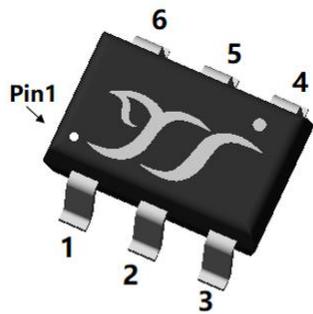
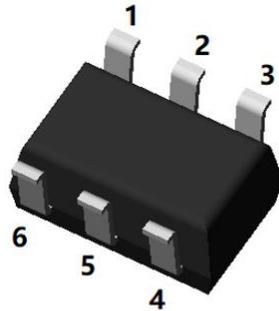


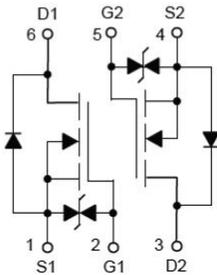
## N-Channel and N-Channel Complementary MOSFET



Top View



Bottom View



**SOT-363**

### Product Summary

- $V_{DS}$  60V
- $I_D$  0.3A
- $R_{DS(ON)}$  ( at  $V_{GS}=10V$ )  $<2.0\Omega$
- $R_{DS(ON)}$  ( at  $V_{GS}=4.5V$ )  $<2.5\Omega$
- $R_{DS(ON)}$  ( at  $V_{GS}=2.5V$ )  $<3.5\Omega$
- ESD Protected Up to 2KV (HBM)

### General Description

- Trench Power MV MOSFET technology
- Voltage controlled small signal switch
- Low input Capacitance
- Fast Switching Speed
- Low Input / Output Leakage
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free

### Applications

- Battery operated systems
- Solid-state relays
- Direct logic-level interface: TTL/CMOS

### Limiting Values

Parameter	Conditions		Symbol	Min	Max	Unit
Drain-source Voltage			$V_{DS}$	-	60	V
Gate-source Voltage			$V_{GS}$	-20	20	V
Continuous Drain Current (Note 1,2)	Steady-State	$T_A=25^\circ\text{C}, V_{GS}=10\text{V}$	$I_D$	-	0.3	A
		$T_A=100^\circ\text{C}, V_{GS}=10\text{V}$		-	0.2	
Pulsed Drain Current	$T_A=25^\circ\text{C}, t_p \leq 10\mu\text{s}$		$I_{DM}$	-	1.85	
Maximum Body-Diode Continuous Current	$T_A=25^\circ\text{C}$		$I_S$		0.3	
Total Power Dissipation (Note 1,2)	Steady-State	$T_A=25^\circ\text{C}$	$P_D$	-	0.36	W
		$T_A=100^\circ\text{C}$		-	0.18	
Junction and Storage Temperature Range			$T_J, T_{STG}$	-55	175	$^\circ\text{C}$

### Thermal Resistance

Parameter	Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient (Note 2)	$R_{\theta JA}$	-	410	$^\circ\text{C/W}$

### Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
2N7002DWKF	F2	72KF	3000	30000	120000	7" reel



# 2N7002DWKF

## ■ Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Static Parameter</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A, T_j=25^\circ C$	60	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V, T_j=25^\circ C$	-	-	1	$\mu A$
		$V_{DS}=60V, V_{GS}=0V, T_j=125^\circ C$	-	-	100	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V, T_j=25^\circ C$	-	-	$\pm 10$	$\mu A$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A, T_j=25^\circ C$	0.55	0.85	1.15	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=0.3A, T_j=25^\circ C$	-	0.9	2.0	$\Omega$
		$V_{GS}=4.5V, I_D=0.2A, T_j=25^\circ C$	-	1.0	2.5	
		$V_{GS}=2.5V, I_D=0.1A, T_j=25^\circ C$	-	1.2	3.5	
Diode Forward Voltage	$V_{SD}$	$I_S=0.3A, V_{GS}=0V, T_j=25^\circ C$	-	0.84	1.2	V
Gate Resistance	$R_G$	$f=1MHz, T_j=25^\circ C$	-	100	-	$\Omega$
<b>Dynamic Parameters</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V, f=1MHz, T_j=25^\circ C$	-	23	-	$pF$
Output Capacitance	$C_{oss}$		-	4.5	-	
Reverse Transfer Capacitance	$C_{rss}$		-	1.7	-	
<b>Switching Parameters</b>						
Total Gate Charge	$Q_g$	$V_{GS}=10V, V_{DS}=30V, I_D=0.3A, T_j=25^\circ C$	-	1.1	-	$nC$
Gate-Source Charge	$Q_{gs}$		-	0.07	-	
Gate-Drain Charge	$Q_{gd}$		-	0.15	-	
Reverse Recovery Charge	$Q_{rr}$	$I_F=0.3A, di/dt=100A/\mu s, V_{GS}=0V, V_R=30V, T_j=25^\circ C$	-	10.7	-	$nC$
Reverse Recovery Time	$t_{rr}$		-	32.6	-	ns
Turn-on Delay Time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=30V, I_D=0.3A, R_{GEN}=3\Omega, T_j=25^\circ C$	-	2.9	-	$ns$
Turn-on Rise Time	$t_r$		-	2.6	-	
Turn-off Delay Time	$t_{D(off)}$		-	15.9	-	
Turn-off Fall Time	$t_f$		-	43.3	-	

