



# JMPK1N60A/JMPH1N60A

## Description

### JMP N-channel MOSFET

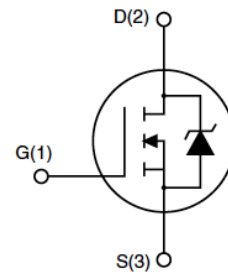
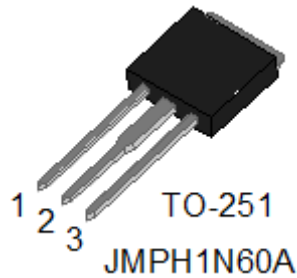
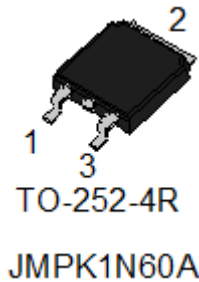
#### Features

- 600V, 1.3A
- $R_{DS(ON)} = 8.5\Omega$  (Typ.) @  $V_{GS} = 10V, I_D = 0.65A$
- Fast Switching
- Improved dv/dt Capability
- 100% Avalanche Tested

#### Application

- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- Power Factor Correction(PFC)

#### Package



## Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Max.	Units
$V_{DSS}$	Drain-Source Voltage	600	V
$V_{GSS}$	Gate-Source Voltage	$\pm 30$	V
$I_D$	Continuous Drain Current	$T_C = 25^\circ\text{C}$	1.3
		$T_C = 100^\circ\text{C}$	0.8
$I_{DM}$	Pulsed Drain Current <sup>note1</sup>	4	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>note2</sup>	20	mJ
dv/dt	Peak Diode Recovery Energy	5	V/ns
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	45
$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.8	$^\circ\text{C}/\text{W}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

\*Drain current limited by maximum junction temperature



# JMPK1N60A/JMPH1N60A

## Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	600	-	-	V
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =250μA	-	0.6	-	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C	-	-	1	μA
		V <sub>DS</sub> = 480V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C	-	-	10	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±30V	-	-	±100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0	3.0	4.0	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance <small>note3</small>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.65A	-	8.5	10	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40V, I <sub>D</sub> = 0.65A	-	0.9	-	S
<b>Dynamic Characteristics</b>						
C <sub>iSS</sub>	Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	105	-	160	pF
C <sub>oSS</sub>	Output Capacitance		18.8	-	28.2	pF
C <sub>rSS</sub>	Reverse Transfer Capacitance		2.8	-	4.5	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 480V, I <sub>D</sub> = 1A, V <sub>GS</sub> = 10V	-	6.1	8	nC
Q <sub>gs</sub>	Gate-Source Charge		-	1.3	2	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	3.1	4	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DS</sub> = 300V, I <sub>D</sub> = 1A, R <sub>G</sub> = 25Ω	-	10	13	ns
t <sub>r</sub>	Turn-on Rise Time		-	10	18	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	20	26	ns
t <sub>f</sub>	Turn-off Fall Time		-	11.5	23	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	1	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	4	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 1A	-	0.82	1	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>DS</sub> = 100V, I <sub>F</sub> = 1.3A,	-	114	137	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt = 100A/μs	-	0.63	0.76	μC

Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

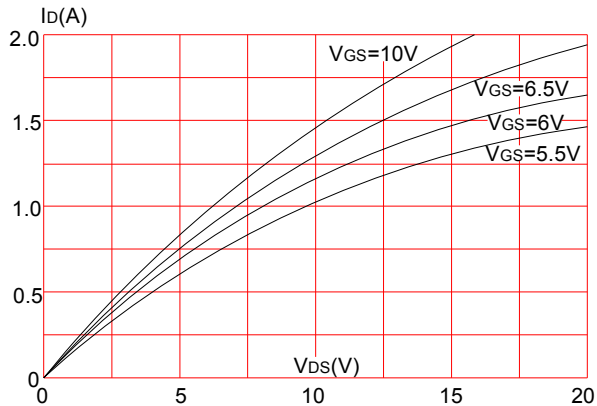
2. L=60mH, I<sub>AS</sub> = 1A, V<sub>DD</sub> = 150V, R<sub>G</sub> = 10 Ω, starting T<sub>J</sub> = 25°C

