

Description

The WTM18N20VP/VD is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in switching power supplies and adaptors.

Features

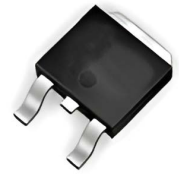
- $R_{DS(ON)} \leq 0.2 \Omega$ @ $V_{GS}=10V$, $I_D=9A$
- Fast switching capability
- Avalanche energy tested
- Improved dv/dt capability, high ruggedness

Mechanical data

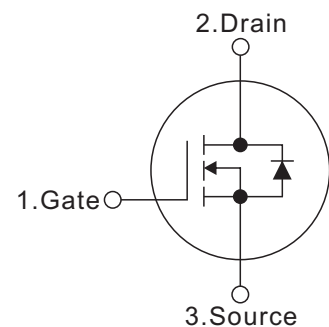
- Case: TO-220/TO-252
- Approx. Weight: 2.0g (0.07oz)/0.33g (0.012oz)
- RoHS compliant
- Case Material: "Green" molding compound, UL flammability classification 94V-0, "Halogen-free".



TO-220



TO-252



Device	Package	Marking	Packaging
WTM18N20VP/VD	TO-220 TO-252	WPM 18N20VP/VD XXX YYWW	50pcs/Tube 2.5K pcs/Tray

Absolute Maximum Ratings ($T_a=25^\circ\text{C}$, unless otherwise specified)

Parameter		Symbols	Ratings	Units
Drain-Source Voltage		V_{DS}	200	V
Gate-Source Voltage		V_{GS}	± 30	V
Continuous Drain Current	$T_c=25^\circ\text{C}$	I_D	18	A
	$T_c=100^\circ\text{C}$		13.6	A
Pulsed Drain Current (Note 2)		I_{DM}	72	A
Avalanche Energy Single Pulsed (Note 3)		E_{AS}	180	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.1	V/ns
Power Dissipation		P_D	62.5	W
Operation Junction Temperature and Storage Temperature		T_j, 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. $L = 10\text{mH}$, $V_{DD} = 50\text{V}$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $ISD \leq 18\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BVDSS$, Starting $T_J = 25^\circ\text{C}$

THERMAL DATA

Parameter	Symbols	Ratings	Units
Junction to Ambient	R_{thJA}	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	R_{thJC}	2.0	$^\circ\text{C}/\text{W}$

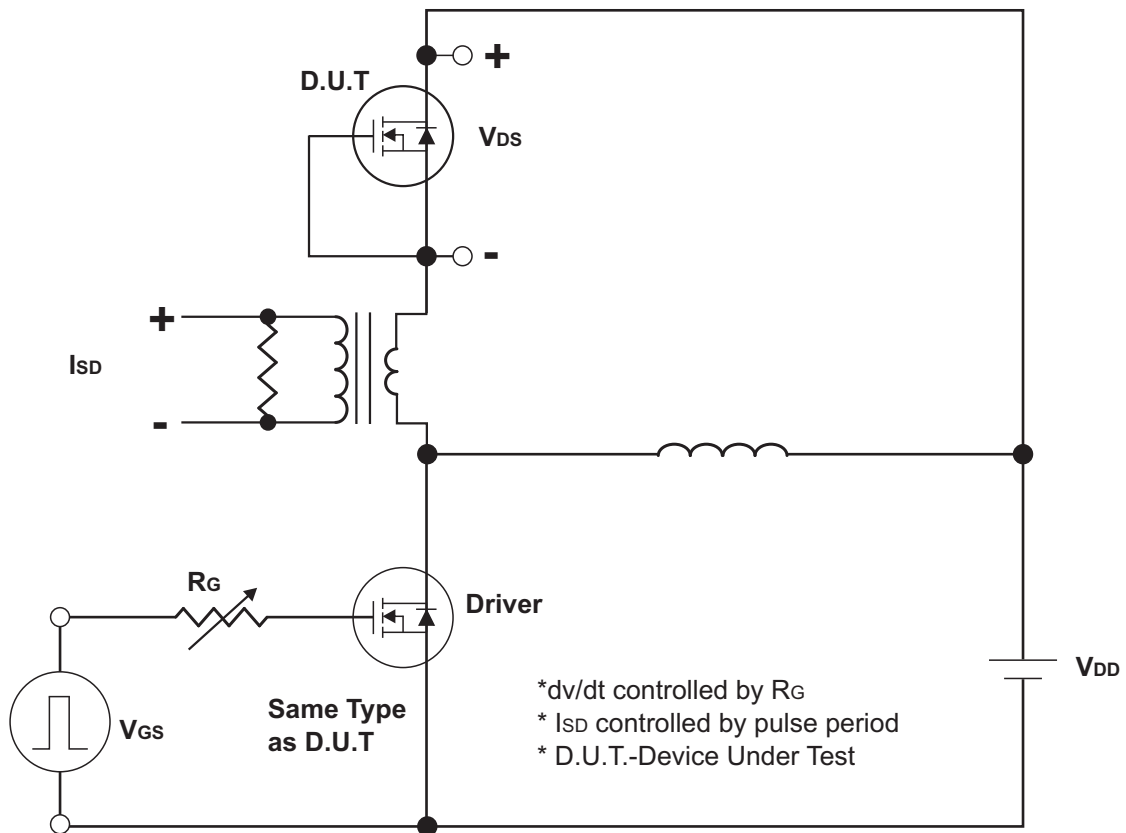
ELECTRICAL CHARACTERISTICS (TA=25°C, unless otherwise specified)