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 175 $^\circ C$ . 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

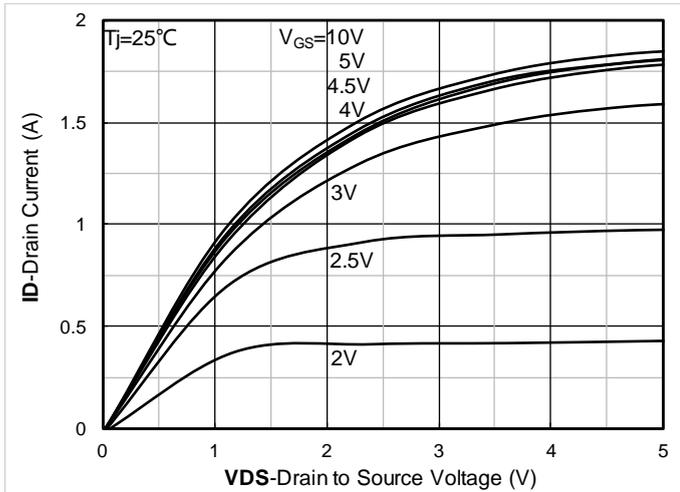


Figure 1. Output Characteristics; typical values

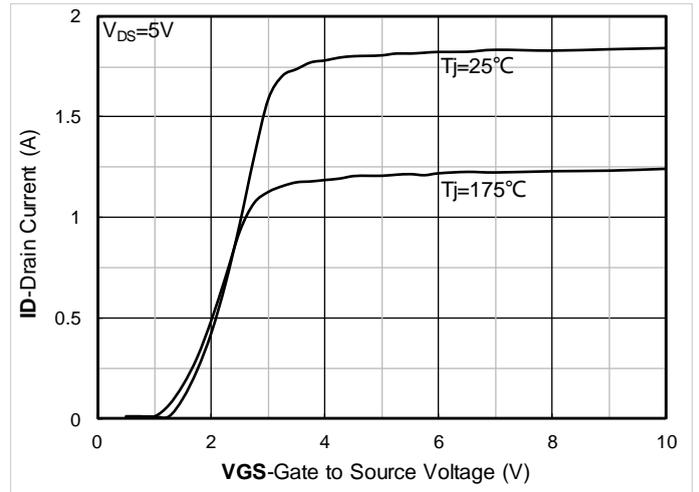


Figure 2. Transfer Characteristics; typical values

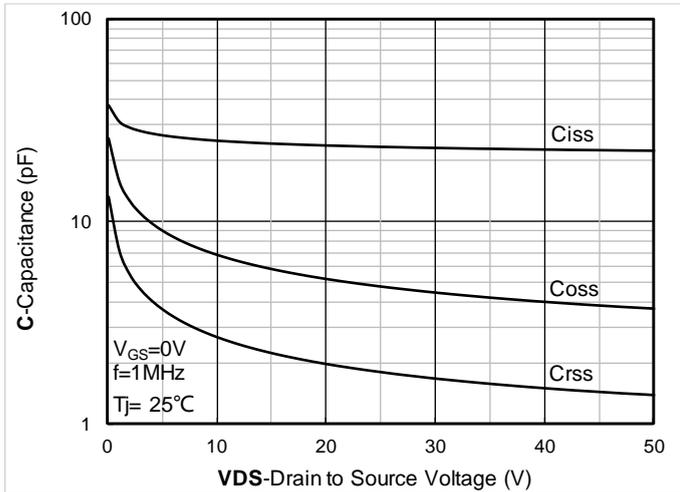


Figure 3. Capacitance Characteristics; typical values

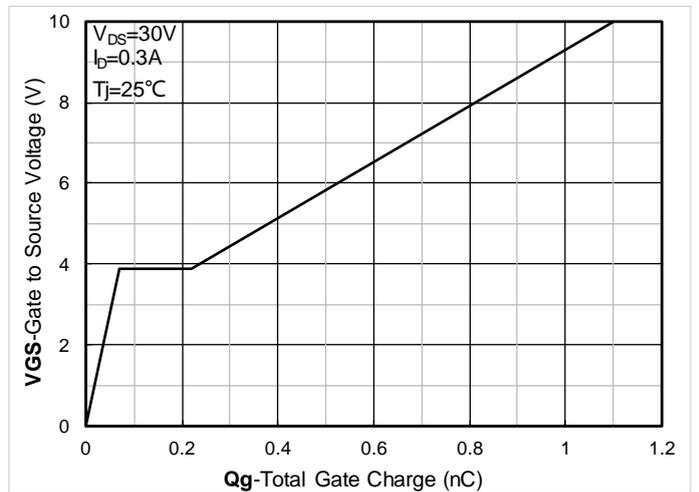


Figure 4. Gate Charge; typical values

