



4N60

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

PRODUCT SUMMARY

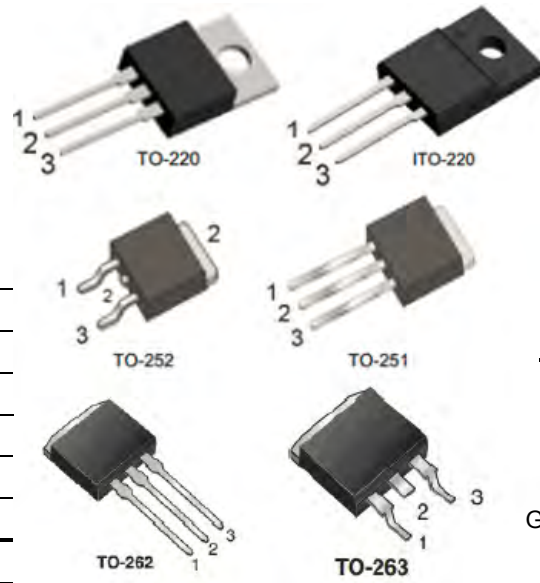
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
600	2.4 @ $V_{GS}=10V$	4

Mechanical Data

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

Ordering Information

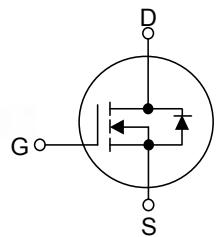
Part No.	Package	Packing
DMP4N60-TU	TO-251	75pcs / Tube
DMD4N60-TR	TO-252	2.5Kpcs / 13" Reel
DMD4N60-TU	TO-252	75pcs / Tube
DMT4N60-TU	TO-220	50pcs / Tube
DMF4N60-TU	ITO-220	50pcs / Tube
DMK4N60-TU	TO-262	50pcs / Tube
DMG4N60-TU	TO-263	50pcs / Tube
DMG4N60-TR	TO-263	800pcs / 13" Reel



Pin Definition:

1. Gate
2. Drain
3. Source

Block Diagram



ABSOLUTE MAXIMUM RATINGS ($T_C=25^\circ C$, 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	Single Pulsed (Note 3)	E_{AS}	217	mJ
Power Dissipation	TO-220/TO-262/TO-263	P_D	106	W
	ITO-220		44	W
	TO-251/TO-252		77	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 maximum junction temperature

3. $L = 30mH$, $I_{AS} = 3.7A$, $V_{DD} = 50V$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ C$



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	

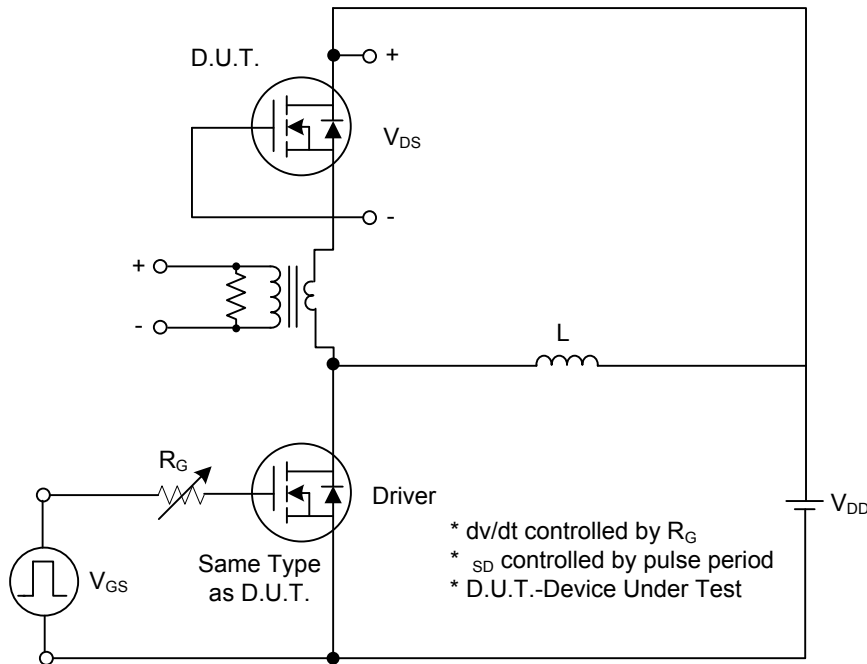
ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 600V, V_{GS} = 0V$			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}			100	nA
	Reverse				$V_{GS} = -30V, V_{DS} = 0V$	-100
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D = 2.0A$		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	$t_{D(ON)}$	$V_{DD} = 300V, I_D = 4.0A,$ $R_G = 25\Omega$ (Note 1, 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	$V_{DS}= 480V, I_D= 4.0A,$ $V_{GS}= 10V$ (Note 1, 2)		80		nC
Gate-Source Charge	Q_{GS}			5		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}	$V_{GS} = 0V, I_S = 4A,$		400		ns
Reverse Recovery Charge	Q_{RR}	$dI_F/dt = 100 A/\mu s$ (Note 1)		1.7		μC