3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1%

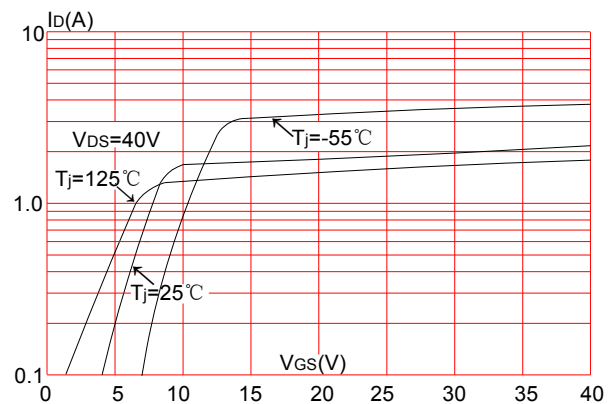


## Typical Performance Characteristics

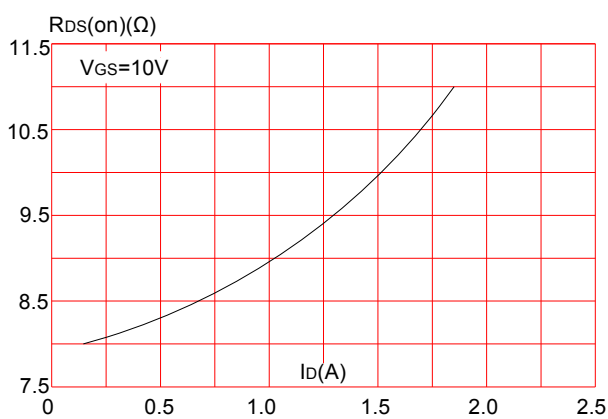
**Figure 1: Output Characteristics**



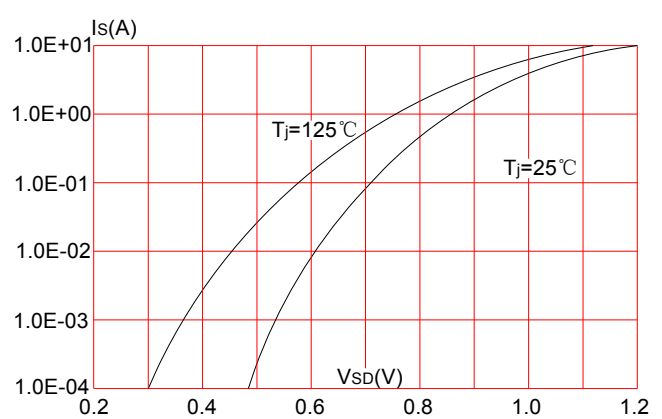
**Figure 2: Typical Transfer Characteristics**



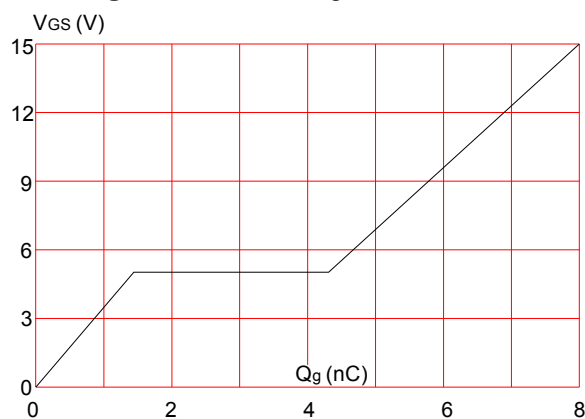
**Figure 3: On-resistance vs Drain Current**



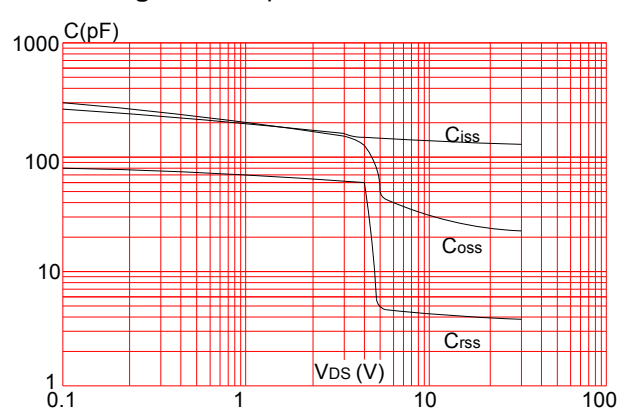
**Figure 4: Body-Diode Characteristics**



