

## SDM033N06D

### 60V N-Channel MOSFETs

Rev A.0

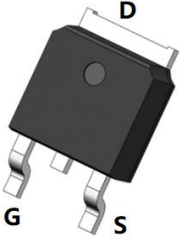
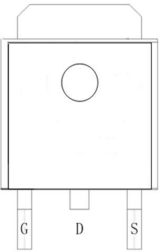
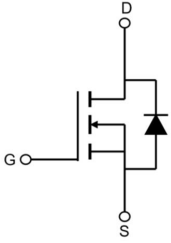
#### Feature

- ✧ Excellent  $R_{DS(ON)}$
- ✧ Low Gate Charge
- ✧ Advanced trench technology
- ✧ Enhanced body diode performance.
- ✧ Green product (RoHS compliant), lead free
- ✧ 100% UIS Tested

#### Product Summary

$V_{DS}$	60	V
$V_{GS(th\_Typ)}$	1.6	V
$R_{DS(ON)\_Typ}$ (at $V_{GS} = 10V$ )	26	m $\Omega$
$I_D$ (at $V_{GS} = 10V$ )	20	A

Type	Package	Marking	Outline	Media	Quantity (pcs)
SDM033N06D	TO-252	M033N06	Tape	13" Reel	2500

 <p><b>TO-252 top view</b></p>	 <p><b>pin Assignment</b></p>	 <p><b>Schematic Diagram</b></p>
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#### Absolute Maximum Ratings (Rating at $T_C=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Maximum	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ C$	20
		$T_C=100^\circ C$	13
Pulsed Drain Current <sup>(1)</sup>	$I_{DM}$	80	A
Avalanche Energy <sup>(2)</sup>	$E_{AS}$	18	mJ
Power Dissipation	$P_D$	27.7	W
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +175	$^\circ C$

**Electrical Characteristics** (Rating at  $T_J=25^{\circ}\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	60	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=60\text{V}$ , $V_{GS}=0\text{V}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 20\text{V}$	-	-	$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	1.0	1.6	2.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>(3)</sup>	$V_{GS}=10\text{V}$ , $I_D=10\text{A}$	-	26	33	m $\Omega$
		$V_{GS}=4.5\text{V}$ , $I_D=5\text{A}$	-	33	45	
$V_{SD}$	Diode Forward Voltage	$I_S=20\text{A}$ , $V_{GS}=0\text{V}$	-	-	1.2	V
$I_S$	Maximum Body-Diode Continuous Current		-	-	20	A
$I_{SM}$	Maximum Body-Diode Pulsed Current		-	-	80	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1\text{MHz}$	-	1149	-	pF
$C_{oss}$	Output Capacitance		-	58.7	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	49.5	-	pF
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=10\text{V}$ , $V_{DS}=30\text{V}$ , $I_D=10\text{A}$	-	20.5	-	nC
$Q_{gs}$	Gate Source Charge		-	3.9	-	nC
$Q_{gd}$	Gate Drain Charge		-	5.5	-	nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}$ , $V_{DS}=30\text{V}$ , $I_D=20\text{A}$ , $R_{GEN}=1.8\Omega$	-	7.7	-	ns
$t_r$	Turn-On Rise Time		-	21	-	ns
$t_{D(off)}$	Turn-Off Delay Time		-	17	-	ns
$t_f$	Turn-Off Fall Time		-	25	-	ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=20\text{A}$ , $di/dt=100\text{A}/\mu\text{s}$	-	31	-	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=20\text{A}$ , $di/dt=100\text{A}/\mu\text{s}$	-	45	-	nC

**Thermal Resistances**

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JC}$	Thermal resistance from junction to case	-	5.4	$^{\circ}\text{C}/\text{W}$

**Notes:**

- 1.Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
- 2.EAS condition :  $T_J=25^{\circ}\text{C}$ ,  $V_{DD}=30\text{V}$ ,  $V_G=10\text{V}$ ,  $L=0.5\text{mH}$ ,  $R_g=25\Omega$ ,  $I_{AS}=8.5\text{A}$ .
- 3.Pulse Test: Pulse Width $\leq 300\mu\text{s}$ , Duty Cycle $\leq 0.5\%$

