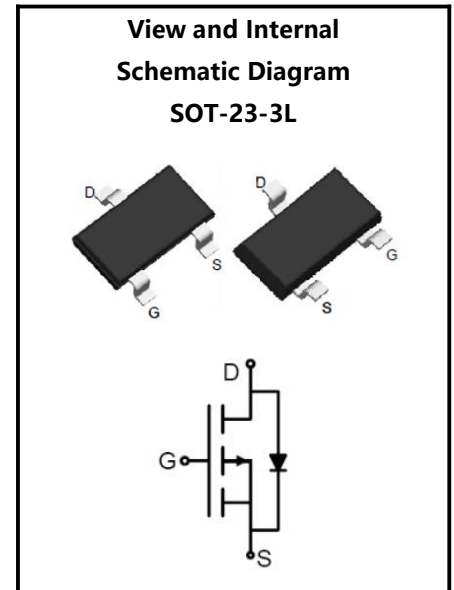


MOSFET

Description and Applications

- ◆ Trench Power MOSFET technology
- ◆ Excellent RDS(ON)
- ◆ RoHS and Halogen-Free Compliant
- ◆ Load switch or other general applications

-4A, -30V, 48 mΩ, P-CHANNEL MOSFET



Parameter	Values	Unit
BV_{DSS}	-30	V
I_D	-4	A
$R_{Dson(max)}$	48	mΩ
$V_{GS(th)}(Typ)$	-0.9	V

Ordering Code	Marking	Package	Packaging
X48P030TLM3	X48P030TLM3	SOT-23-3L	Tape & Reel

Absolute Maximum Ratings($T_A=25^{\circ}C$, unless otherwise noted)

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Drain-Source Voltage	V_{DSS}	-	-	-30	V	$V_{GS}=0V$
Gate-Source Voltage	V_{GS}	-12	-	12	V	$V_{DS}=0V$
Continuous Drain Current	I_D	-	-	-4	A	$T_A=25^{\circ}C$
		-	-	-3.2	A	$T_A=70^{\circ}C$
Pulsed Drain Current(Note 3)	I_{DM}	-	-	-27	A	-
Maximum Power Dissipation(Note 2)	P_D	-	-	1.4	W	$T_A=25^{\circ}C$
		-	-	0.9	W	$T_A=70^{\circ}C$
Operating Junction and Storage Temperature Range	T_j, T_{STG}	-55	-	150	$^{\circ}C$	-

Thermal Characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Thermal resistance , Junction to Ambient(Note 1)	$R_{th(J-a)}$	-	70	90	$^{\circ}C/W$	$t \leq 10s$
Thermal resistance , Junction to Ambient(Note 1,4)	$R_{th(J-a)}$	-	100	125	$^{\circ}C/W$	-
Thermal resistance , Junction to Lead	$R_{th(J-L)}$	-	33	40	$^{\circ}C/W$	-

Electrical Characteristics ($T_j=25^{\circ}\text{C}$, unless otherwise noted)

Static characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Drain-Source Breakdown Voltage	BV_{DSS}	-30	-	-	V	$V_{GS}=0V, I_D=-250\mu A$
Zero Gate Voltage Drain Current	I_{DSS}	-	-	-1	μA	$V_{DS}=-30V, V_{GS}=0V$
Gate-Body Leakage Current, Forward	I_{GSSF}	-	-	100	nA	$V_{GS}=12V, V_{DS}=0V$
Gate-Body Leakage Current, Reverse	I_{GSSR}	-	-	-100	nA	$V_{GS}=-12V, V_{DS}=0V$
Gate-Source Threshold Voltage	$V_{GS(th)}$	-0.5	-	-1.3	V	$V_{DS}=V_{GS}, I_D=-250\mu A$
Drain-Source On-State Resistance	$R_{DS(on)}$	-	39	48	m Ω	$V_{GS}=-10V, I_D=-4A$
		-	43	60	m Ω	$V_{GS}=-4.5V, I_D=-3.5A$
Gate resistance	R_g	-	11.5	-	Ω	$V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$
Forward Transconductance	g_{fs}	-	19	-	S	$V_{DS}=-5V, I_D=-4A$

