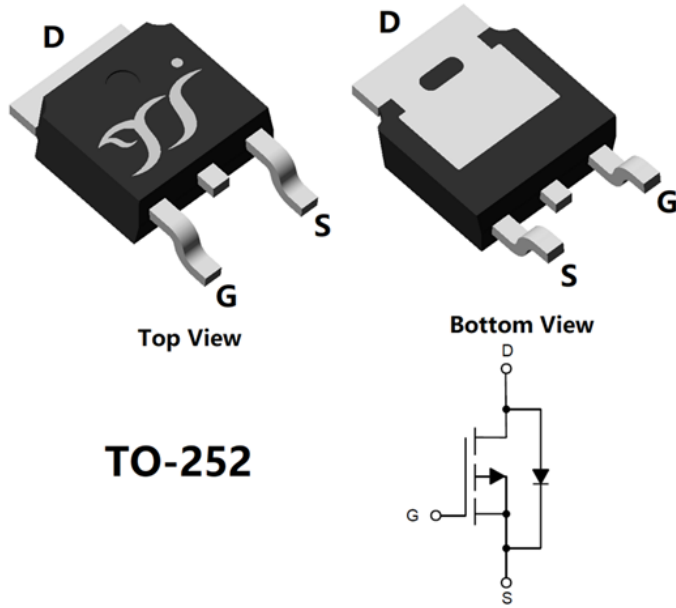


## P-Channel Enhancement Mode Field Effect Transistor



**TO-252**

### Product Summary

- $V_{DS}$  -40V
- $I_D$  -47A
- $R_{DS(ON)}$ ( at  $V_{GS}=-10V$ ) < 12m $\Omega$
- $R_{DS(ON)}$ ( at  $V_{GS}=-4.5V$ ) < 22m $\Omega$
- 100% EAS Tested
- 100%  $\nabla V_{DS}$  Tested

### General Description

- Low  $R_{DS(on)}$  & FOM
- Extremely low switching loss
- Excellent stability and uniformity
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free

### Applications

- Power management
- Portable equipment

### Limiting Values

Parameter	Conditions		Symbol	Min	Max	Unit
Drain-source Voltage			$V_{DS}$	-	-40	V
Gate-source Voltage			$V_{GS}$	-20	20	
Continuous Drain Current (Note 1,2)	Steady-State	$T_A=25^{\circ}C, V_{GS}=-10V$	$I_D$	-	-11	A
		$T_A=100^{\circ}C, V_{GS}=-10V$		-	-7	
Continuous Drain Current (Note 1,3)	Steady-State	$T_C=25^{\circ}C, V_{GS}=-10V, \text{Chip limitation}$		-	-47	
		$T_C=100^{\circ}C, V_{GS}=-10V$		-	-29	
Pulsed Drain Current	$T_C=25^{\circ}C, t_p \leq 10\mu s$		$I_{DM}$	-	-188	
Maximum Body-Diode Continuous Current	$T_C=25^{\circ}C$		$I_S$		-40	
Avalanche energy (non-repetitive )	$T_J=25^{\circ}C, V_G=-10V, R_G=25\Omega, L=0.5mH, I_{AS}=-18.9A$		EAS	-	89.3	mJ
Total Power Dissipation (Note 1,2)	Steady-State	$T_A=25^{\circ}C$	$P_D$	-	2.5	W
		$T_A=100^{\circ}C$		-	1	
Total Power Dissipation (Note 1,3)	Steady-State	$T_C=25^{\circ}C$		-	44	
		$T_C=100^{\circ}C$		-	17	
Junction and Storage Temperature Range			$T_J, T_{STG}$	-55	150	$^{\circ}C$

### Thermal Resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient (Note 2)	Steady-State	$R_{\theta JA}$	-	50	$^{\circ}C/W$
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$	-	2.8	

### Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
YJD012P04A	F1/F2	YJD012P04A	2500	/	25000	13" reel



