

MOSFET

90A,40V,5.5mΩ,N-CHANNEL MOSFET

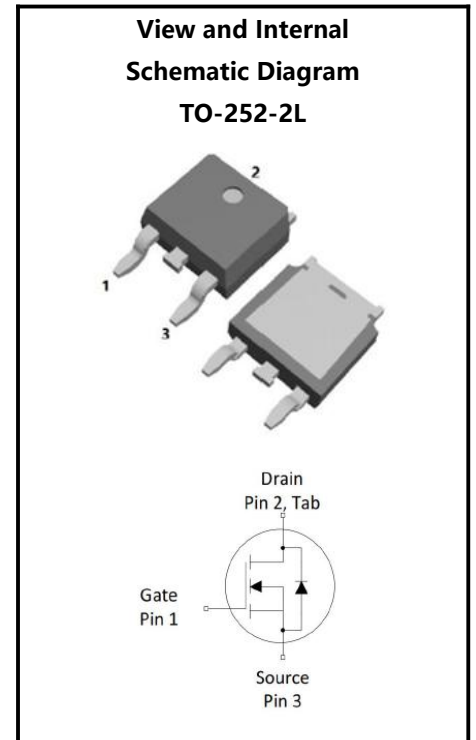
Features

- ◆ Low gate charge
- ◆ Low Ciss
- ◆ Fast switching

Applications

- ◆ Synchronous Rectification for AC/DC Quick Charger
- ◆ Battery management
- ◆ UPS(Uninterruptible Power Supplies)

Parameter	Values	Unit
BV_{DSS}	40	V
I_D	90	A
$R_{Dson}(max)$	5.5	mΩ
$V_{GS(th)}(Typ)$	1.6	V



Ordering Code	Marking	Package	Packaging
X5P5N040TLE2	X5P5N040TLE2	TO-252-2L	Tape & Reel

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

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Drain-Source Voltage	V_{DSS}	-	-	40	V	-
Gate-Source Voltage	V_{GS}	-20	-	20	V	-
Continuous Drain Current(Note 1)	I_D	-	-	90	A	$T_C=25^{\circ}C$
		-	-	57	A	$T_C=100$
Pulsed Drain Current(Note 2)	I_{DM}	-	-	360	A	-
Single Pulse Avalanche Energy	E_{AS}	-	-	189	mJ	$L=0.5mH, V_D=32V, T_C=25^{\circ}C$
Maximum Power Dissipation	P_D	-	-	81	W	$T_C=25^{\circ}C$
	P_D	-	-	3.1	W	$T_A=25^{\circ}C$
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-50	-	150	$^{\circ}C$	-

Thermal Characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Thermal resistance , Junction to Case	$R_{th(J-C)}$	-	1.54	-	$^{\circ}C/W$	-
Thermal resistance ,Junction to Ambient	$R_{th(J-a)}$	-	40	-		-

Electrical Characteristics (T_j=25°C,unless otherwise noted)

Static characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Drain-Source Breakdown Voltage	BV _{DSS}	40	-	-	V	V _{GS} =0V, I _D =250μA
Zero Gate Voltage Drain Current	I _{DSS}	-	-	1	μA	V _{DS} =40V, V _{GS} =0V
Gate-Body Leakage Current,Forward	I _{GSSF}	-	-	100	nA	V _{GS} =20V, V _{DS} =0V
Gate-Body Leakage Current,Reverse	I _{GSSR}	-	-	-100	nA	V _{GS} =-20V, V _{DS} =0V
Gate-Source Threshold Voltage	V _{GS(th)}	1	-	2.4	V	V _{DS} =V _{GS} , I _D =250μA
Drain-Source On-State Resistance	R _{DS(on)}	-	4.5	5.5	mΩ	V _{GS} =10V, I _D =9A
		-	6.6	8.3	mΩ	V _{GS} =4.5V, I _D =5A
Gate Resistance	R _g	-	2.6	-	Ω	V _{GS} =0V, V _{DS} =0V, f=1MHz
Forward Transconductance	g _{fs}	-	15	-	S	V _{DS} =5V, I _D =9A

Dynamic characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Input Capacitance	C _{iss}	-	2595	-	pF	V _{DS} =20V, V _{GS} =0V, f=1.0MHZ
Output Capacitance	C _{oss}	-	229	-	pF	
Reverse Transfer Capacitance	C _{rss}	-	214	-	pF	
Turn-On Delay Time	t _{d(on)}	-	13	-	ns	V _{DD} =20V, R _G =2.2Ω, V _{GS} =10V, I _D =4A
Turn-On Rise Time	t _r	-	14	-	ns	
Turn-Off Delay Time	t _{d(off)}	-	72	-	ns	
Turn-Off Fall Time	t _f	-	26	-	ns	

