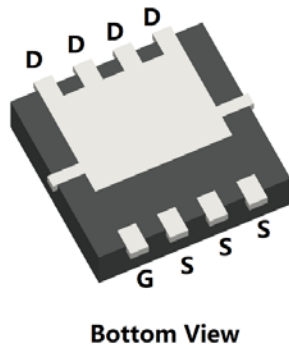
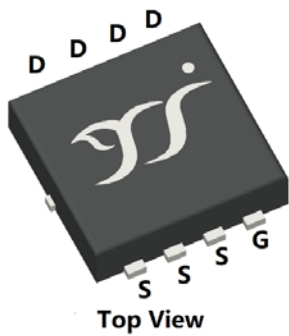
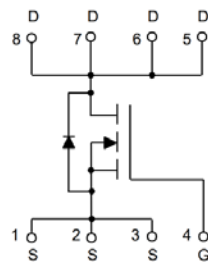


## N-Channel Enhancement Mode Field Effect Transistor



PDFN3333-8L



### Product Summary

- $V_{DS}$  40V
- $I_D$  30A
- $R_{DS(ON)}$  (at  $V_{GS}=10V$ )  $< 12m\Omega$
- $R_{DS(ON)}$  (at  $V_{GS}=4.5V$ )  $< 17m\Omega$
- 100% EAS Tested
- 100%  $\nabla V_{DS}$  Tested

### General Description

- Excellent package for heat dissipation
- High density cell design for low  $R_{DS(ON)}$
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free
- Part no. with suffix "Q" means AEC-Q101 qualified

### Applications

- Power switching application
- Uninterruptible power supply
- DC-DC convertor

### 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	$T_A=25^\circ C, V_{GS}=10V$	$I_D$	-	9	A		
		$T_A=100^\circ C, V_{GS}=10V$		-	5.5			
Continuous Drain Current (Note 1,3)	Steady-State	$T_C=25^\circ C, V_{GS}=10V, \text{Chip limitation}$		-	30			
		$T_C=100^\circ C, V_{GS}=10V$		-	19			
Pulsed Drain Current	$T_C=25^\circ C, t_p \leq 10\mu s$			$I_{DM}$	-		110	
Maximum Body-Diode Continuous Current	$T_C=25^\circ C$		$I_S$		30			
Avalanche energy (non-repetitive)	$T_J=25^\circ C, V_G=10V, R_G=25\Omega, L=0.5mH, I_{AS}=12.8A$		EAS	-	40.96	mJ		
Total Power Dissipation (Note 1,2)	Steady-State	$T_A=25^\circ C$	$P_D$	-	1.92	W		
		$T_A=100^\circ C$		-	0.76			
Total Power Dissipation (Note 1,3)	Steady-State	$T_C=25^\circ C$		-	34			
		$T_C=100^\circ C$		-	13			
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	$R_{\theta JA}$	-	65	$^\circ C/W$
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$	-	3.6	

### Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
YJQ012N04AQ	F1	012N04A	5000	10000	100000	13" reel



# YJQ012N04AQ

## ■ Electrical Characteristics

Parameter	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	1.5	2	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=15A, T_j=25^\circ C$	-	9	12	$m\Omega$
		$V_{GS}=4.5V, I_D=10A, T_j=25^\circ C$	-	12.5	17	$m\Omega$
Diode Forward Voltage	$V_{SD}$	$I_S=10A, V_{GS}=0V, T_j=25^\circ C$	-	0.82	1.2	V
Gate Resistance	$R_G$	$f=1MHz, T_j=25^\circ C$	-	3	-	$\Omega$
<b>Dynamic Parameters</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=20V, V_{GS}=0V, f=1MHz, T_j=25^\circ C$	-	980	-	$pF$
Output Capacitance	$C_{oss}$		-	95	-	
Reverse Transfer Capacitance	$C_{rss}$		-	82	-	
<b>Switching Parameters</b>						
Total Gate Charge	$Q_g$	$V_{GS}=10V, V_{DS}=20V, I_D=15A, T_j=25^\circ C$	-	21.4	-	$nC$
Gate-Source Charge	$Q_{gs}$		-	3.1	-	
Gate-Drain Charge	$Q_{gd}$		-	5.3	-	
Reverse Recovery Charge	$Q_{rr}$	$I_F=15A, di/dt=100A/\mu s, V_{GS}=0V, V_R=20V, T_j=25^\circ C$	-	6.3	-	$nC$
Reverse Recovery Time	$t_{rr}$		-	12	-	ns
Turn-on Delay Time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=20V, I_D=15A, R_{GEN}=2.7\Omega, T_j=25^\circ C$	-	8.5	-	$ns$
Turn-on Rise Time	$t_r$		-	51	-	
Turn-off Delay Time	$t_{D(off)}$		-	26.2	-	
Turn-off Fall Time	$t_f$		-	6.5	-	