# YJD012P04A

## ■ Electrical Characteristics

s	Symbol	Conditions	Min	Typ	Max	Units
<b>Static Parameter</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A, T_J=25^\circ C$	-40	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-40V, V_{GS}=0V, T_J=25^\circ C$	-	-	-1	$\mu A$
		$V_{DS}=-40V, V_{GS}=0V, T_J=150^\circ C$	-	-	-100	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V, T_J=25^\circ C$	-	-	$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A, T_J=25^\circ C$	-1.2	-1.7	-2.2	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-20A, T_J=25^\circ C$	-	9.5	12	$m\Omega$
		$V_{GS}=-4.5V, I_D=-20A, T_J=25^\circ C$	-	16.5	22	$m\Omega$
Diode Forward Voltage	$V_{SD}$	$I_S=-20A, V_{GS}=0V, T_J=25^\circ C$	-	-0.88	-1.2	V
Gate Resistance	$R_G$	$f=1MHz, T_J=25^\circ C$	-	5.9	-	$\Omega$
<b>Dynamic Parameters</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-20V, V_{GS}=0V, f=1MHz, T_J=25^\circ C$	-	2595	-	$pF$
Output Capacitance	$C_{oss}$		-	265	-	
Reverse Transfer Capacitance	$C_{rss}$		-	240	-	
<b>Switching Parameters</b>						
Total Gate Charge	$Q_g$	$V_{GS}=-10V, V_{DS}=-20V, I_D=-20A, T_J=25^\circ C$	-	55.6	-	nC
Gate-Source Charge	$Q_{gs}$		-	10.5	-	
Gate-Drain Charge	$Q_{gd}$		-	8.6	-	
Reverse Recovery Charge	$Q_{rr}$	$I_F=-20A, di/dt=100A/\mu s, V_{GS}=0V, V_R=-20V, T_J=25^\circ C$	-	21.3	-	nC
Reverse Recovery Time	$t_{rr}$		-	24	-	ns
Turn-on Delay Time	$t_{D(on)}$	$V_{GS}=-10V, V_{DS}=-20V, I_D=-20A, R_{GEN}=3\Omega, T_J=25^\circ C$	-	10	-	ns
Turn-on Rise Time	$t_r$		-	13	-	
Turn-off Delay Time	$t_{D(off)}$		-	72	-	
Turn-off Fall Time	$t_f$		-	43	-	

### Note:

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- The value of  $R_{\theta JA}$  is measured with the device mounted on the 40mm\*40mm\*1.1mm single layer FR-4 PCB board with 1 in<sup>2</sup> pad of 2oz. Copper, in the still air environment with  $T_A=25^\circ C$ . The maximum allowed junction temperature of  $150^\circ C$ . The value in any given application depends on the user's specific board design.
- Thermal resistance from junction to soldering point (on the exposed drain pad).