**Figure 5: Gate Charge Characteristics**



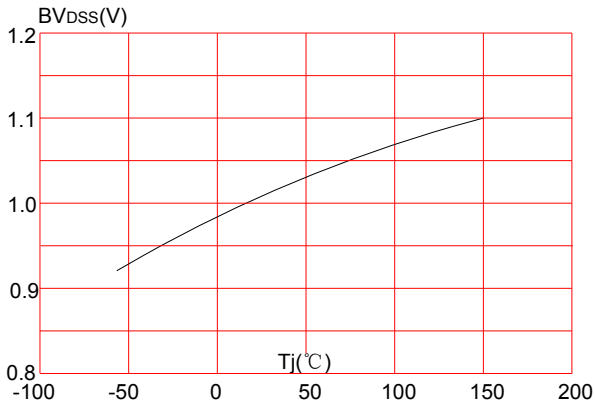
**Figure 6: Capacitance Characteristics**



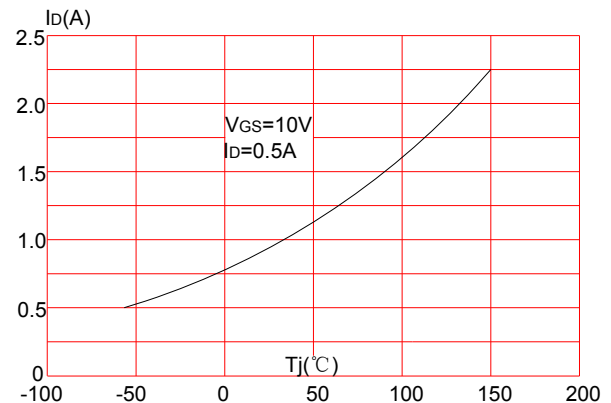


# JMPK1N60A/JMPH1N60A

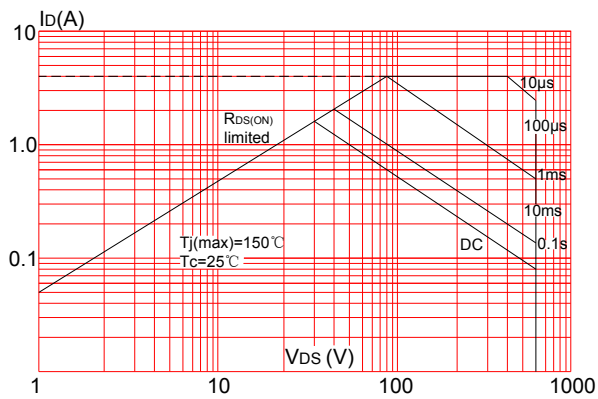
**Figure 7: Breakdown Voltage vs Junction Temperature**



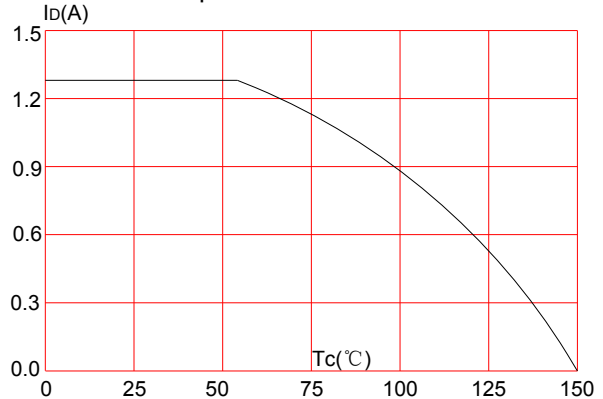
**Figure 8: On-Resistance vs Junction Temperature**