Typical Electrical and Thermal Characteristics

Figure 1: Saturation Characteristics      Figure 2: Transfer Characteristics

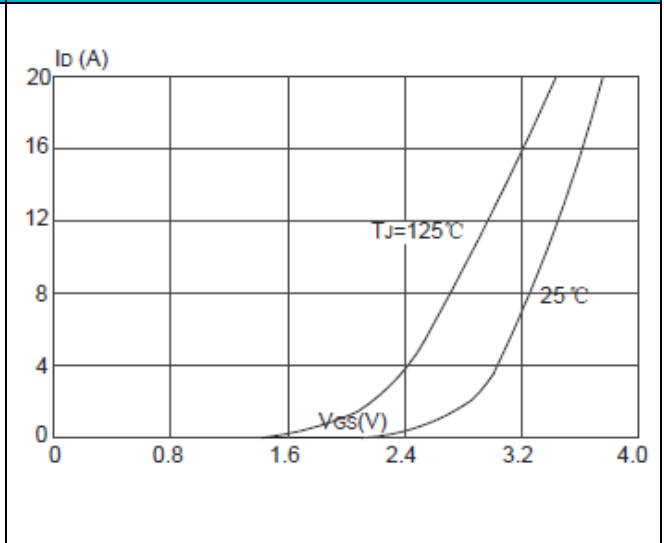
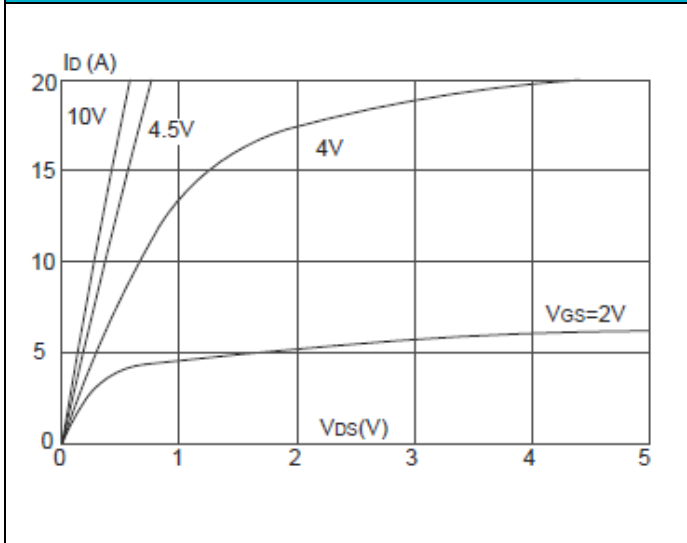