## Typical Electrical and Thermal Characteristics Diagrams

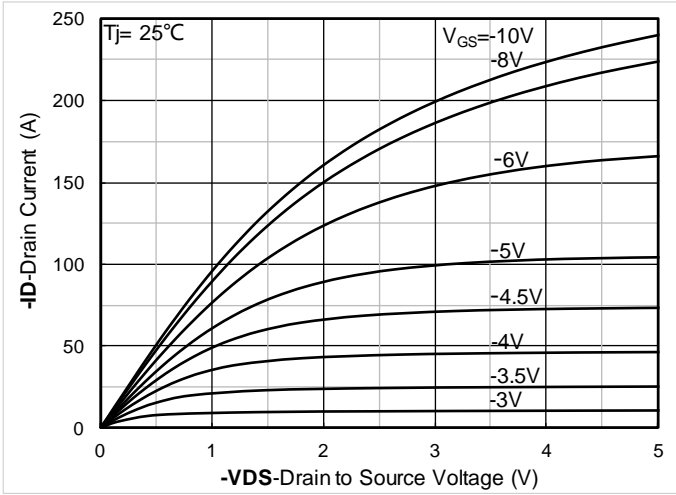


Figure 1. Output Characteristics; typical values

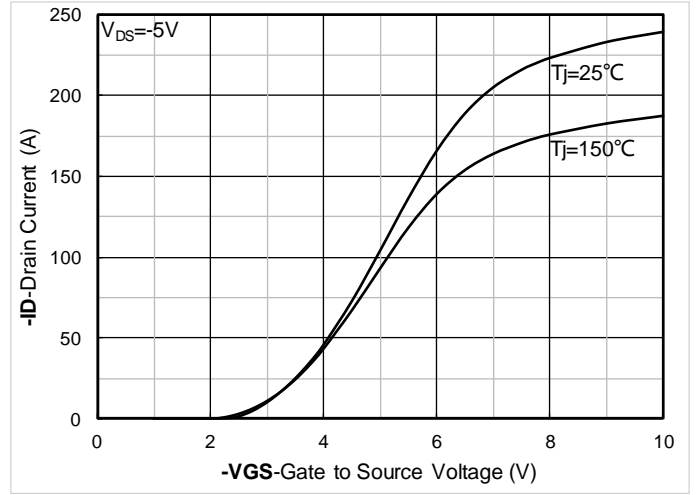


Figure 2. Transfer Characteristics; typical values

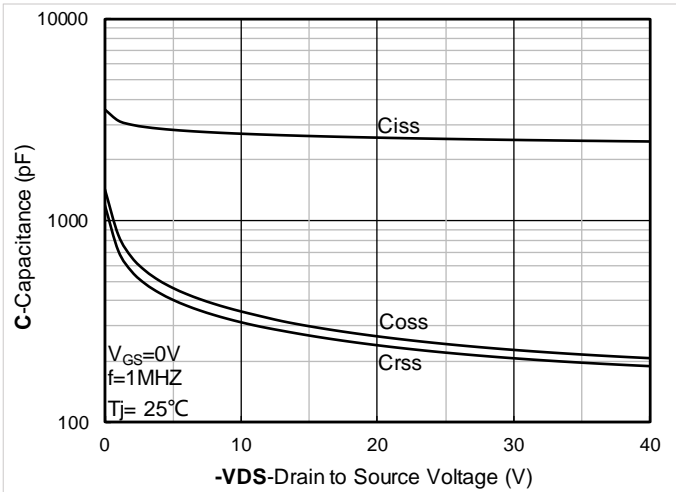


Figure 3. Capacitance Characteristics; typical values