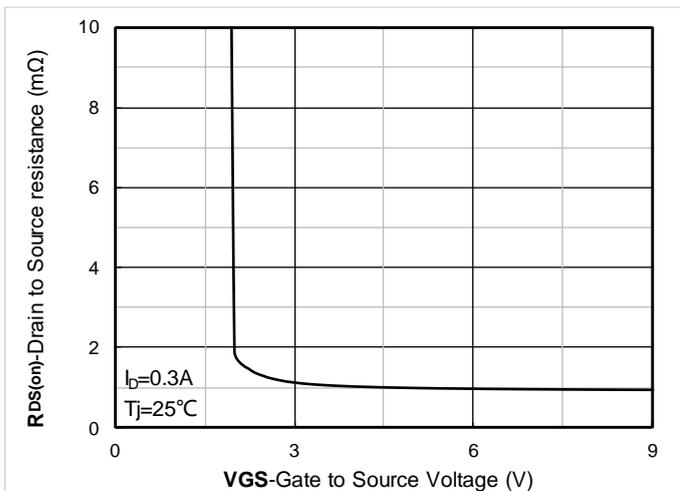


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

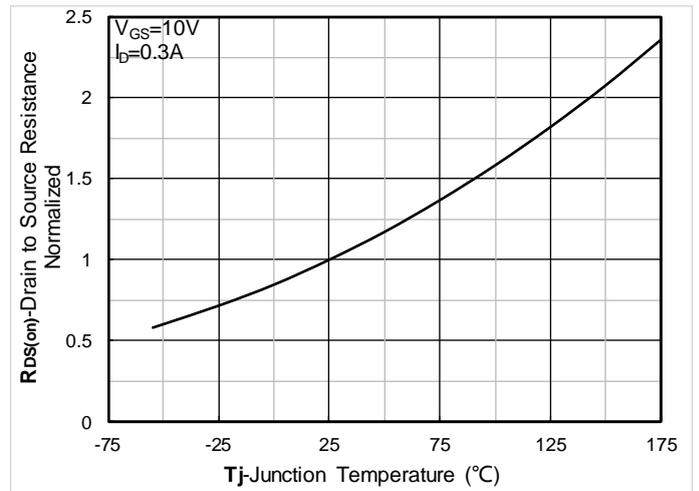


Figure 6. Normalized On-Resistance



# 2N7002DWKF

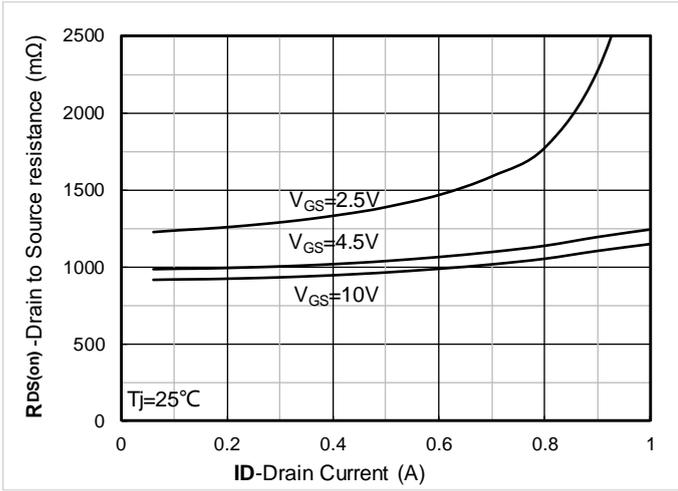


Figure 7. RDS(on) vs. Drain Current; typical values

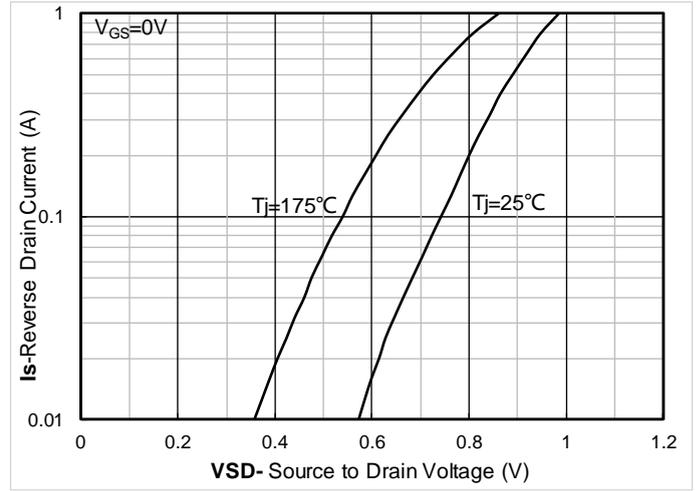


Figure 8. Forward characteristics of reverse diode; typical values

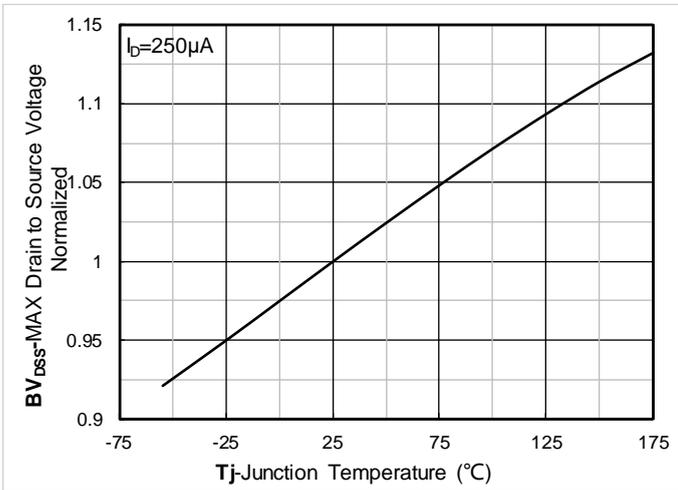


Figure 9. Normalized breakdown voltage

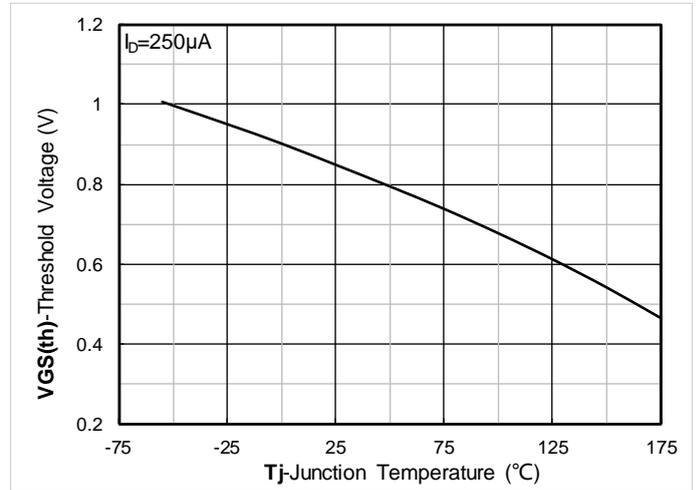


