

# L2N60

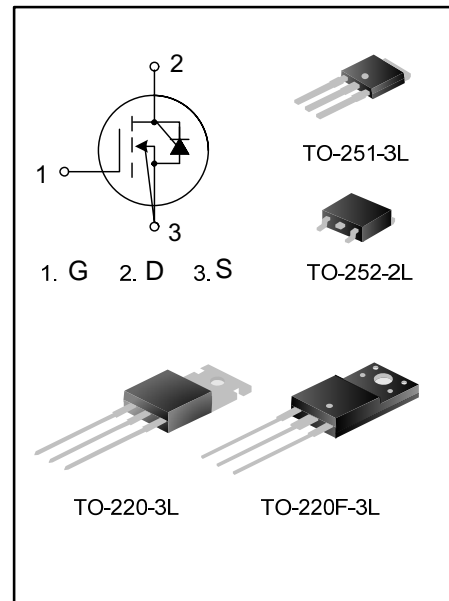
## 600V N-Channel MOSFET

### DESCRIPTION

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.

### FEATURES

- 2.0A, 600V,  $R_{DS(ON)} = 5.0\Omega @ V_{GS} = 10V$
- Low gate charge
- Low  $C_{rss}$
- Fast switching
- Improved dv/dt capability



### ORDERING INFORMATION

Order Number	Package	Pin Assignment			Packing
		1	2	3	
L2N60P	TO-220	G	D	S	Tube
L2N60F	TO-220F	G	D	S	Tube
L2N60I	TO-251	G	D	S	Tube
L2N60D	TO-252	G	D	S	Tube

**L2N60**

**Absolute Maximum Ratings** T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units			
V <sub>DSS</sub>	Drain-Source Voltage	600	V			
I <sub>D</sub>	Drain Current - Continuous	2.0	A			
I <sub>DM</sub>	Drain Current - Pulsed (Note 1)	8.0	A			
V <sub>GSS</sub>	Gate-Source Voltage	30	V			
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)	140	mJ			
I <sub>AR</sub>	Avalanche Current (Note 1)	2.0	A			
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)	4.5	mJ			
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns			
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +150	°C			
T <sub>L</sub>	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	°C			
Total Power Dissipation P <sub>D</sub>		L2N60P	L2N60F	L2N60I	L2N60D	UNIT
	T <sub>C</sub> =25°C	44	23	34	34	W
	Derate above 25°C	0.35	0.18	0.27	0.27	W/°C

\* Drain current limited by maximum junction temperature.

**Thermal Characteristics**

Symbol	Parameter	L2N60P	L2N60F	L2N60I/D	Units
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	2.26	5.56	3.7	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	62.5	120	112	°C/W

## L2N60

**Electrical Characteristics**
 $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Off Characteristics**

$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	600	--	--	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.4	--	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	$\mu\text{A}$
		$V_{DS} = 480\text{ V}, T_C = 125^\circ\text{C}$	--	--	100	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

**On Characteristics**

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 1.0\text{ A}$	--	4.0	5.0	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 50\text{ V}, I_D = 1.0\text{ A}$ (Note 4)	--	2.25	--	S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	320	380	pF
$C_{oss}$	Output Capacitance		--	30	45	pF
$C_{rss}$	Reverse Transfer Capacitance		--	3	5.6	pF

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 300\text{ V}, I_D = 2.0\text{ A},$ $R_G = 25\ \Omega$	--	13	30	ns
$t_r$	Turn-On Rise Time		--	12	60	ns
$t_{d(off)}$	Turn-Off Delay Time		--	73	100	ns
$t_f$	Turn-Off Fall Time		(Note 4, 5)	--	14.3	70
$Q_g$	Total Gate Charge	$V_{DS} = 480\text{ V}, I_D = 7.5\text{ A},$ $V_{GS} = 10\text{ V}$	--	9.3	13	nC
$Q_{gs}$	Gate-Source Charge		--	2.0	--	nC
$Q_{gd}$	Gate-Drain Charge		(Note 4, 5)	--	3.3	--

**Drain-Source Diode Characteristics and Maximum Ratings**

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	2.0	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	8.0	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 7.5\text{ A}$	--	--	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 7.5\text{ A},$	--	230	--	ns
$Q_{rr}$	Reverse Recovery Charge	$dI_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4)	--	1.0	--	$\mu\text{C}$