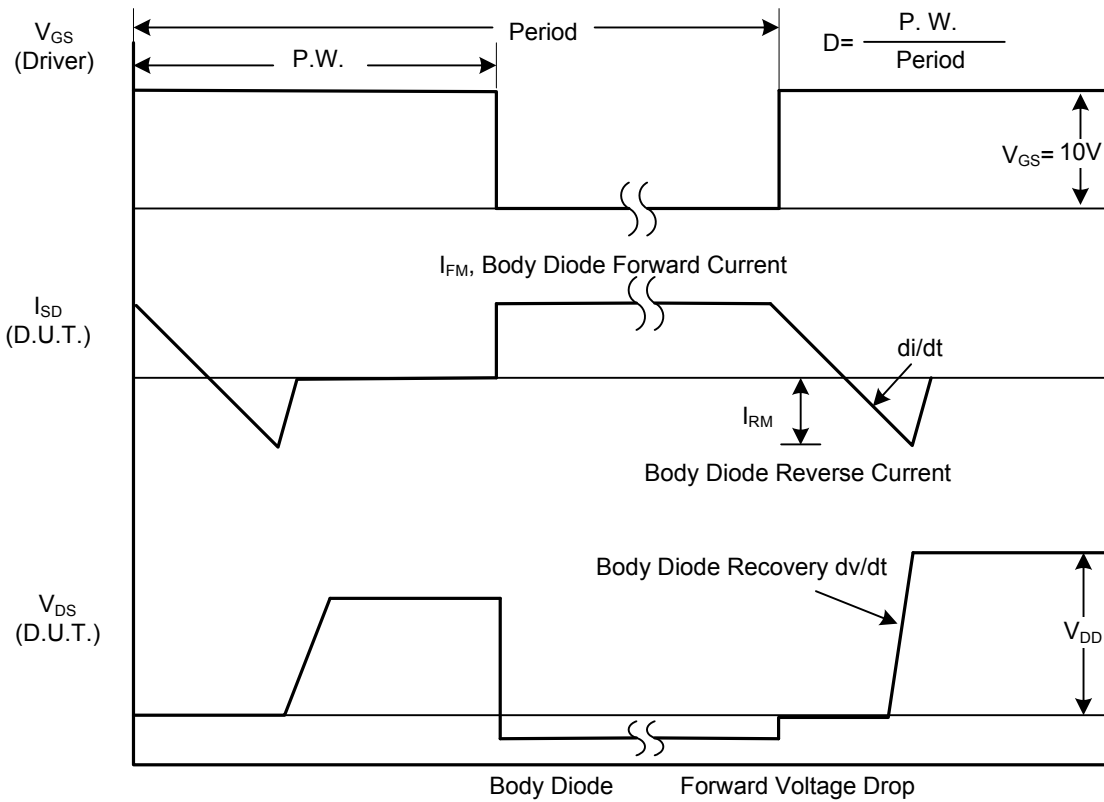
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
 2. Essentially independent of operating temperature