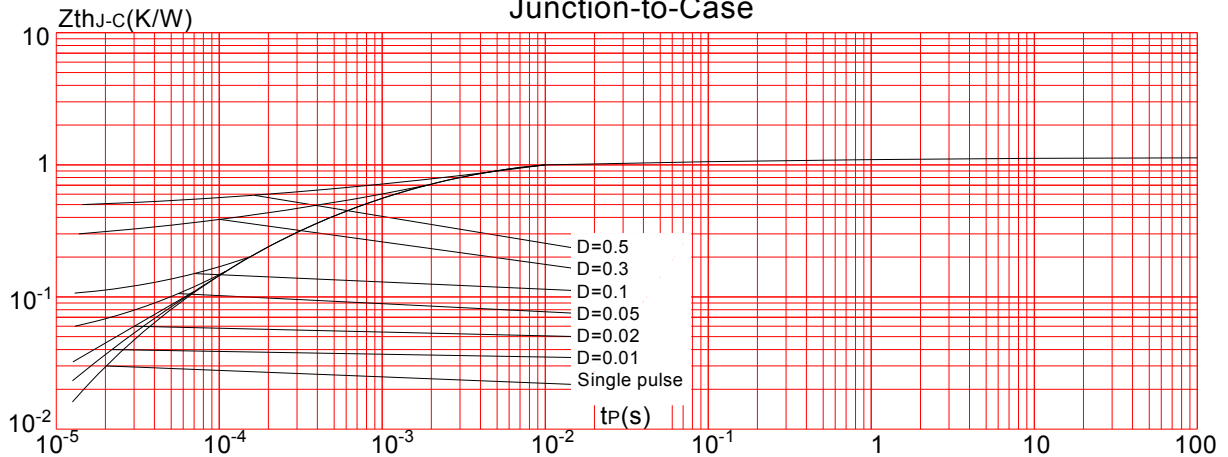
**Figure 9: Maximum Safe Operating Area**