Figure 10. Gate Threshold voltage; typical values

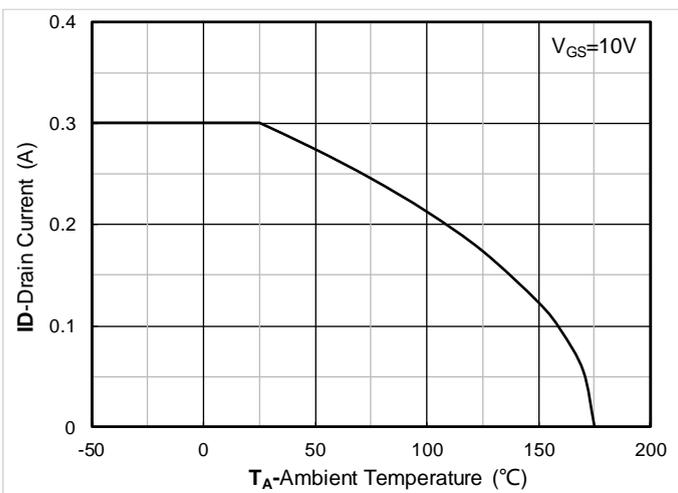


Figure 11. Current dissipation

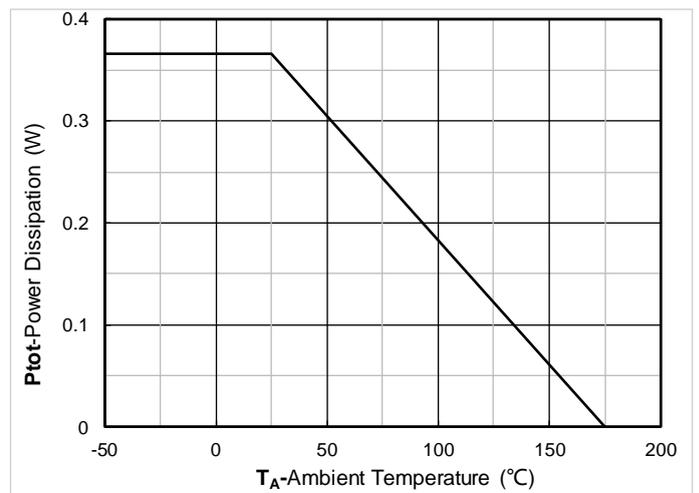


Figure 12. Power dissipation



# 2N7002DWKF

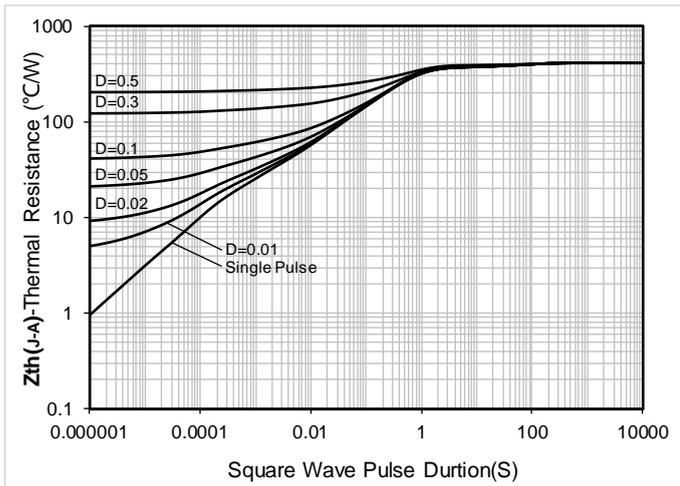


Figure 13. Maximum Transient Thermal Impedance

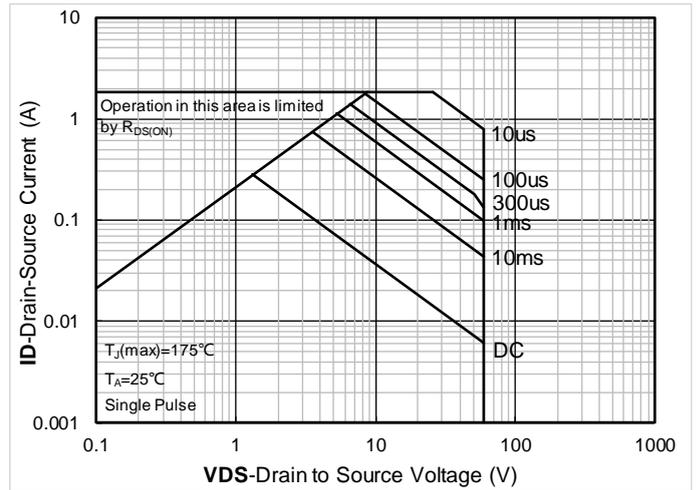


Figure 14. Safe Operation Area

## ■ Test Circuits & Waveforms

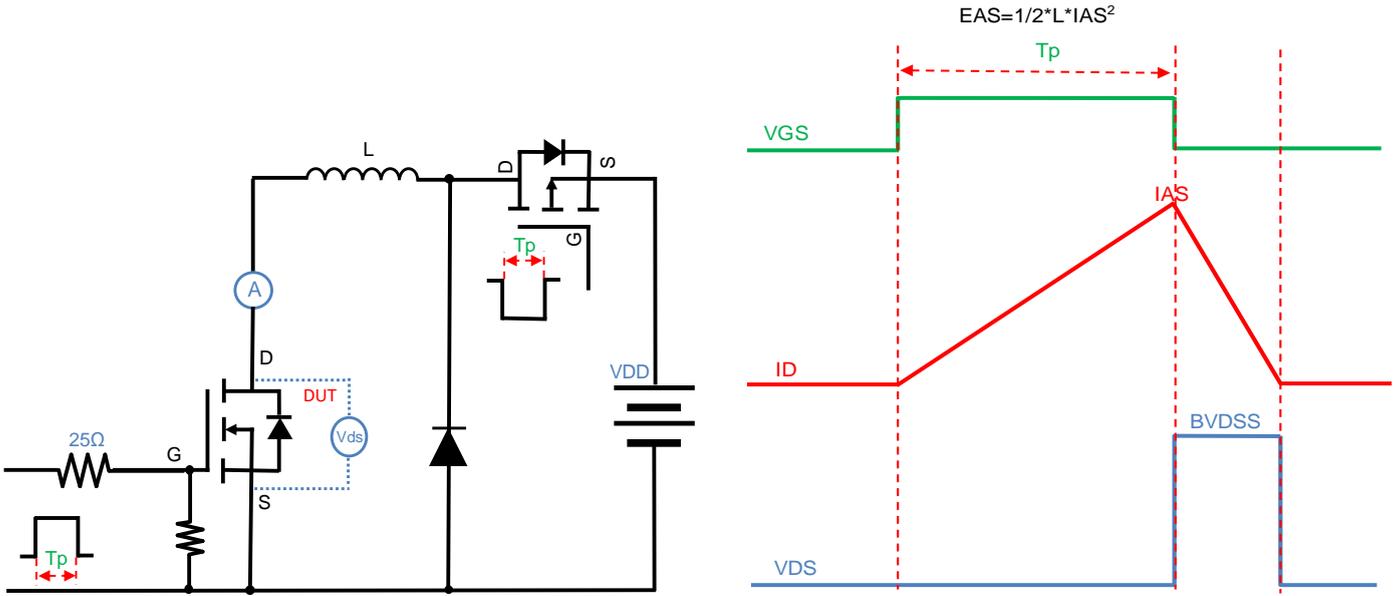


Figure A. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