TEST CIRCUITS AND WAVEFORMS



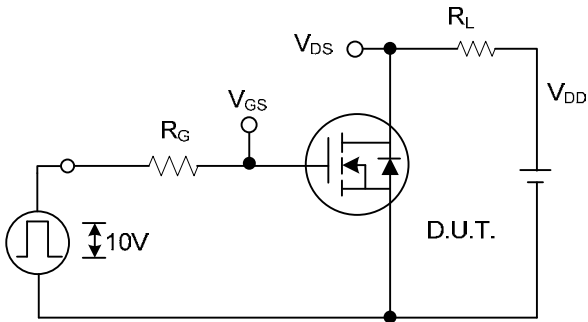
Peak Diode Recovery dv/dt Test Circuit



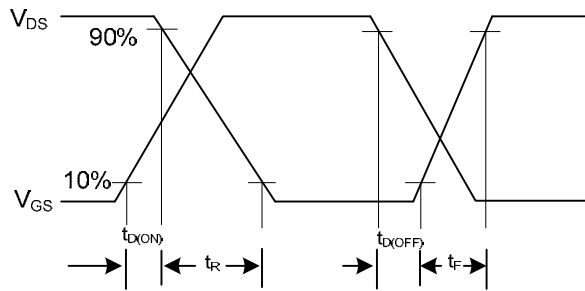
Peak Diode Recovery dv/dt Waveforms



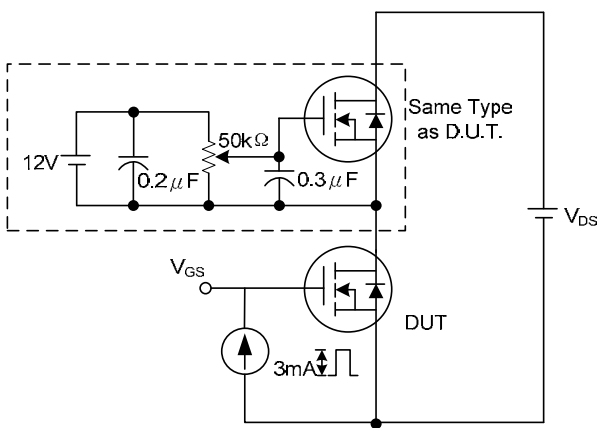
TEST CIRCUITS AND WAVEFORMS(Cont.)