**Figure 10: Maximum Continuous Drain Current vs. Case Temperature**



**Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case**



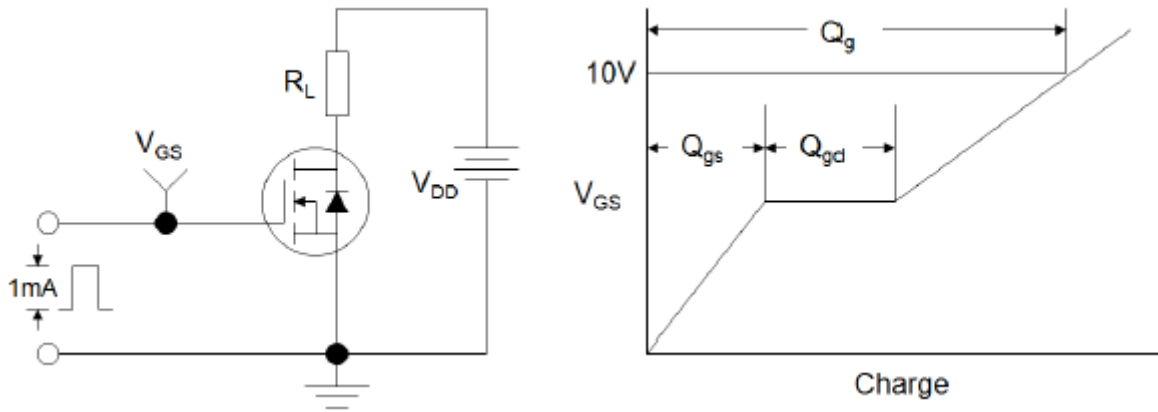


Figure 12: Gate Charge Test Circuit & Waveform

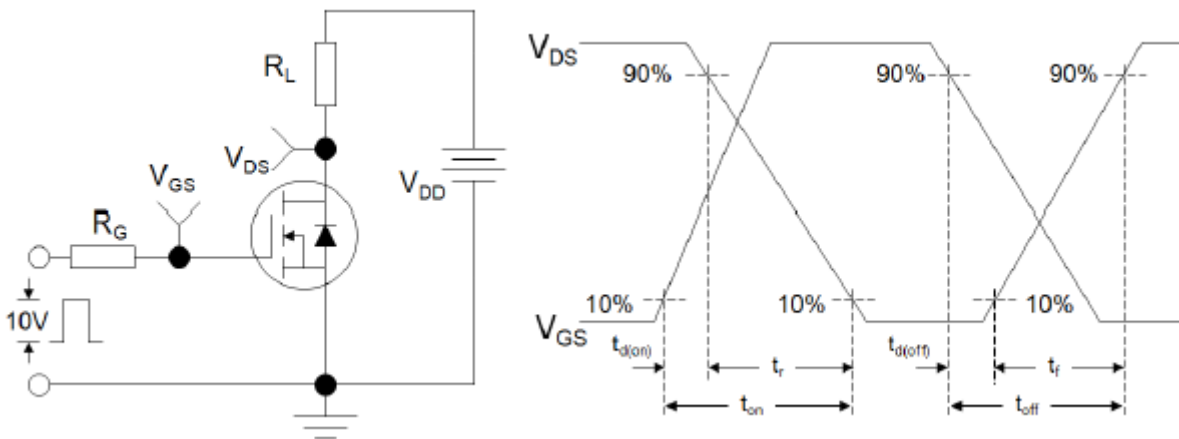


Figure 13: Resistive Switching Test Circuit & Waveforms