Parameter		Symbols	Test Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V,I _D =250uA	200			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =200V,V _{GS} =0V			1	uA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V,V _{DS} =0V			100	nA
	Reverse		V _{GS} =-30V,V _{DS} =0V			-100	
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} ,I _D =250uA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V,I _D =9A		0.16	0.20	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz		1230		pF
Output Capacitance		C _{OSS}			154		pF
Reverse Transfer Capacitance		C _{RSS}			6.6		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =160V,V _{GS} =10V, I _D =18A,I _G =1mA (NOTE1,2)		31		nC
Gate-Source Charge		Q _{GS}			3.3		nC
Gate-Drain Charge		Q _{GD}			16.5		nC
Turn-On Delay Time (Note 1)		t _{D(ON)}	V _{DS} =100V,V _{GS} =10V, I _D =18A,R _G =20Ω (NOTE1,2)		35		ns
Turn-On Rise Time		t _R			20		ns
Turn-Off Delay Time		t _{D(OFF)}			150		ns
Turn-Off Fall Time		t _F			36		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Body-Diode Continuous Current		I _S				18	A
Maximum Body-Diode Pulsed Current		I _{SM}				72	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =18A,V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)		t _{rr}	I _F =18A		370		ns
Reverse Recovery Charge		Q _{rr}	di/dt=100A/us		0.95		uC