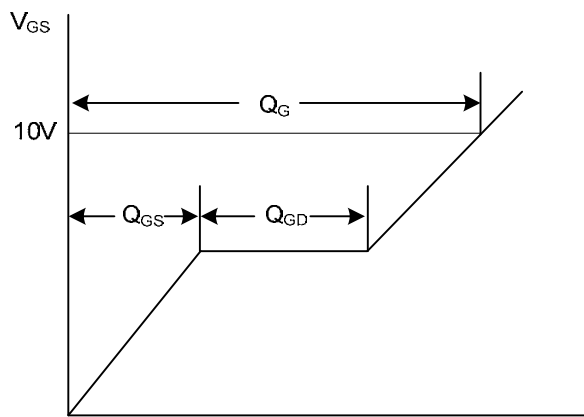
Switching Test Circuit



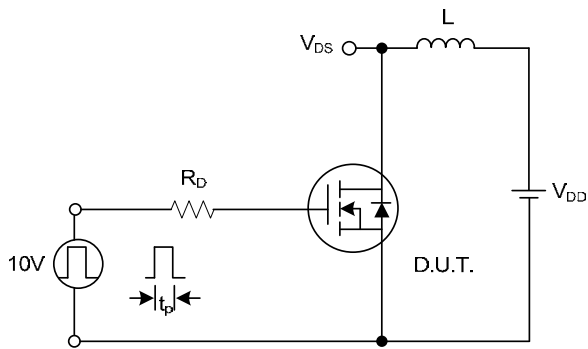
Switching Waveforms



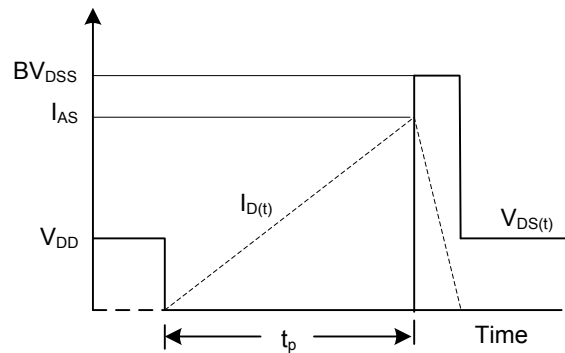
Gate Charge Test Circuit



Charge
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

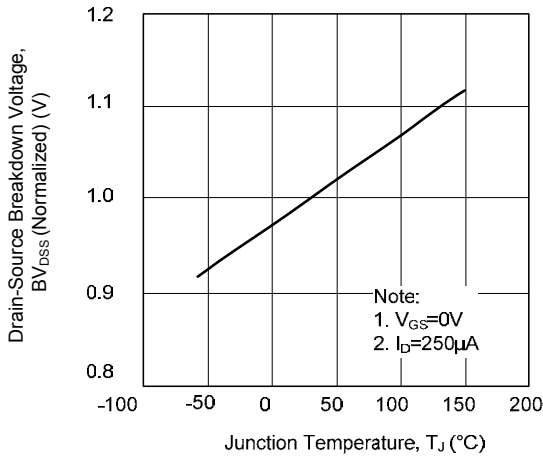


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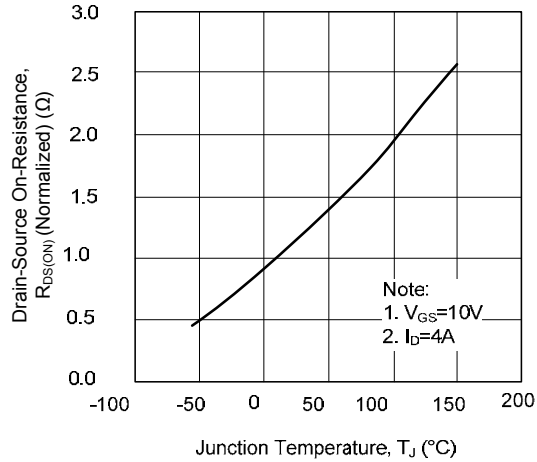
600V N-Channel Power MOSFET

TYPICAL CHARACTERISTICS

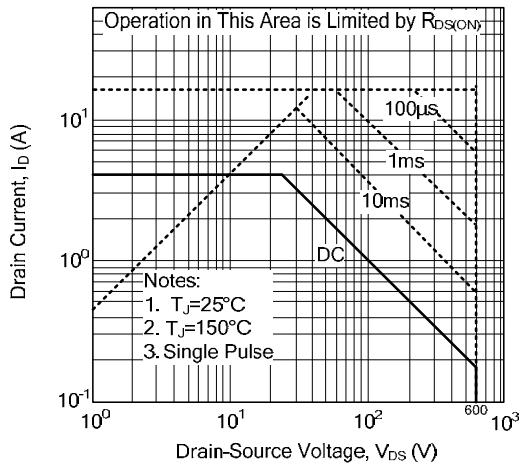
Breakdown Voltage Variation vs. Temperature



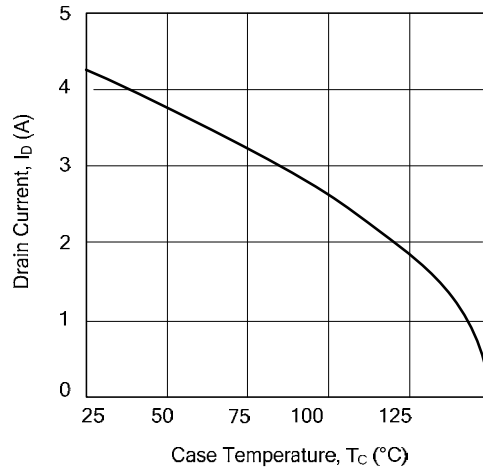
On-Resistance Junction Temperature



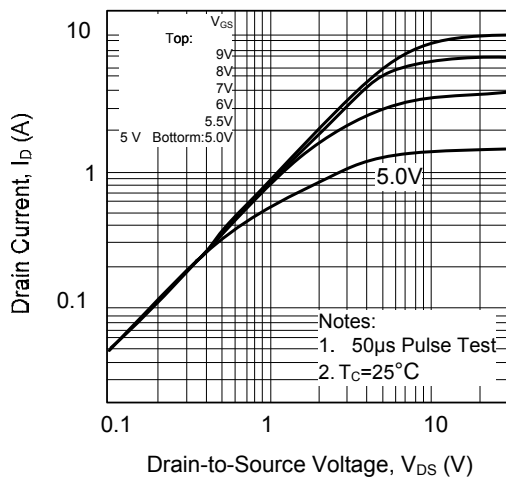
Safe Operating Area - 600V



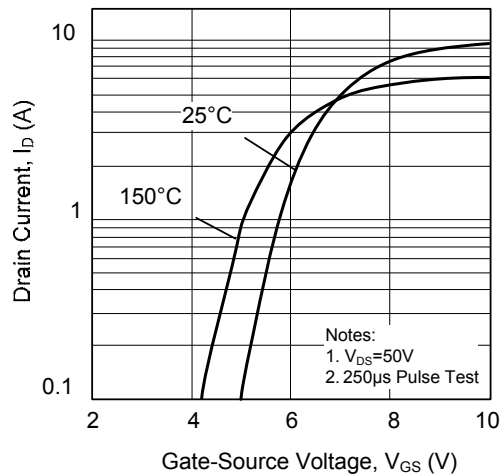
Maximum Drain Current vs. Case Temperature



