

600V N-Channel Power MOSFET

Features:

- $R_{DS(ON)} < 2.4 \Omega$ @ $V_{GS} = 10V$
- Fast switching capability
- Lead free in compliance with EU RoHS directive.
- Green molding compound

Mechanical Data:

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

Ordering Information

Part No.	Package	Packing
KW4N60-TU	TO-220	50pcs / Tube
KW4N60F-TU	ITO-220	50pcs / Tube
KW4N60E-TU	TO-262	50pcs / Tube
KW4N60D-TU	TO-263	50pcs / Tube
KW4N60D-TR	TO-263	800pcs / 13"Reel
KW4N60N-TU	TO-251	75pcs / Tube
KW4N60M-TU	TO-252	50pcs / Tube
KW4N60M-TR	TO-252	2.5Kpcs / 13"Reel

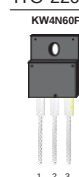
PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
600	2.4 @ $V_{GS} = 10V$	4

TO-220AB



ITO-220AB



TO-263



TO-262



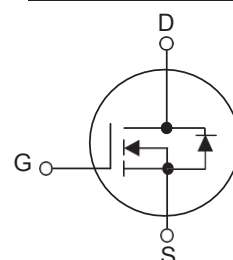
TO-251



TO-252



Block Diagram



Pin Definition:

1. Gate
2. Drain
3. Source

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DSS}	600	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	E_{AS}	217	mJ
Power Dissipation	TO-220/TO-263/TO-262	106	W
	ITO-220	44	
	TO-251/TO-252	77	
Junction Temperature	T_J	+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. $L=30\text{mH}$, $I_{AS}=3.7\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$

THERMAL DATA

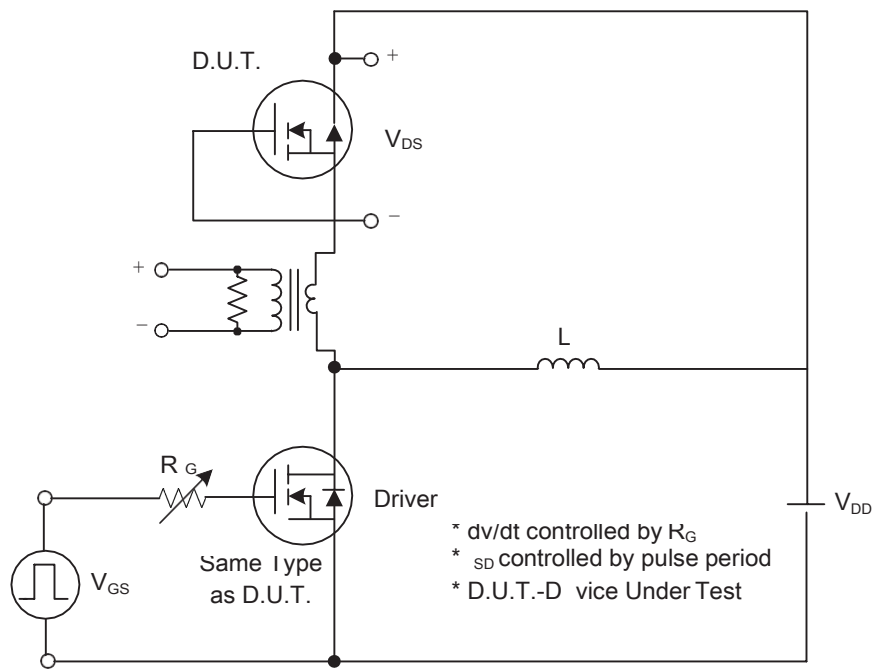
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ITO-220 TO-262/TO-263	θ_{JA}	62.5	°C/W
	TO-251/TO-252			
Junction to Case	TO-220/TO-263/TO-262	θ_{JC}	2.35	°C/W
	ITO-220		5.5	
	TO-251/TO-252		2.9	