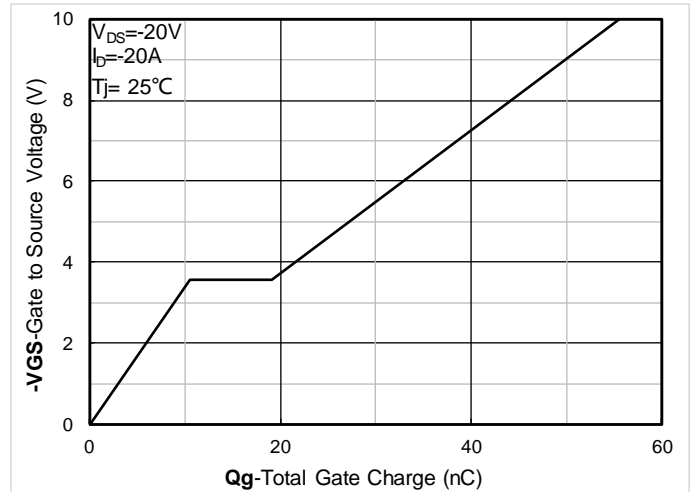


Figure 4. Gate Charge; typical values

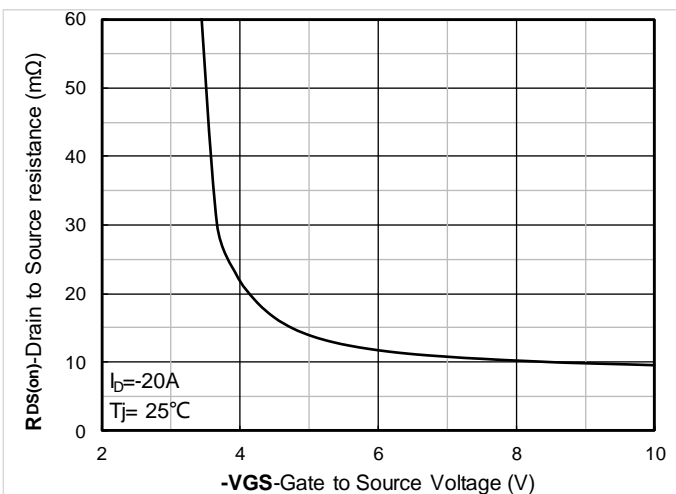


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

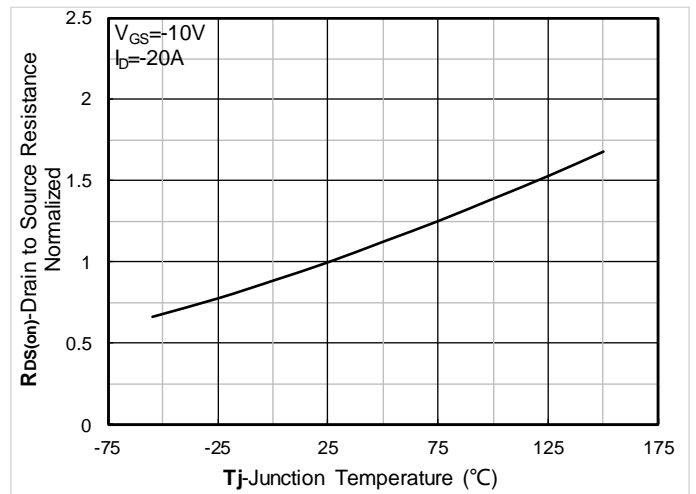


Figure 6. Normalized On-Resistance



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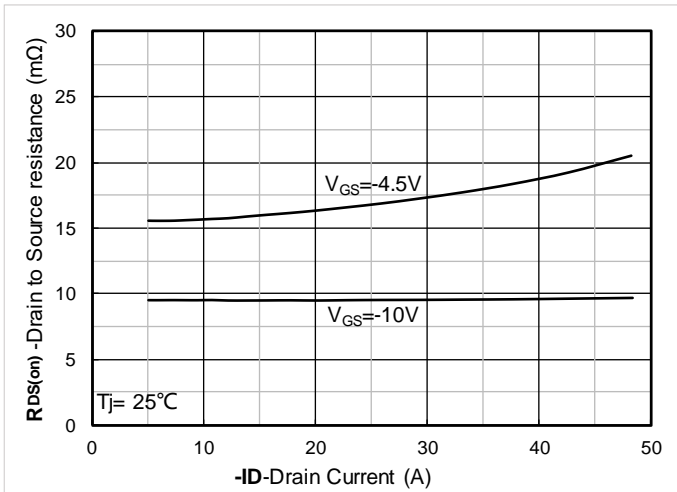