On-State Characteristics

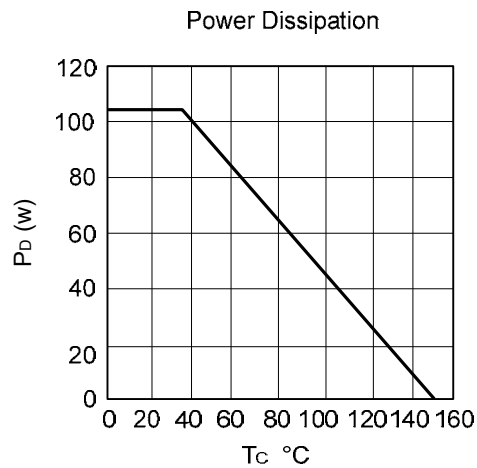
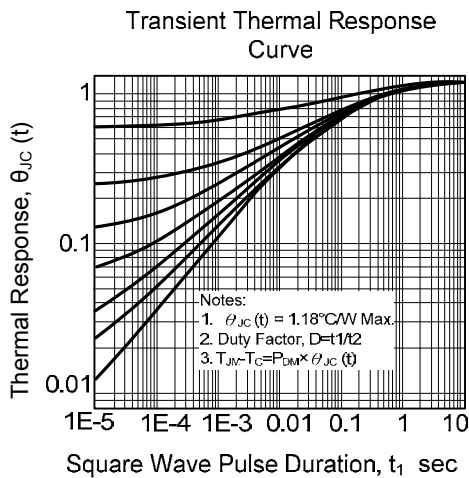
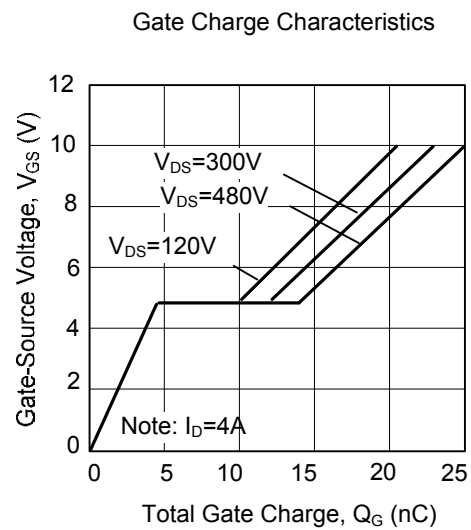
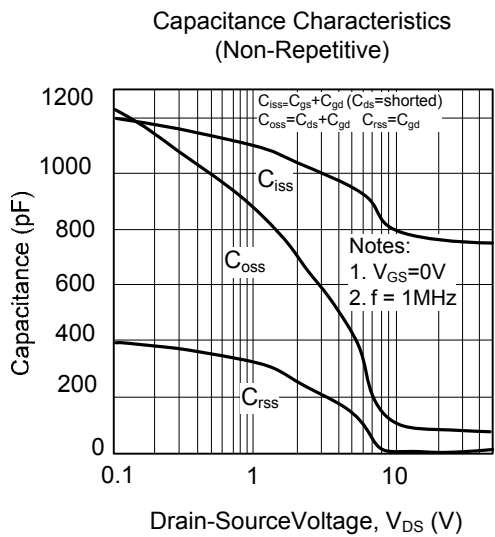
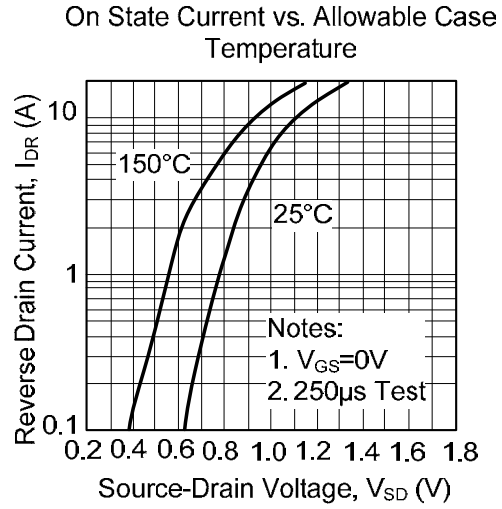
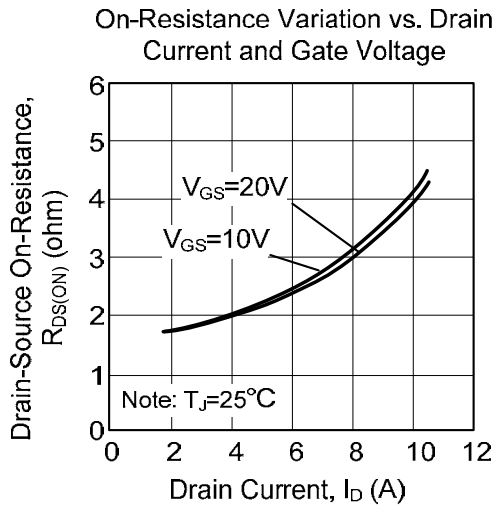