Gate charge characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Total Gate Charge	Q _g	-	55	-	nC	V _{DS} =20V, I _D =9A, V _{GS} =10V
Gate-Source Charge	Q _{gs}	-	9	-	nC	
Gate-Drain Charge	Q _{gd}	-	11	-	nC	

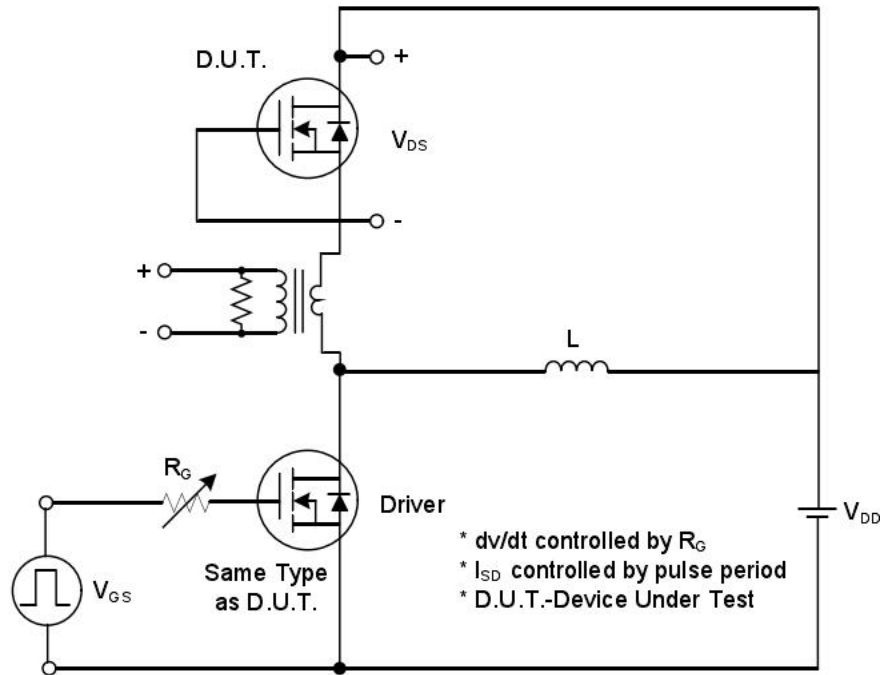
Reverse diode

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Continuous Diode Forward Current	I _S	-	-	90	A	-
Pulsed Diode Forward Current	I _{SM}	-	-	360	A	-
Diode Forward Voltage	V _{SD}	-	-	1.2	V	I _S =9A, V _{GS} =0V
Reverse Recovery Time	t _{rr}	-	19	-	ns	V _{DS} =20V, V _{GS} =0V, I _S =1A
Reverse Recovery Charge	Q _{rr}	-	14	-	nC	di/dt=100A/μs

