



## -50A, -60V P-CHANNEL POWER MOSFET

### Description

This model is an advanced trench MOSFET with better characteristics, such as fast switching time, low gate charge and low on state resistance.

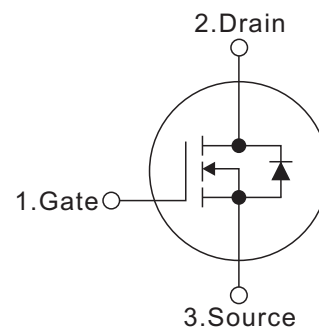
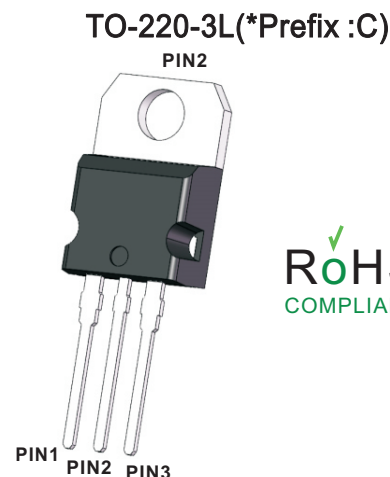
Such enhanced MOSFET are commonly used in switching power supplies and adapters for high-speed switching applications.

### Features

- $R_{DS(ON)} < 22m\Omega @ V_{GS} = -10V, I_D = -25A$
- Extremely low on impedance
- Low gate charge
- Superior switching characteristics

### Mechanical data

- Case: TO-220-3L
- Approx. Weight: 2.04g (0.072oz)
- RoHS compliant
- Case Material: "Green" molding compound, UL flammability classification 94V-0, "Halogen-free".



### Absolute Maximum Ratings (Ta=25°C, Unless Otherwise Specified)

Parameter	Symbols	Ratings	Units
Drain-Source Voltage	$V_{DSS}$	-60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	-50 -35.4	A
		$T_c = 25^\circ C$ $T_c = 100^\circ C$	
Pulsed Drain Current (Note 2)	$I_{DM}$	-200	A
Avalanche Energy Single Pulsed (Note 3)	$E_{AS}$	490	mJ
Power Dissipation	$P_D$	115	W
Operating junction and storage temperature	$T_J, T_{STG}$	-55 ~ +150	$^\circ C$

#### Notes:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.
2. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
3. Repetitive Rating: Pulse width limited by maximum junction temperature.  
L = 0.5mH, IAS=10A, VDD = 50V, RG = 25  $\Omega$ , Starting  $T_J = 25^\circ C$

### Thermal Resistance

Parameter	Symbols	Ratings	Units
Thermal resistance, junction – case.	$R_{thJC}$	1.08	$^\circ C/W$
Thermal resistance, junction – ambient(min. footprint)	$R_{thJA}$	62	$^\circ C/W$



Electrical Characteristics (Ta=25°C, Unless Otherwise Specified)