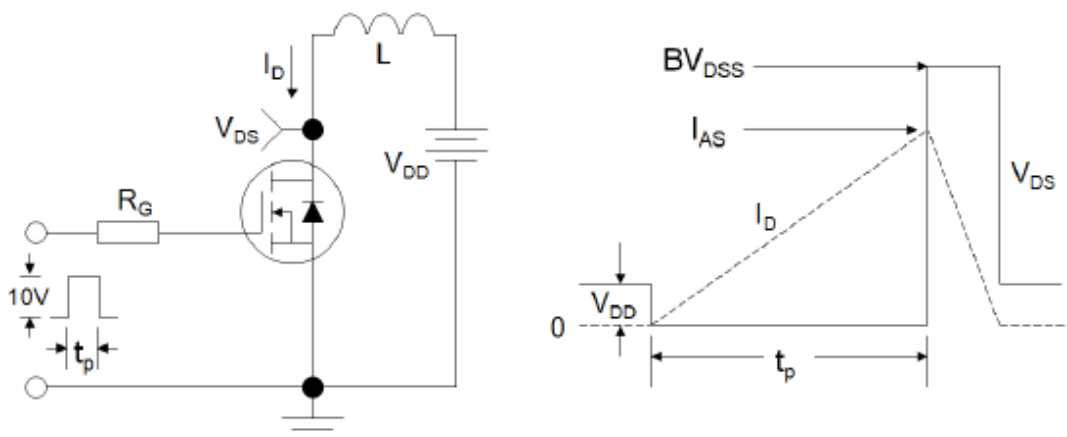


Figure 14: Unclamped Inductive Switching Test Circuit & Waveforms

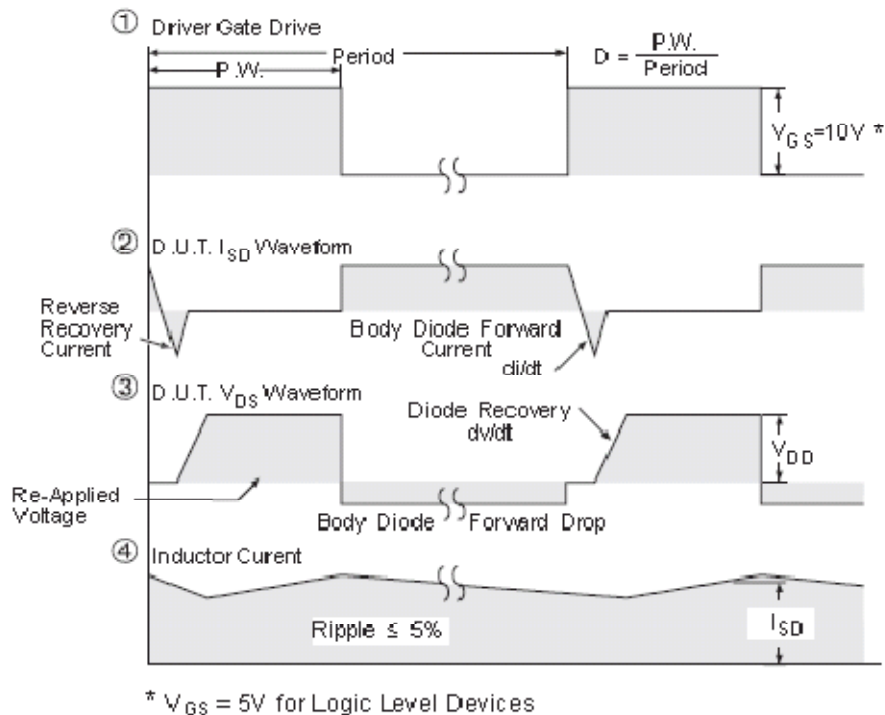
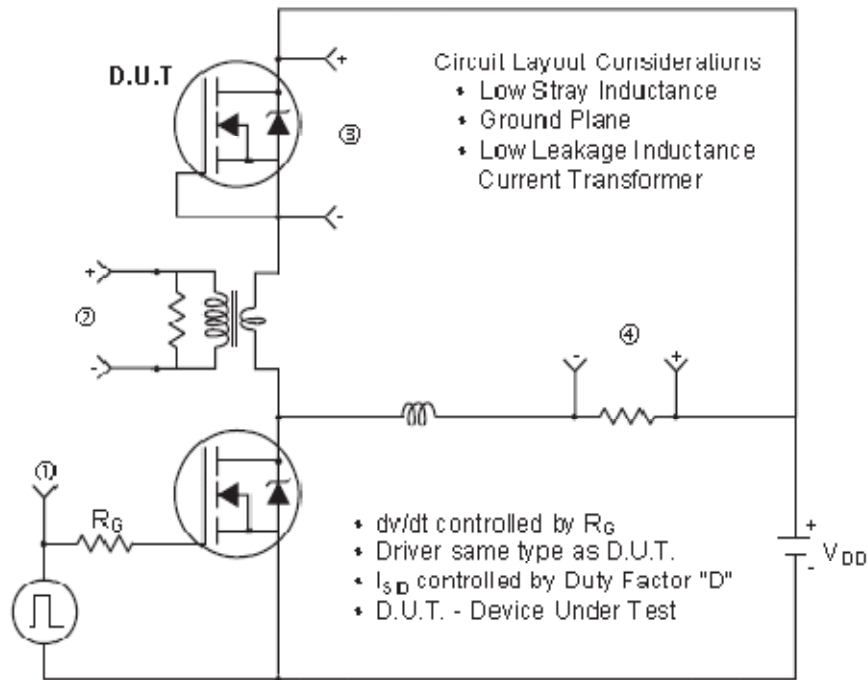
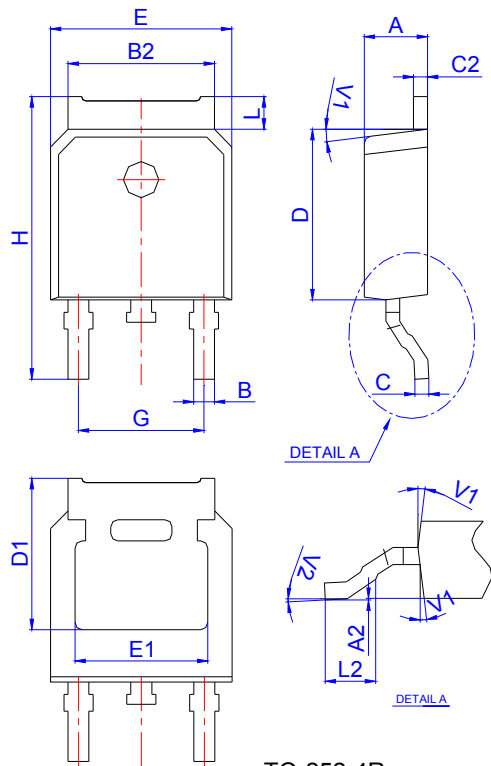


Figure 15: Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms (For N-channel)