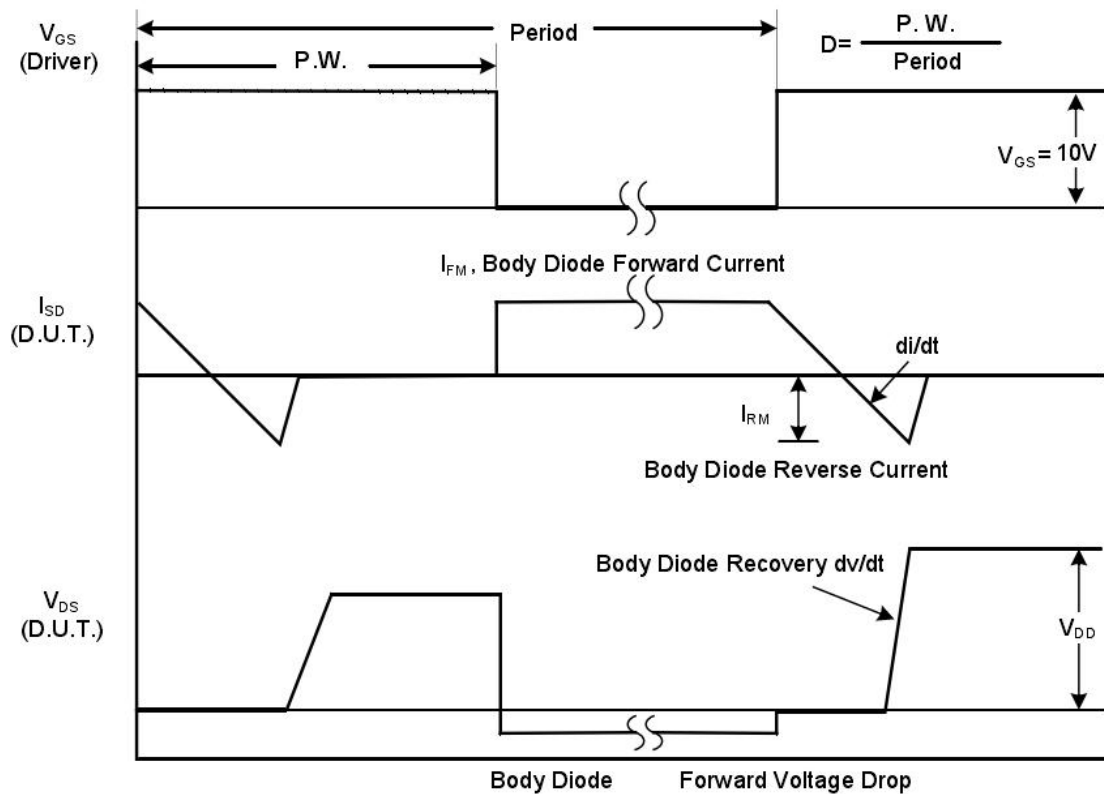
Notes

1. Computed continuous current assumes the condition of T_{j,Max} while the actual continuous current depends on the thermal & electro-mechanical application board design.
- 2.This single-pulse measurement was taken under T_{j,Max} = 150°C.