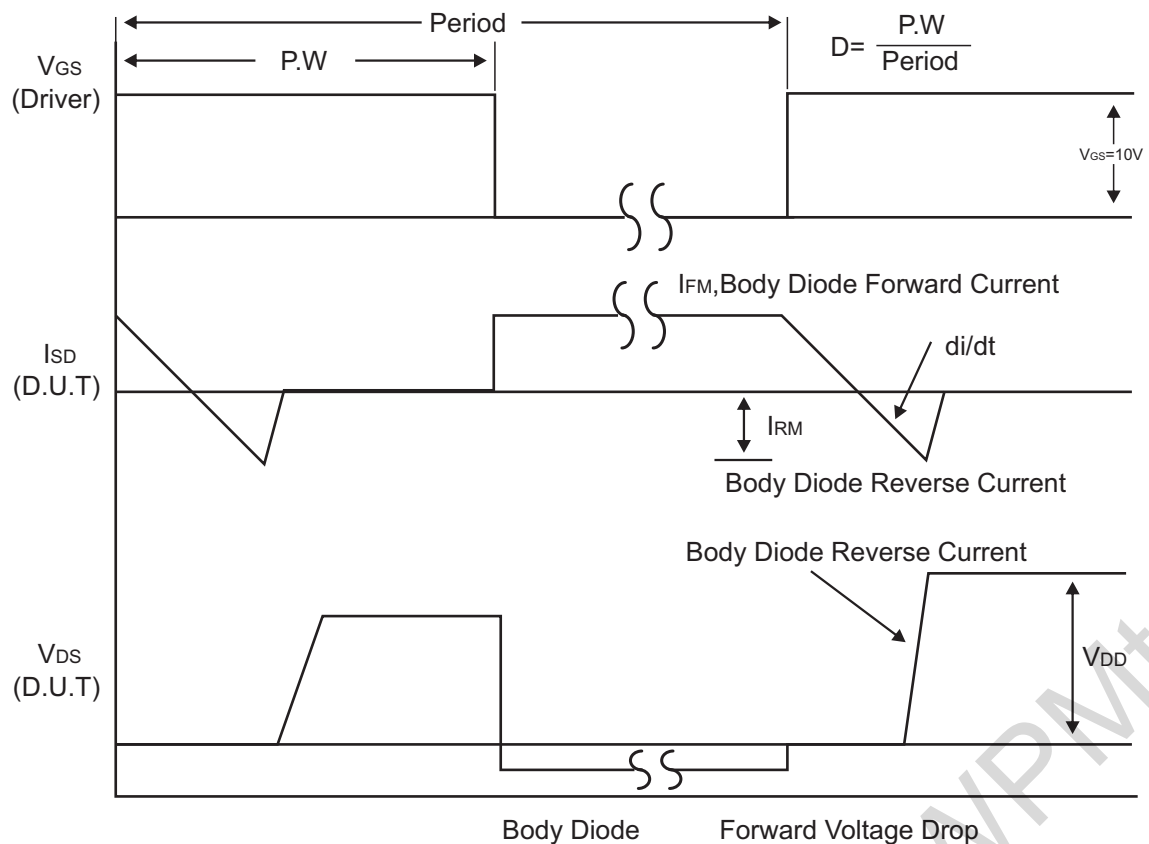
Notes:

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

Test Circuits and waveforms

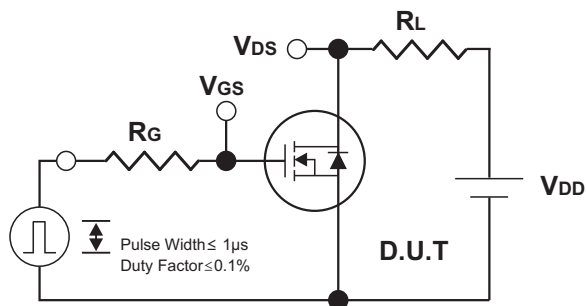


Peak Diode Recovery dv/dt Test Circuit

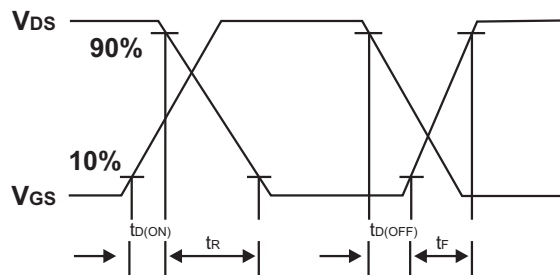


Peak Diode Recovery dv/dt Waveforms

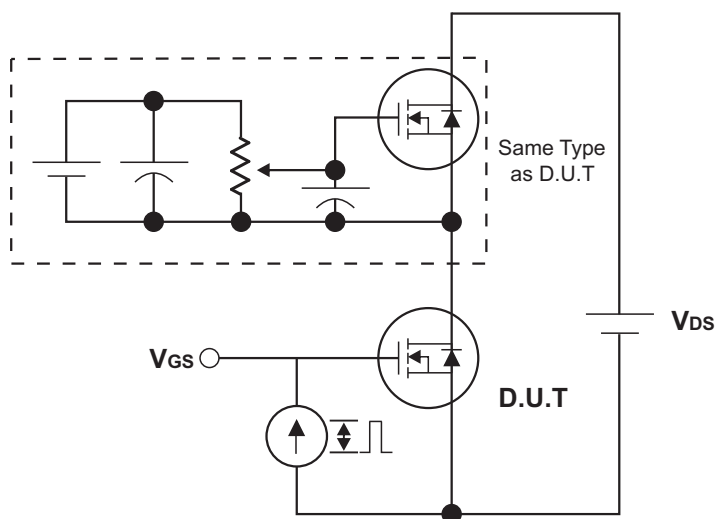
Test Circuits and waveforms



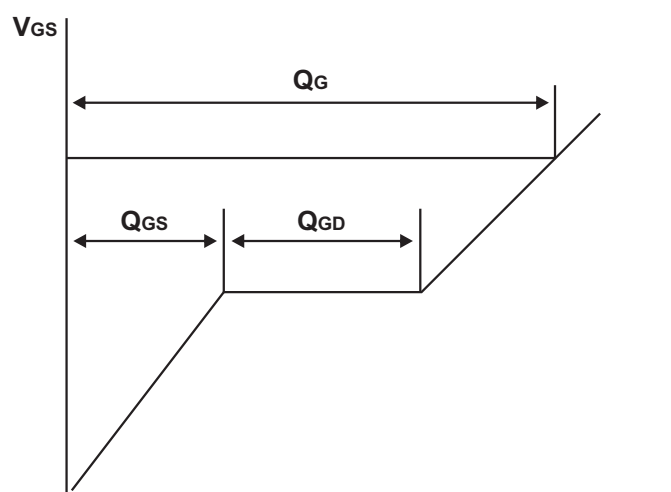
Switching Test Circuit



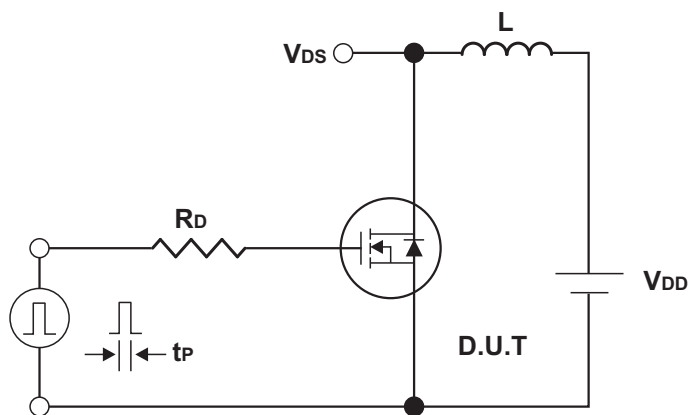
Switching Waveforms



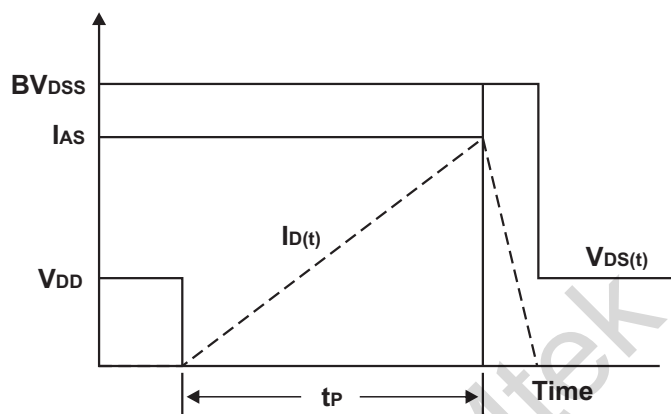
Gate Charge Test Circuit



Charge
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

Typical Characteristics