Dynamic characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Input Capacitance	C_{iss}	-	753	-	pF	$V_{DS}=-15V, V_{GS}=0V, f=1.0\text{MHz}$
Output Capacitance	C_{oss}	-	69	-	pF	
Reverse Transfer Capacitance	C_{rss}	-	59	-	pF	
Turn-On Delay Time	$t_{d(on)}$	-	4.5	-	ns	$V_{DD}=-15V, R_G=2.5\Omega$ $V_{GS}=-10V, R_L=15\Omega$
Turn-On Rise Time	t_r	-	32	-	ns	
Turn-Off Delay Time	$t_{d(off)}$	-	79.5	-	ns	
Turn-Off Fall Time	t_f	-	62	-	ns	

Gate charge characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Total Gate Charge	Q_g	-	21	-	nC	$V_{DS}=-24V, I_D=-4A, V_{GS}=-10V$
Gate-Source Charge	Q_{gs}	-	2	-	nC	
Gate-Drain Charge	Q_{gd}	-	2.4	-	nC	

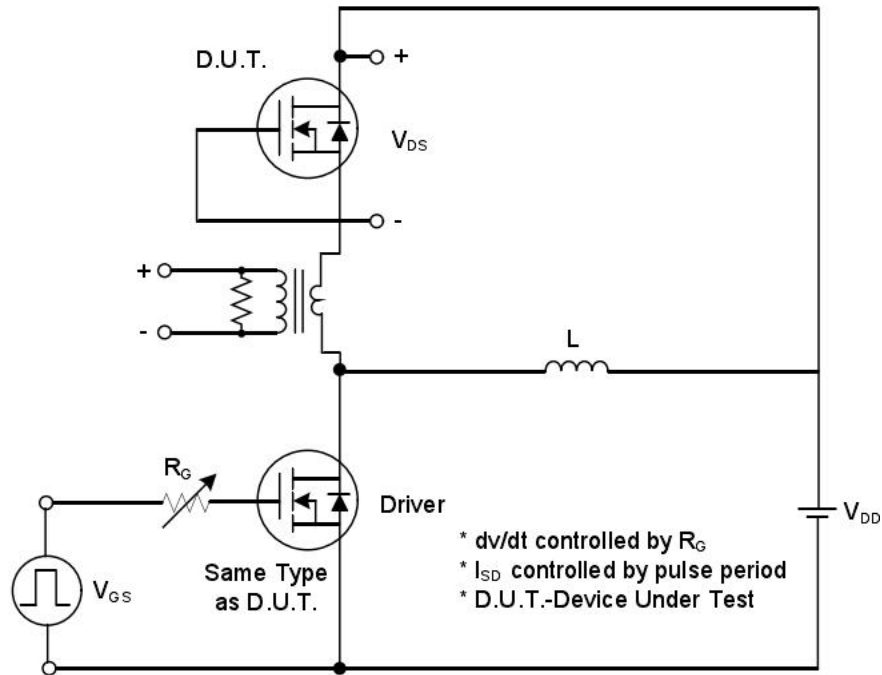
Reverse diode

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Continuous Diode Forward Current	I_S	-	-	-4	A	-
Diode Forward Voltage	V_{SD}	-	-	-1.2	V	$I_S=-4A, V_{GS}=0V$
Body Diode Reverse Recovery Time	t_{rr}	-	8.8	-	ns	$V_{GS}=0V, I_S=-4.0A, dI/dt=-100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	2.5	-	nC	