**Notes:**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 30\text{mH}, I_{AS} = 2.58\text{ A}, V_{DD} = 123\text{ V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 2.4\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width  $\leq 300\ \mu\text{s}$ , Duty cycle  $\leq 2\%$
5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

L2N60

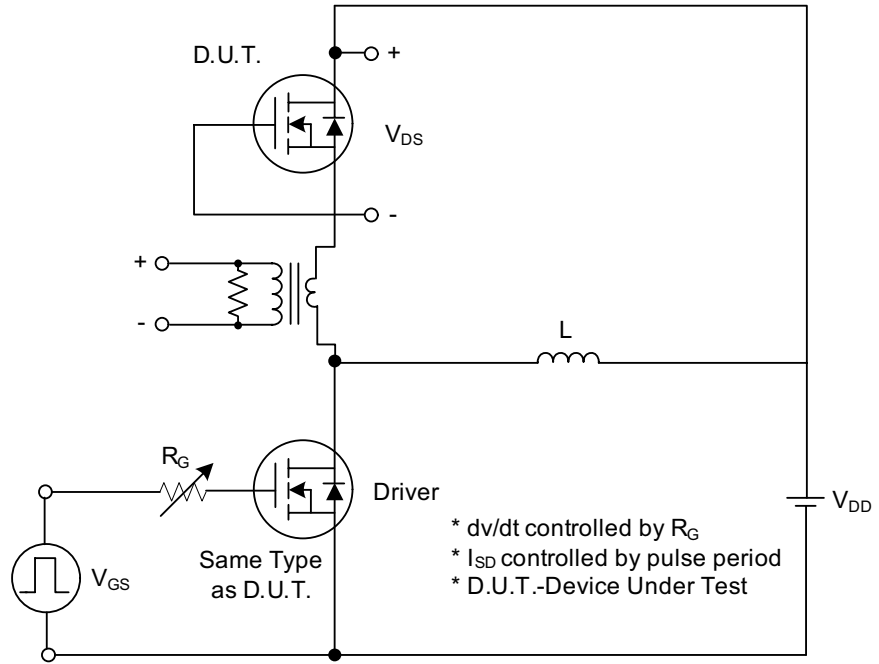


Fig. 1A Peak Diode Recovery  $dv/dt$  Test Circuit

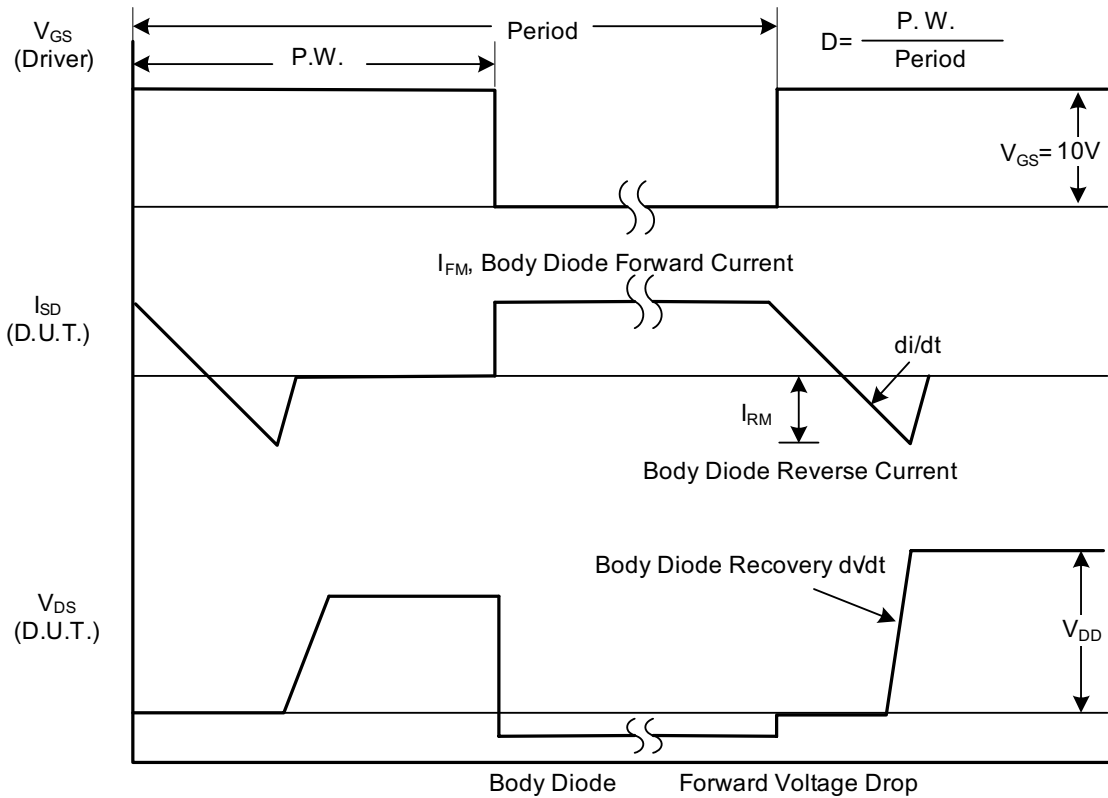


Fig. 1B Peak Diode Recovery  $dv/dt$  Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