Fig.1 Typical Output Characteristics

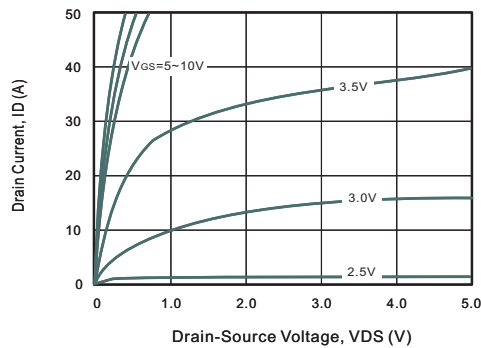


Fig.2 Power Dissipation

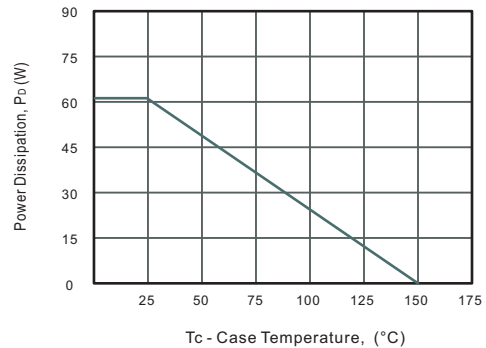


Fig.3 Drain Current Derating

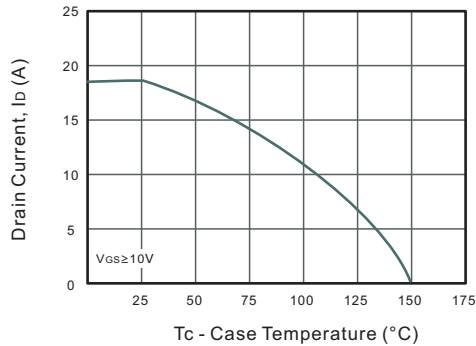


Fig.4 Drain-Source On-Resistance vs. Drain Current

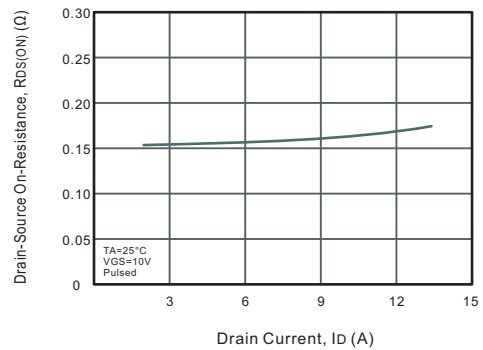


Fig.5 Gate Threshold Voltage vs. Junction Temperature

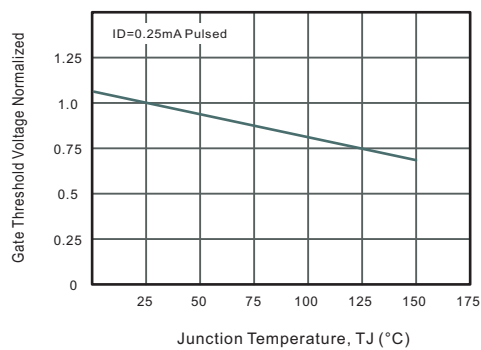


Fig.6 Body-diode Forward Characteristics

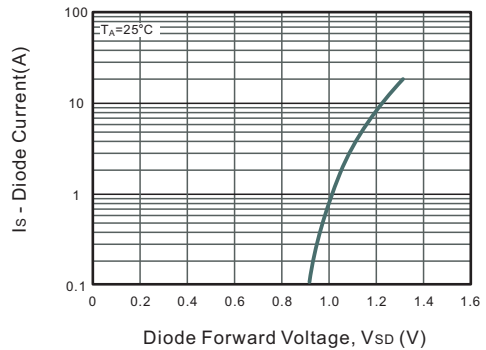


Fig.7 Drain-Source On-Resistance vs. Junction Temperature

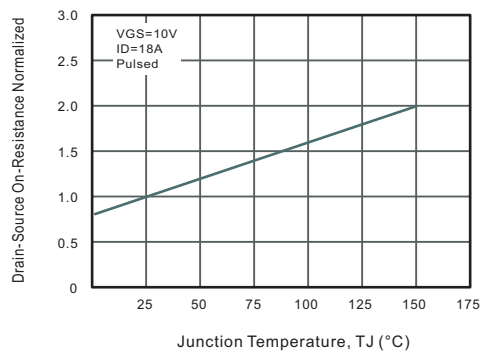
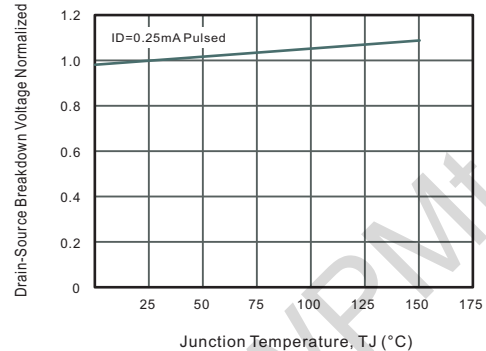