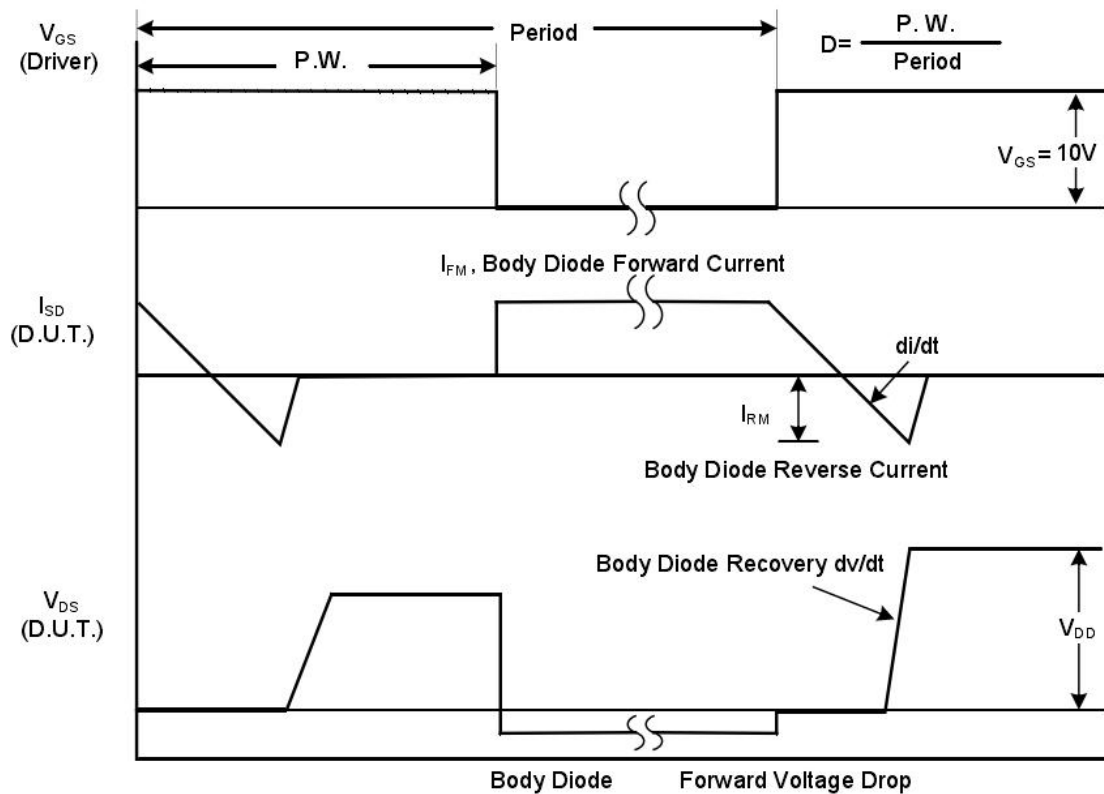
Notes

1. The value of $R_{th(j-a)}$ is measured with the device mounted on 1in² FR-4 board with 1oz. Copper, in a still air environment with $T_A = 25^{\circ}\text{C}$. The value in any given application depends on the user's specific board design.
2. The power dissipation P_D is based on $T_{j(MAX)} = 150^{\circ}\text{C}$, using $\leq 10\text{s}$ junction-to-ambient thermal resistance.
3. Repetitive rating, pulse width limited by junction temperature $T_{j(MAX)} = 150^{\circ}\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_j = 25^{\circ}\text{C}$.
4. The $R_{th(j-a)}$ is the sum of the thermal impedance from junction to lead $R_{th(j-l)}$ and lead to ambient.
- 5 The static characteristics in Figures 1 to 6 are obtained using $< 300\mu\text{s}$ pulses, duty cycle 0.5% max.
6. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 1oz. Copper, assuming a maximum junction temperature of $T_{j(MAX)} = 150^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