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

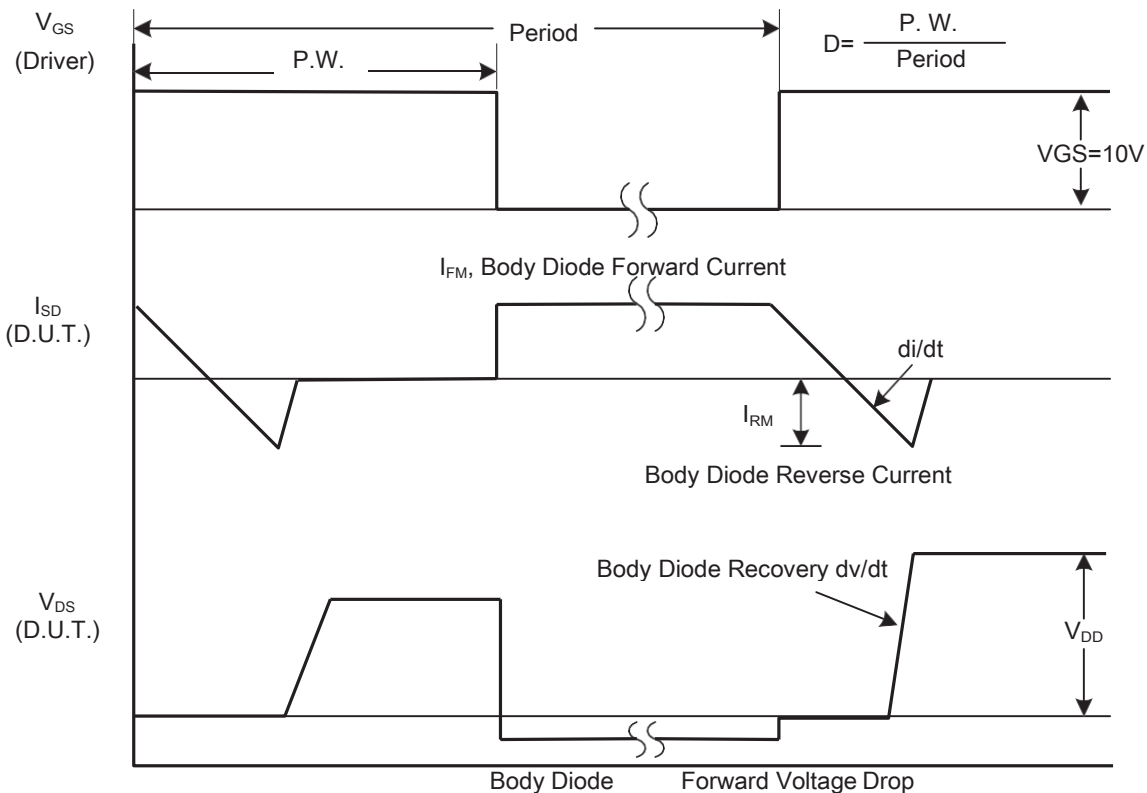
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	600			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =600V, V _{GS} =0V			1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _G =30V, V _{DS} =0V			100	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 =2.0A		1.9	2.4	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		550		pF
Output Capacitance		C _{OSS}			80		pF
Reverse Transfer Capacitance		C _{RSS}			30		pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		t _{D(ON)}	V _{DD} =300V, I _D =4.0A, R _G =25Ω(Note1, 2)		35		ns
Turn-On Rise Time		t _R			80		ns
Turn-Off Delay Time		t _{D(OFF)}			160		ns
Turn-Off Fall Time		t _F			120		ns
Total Gate Charge		Q _G	V _{DS} =480V, I _D =4.0A, V _{GS} =10V(Note1, 2)		80		nC
Gate-Source Charge		Q _{GS}			5		nC
Gate-Drain Charge		Q _{GD}			20		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =4. 0A			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 =4. 0A		400		ns
Reverse Recovery Charge		Q _{RR}	dI _F /dt=100A/μs (Note 1)		1.7		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