Fig.8 Breakdown Voltage vs. Junction Temperature



Typical Characteristics

Fig.9 Capacitance Characteristics

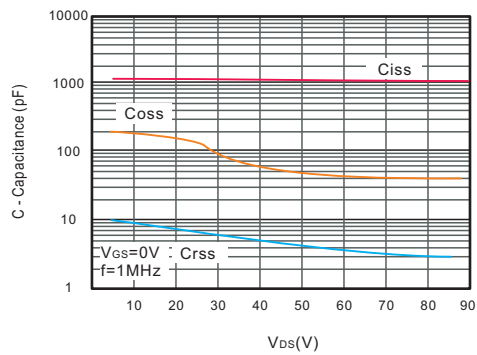


Fig.10 Gate Charge Characteristics

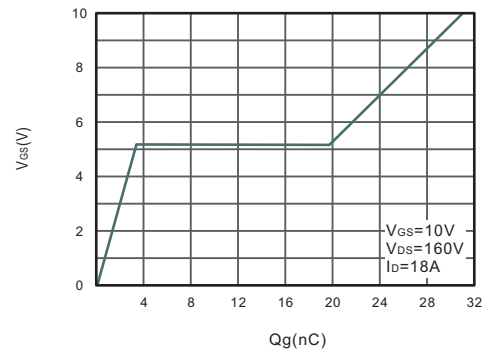


Fig.11 Safe Operating Area