Figure 7. RDS(on) vs. Drain Current; typical values

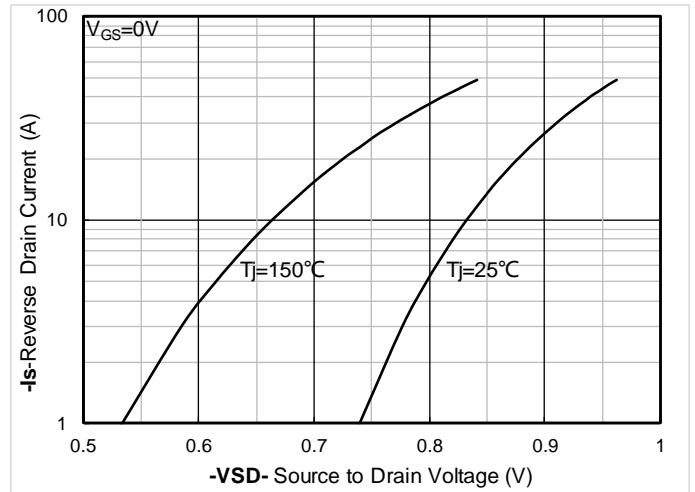


Figure 8. Forward characteristics of reverse diode; typical values

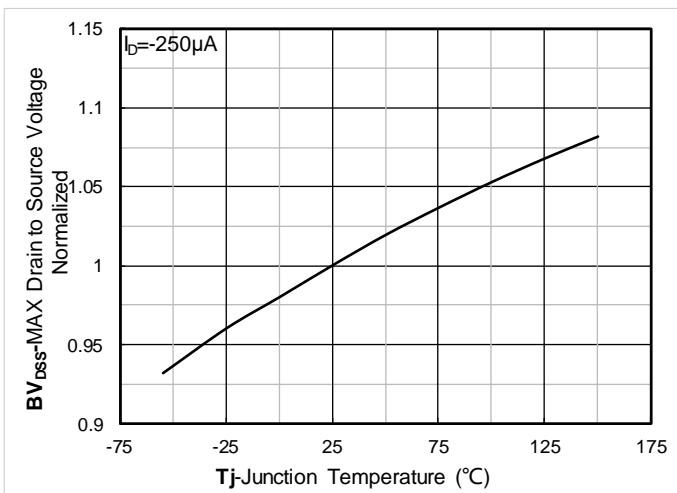


Figure 9. Normalized breakdown voltage

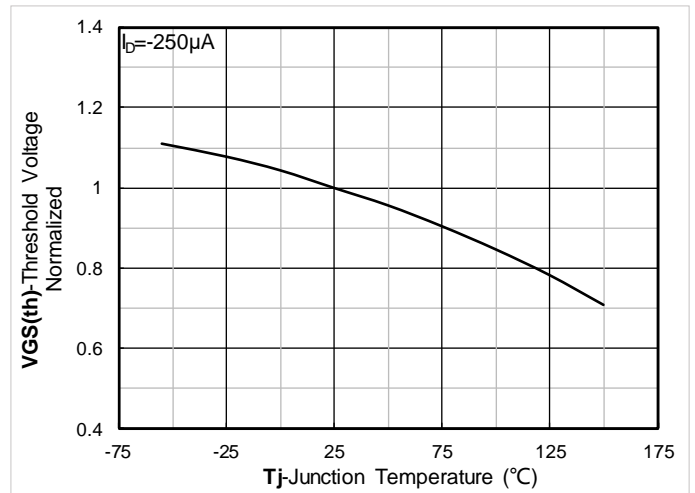


Figure 10. Normalized Threshold voltage

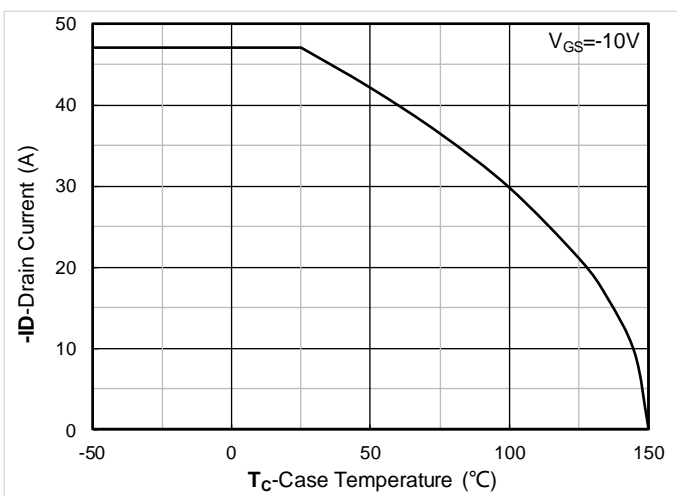


