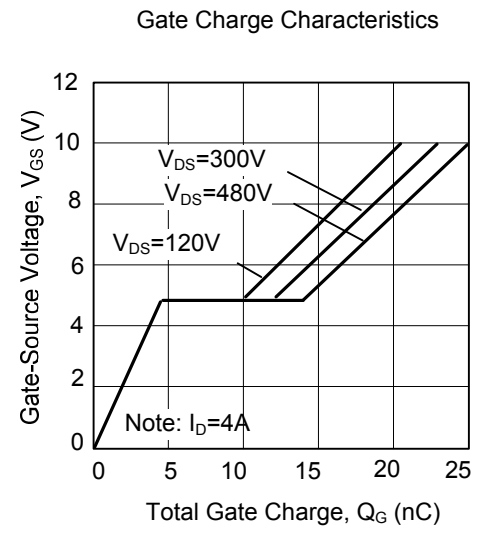
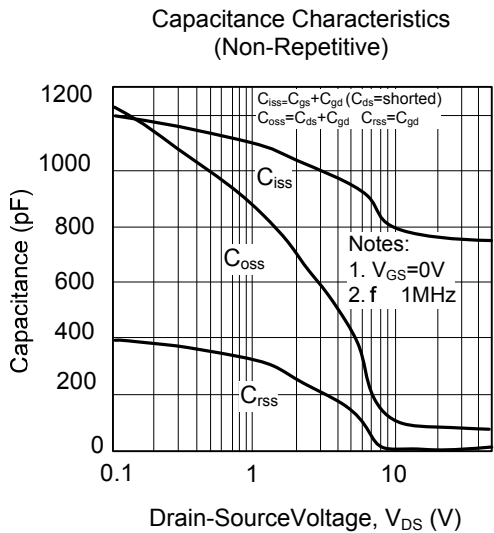
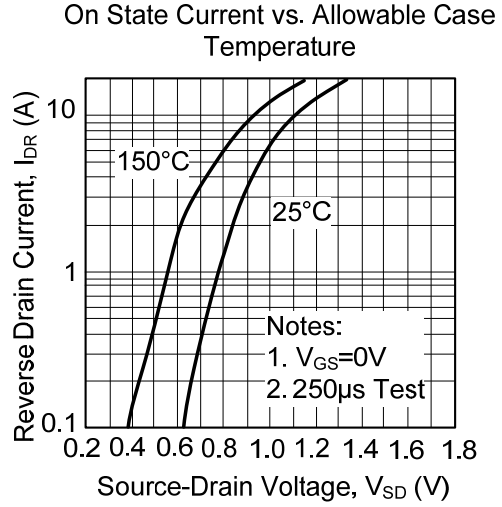
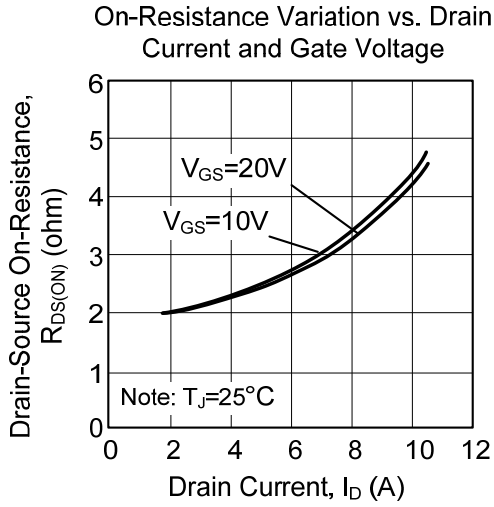