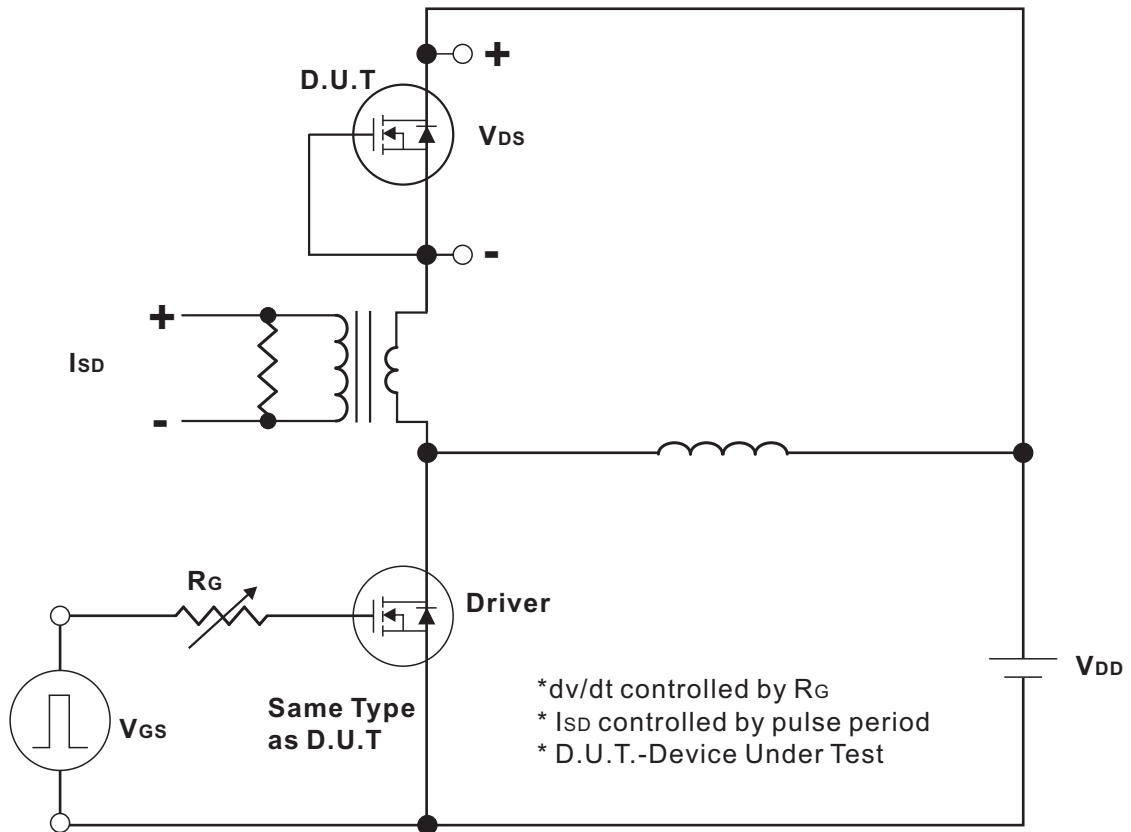
Parameter	Symbols	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{DS}=0V, I_D=-250\mu A$	-60			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=-60V, V_{GS}=0V$			1	$\mu A$
Gate- Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse				-100	
<b>On Characteristics</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0		-3.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-25A$		18	22	m $\Omega$
		$V_{GS}=-4.5V, I_D=-10A$		20	26	
Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=10A$		10		S
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=-25V,$ $V_{GS}=0V,$ $f=1.0MHz$		1050		pF
Output Capacitance	$C_{OSS}$			460		pF
Reverse Transfer Capacitance	$C_{RSS}$			70		pF
Gate resistance	$R_G$			4		$\Omega$
<b>Switching Characteristics</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=-48V, V_{GS}=-10V,$ $I_D=-50A$ (NOTE1,2)		32		nC
Gate-Source Charge	$Q_{GS}$			8		nC
Gate-Drain Charge	$Q_{GD}$			12		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=-30V, V_{GS}=-10V,$ $I_D=-25A, R_G=25\Omega$ (NOTE1,2)		20		ns
Turn-On Rise Time	$t_R$			100		ns
Turn-Off Delay Time	$t_{D(OFF)}$			80		ns
Turn-Off Fall Time	$t_F$			85		ns
<b>Drain-Source Diode Characteristics And Maximum Ratings</b>						
Maximum Body-Diode Continuous Current	$I_S$				-50	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$I_S=-50A, V_{GS}=0V$			-1.5	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$I_S=-50A, V_{GS}=0V,$ $di/dt=100A/\mu s$		200		ns
Reverse Recovery Charge	$Q_{rr}$			135		nC

Notes:

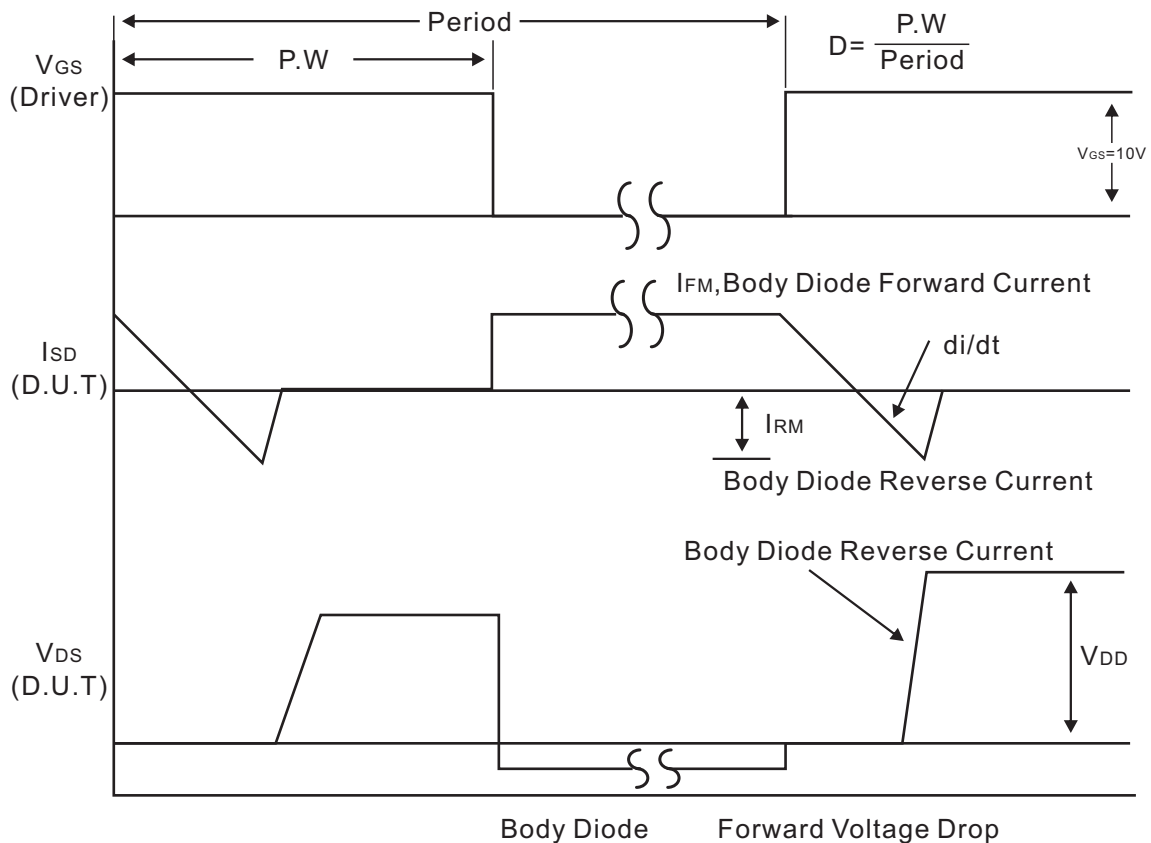
1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .
2. Essentially independent of operating temperature.