Figure 11. Current dissipation

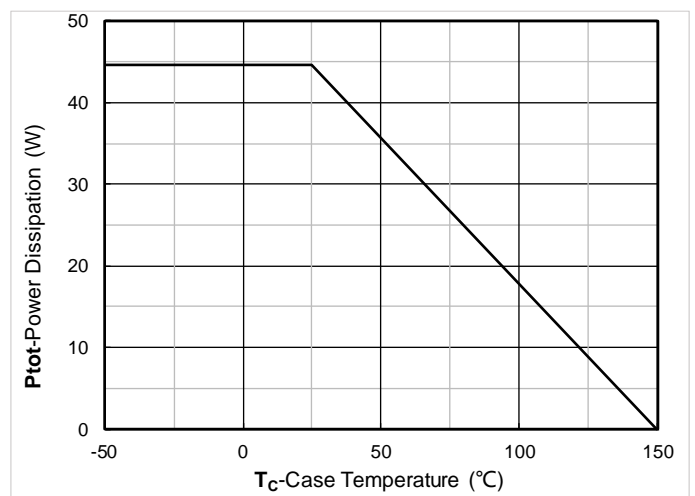


Figure 12. Power dissipation



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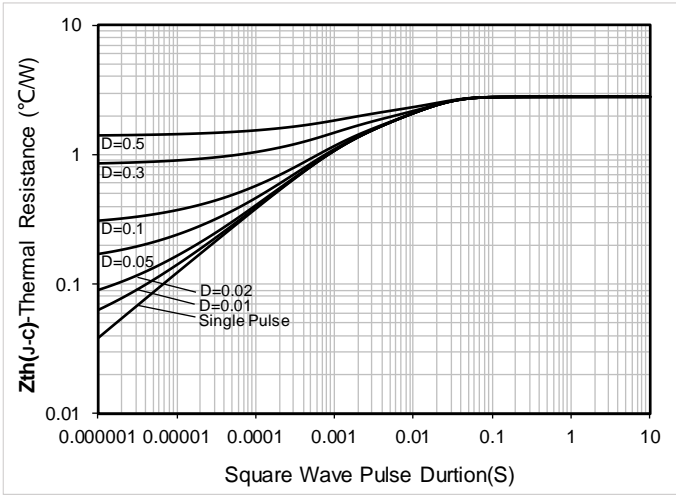


Figure 13. Maximum Transient Thermal Impedance

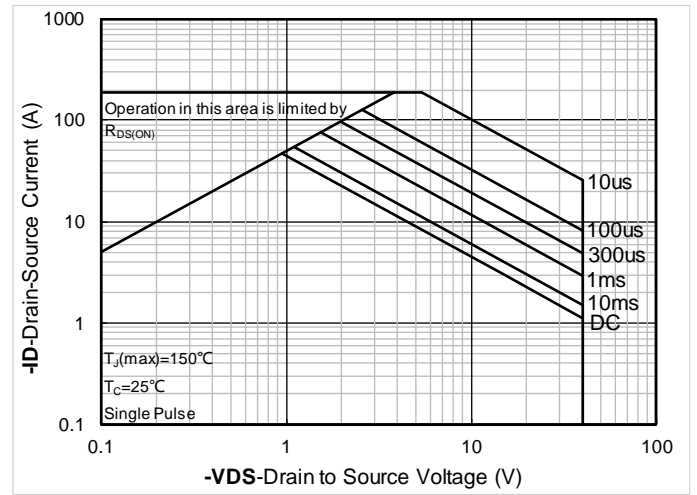
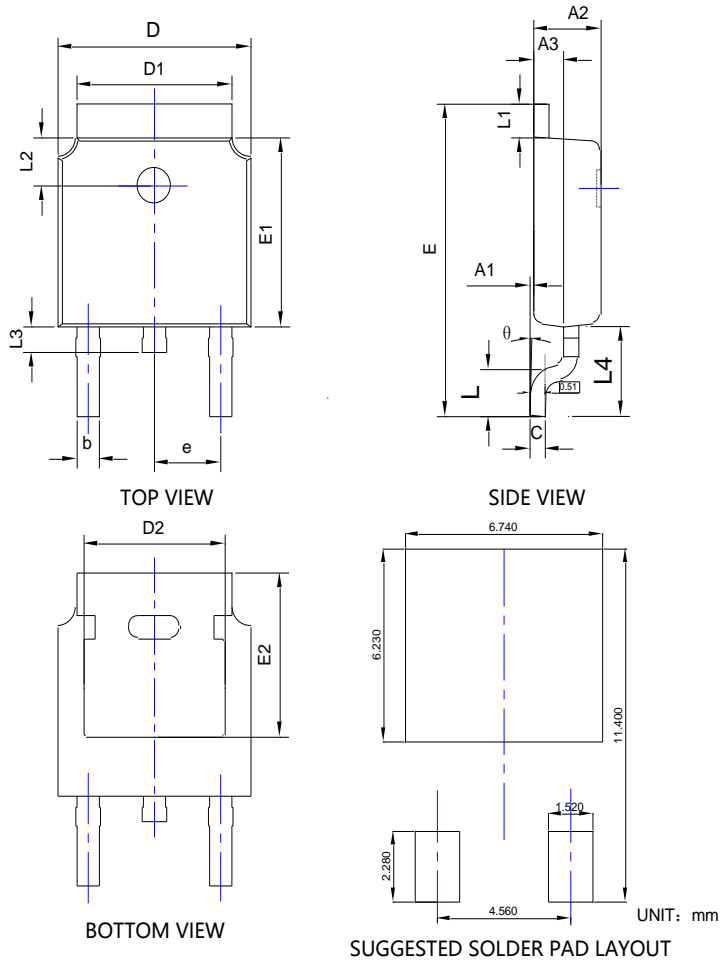