TYPICAL CHARACTERISTICS

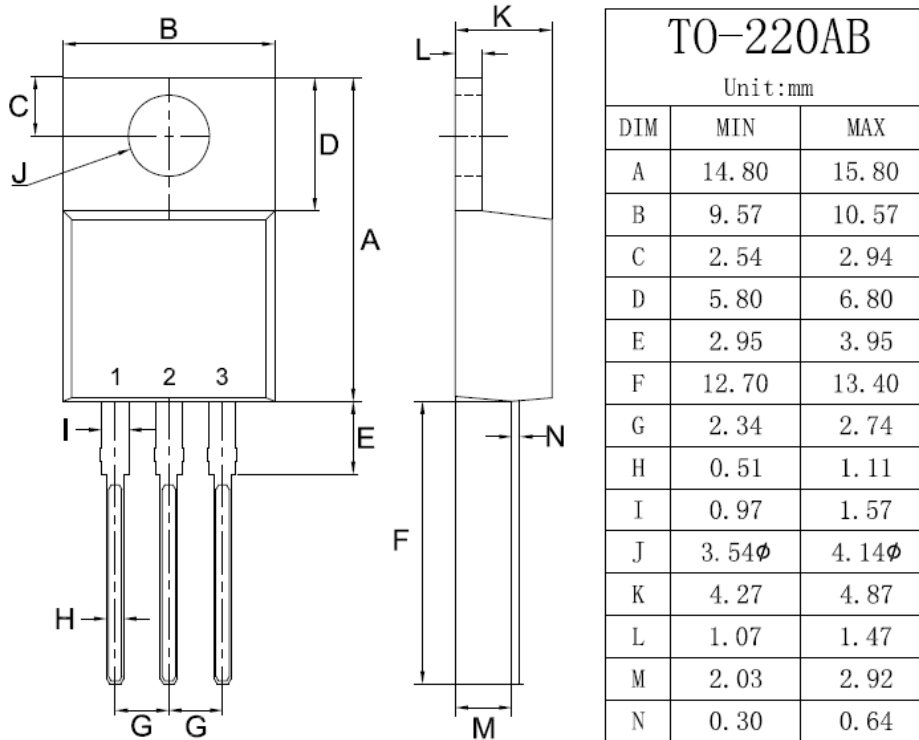




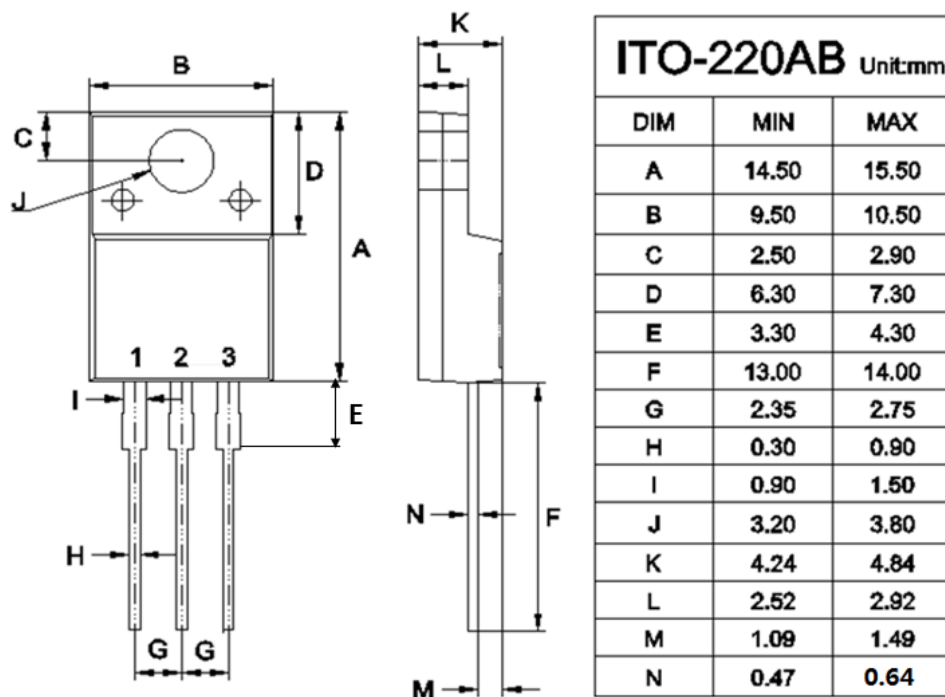
TYPICAL CHARACTERISTICS(Cont.)