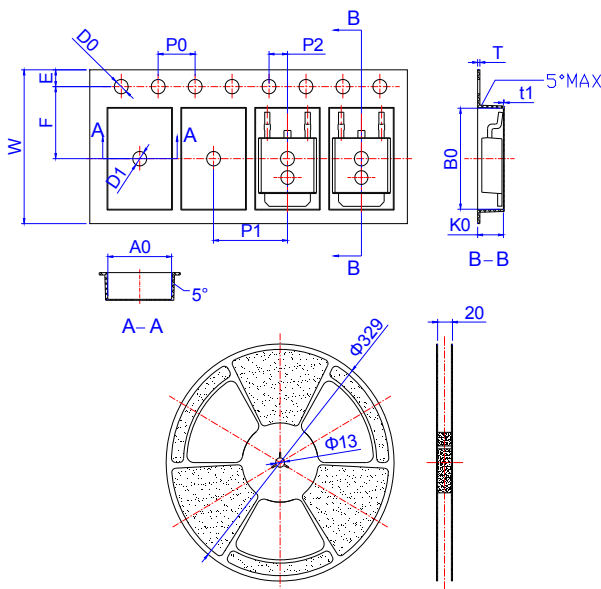
# JMPK1N60A/JMPH1N60A

## Package Mechanical Data



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

## Reel Specification-TO-252-4R



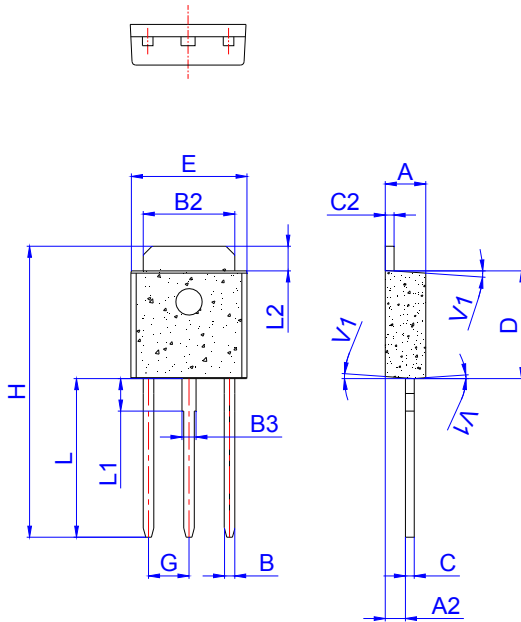
Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
W	15.90	16.00	16.10	0.626	0.630	0.634
E	1.65	1.75	1.85	0.065	0.069	0.073
F	7.40	7.50	7.60	0.291	0.295	0.299
D0	1.40	1.50	1.60	0.055	0.059	0.063
D1	1.40	1.50	1.60	0.055	0.059	0.063
P0	3.90	4.00	4.10	0.154	0.157	0.161
P1	7.90	8.00	8.10	0.311	0.315	0.319
P2	1.90	2.00	2.10	0.075	0.079	0.083
A0	6.85	6.90	7.00	0.270	0.271	0.276
B0	10.45	10.50	10.60	0.411	0.413	0.417
K0	2.68	2.78	2.88	0.105	0.109	0.113
T	0.24		0.27	0.009		0.011
t1	0.10			0.004		
10P0	39.80	40.00	40.20	1.567	1.575	1.583

OUTLINE	REEL (PCS)	PER CARTON (PCS)	TAPE & REEL
TAPING	2,500	25,000	13inch



# JMPK1N60A/JMPH1N60A

## Package Mechanical Data



TO-251

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.086		0.095
A2	0.90		1.20	0.035		0.047
B	0.55		0.65	0.022		0.026
B2	5.10		5.40	0.200		0.213
B3	0.76		0.85	0.030		0.033
C	0.45		0.62	0.018		0.024
C2	0.48		0.62	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.70	0.252		0.264
G		2.30			0.091	
H	16.0		17.0	0.630		0.669
L	8.90		9.40	0.350		0.370
L1	1.80		1.90	0.071		0.075
L2	1.37		1.50	0.054		0.059
V1		4°			4°	

## Package Information -TO-251

OUTLINE	TUBE (PCS)	INNER BOX (PCS)	PER CARTON (PCS)
TUBE	80	4,000	32,000

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