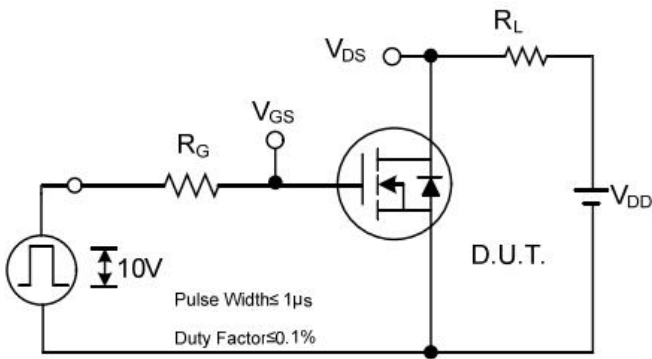
RATING AND CHARACTERISTIC CURVES



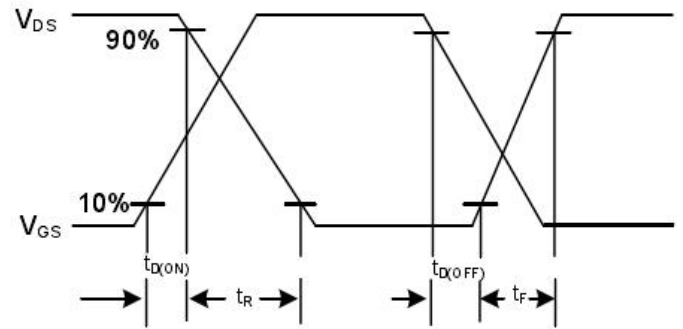
Peak Diode Recovery dv/dt Test Circuit



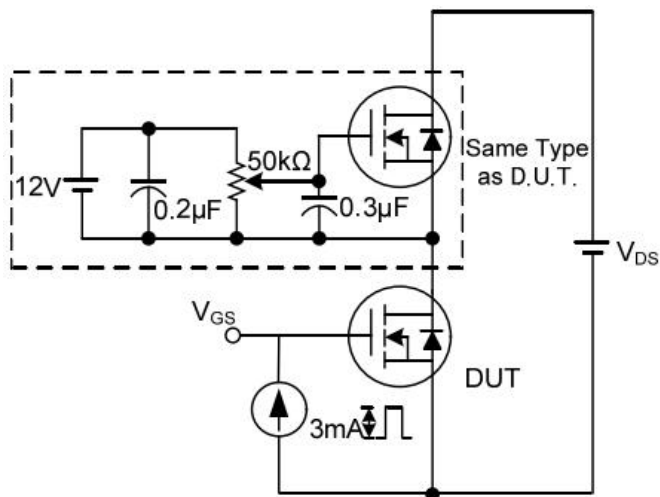
Peak Diode Recovery dv/dt Waveforms



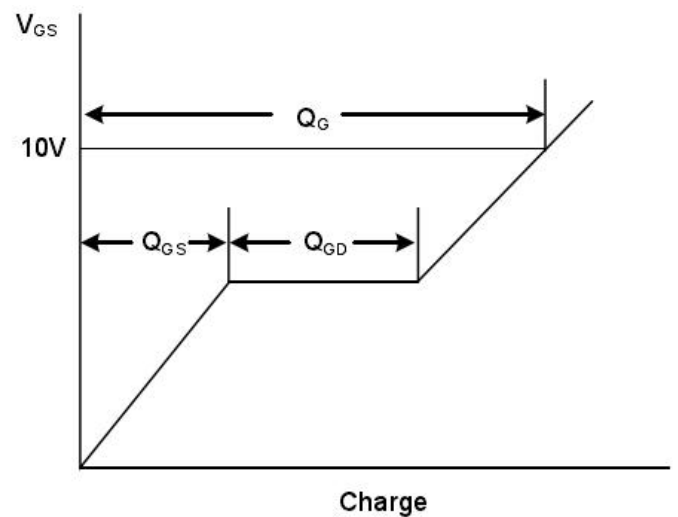
Switching Test Circuit



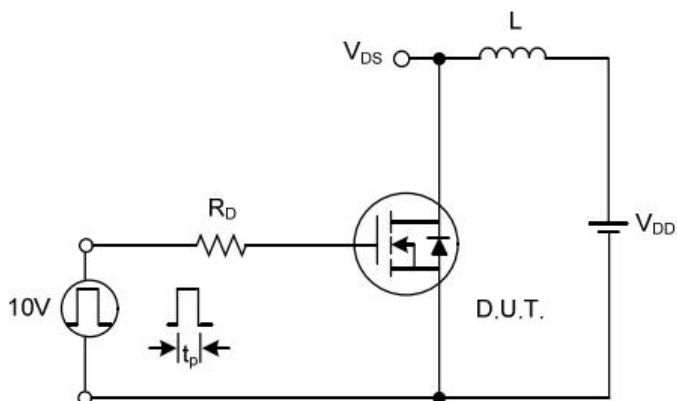
Switching Waveforms



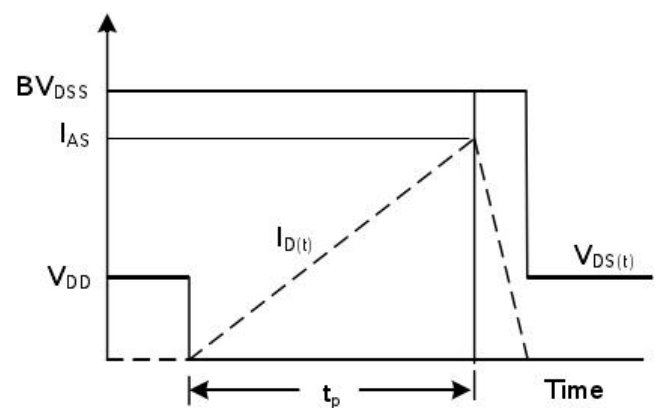
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