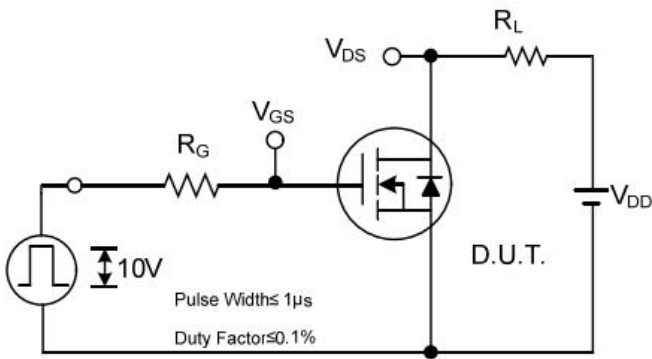
RATING AND CHARACTERISTIC CURVES



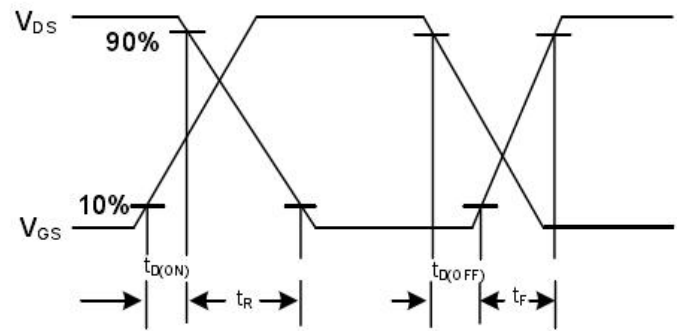
Peak Diode Recovery dv/dt Test Circuit



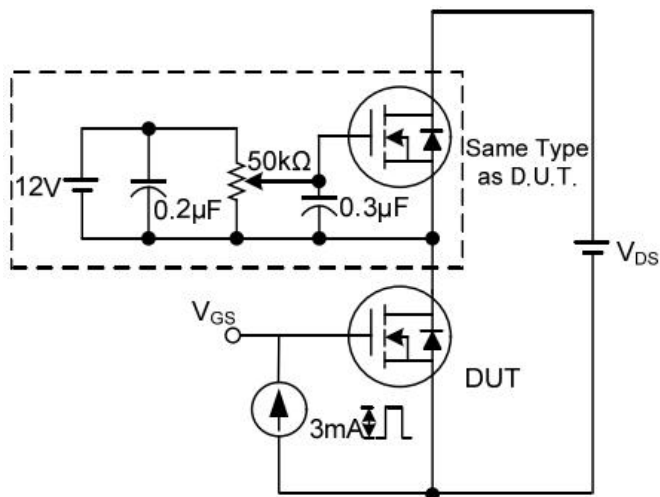
Peak Diode Recovery dv/dt Waveforms



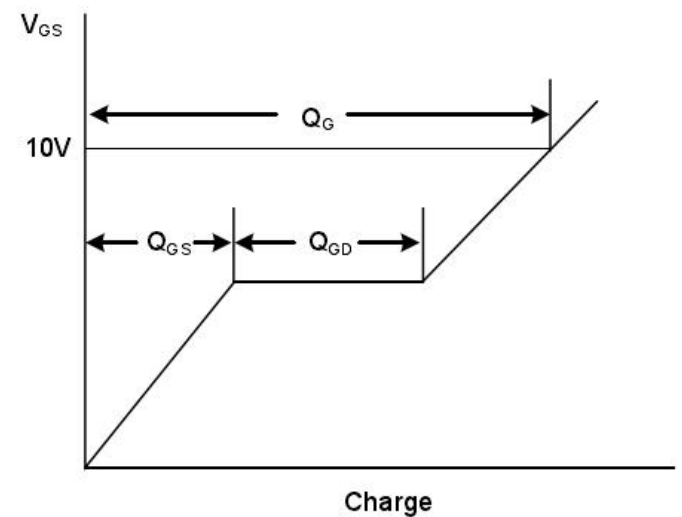
Switching Test Circuit



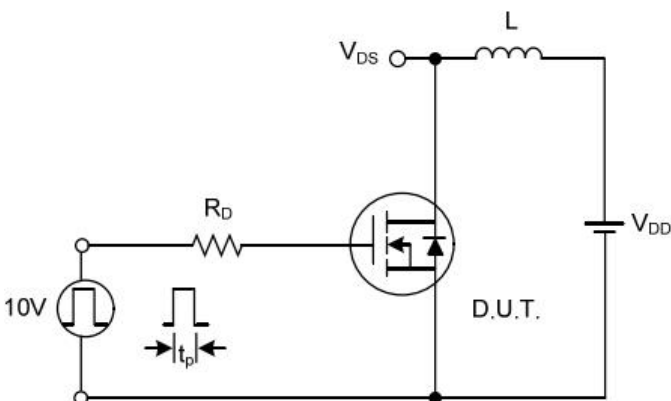
Switching Waveforms



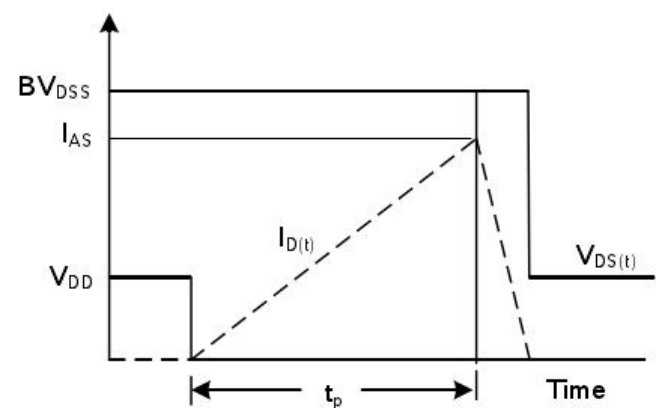