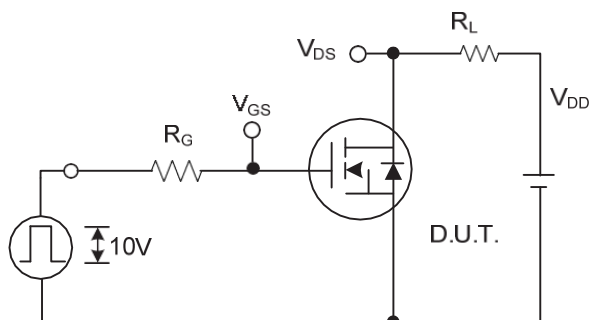


Peak Diode Recovery dv/dt Test Circuit

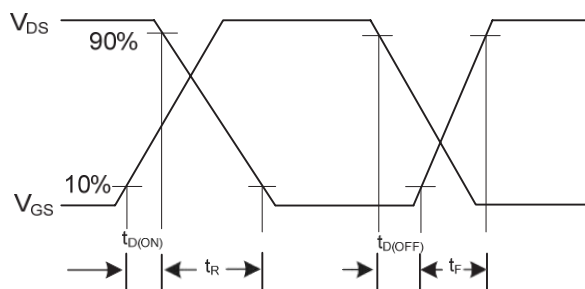


Peak Diode Recovery dv/dt Waveforms

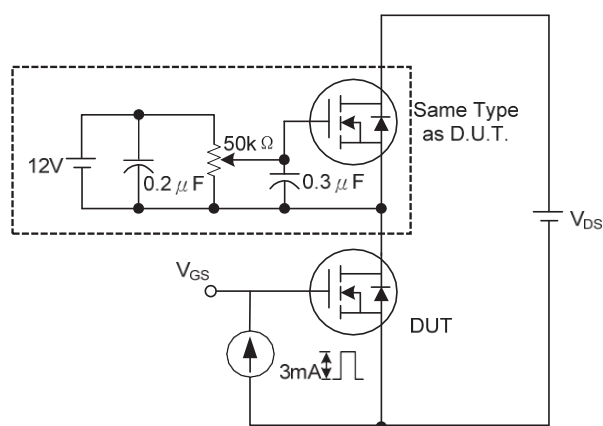
TEST CIRCUITS AND WAVEFORMS(Cont.)