RATING AND CHARACTERISTIC CURVES

Figure.1 Output Characteristics $T_J=25^{\circ}\text{C}$

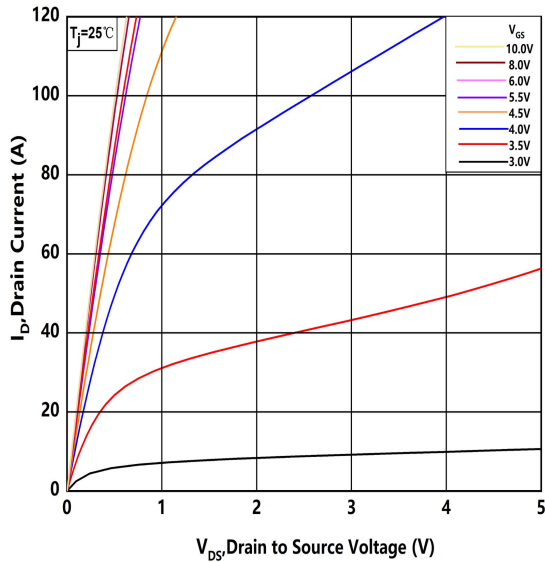


Figure.2 Transfer Characteristic for Various Junction Temperatures

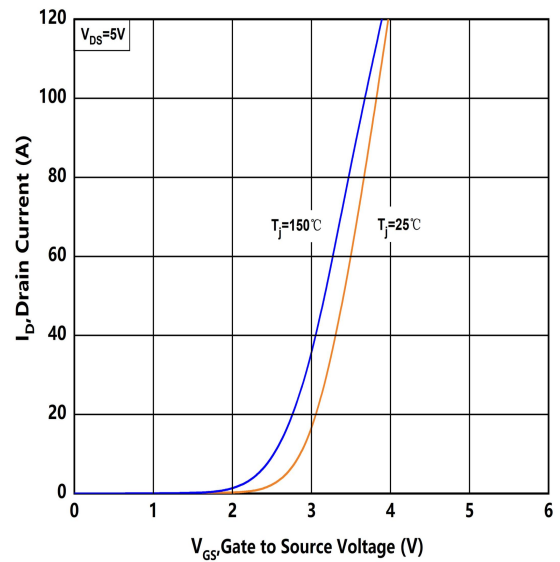


Figure.3 On-Resistance vs Drain Current For Various Gate Voltage

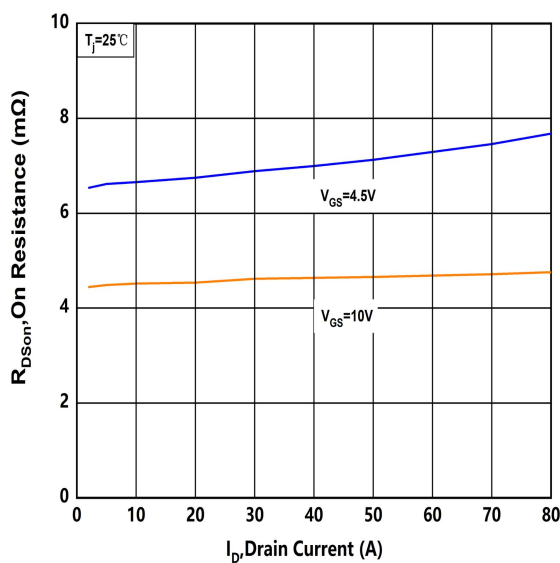


Figure.4 Typical On-Resistance vs Junction Temperature