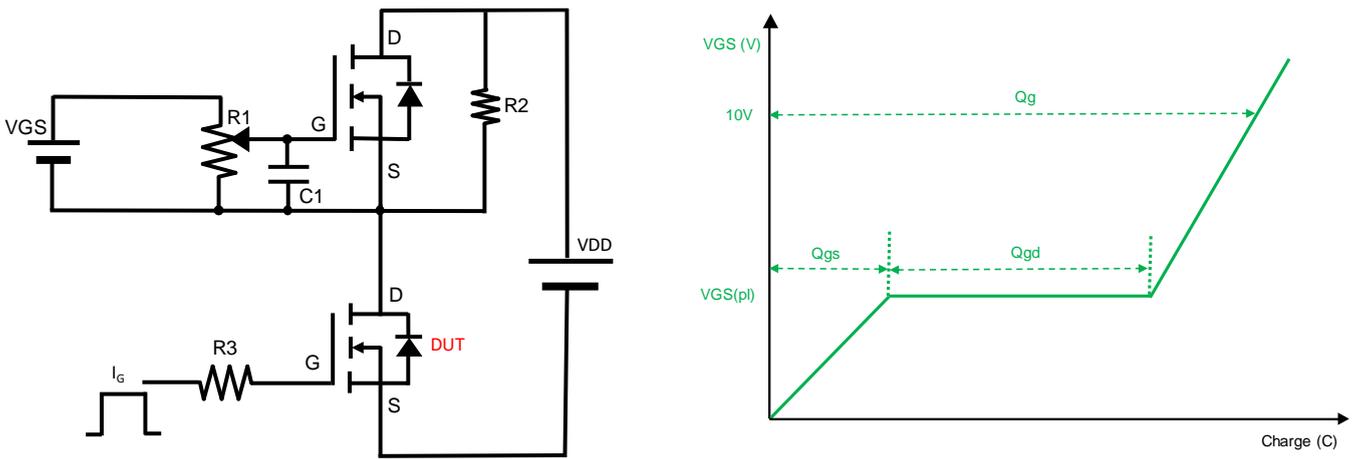


Figure B. Gate Charge Test Circuit & Waveform

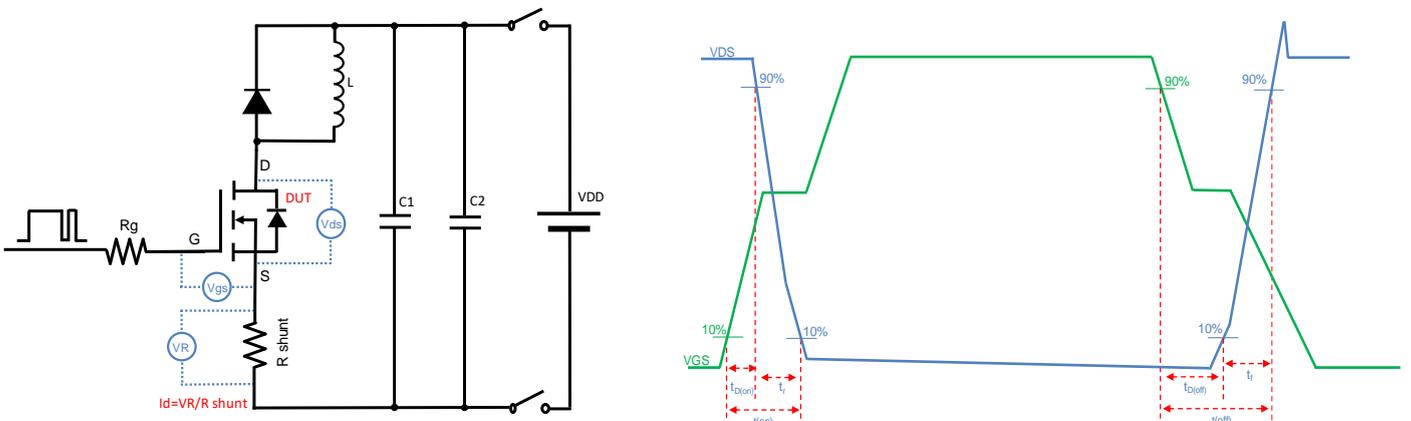


Figure C. Resistive Switching Test Circuit & Waveform

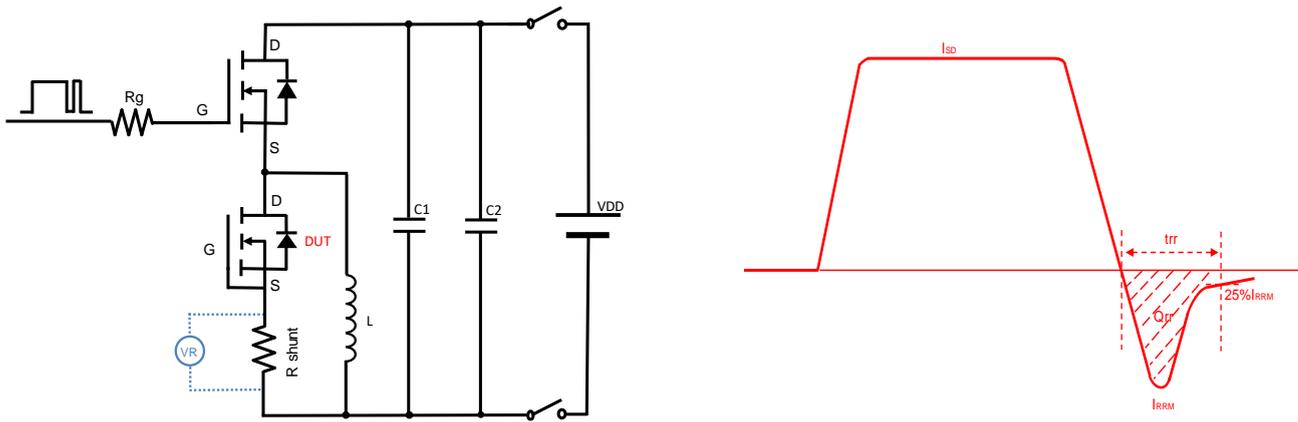
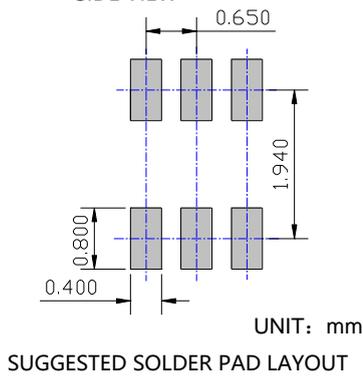
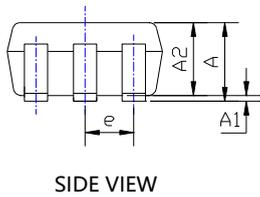
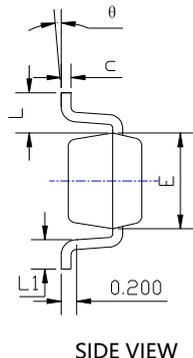
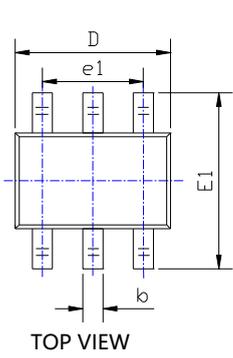


Figure D. Diode Recovery Test Circuit & Waveform

## ■ SOT-363 Package information



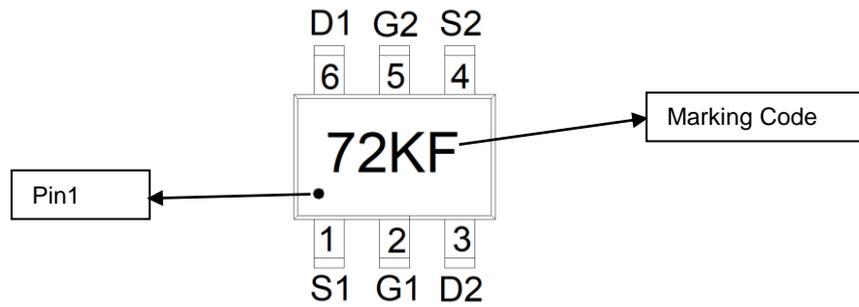