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

RATING AND CHARACTERISTIC CURVES

Figure.1 On-Region Characteristics (Note 5)

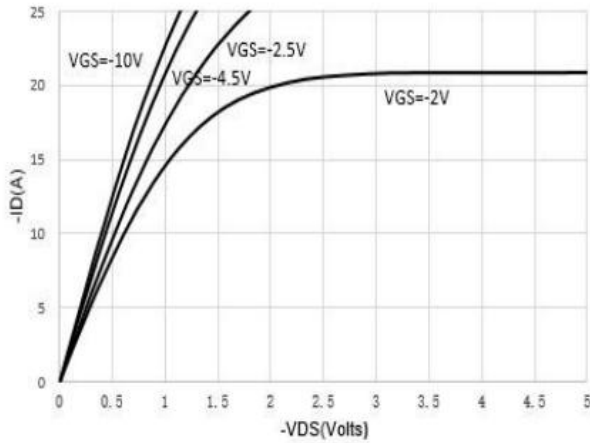


Figure.2 Transfer Characteristics (Note 5)

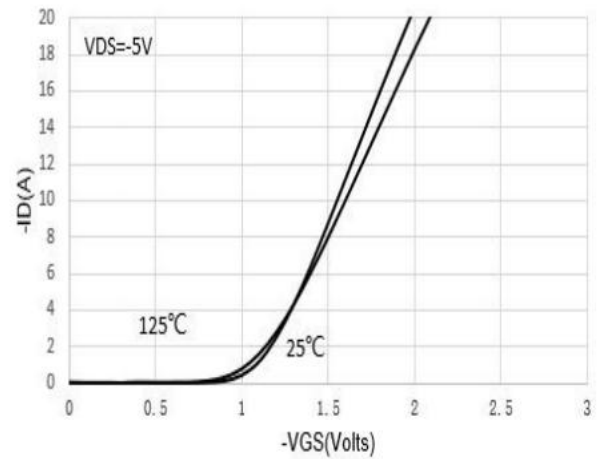


Figure.3 On-Resistance vs. Drain Current and Gate Voltage (Note 5)

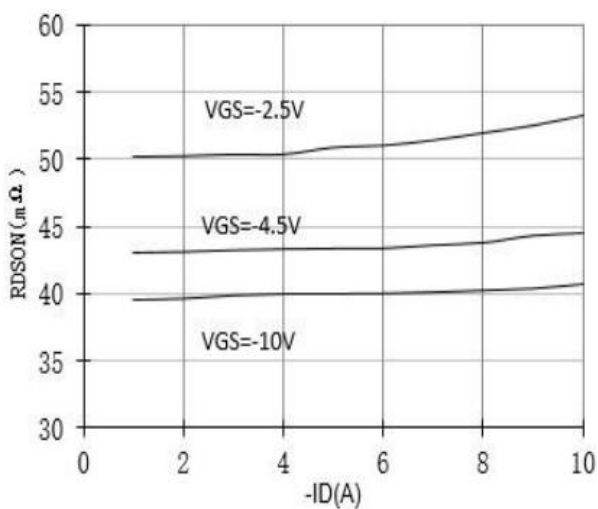


Figure.4 On-Resistance vs. Junction Temperature (Note 5)