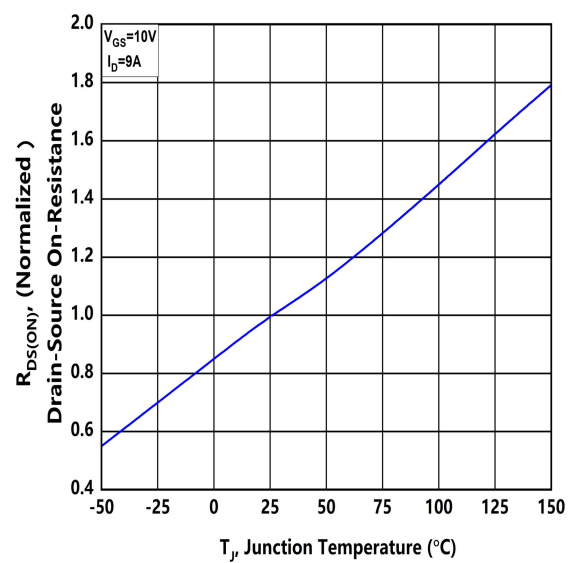


Figure.5 Typical Threshold Voltage vs Junction Temperature

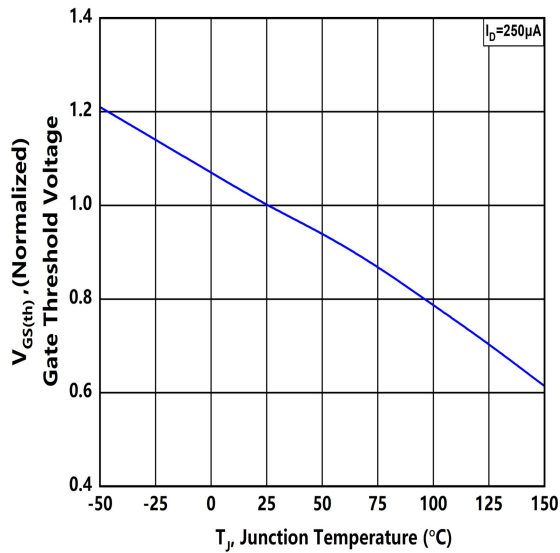


Figure.6 Typical Breakdown Voltage vs Junction Temperature

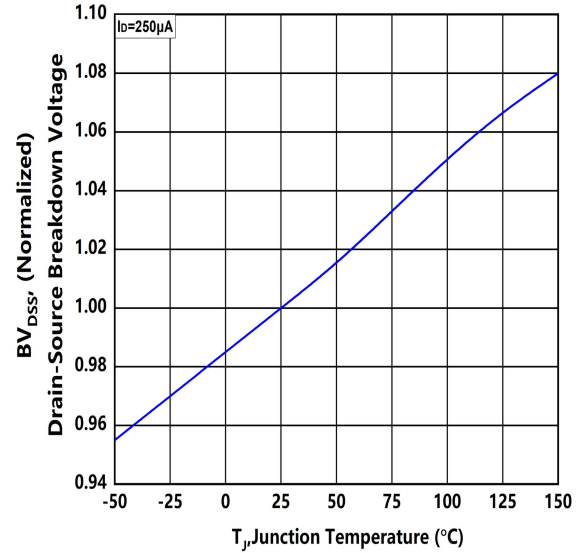


Figure.7 Typical Capacitance vs Drain to Source Voltage

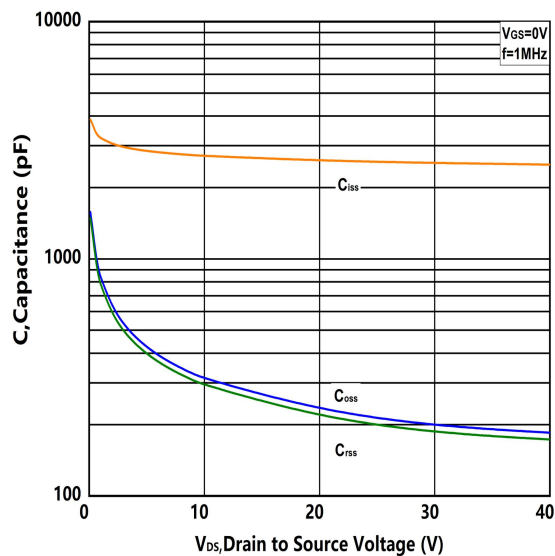


Figure.8 Typical Gate Charge vs Gate to Source Voltage