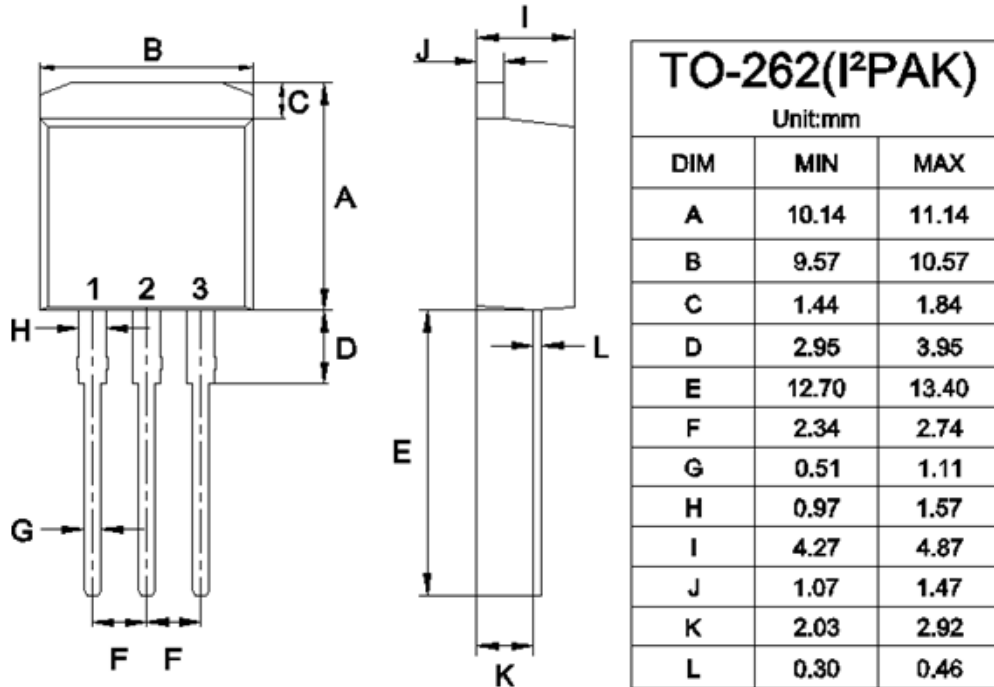
TO-220 Mechanical Drawing



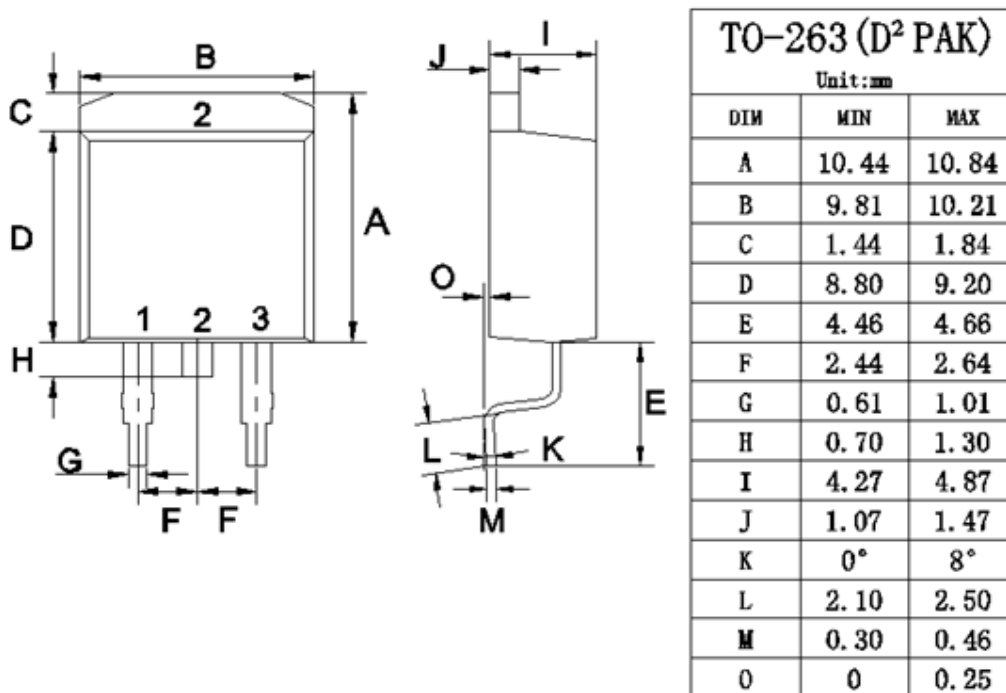
ITO-220 Mechanical Drawing



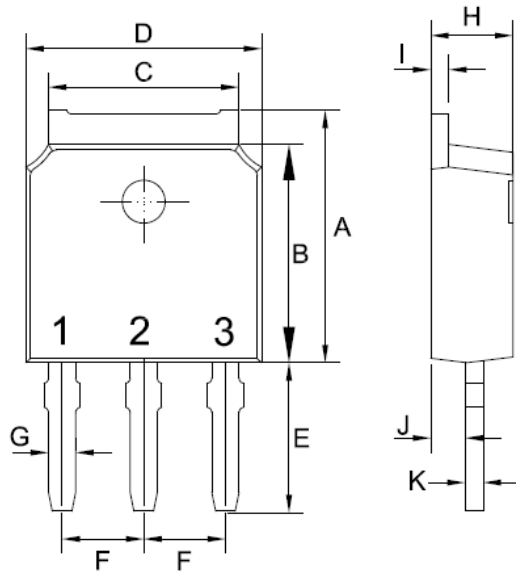
TO-262 Mechanical Drawing



TO-263 Mechanical Drawing

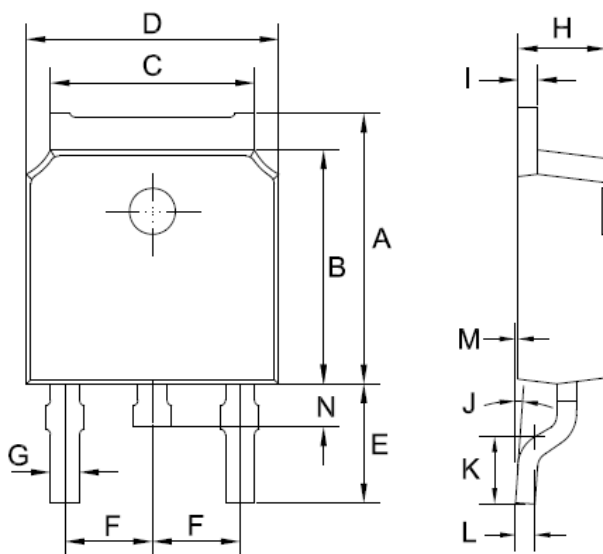


TO-251 Mechanical Drawing



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