Test Circuits and waveforms



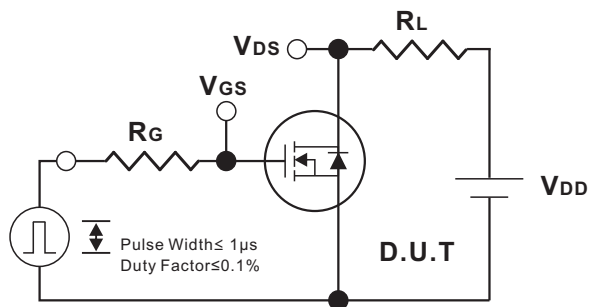
Peak Diode Recovery dv/dt Test Circuit



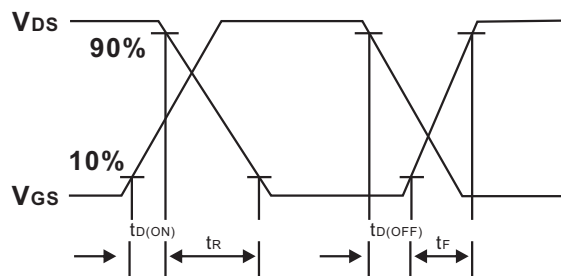
Peak Diode Recovery dv/dt Waveforms



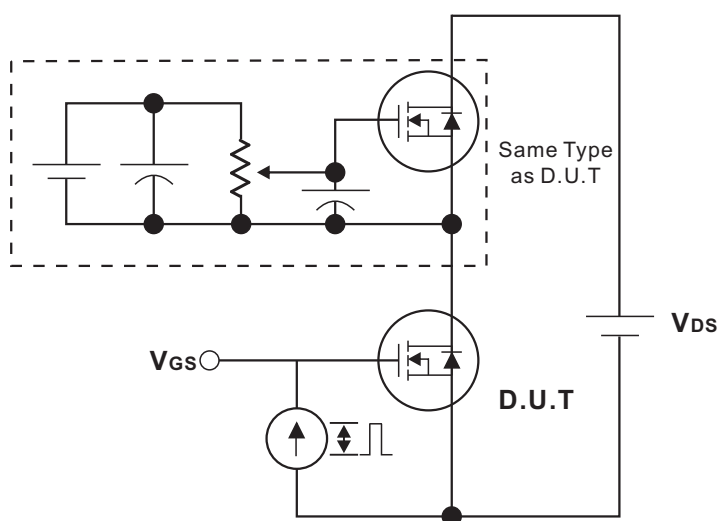
### Test Circuits and waveforms



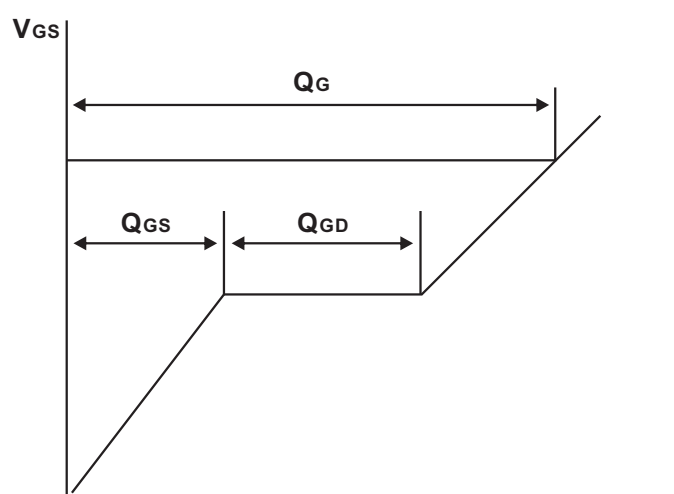
Switching Test Circuit



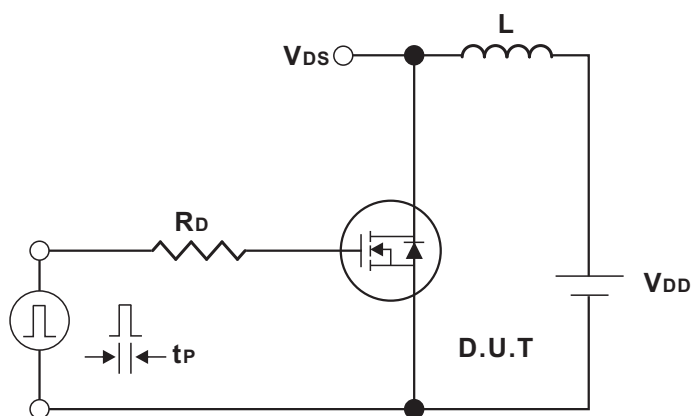
Switching Waveforms