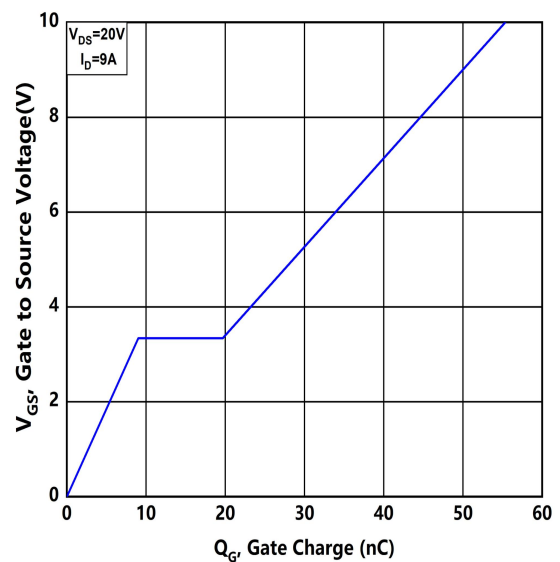


Figure.9 Typical Body Diode Characteristics

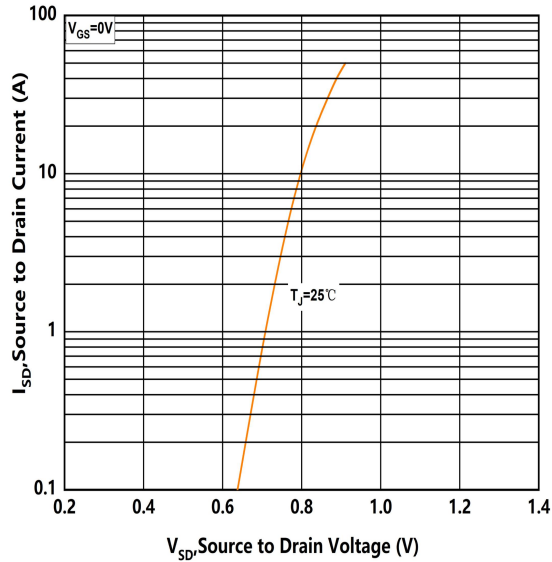


Figure.10 Maximum power Dissipation Derating vs Case Temperature

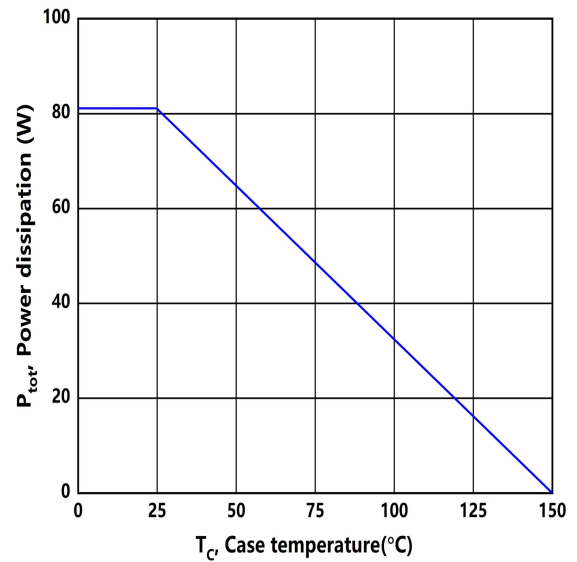


Figure.11 Continuous Drain Current Derating vs Case Temperature

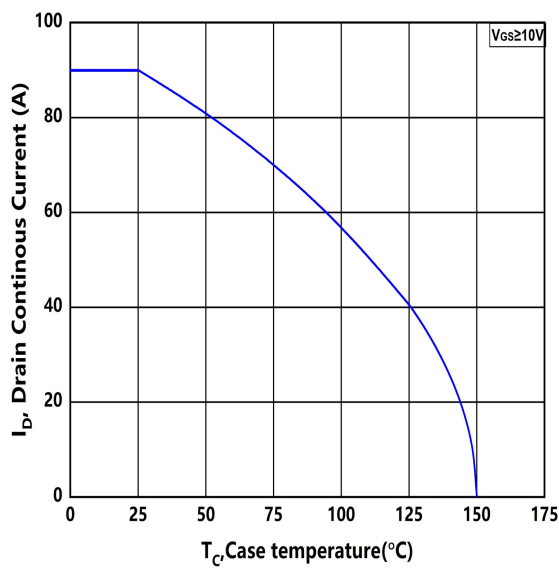


Figure.12 Safe Operating Area

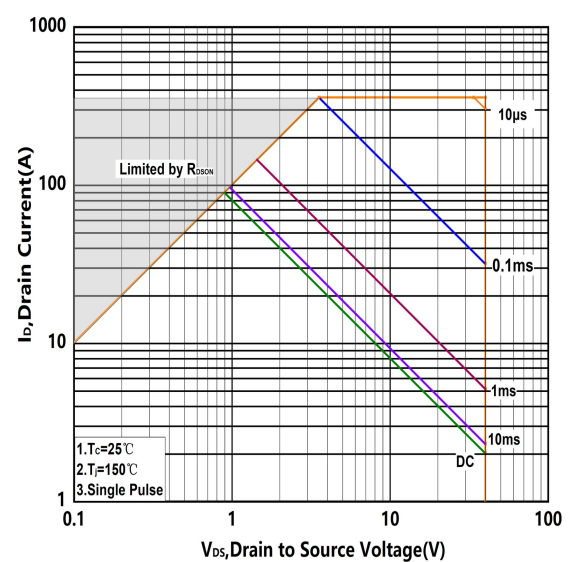