SYMBOL	DIMENSIONS			
	INCHES		Millimeter	
	MIN.	MAX.	MIN.	MAX.
A	0.035	0.043	0.900	1.100
A1	0.000	0.004	0.000	0.100
A2	0.035	0.039	0.900	1.000
b	0.006	0.014	0.150	0.350
c	0.004	0.010	0.100	0.250
D	0.071	0.087	1.800	2.200
E	0.045	0.053	1.150	1.350
E1	0.085	0.096	2.150	2.450
e	0.026TYP		0.650TYP	
e1	0.047	0.055	1.200	1.400
L	0.021REF		0.525REF	
L1	0.010	0.018	0.260	0.460
θ	0°	8°	0°	8°

- 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.



## 2N7002DWKF

### ■ Marking Information



Note:

1. All marking is at middle of the product body
2. All marking is in laser printing
3. 72KF is marking code
4. Body color: Black



## 2N7002DWKF

---

### Disclaimer

The information presented in this document is for reference only. Yangzhou Yangjie Electronic Technology Co., Ltd. reserves the right to make changes without notice for the specification of the products displayed herein to improve reliability, function or design or otherwise.

The product listed herein is designed to be used with ordinary electronic equipment or devices, and not designed to be used with equipment or devices which require high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), Yangjie or anyone on its behalf, assumes no responsibility or liability for any damages resulting from such improper use of sale.

This publication supersedes & replaces all information previously supplied. For additional information, please visit our website <http://www.21yangjie.com> , or consult your nearest Yangjie's sales office for further assistance.