### 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).



# YJQ012N04AQ

## Typical Electrical and Thermal Characteristics Diagrams

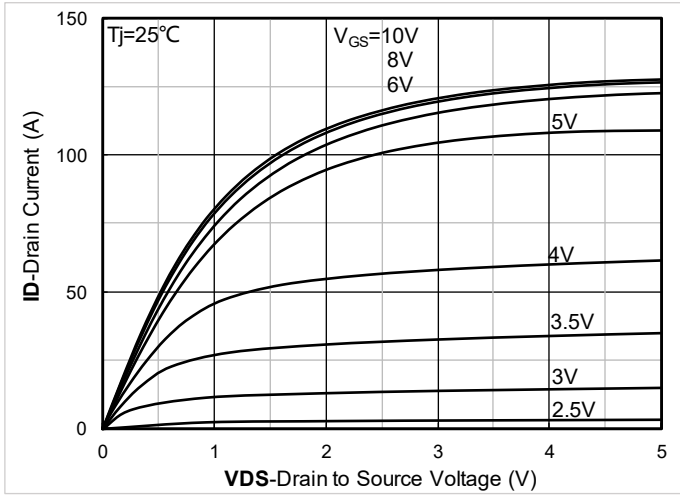


Figure 1. Output Characteristics; typical values

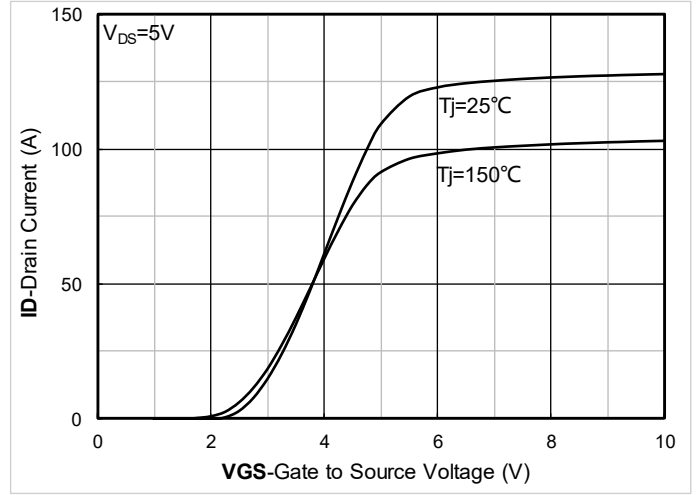


Figure 2. Transfer Characteristics; typical values

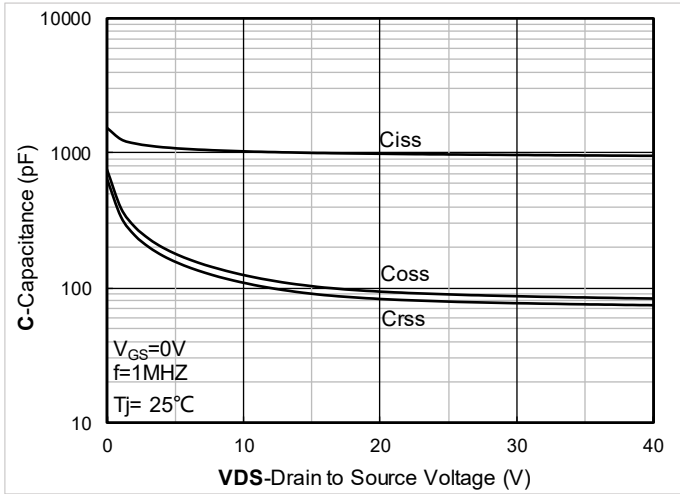