L2N60

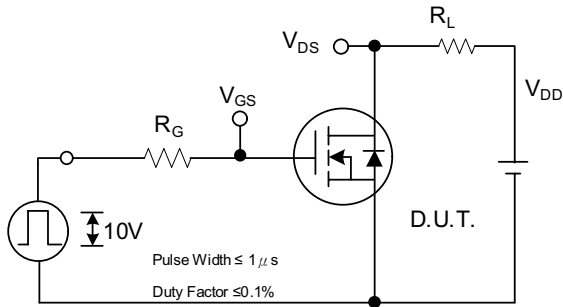


Fig. 2A Switching Test Circuit

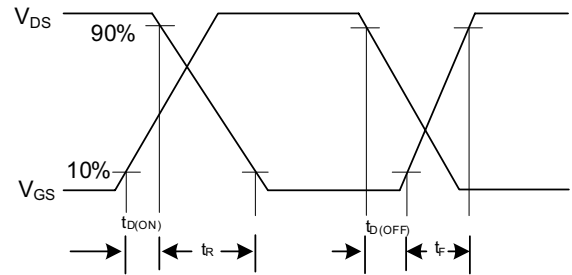


Fig. 2B Switching Waveforms

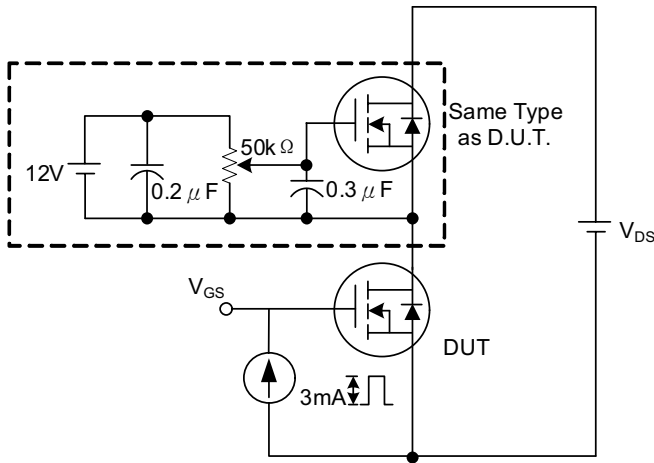


Fig. 3A Gate Charge Test Circuit

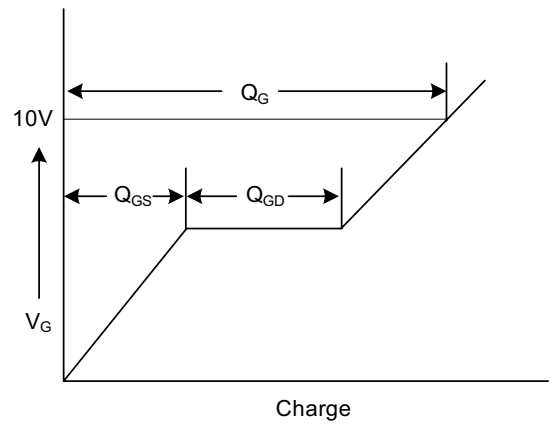


Fig. 3B Gate Charge Waveform

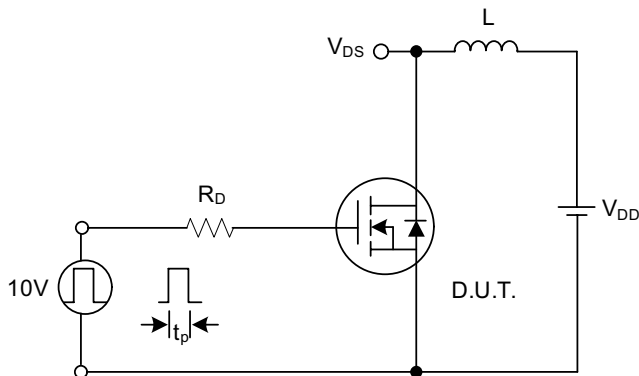