Figure 14. Safe Operation Area



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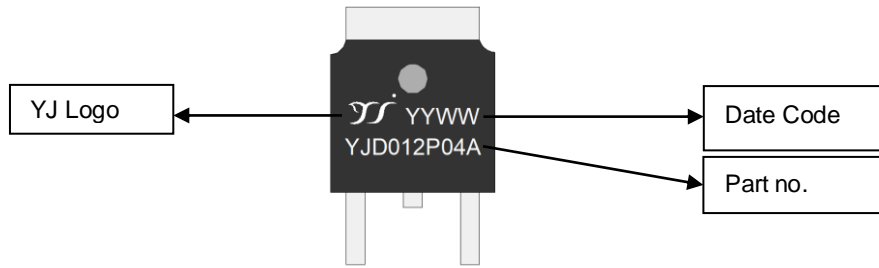
## ■ TO-252-B Package Information



SYMBOL	DIMENSIONS					
	INCHES			Millimeter		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A1	0.000	---	0.008	0.000	---	0.200
A2	0.087	0.091	0.094	2.200	2.300	2.400
A3	0.035	0.039	0.043	0.900	1.000	1.100
b	0.026	0.030	0.034	0.660	0.760	0.860
c	0.018	0.020	0.023	0.460	0.520	0.580
D	0.256	0.260	0.264	6.500	6.600	6.700
D1	0.203	0.209	0.215	5.150	5.300	5.450
D2	0.181	0.189	0.195	4.600	4.800	4.950
E	0.390	0.398	0.406	9.900	10.100	10.300
E1	0.236	0.240	0.244	6.000	6.100	6.200
E2	0.203	0.209	0.215	5.150	5.300	5.450
e	0.090BSC			2.286BSC		
L	0.049	0.059	0.069	1.250	1.500	1.750
L1	0.035	---	0.050	0.900	---	1.270
L2	0.055	---	0.075	1.400	---	1.900
L3	0.024	0.031	0.039	0.600	0.800	1.000
L4	0.114REF			2.900REF		
$\theta$	0°	---	10°	0°	---	10°

NOTE:  
 1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.  
 2. TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.  
 3. THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.

## ■ Marking Information



**Note:**

1. All marking is at middle of the product body
2. All marking is in laser printing
3. YJD012P04A is part no., YYWW is date code, "YY" is year, "WW" is week
4. Body color: Black



## YJD012P04A

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