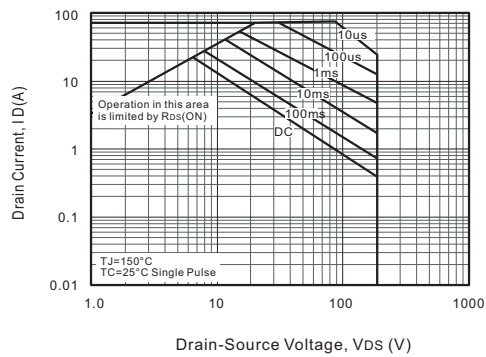
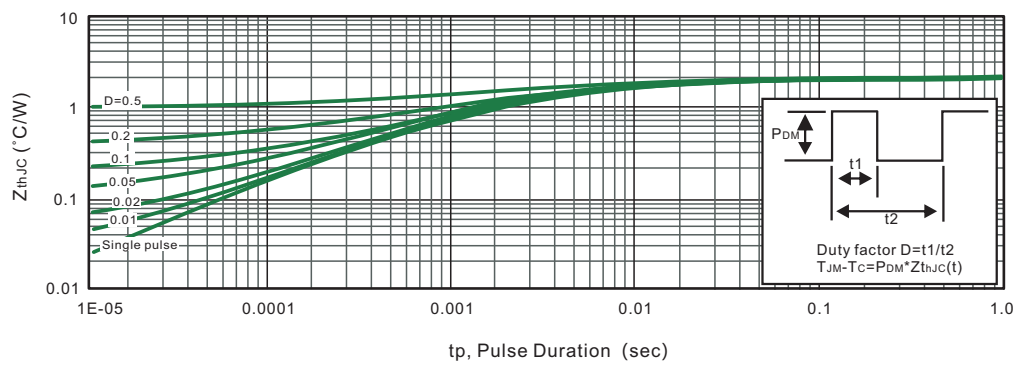
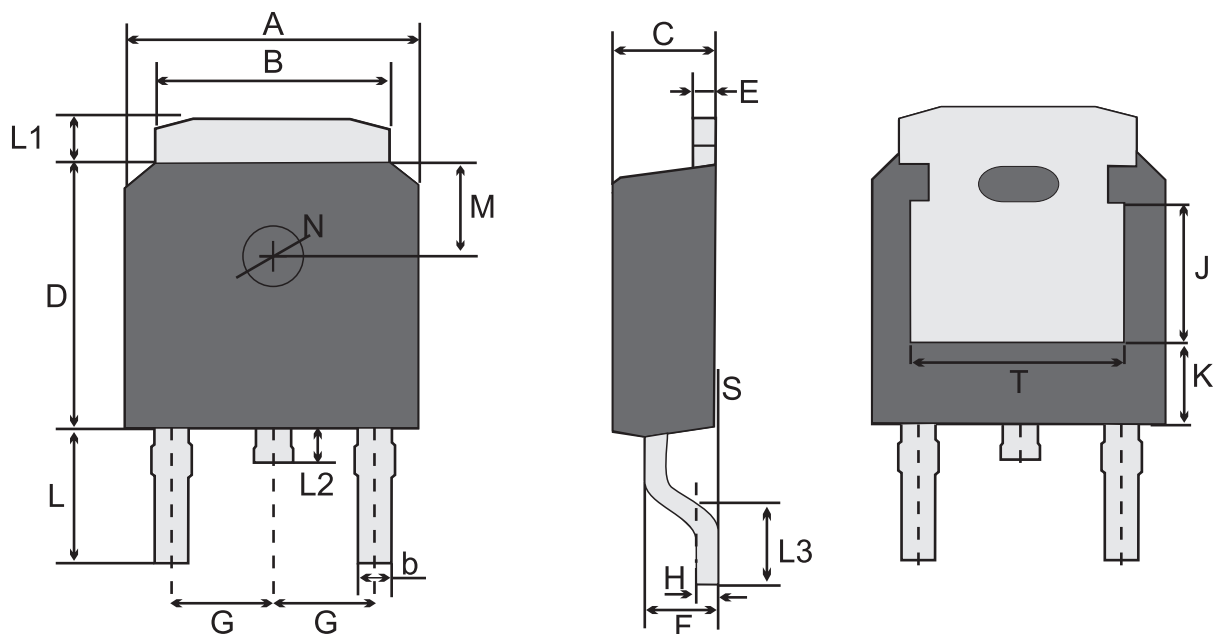


Fig.12 Max. Transient Thermal Impedance



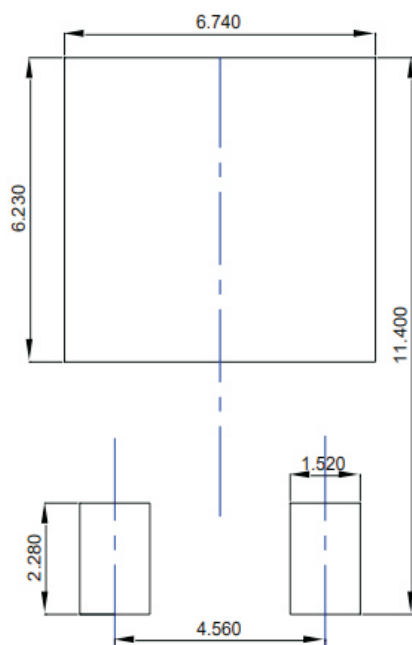
Package Outline
Through Hole Package ; 3 leads