Fig. 4A Unclamped Inductive Switching Test Circuit

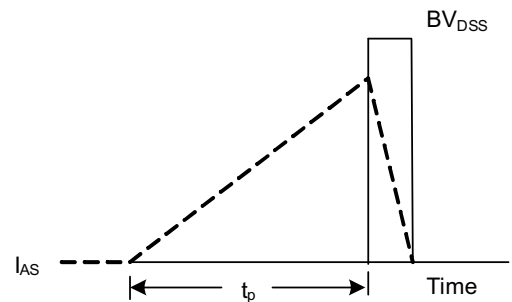
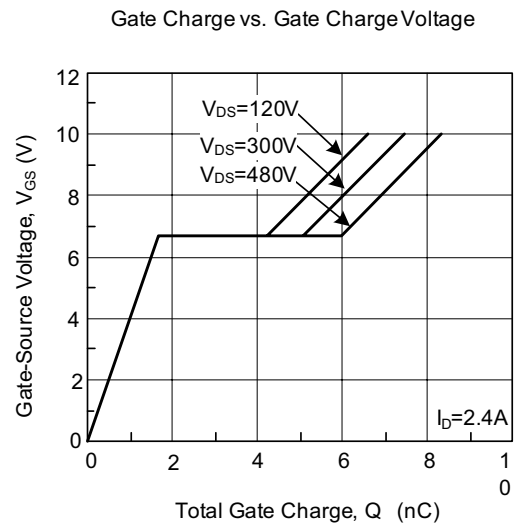
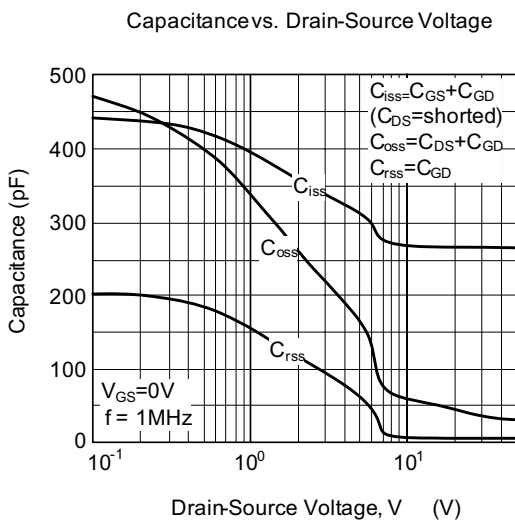
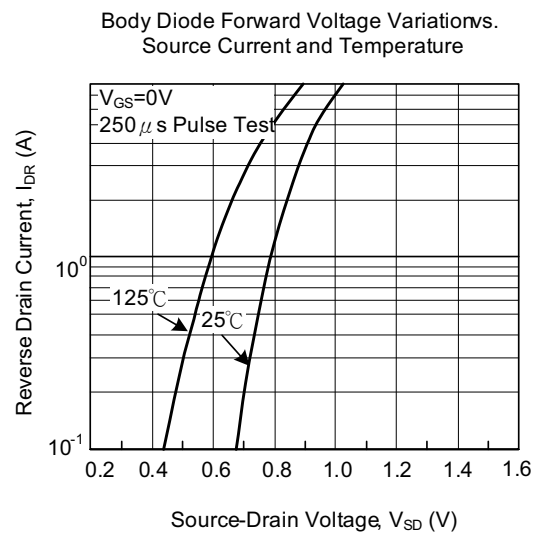
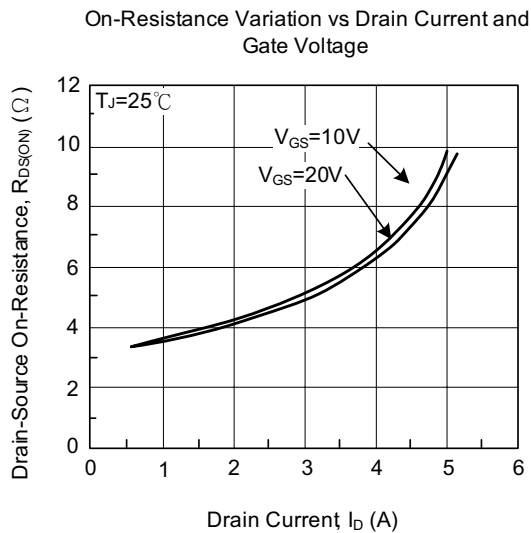
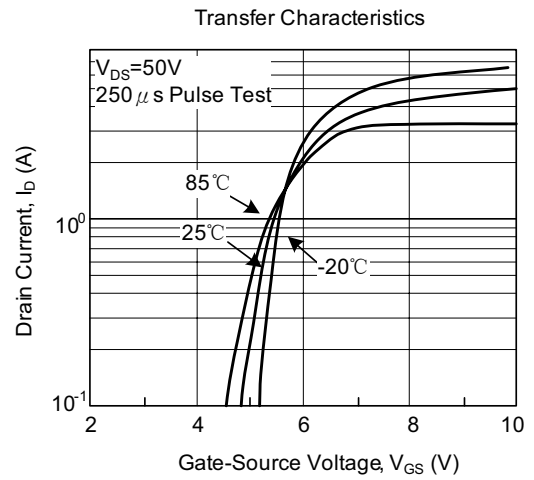
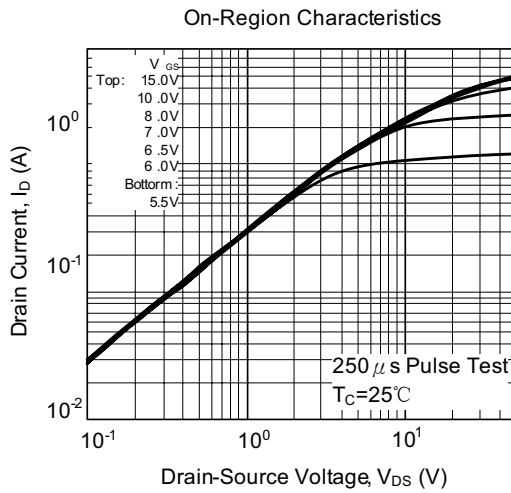


Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

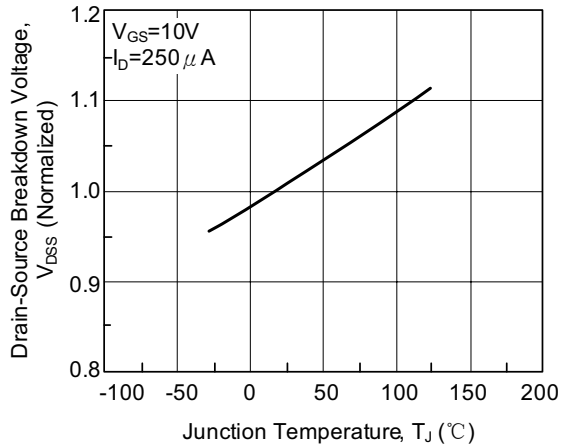
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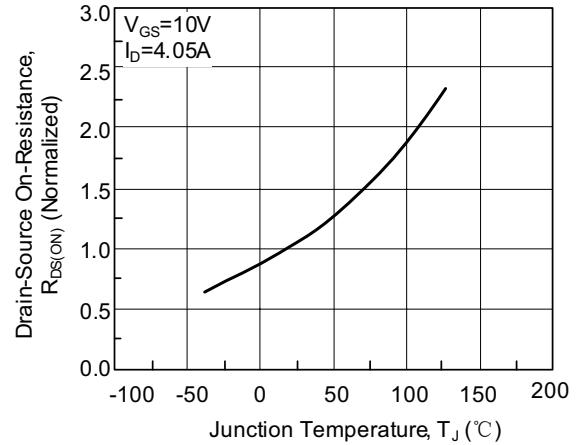
■ **TYPICAL CHARACTERISTICS(Cont.)**