Transfer Characteristics



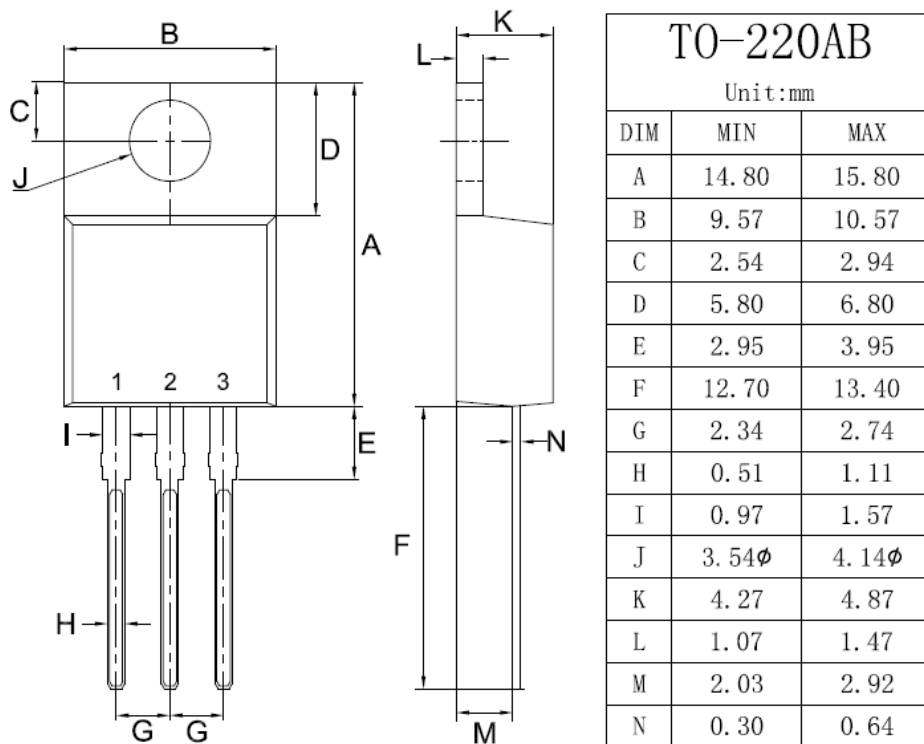


TYPICAL CHARACTERISTICS(Cont.)