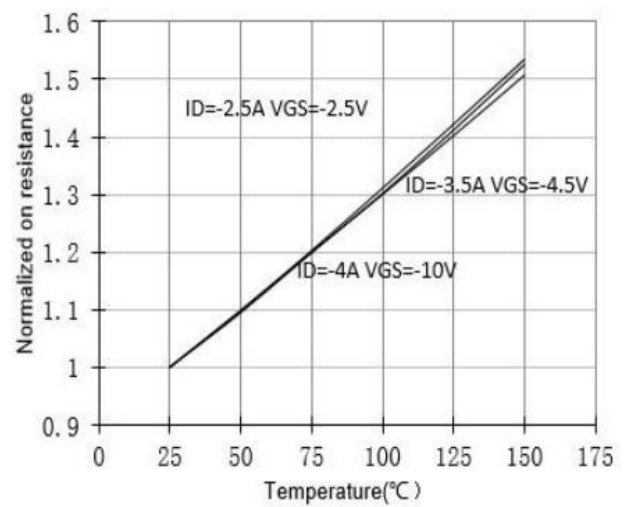


Figure.5 On-Resistance vs. Gate-Source Voltage(Note 5)

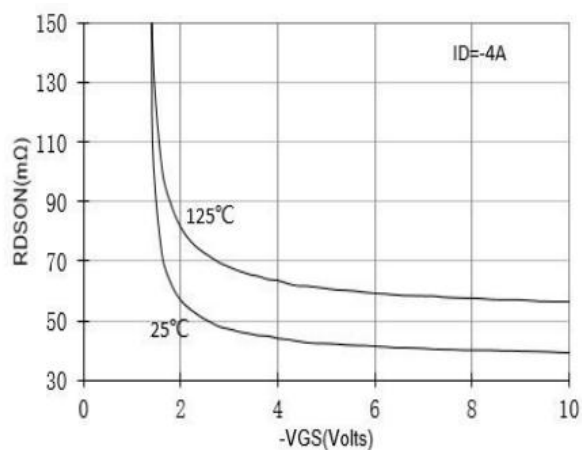


Figure.6 Body-Diode Characteristics (Note 5)