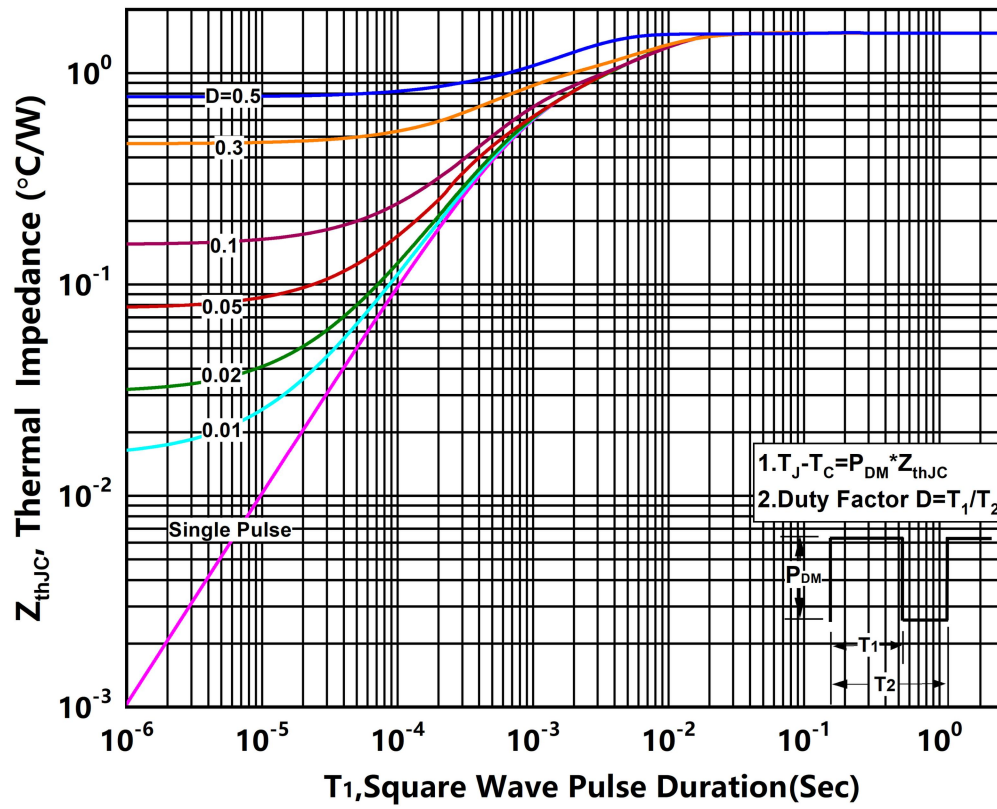
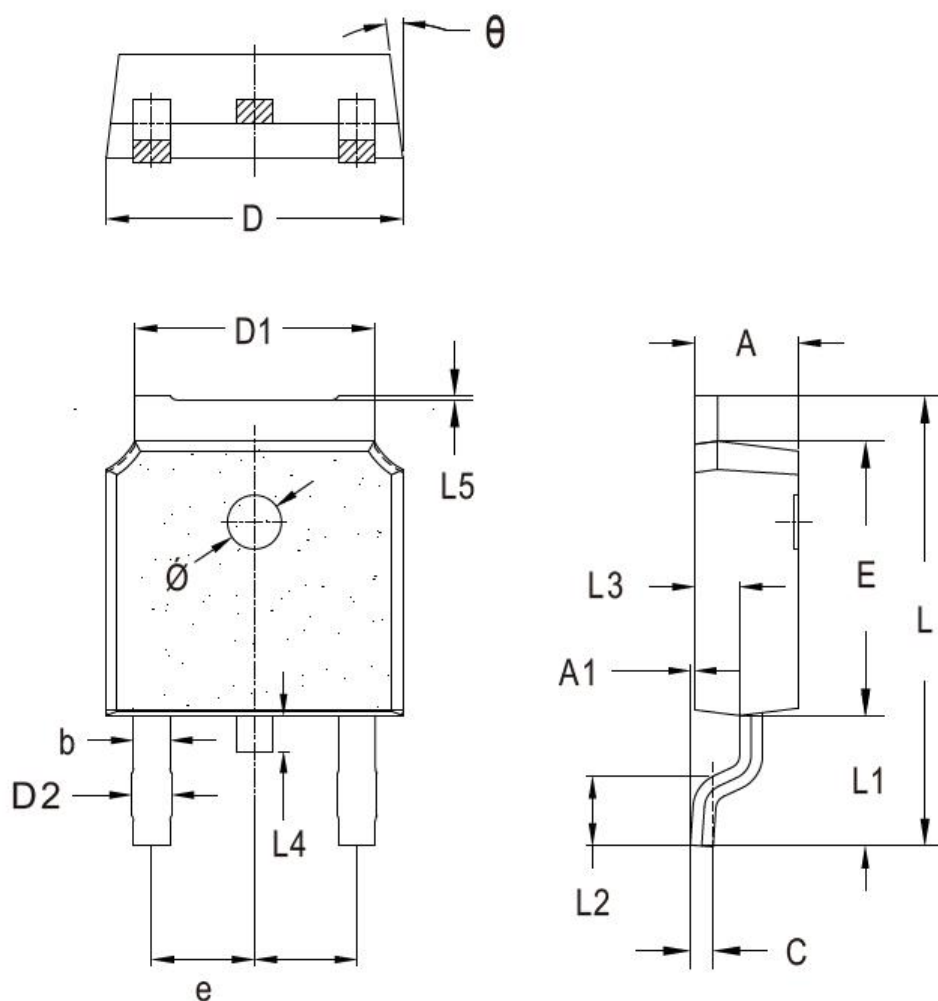


Figure.13 Transient Thermal Impedance (Junction - Case)



Package Outline:TO-252-2L



Symbol	Millimeters		Symbol	Millimeters	
	Min	Max		Min	Max
A	2.20	2.40	L	9.80	10.40
A1	0.00	0.13	L1	2.80	3.00
b	0.60	0.86	L2	1.40	1.70
C	0.48	0.52	L3	0.95	1.05
D	6.50	6.70	L4	0.70	0.90
D1	5.10	5.46	L5	0.095	0.105
E	6.00	6.30	Φ	1.10	1.30
e	2.19	2.39	θ	0.0°	7.0°