TO-252



TO-252 mechanical data

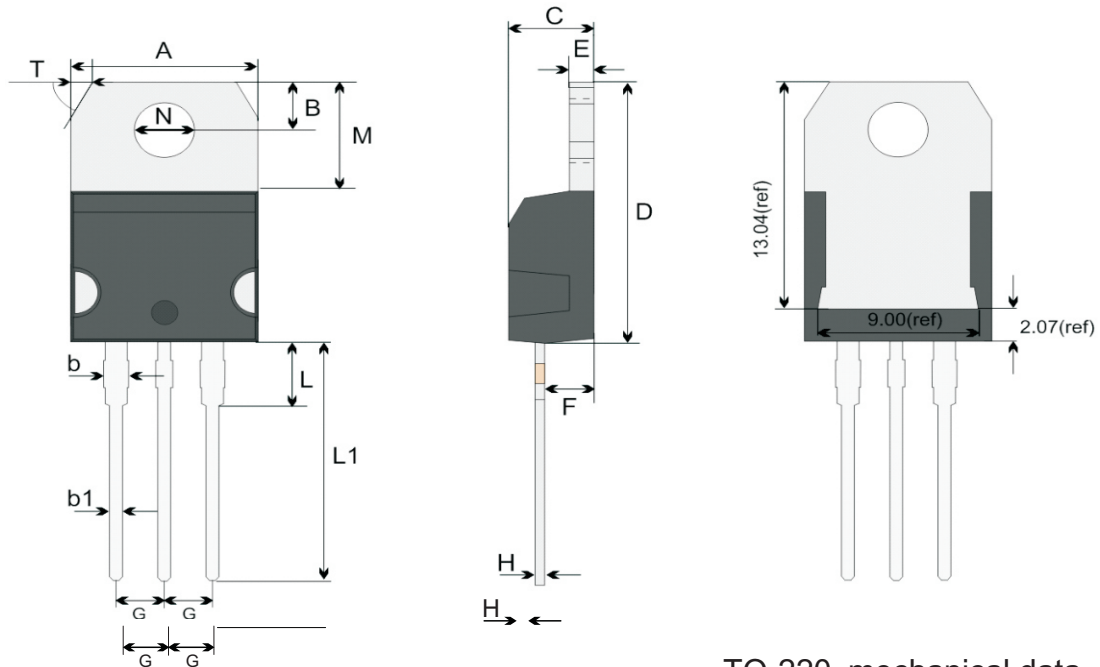
UNIT		A	B	b	C	D	E	F	G	H	L	L1	L2	L3	S	M	N	J	T	K
mm	max	6.7	5.53	0.86	2.5	6.3	0.61	1.87	2.3 typ.	0.55	3.1	1.2	1.0	1.75	0.1	1.8 typ.	1.3 typ.	3.2 ref.	4.83 ref.	1.8 ref.
	typ	6.6	5.33	0.76	2.3	6.1	0.51	1.57		0.50	2.95	1.0	0.8	1.30	0.05					
	min	6.3	5.13	0.66	2.1	5.9	0.41	1.27		0.45	2.7	0.8	0.6	1.0	/					
mil	max	264	218	34	98	248	24	74	91 typ.	22	121	47	39	69	3.9	71 typ.	51 typ.	126 ref.	190 ref.	71 ref.
	typ	260	210	30	91	240	20	62		20	116	39	31	51	2					
	min	248	202	26	83	232	16	50		18	106	31	24	39	/					



SUGGESTED SOLDER PAD LAYOUT

Package Outline
Through Hole Package ; 3 leads

TO-220



TO-220 mechanical data

UNIT		A	B	b	b1	C	D	E	F	G	H	L	L1	M	N	T
mm	max	10.28	2.84	1.67	0.9	4.65	15.54	1.37	2.79	2.64	0.6	3.88	13.13	6.39	3.82 typ.	1.19 58° ref.
	typ	10.18	2.74	1.47	0.8	4.45	15.34	1.27	2.59	2.54	0.5	3.68	12.93	6.19		
	min	10.08	2.64	1.27	0.7	4.25	15.14	1.17	2.39	2.44	0.4	3.48	12.73	5.99		
mil	max	405	112	66	35	183	612	54	110	104	24	153	517	252	150 typ.	47 58° ref.
	typ	401	108	58	31	175	604	50	102	100	20	145	509	244		
	min	397	104	50	28	167	596	46	94	96	16	137	501	236		

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