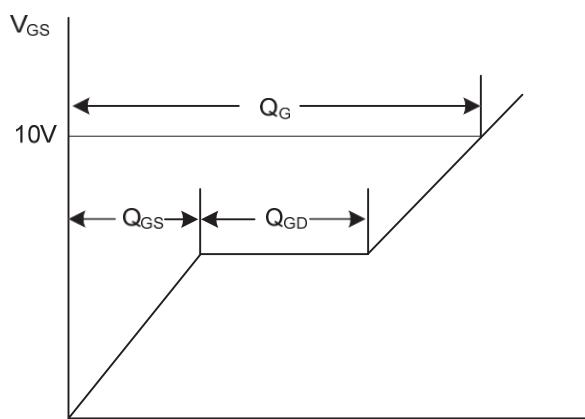
Switching Test Circuit



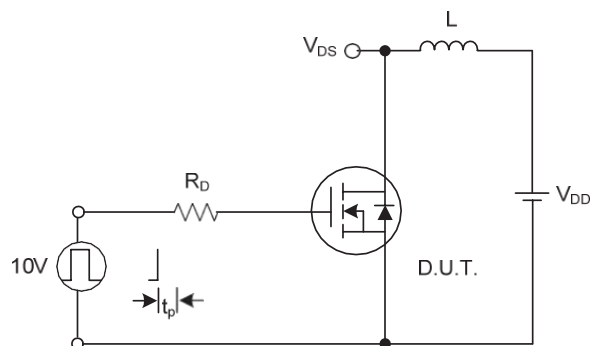
Switching Waveforms



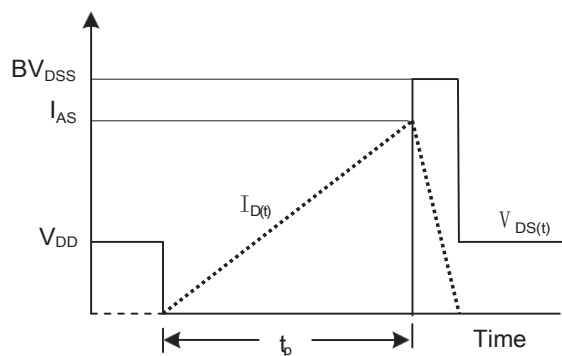
Gate Charge Test Circuit



Charge
Gate Charge Waveform