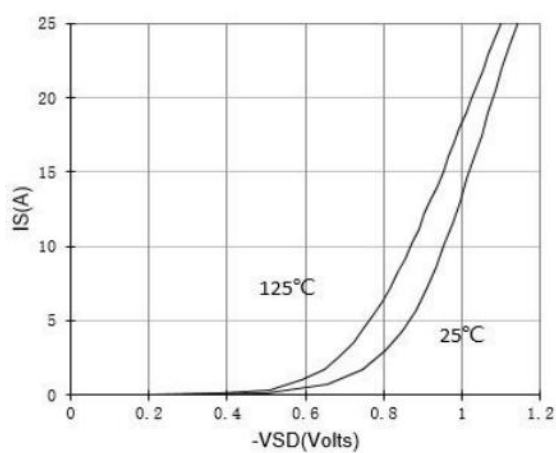


Figure.7 Gate-Charge Characteristics

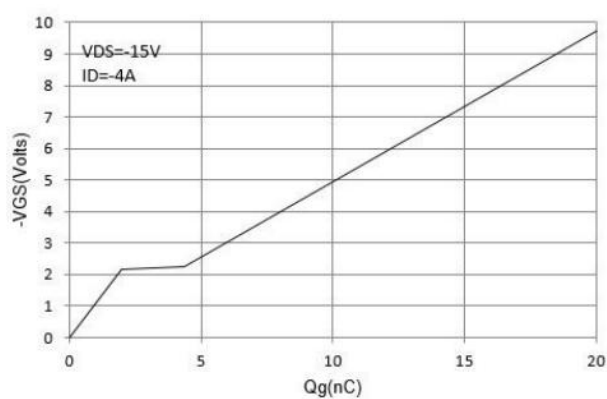


Figure.8 Capacitance Characteristics

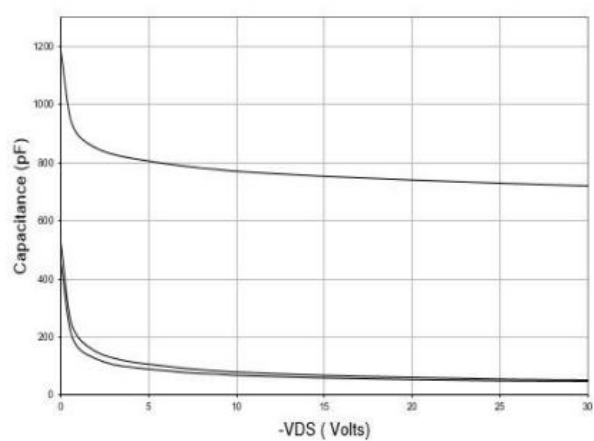


Figure.9 Maximum Forward Biased Safe Operating Area

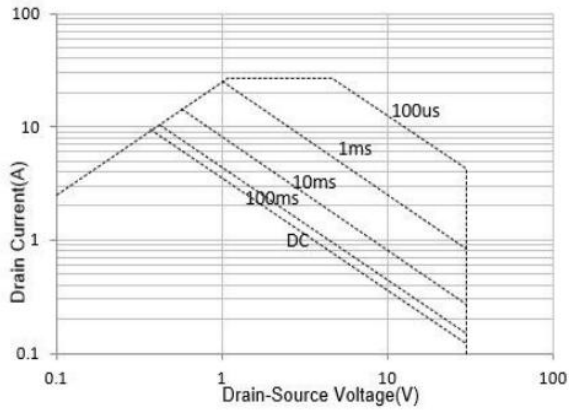


Figure.10 Single Pulse Power Rating Junction-to-Ambient (Note 5)