Figure 3. Capacitance Characteristics; typical values

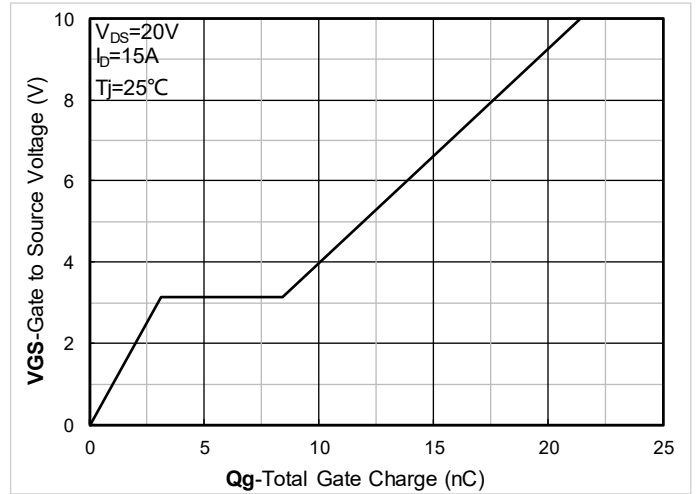


Figure 4. Gate Charge; typical values

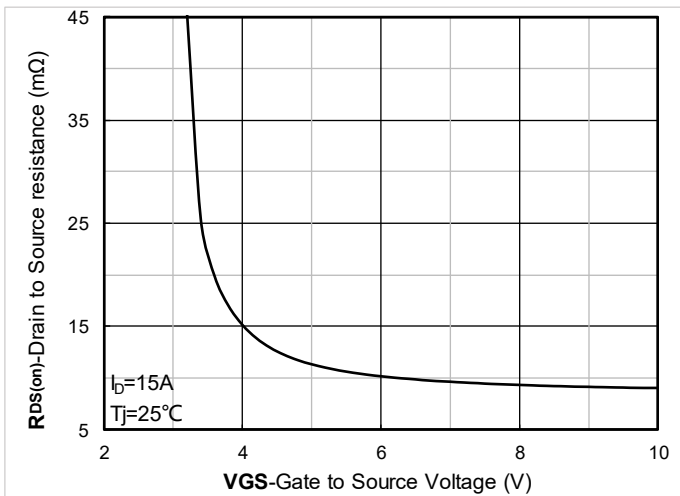


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

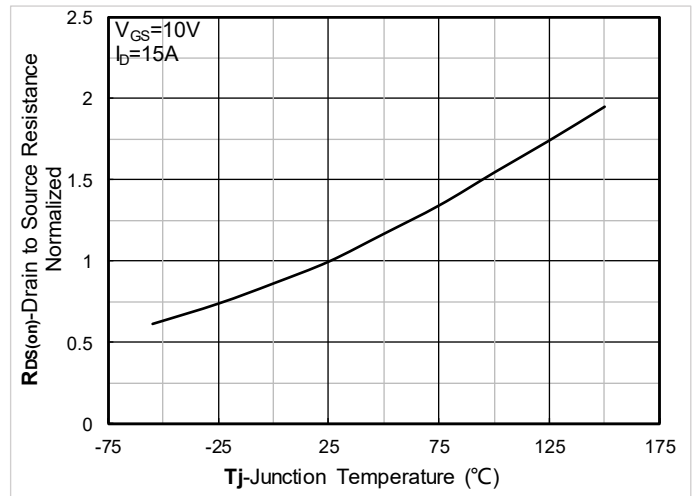


Figure 6. Normalized On-Resistance



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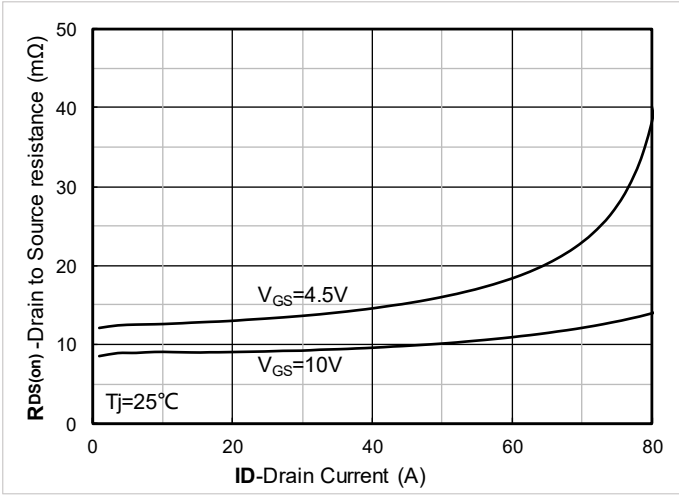