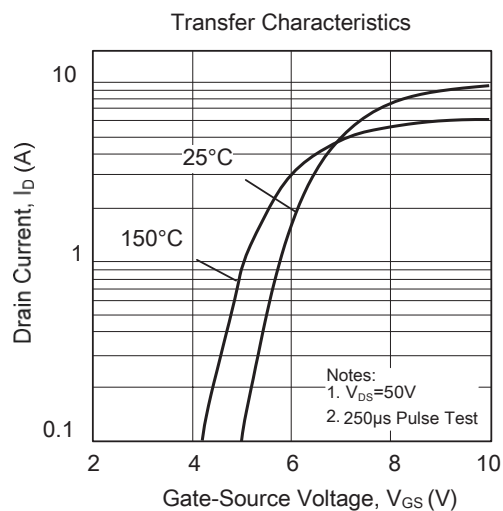
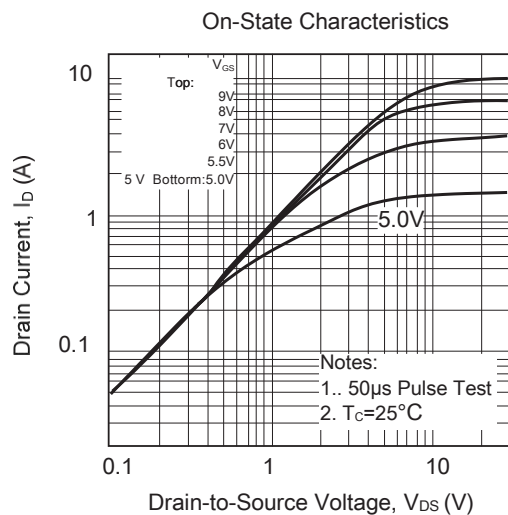
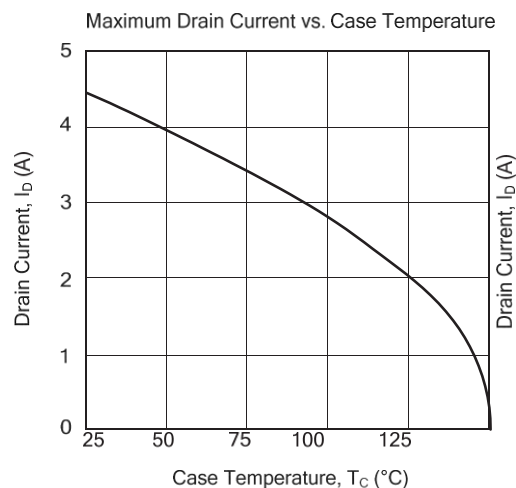
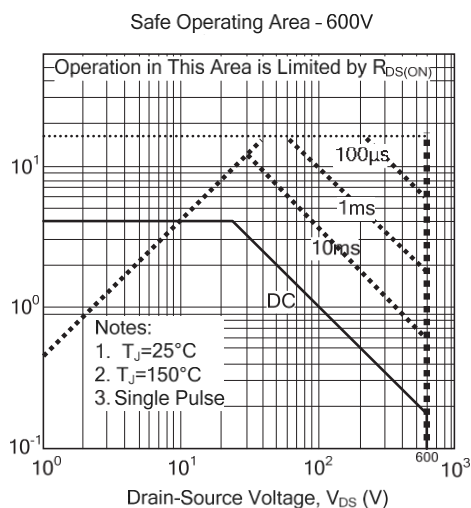
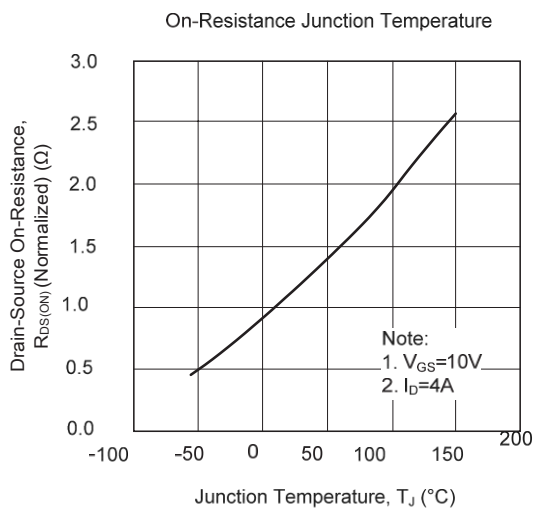
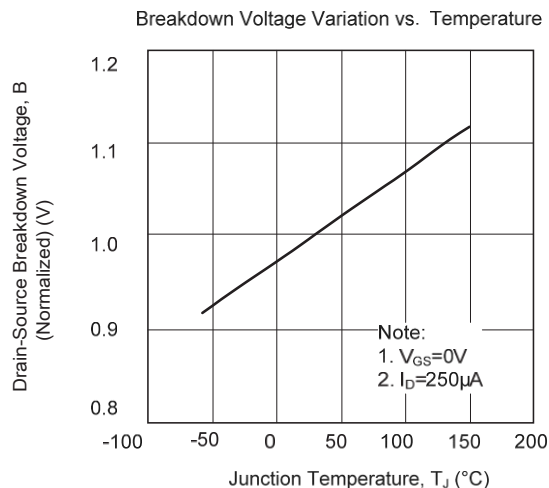