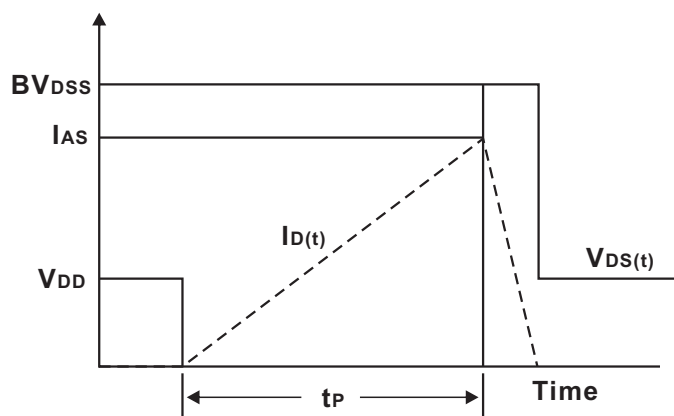
Gate Charge Test Circuit



Charge  
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



## Typical Characteristics

Fig.1 Output Characteristics

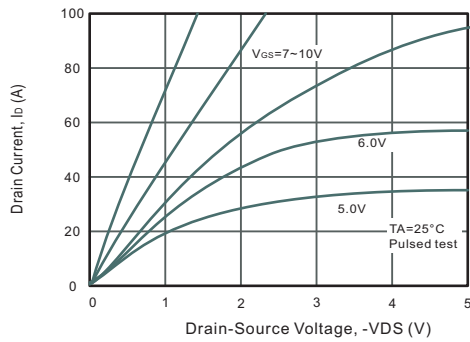


Fig.2 Power Dissipation

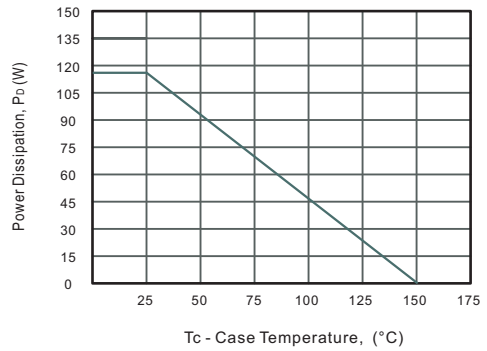


Fig.3 Drain Current Derating

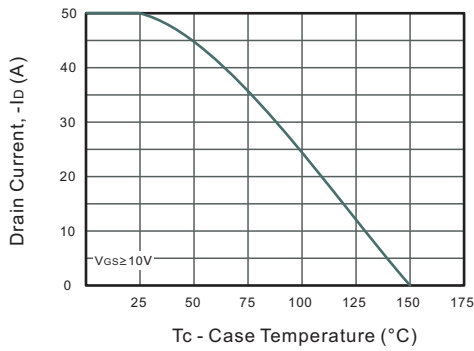