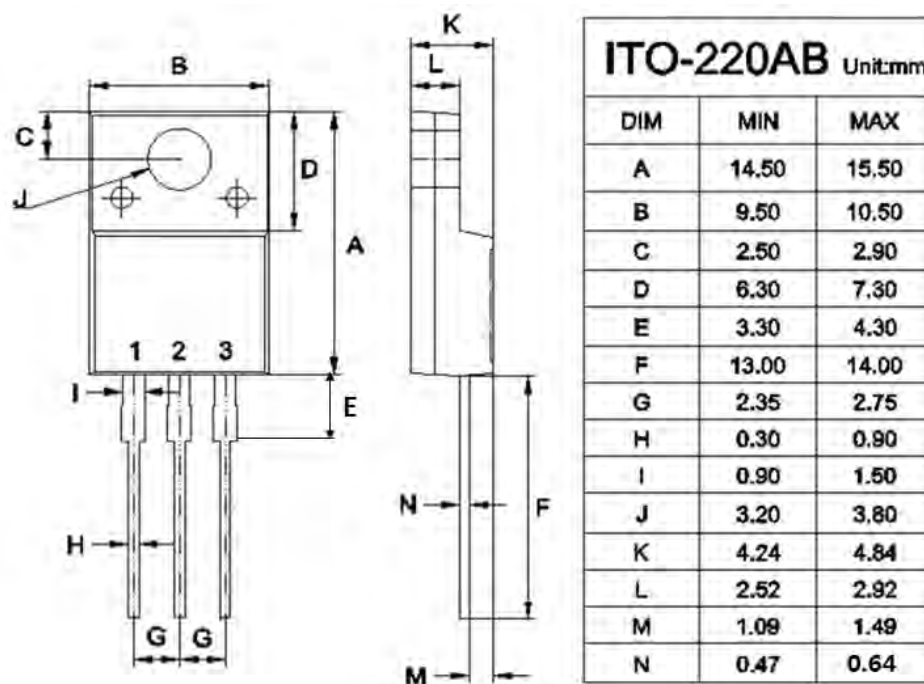




TO-220 Mechanical Drawing

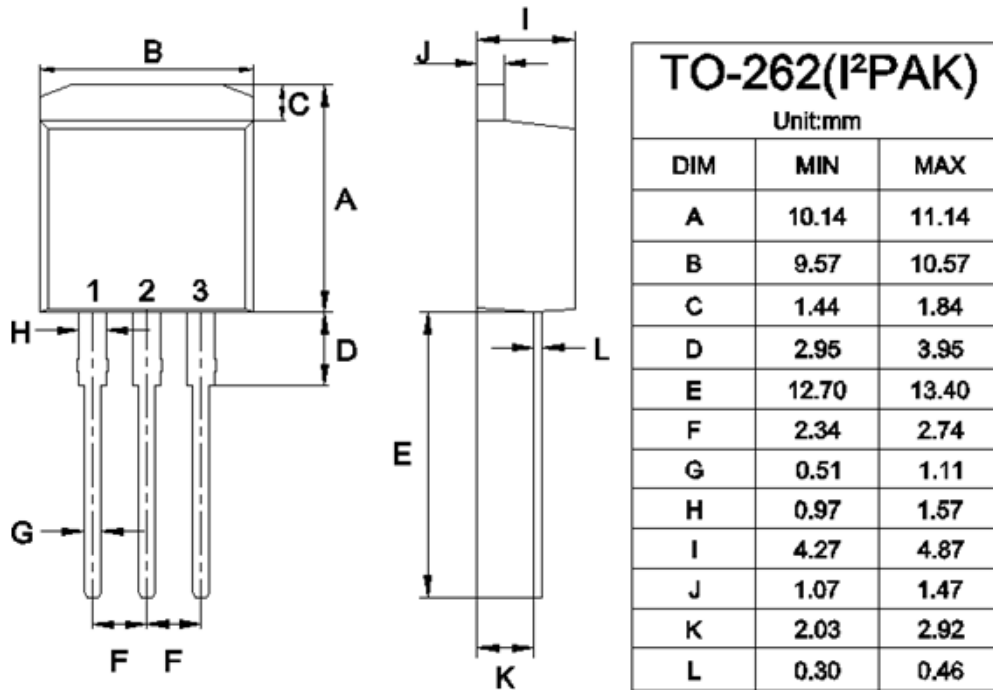


ITO-220 Mechanical Drawing

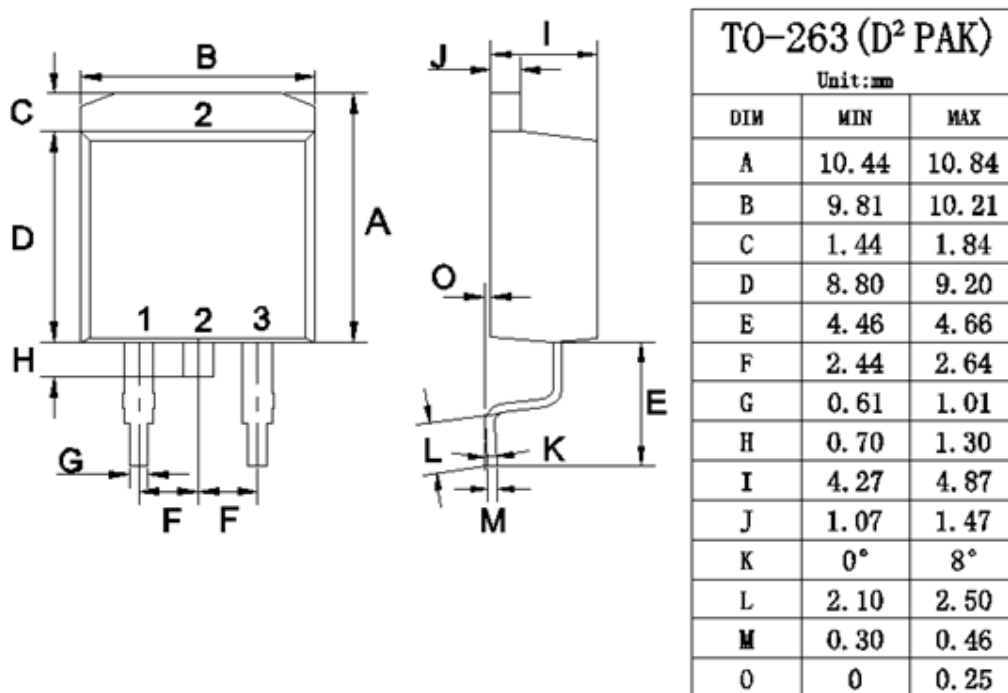




TO-262 Mechanical Drawing