Unclamped Inductive Switching Test Circuit

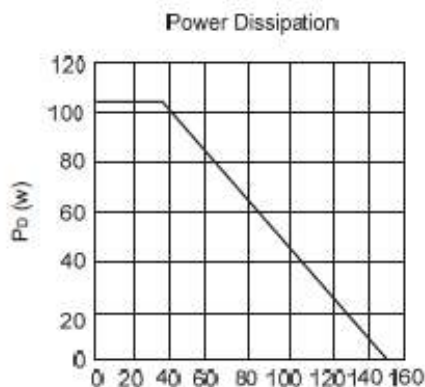
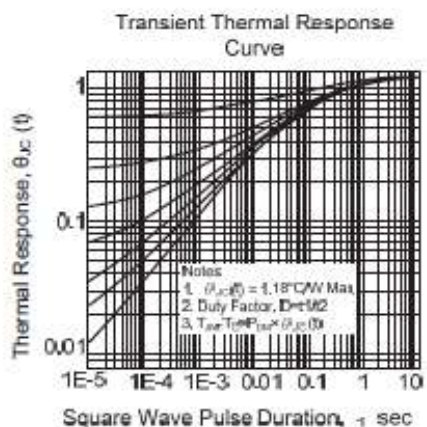
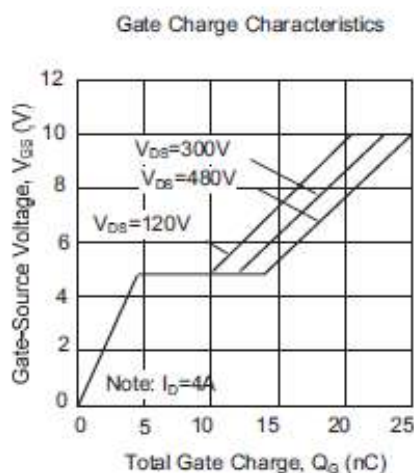
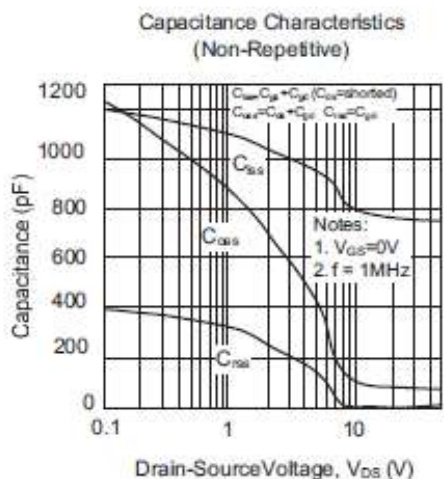
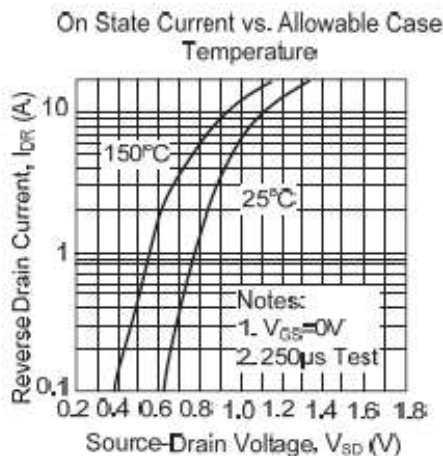
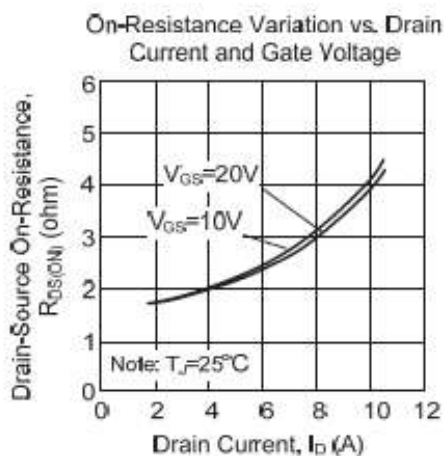