Figure 7. RDS(on) vs. Drain Current; typical values

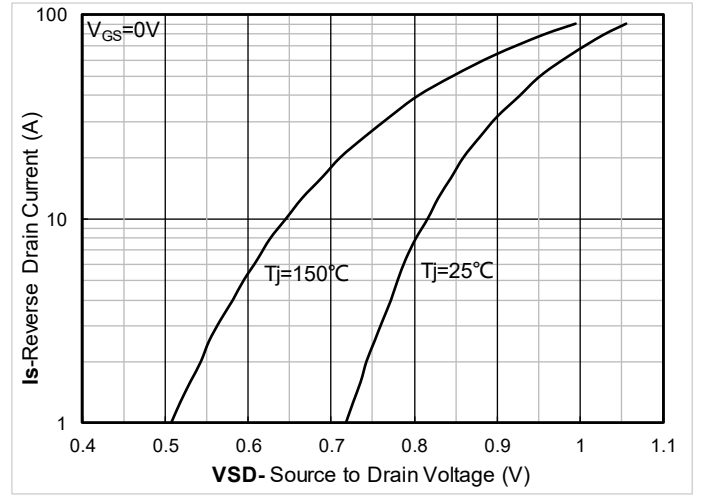


Figure 8. Forward characteristics of reverse diode; typical values

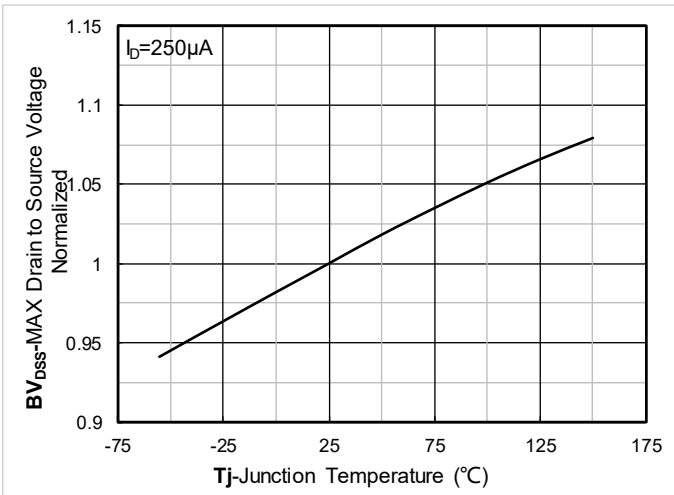


Figure 9. Normalized breakdown voltage

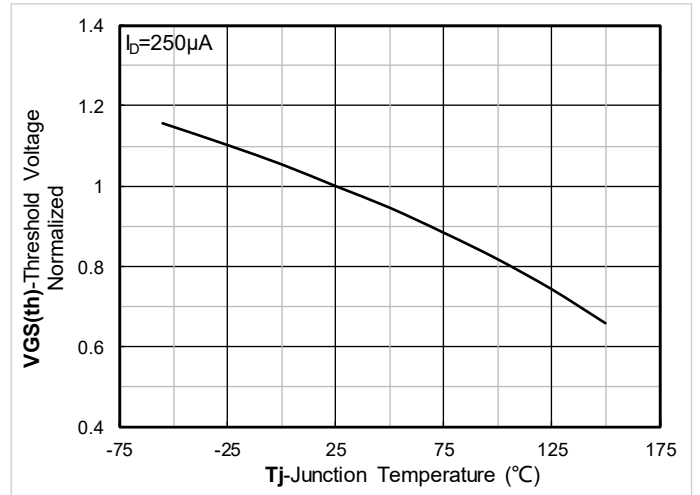