# L2N60

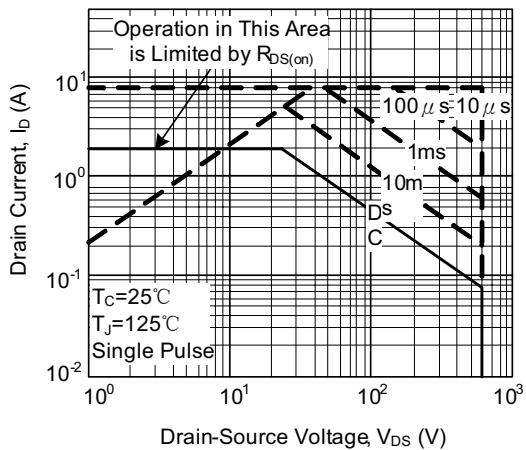
Breakdown Voltage vs Temperature



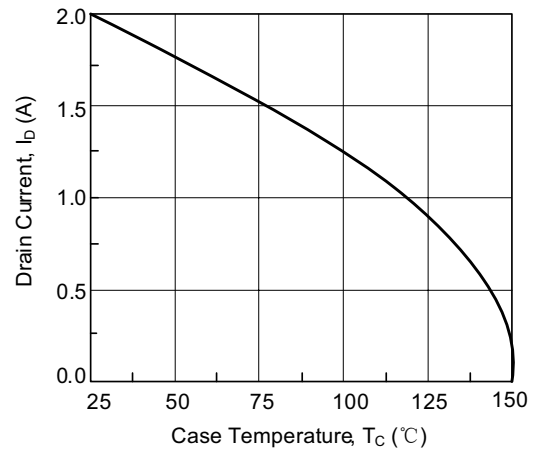
On-Resistance vs Temperature



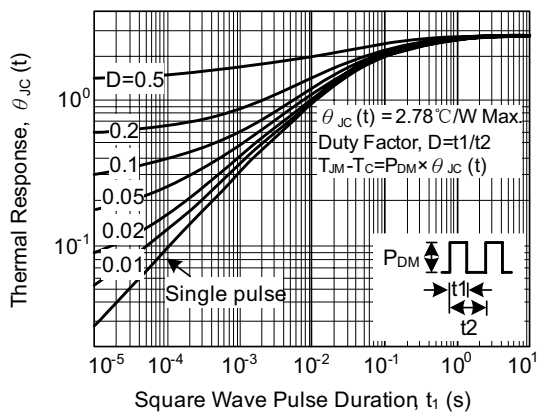
Max. Safe Operating Area



Max. Drain Current vs. Case Temperature

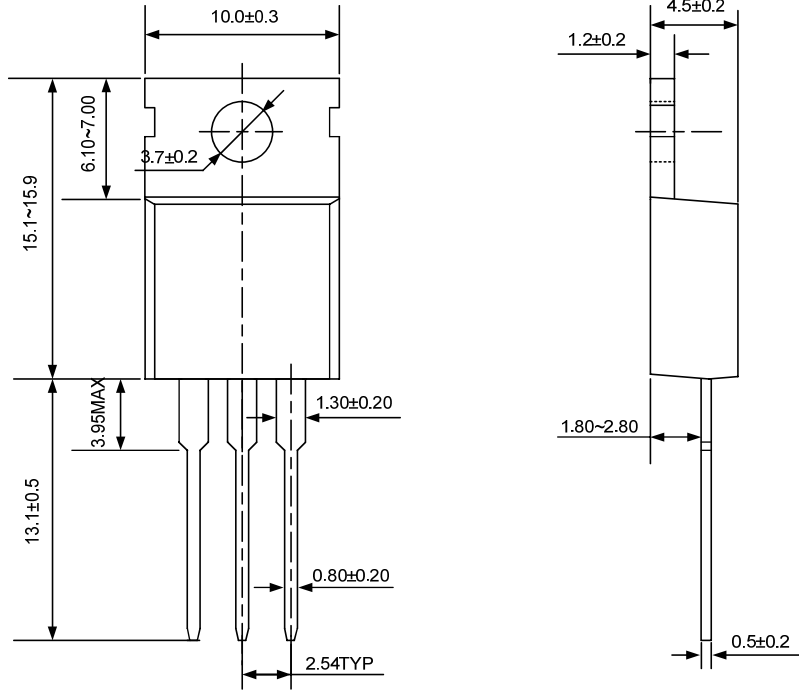


Thermal Response



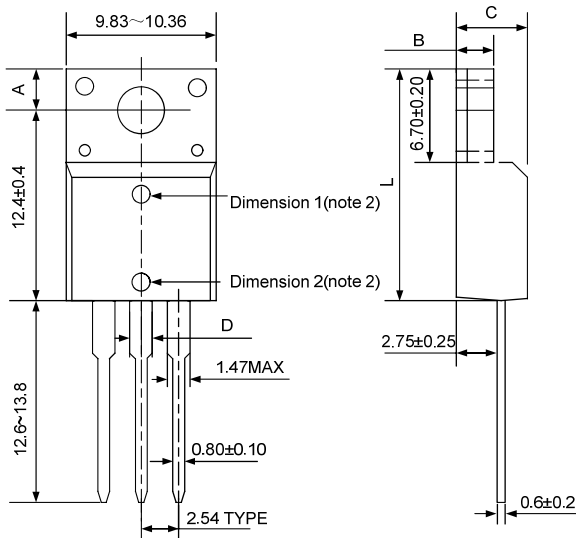
TO-220-3L

Unit:mm



TO-220F-3L

Unit:mm