Unclamped Inductive Switching Waveforms

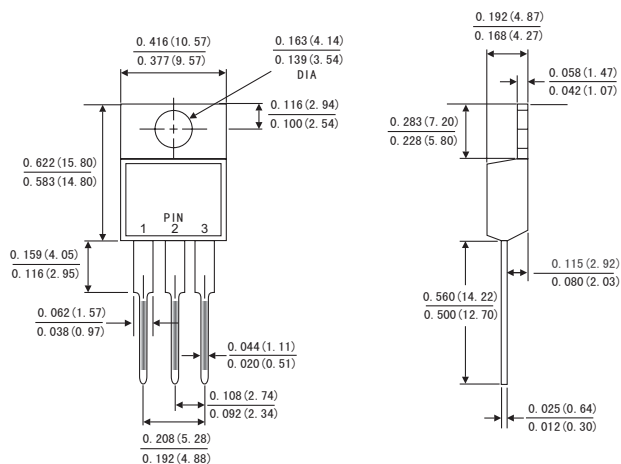
TYPICAL CHARACTERISTICS



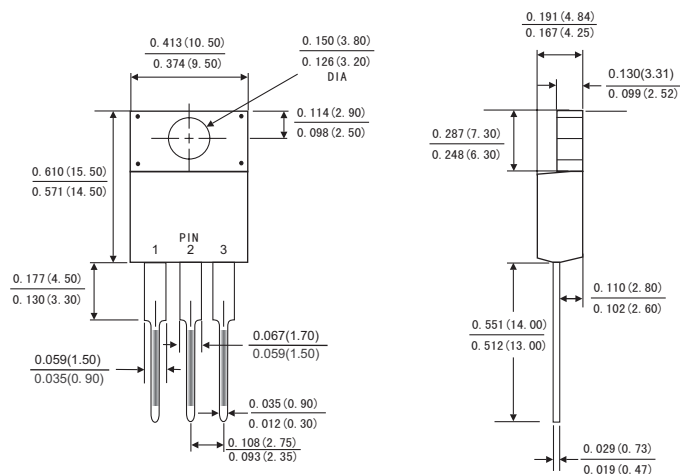
TYPICAL CHARACTERISTICS



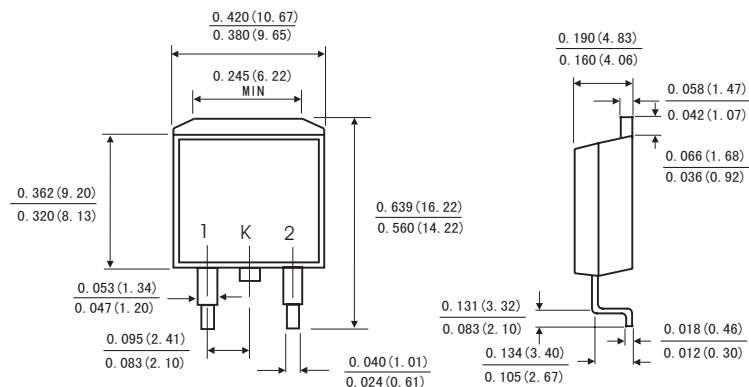
TO-220AB



ITO-220AB



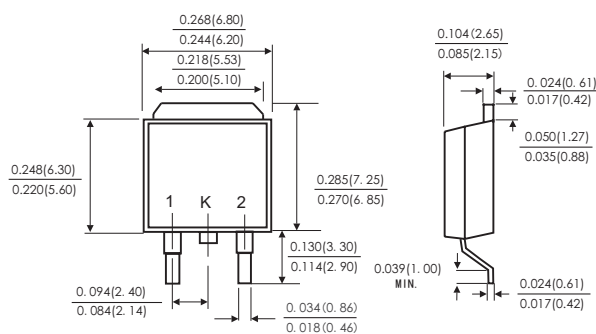
TO-263



Dimensions in inches and (millimeters)

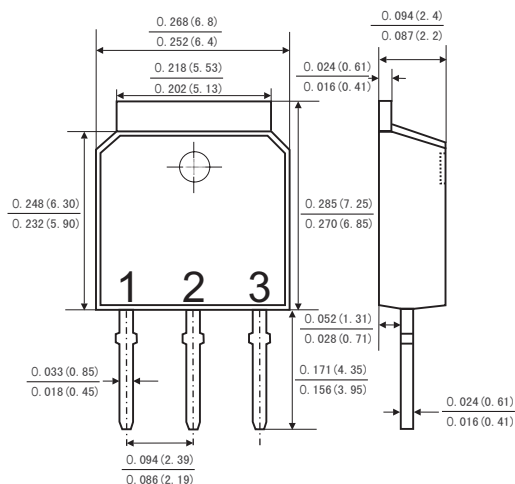
TO-252

(DPAK)



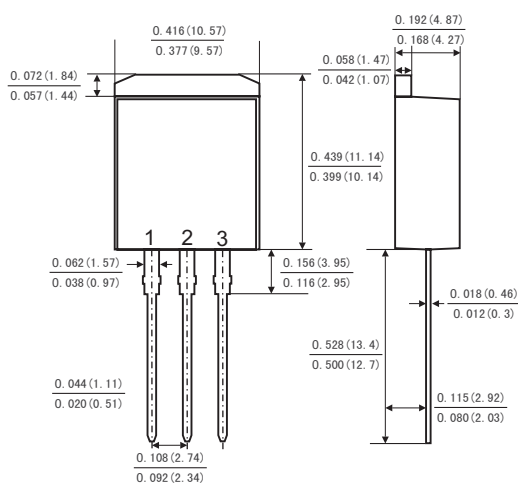
Dimensions in inches and (millimeters)

TO-251



Dimensions in inches and (millimeters)

TO-262



Dimensions in inches and (millimeters)