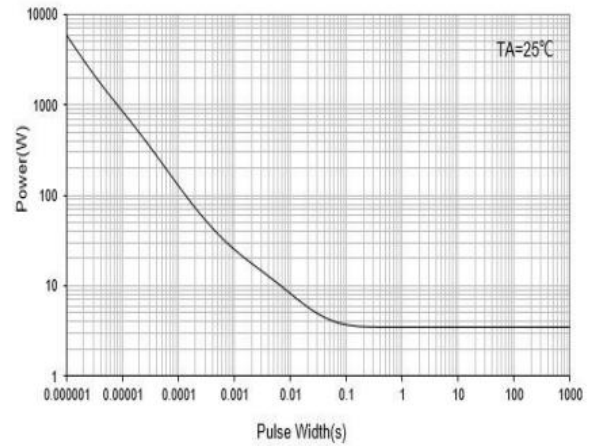
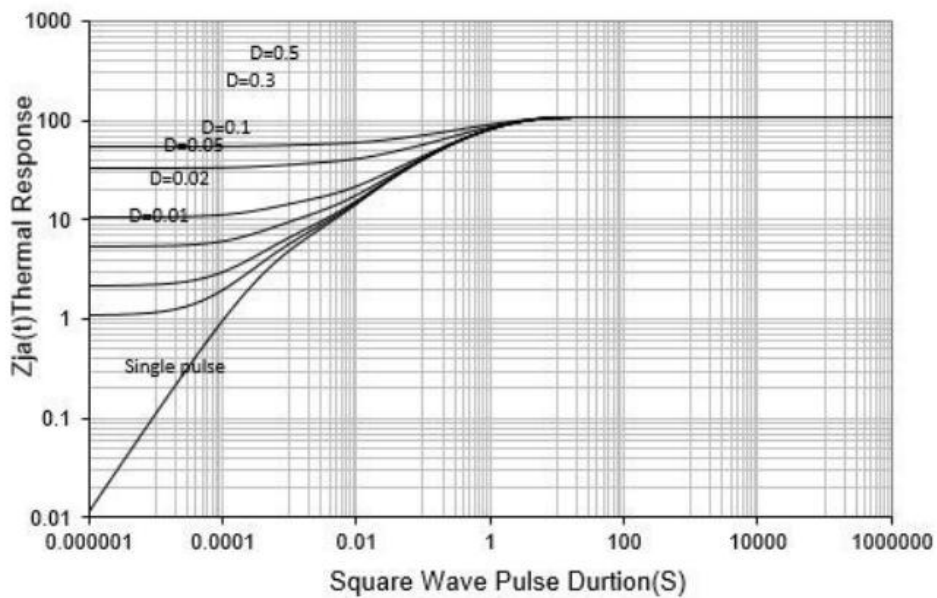
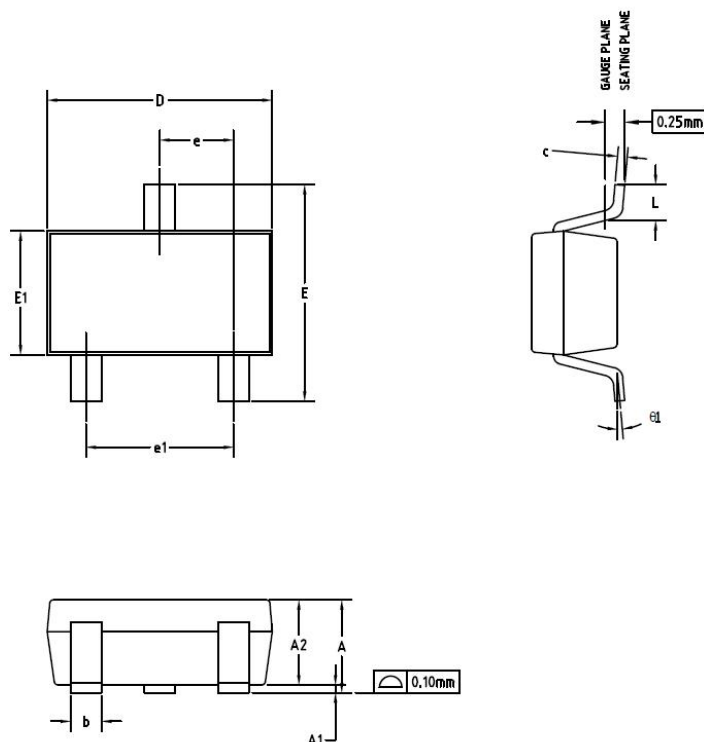


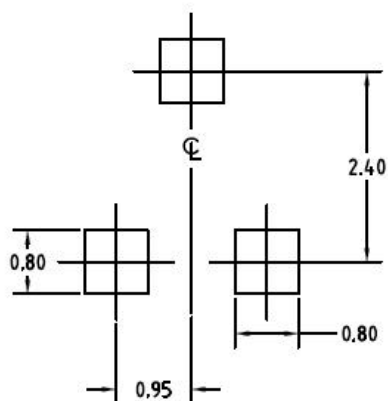
Figure 11: Maximum Transient Thermal Impedance (Note 5)



Package Outline: SOT-23-3L



RECOMMENDED LAND PATTERN



SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	-	1.25	0.033	-	0.049
A1	0.00	-	0.15	0.000	-	0.006
A2	0.70	1.05	1.20	0.028	0.041	0.047
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.08	0.13	0.20	0.003	0.005	0.008
D	2.80	2.90	3.10	0.110	0.114	0.122
e	0.95BSC			0.037BSC		
e1	1.90BSC			0.075BSC		
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.40	1.60	1.80	0.055	0.063	0.071
L	0.30	-	0.60	0.012	-	0.024
Q1	0°	5°	8°	0°	5°	8°

NOTE:

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH OR GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 5 MILS EACH.
2. TOLERANCE ± 0.100 mm (4 mil) UNLESS OTHERWISE SPECIFIED.
3. DIMENSION L IS MEASURED IN GAUGE PLANE.
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. ALL DIMENSIONS ARE IN MILLIMETERS.