Figure 10. Normalized Threshold voltage

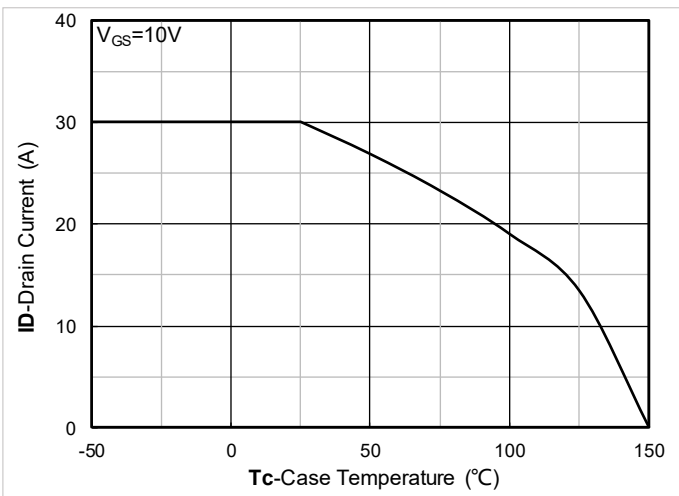


Figure 11. Current dissipation

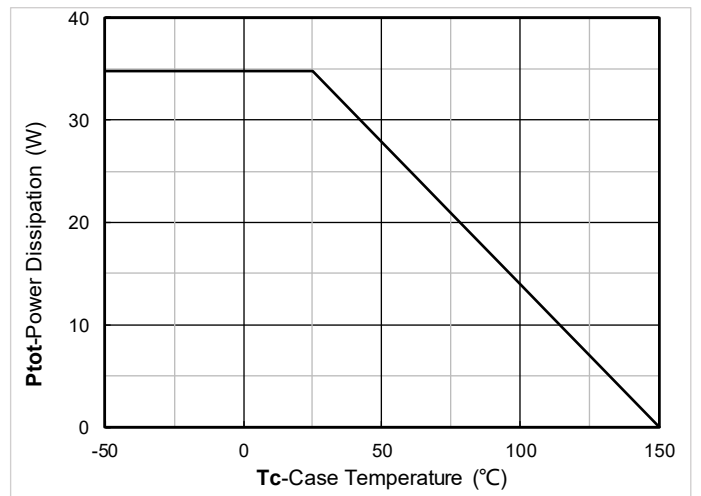


Figure 12. Power dissipation



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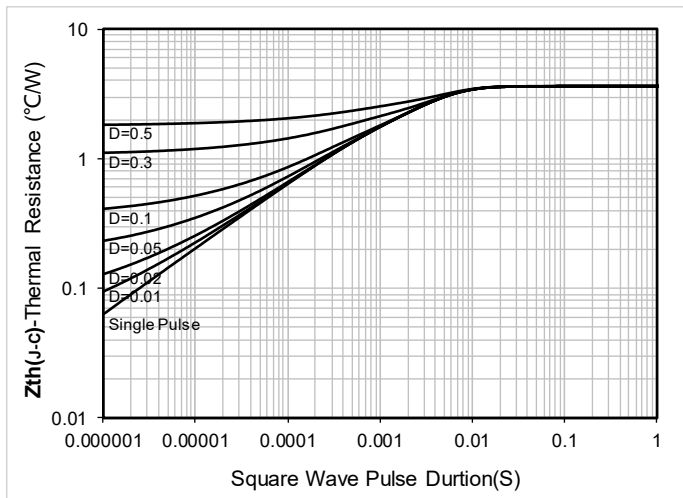