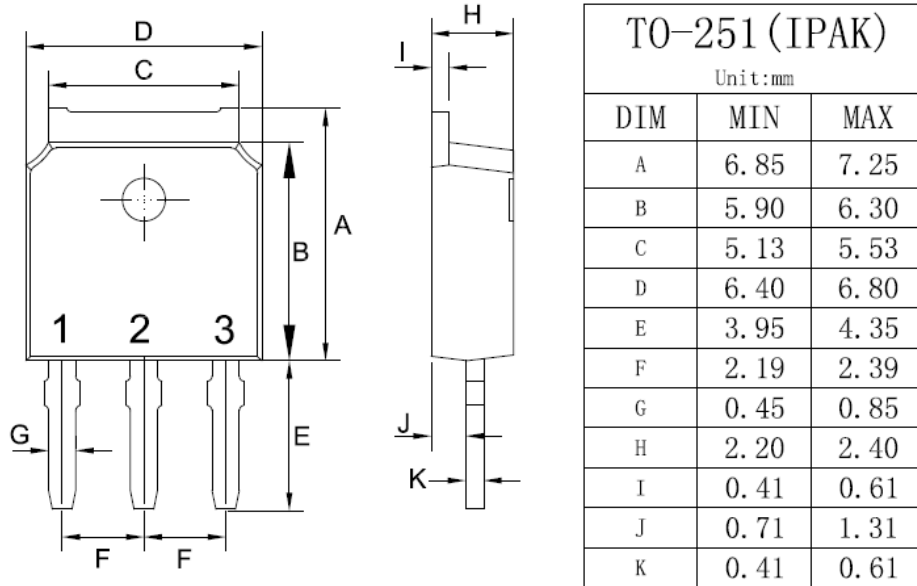


TO-263 Mechanical Drawing

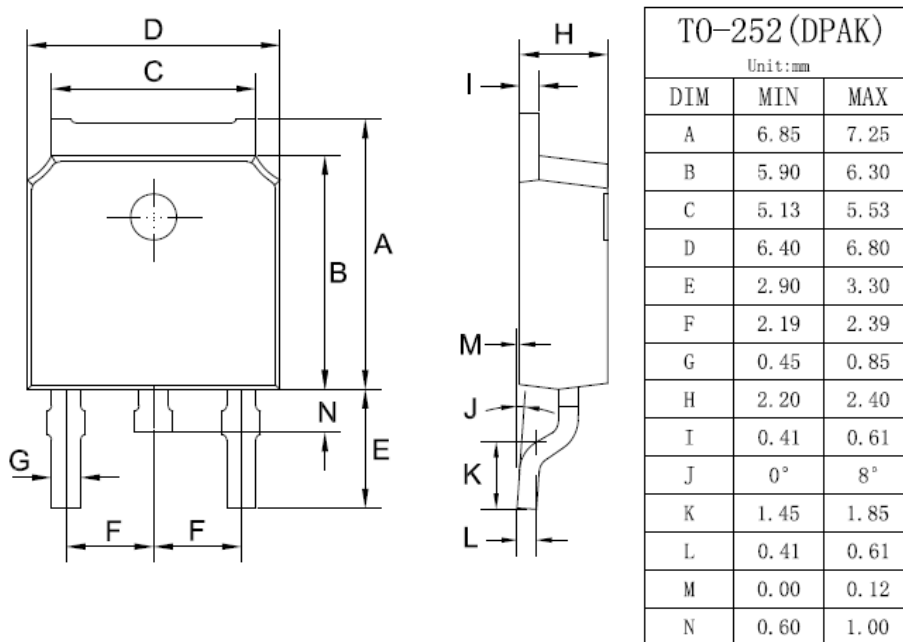




TO-251 Mechanical Drawing



TO-252 Mechanical Drawing



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