Fig.4 Drain-Source On-Resistance vs. Drain Current

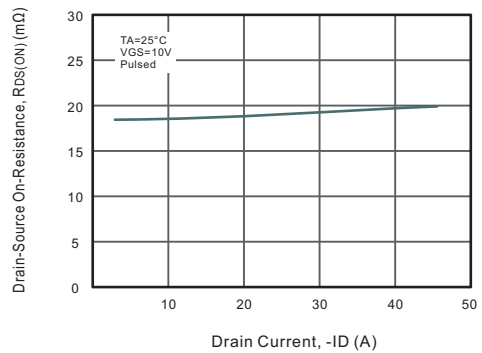


Fig.5 Gate Threshold Voltage vs. Junction Temperature

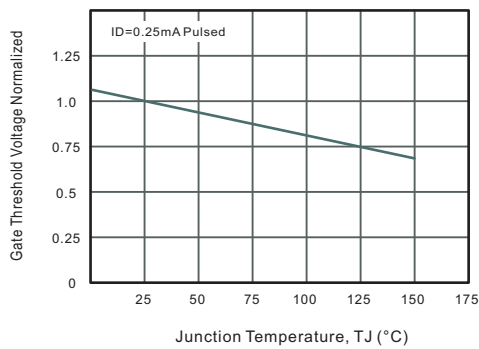


Fig.6 Body-diode Forward Characteristics

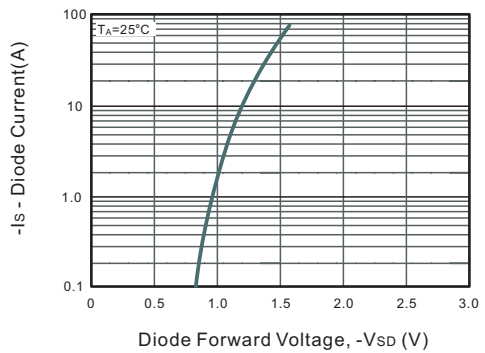


Fig.7 Drain-Source On-Resistance vs. Junction Temperature

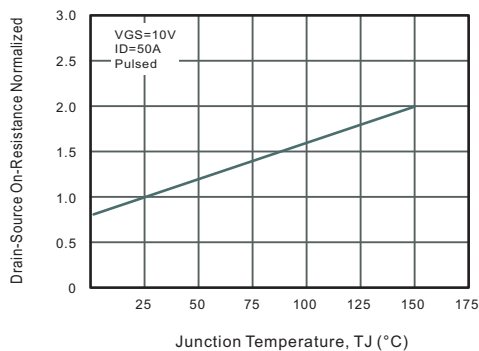
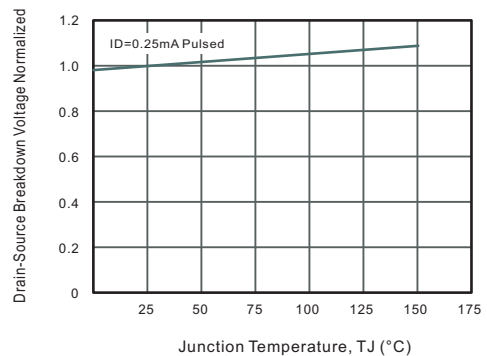