Figure 13. Maximum Transient Thermal Impedance

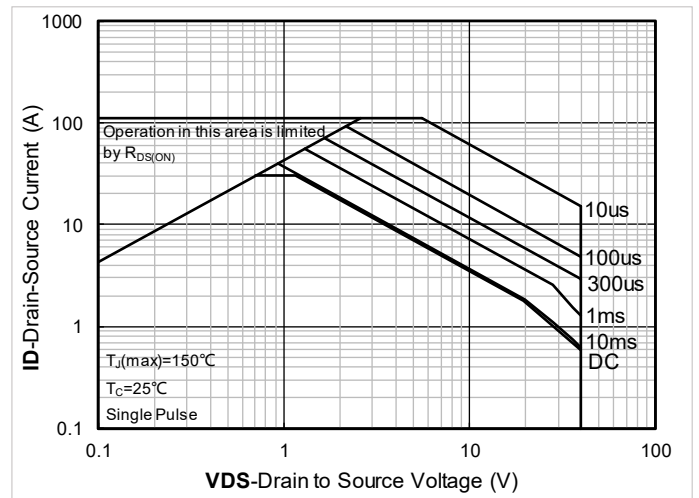


Figure 14. Safe Operation Area

## ■ Test Circuits & Waveforms

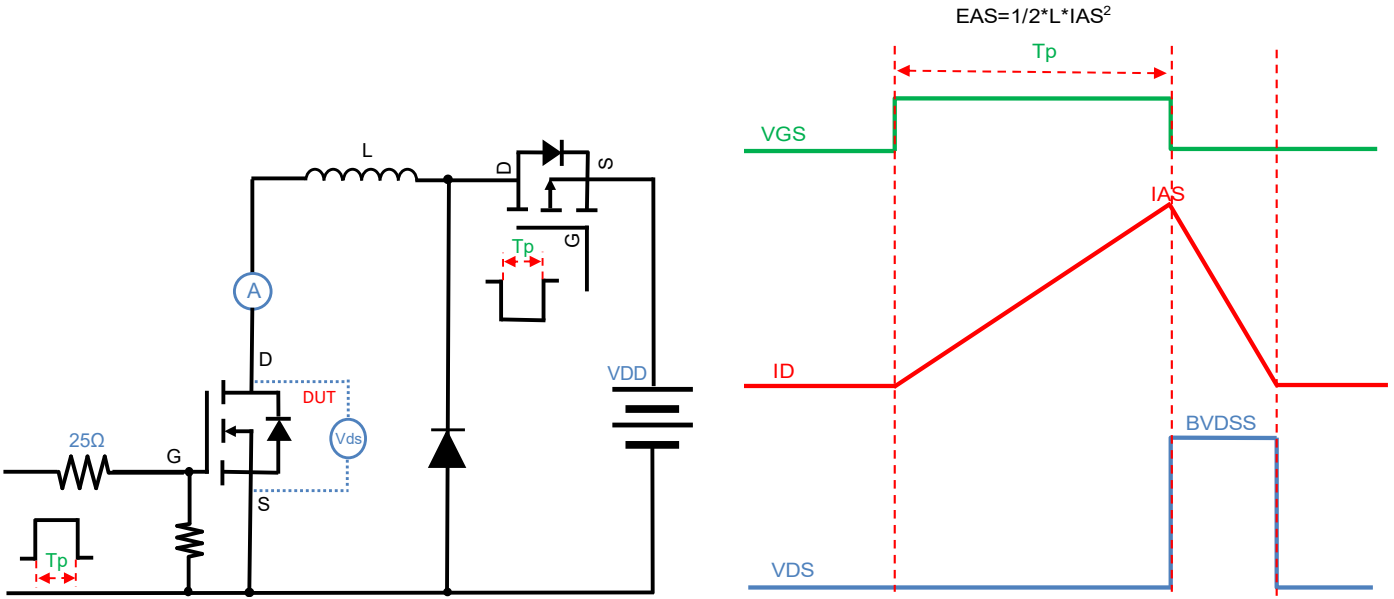


Figure A. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

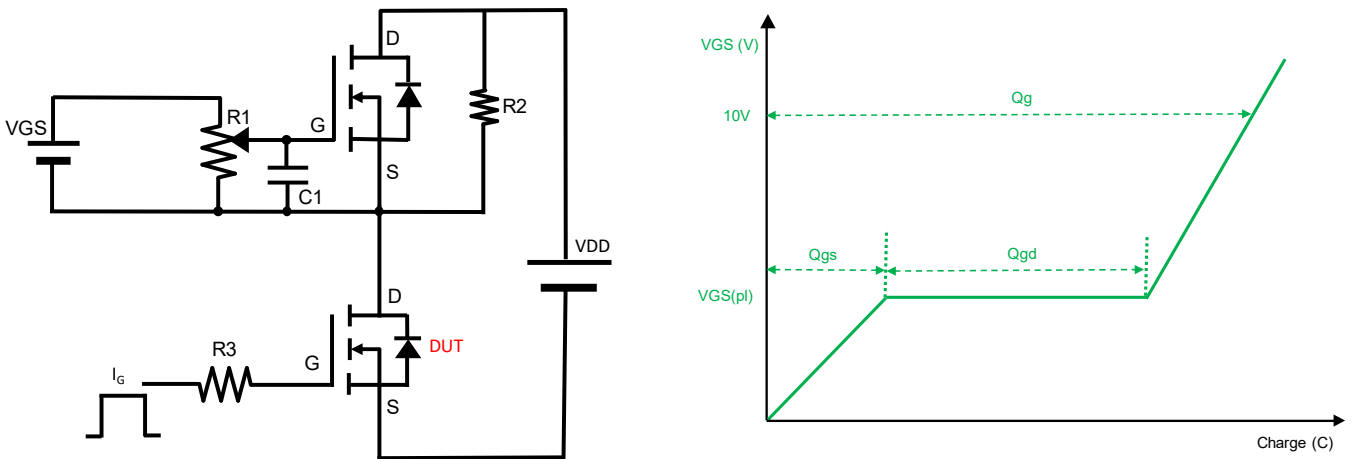


Figure B. Gate Charge Test Circuit & Waveform

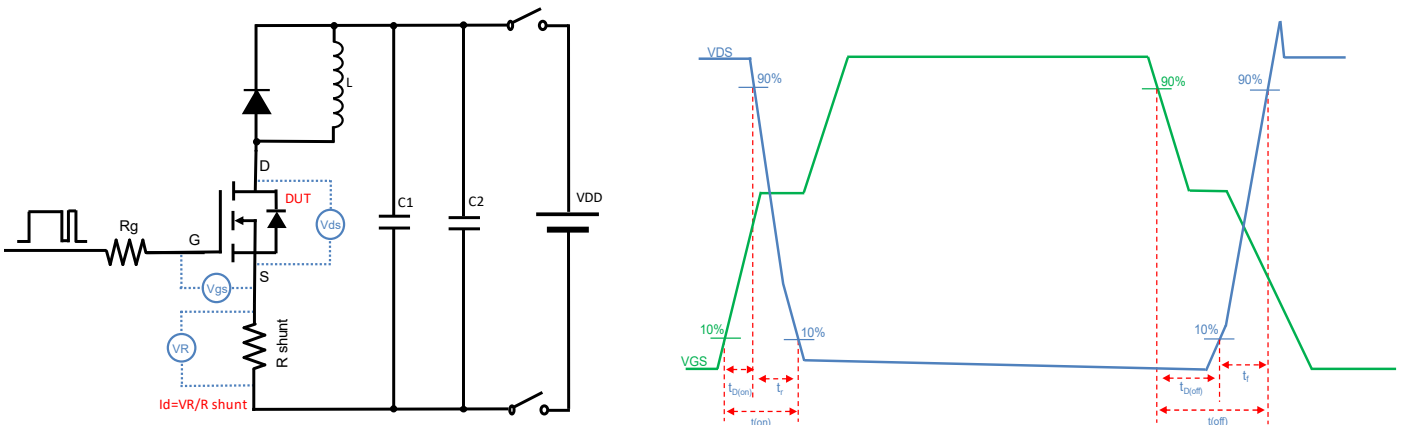


Figure C. Resistive Switching Test Circuit & Waveform