Symbol(note1)	Dimension1	Dimension2
A	$3.3 \pm 0.15$	$2.70 \pm 0.15$
B	$2.55 \pm 0.20$	$3.0 \pm 0.20$
C	$4.72 \pm 0.2$	$4.5 \pm 0.20$
D	$1.47 \text{ MAX}$	$1.75 \text{ MAX}$
L	$15.75 \pm 0.30$	$15 \pm 0.30$

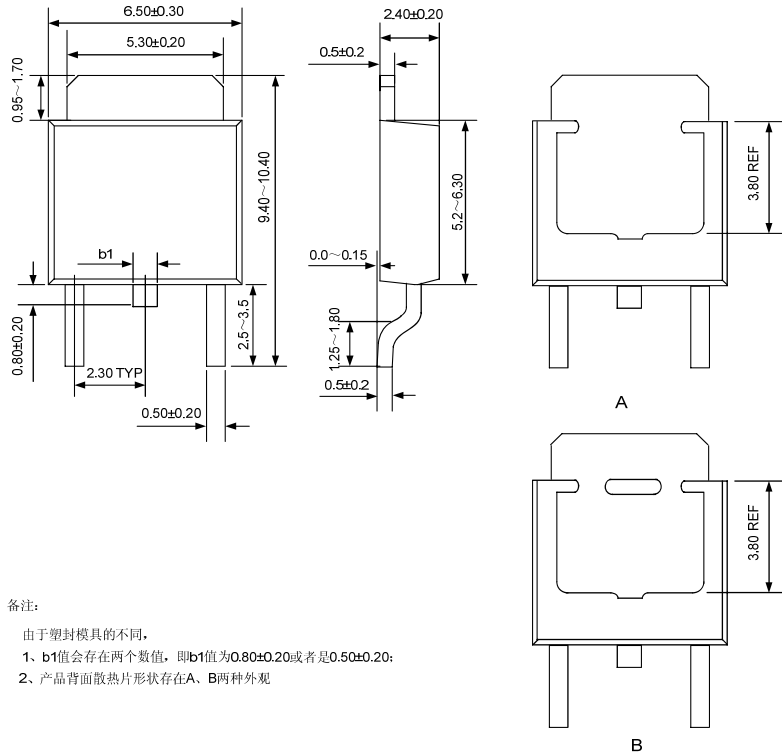
Note1:由于塑封模具不同,产品某些尺寸会存在两个数值,特建立此表列出同一位置的两个尺寸;

Note2:当产品尺寸为Dimension1时,顶针孔位置位于产品表面靠上的位置;当产品尺寸为Dimension2时,顶针孔位置位于产品表面靠下的位置



TO-252-2L

单位: mm



TO-251-3L

单位: mm