Fig.8 Breakdown Voltage vs. Junction Temperature





## Typical Characteristics

Fig.9 Capacitance Characteristics

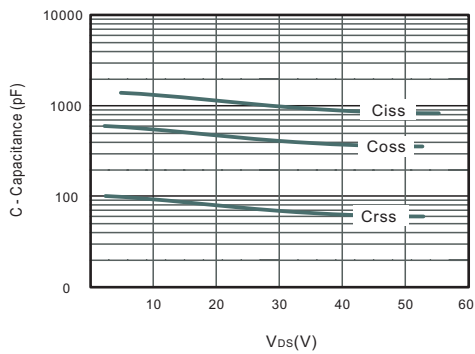


Fig.10 Gate Charge Characteristics

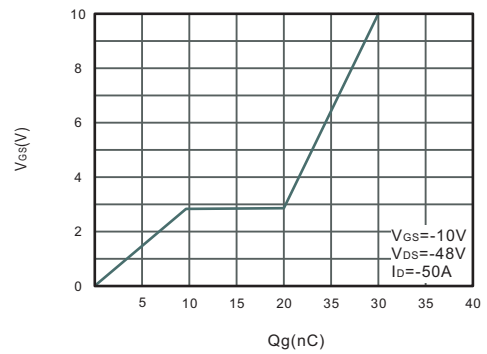


Fig.11 Safe Operating Area

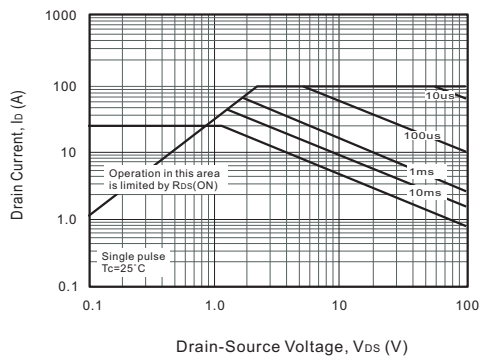
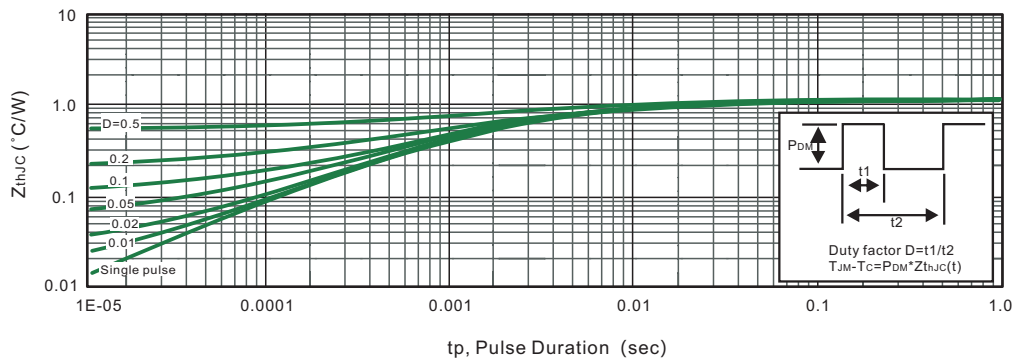


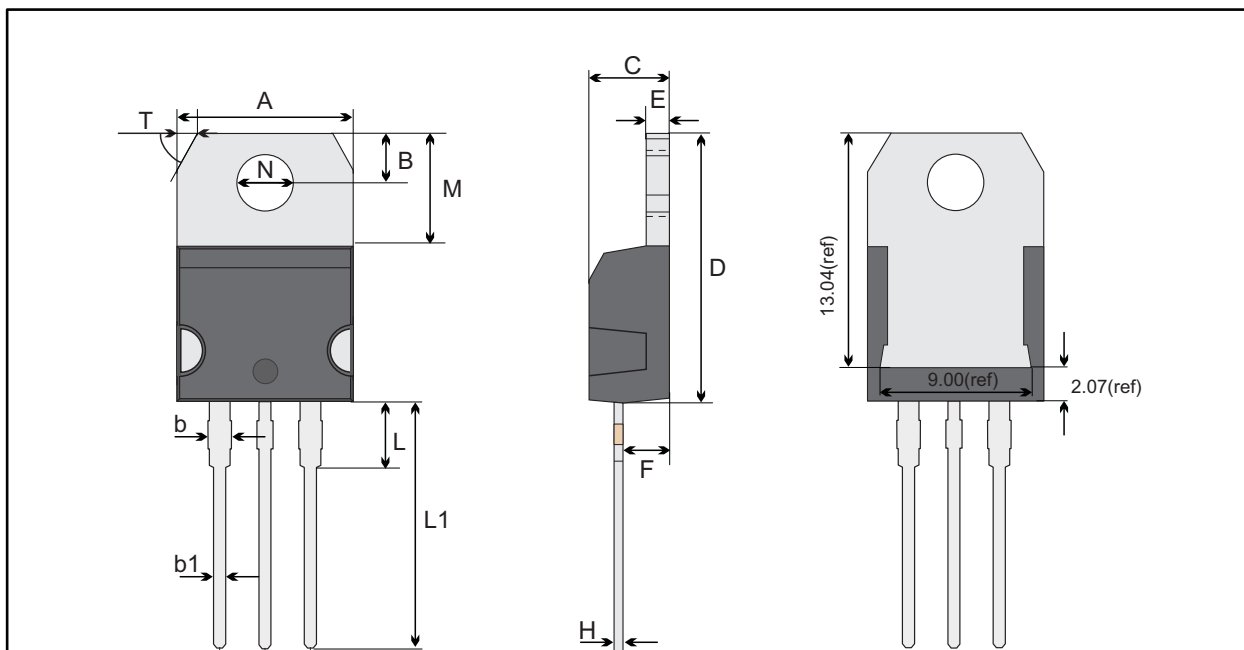
Fig.12 Max. Transient Thermal Impedance





Package Outline  
Through Hole Package ; 3 leads

TO-220-3L



TO-220-3L 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	92	16	137	501	236		

Marking

Type number	Marking code
C18RP60P	C18RP60P



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