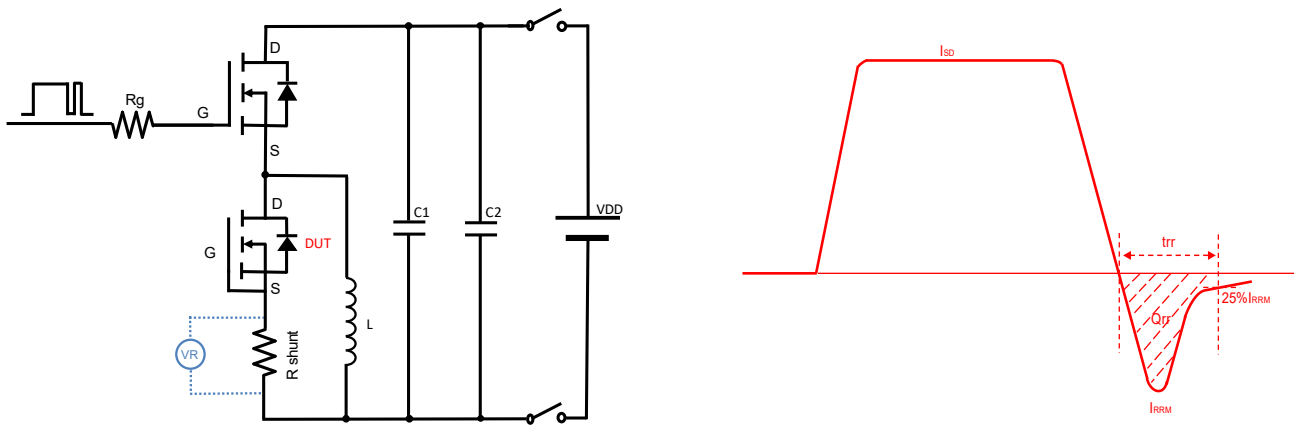
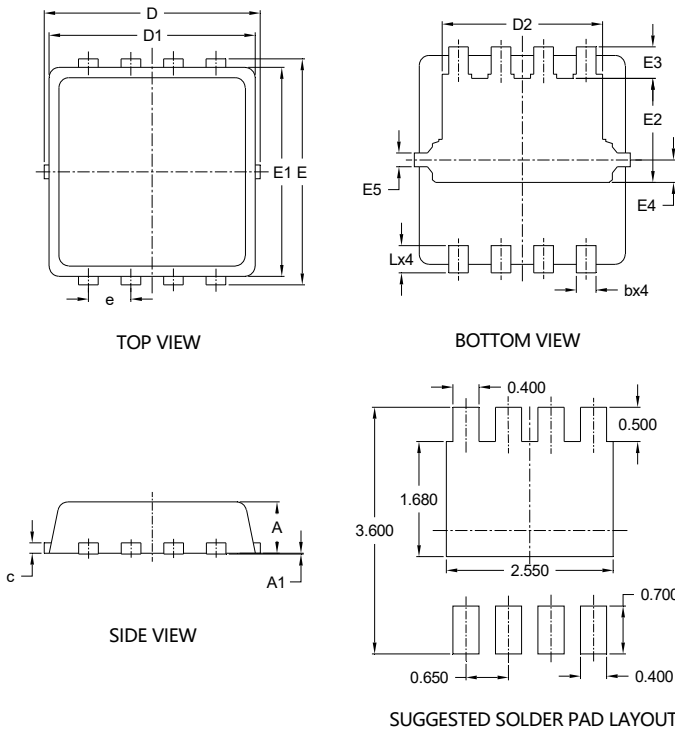


Figure D. Diode Recovery Test Circuit & Waveform



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## ■ PDFN3333-8L-B-0.75MM Package information



SYMBOL	DIMENSIONS			
	INCHES		Millimeter	
	MIN.	MAX.	MIN.	MAX.
A	0.028	0.033	0.700	0.850
A1	0.000	0.002	0.000	0.050
b	0.008	0.016	0.200	0.400
c	0.004	0.010	0.100	0.250
D	0.124	0.136	3.150	3.450
D1	0.118	0.130	3.000	3.300
D2	0.089	0.104	2.250	2.650
E	0.124	0.136	3.150	3.450
E1	0.114	0.126	2.900	3.200
E2	0.052	0.068	1.320	1.720
E3	0.011	0.026	0.280	0.650
E4	0.013 REF		0.330 REF	
E5	0.008 REF		0.200 REF	
e	0.026 BSC		0.650 BSC	
L	0.012	0.020	0.300	0.500

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.

UNIT: mm





## YJQ012N04AQ

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