Figure 3:  $R_{DS(ON)}$  vs. Drain Current

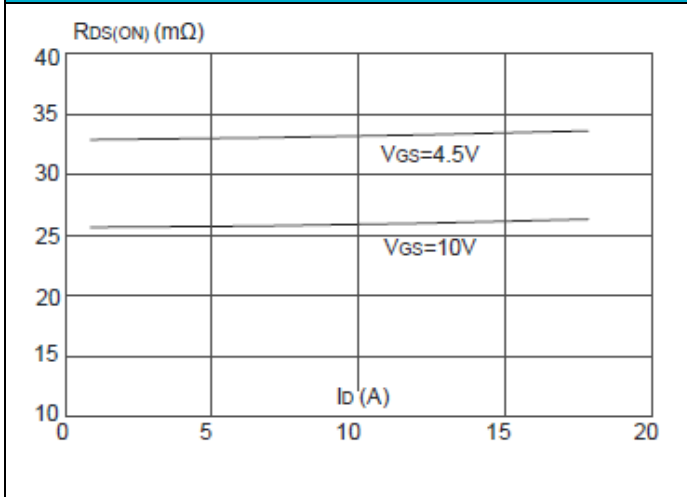


Figure 4:  $R_{DS(ON)}$  vs. Junction Temperature

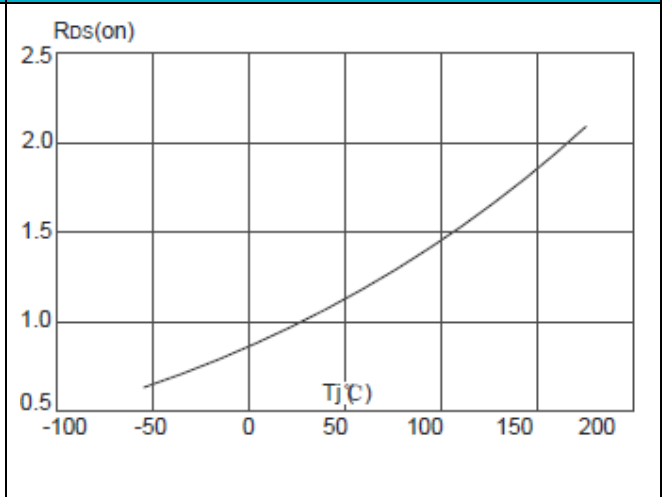


Figure 5: Body-Diode Characteristics

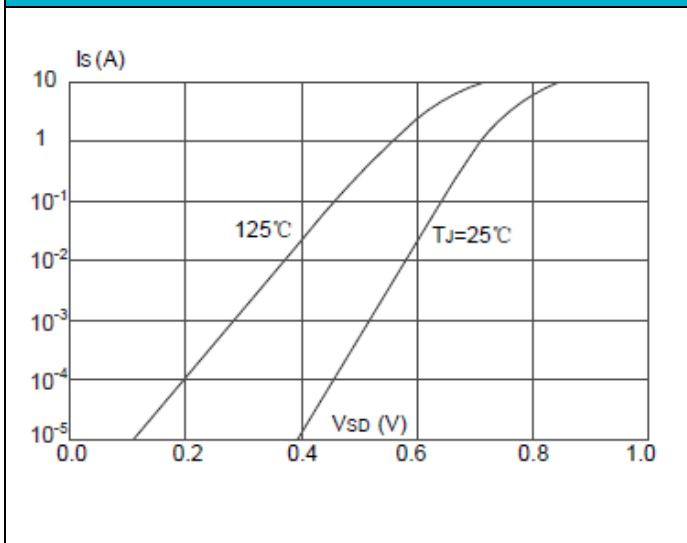
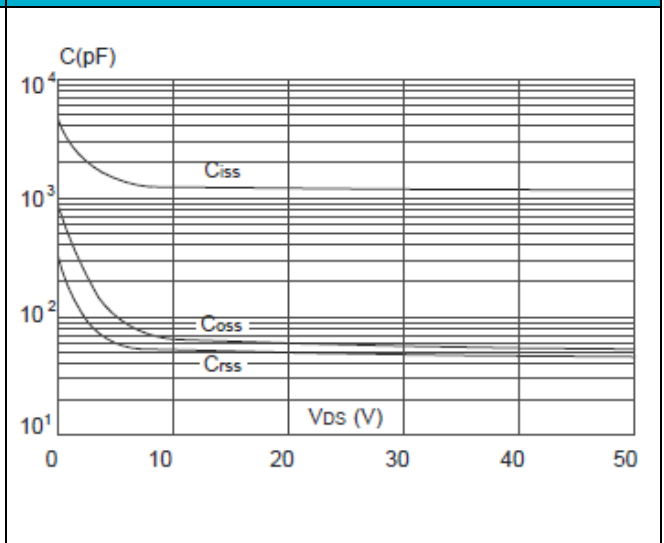


Figure 6: Capacitance characteristics



Typical Electrical and Thermal Characteristics

Figure 7: Current De-rating

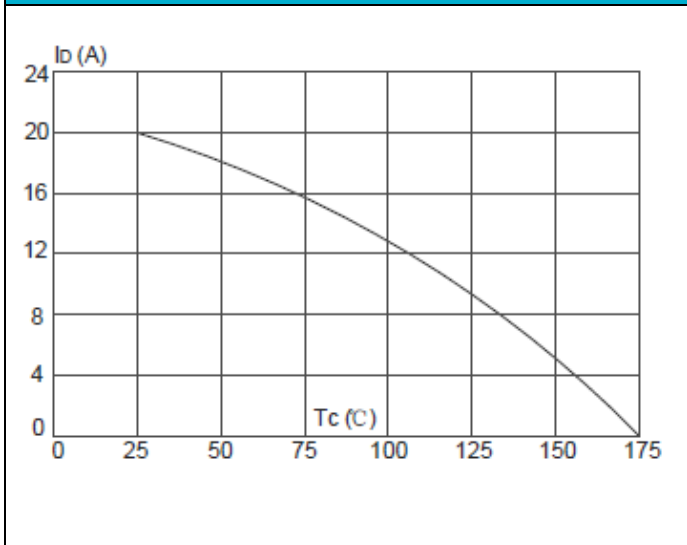


Figure 8: Gate Charge Characteristics

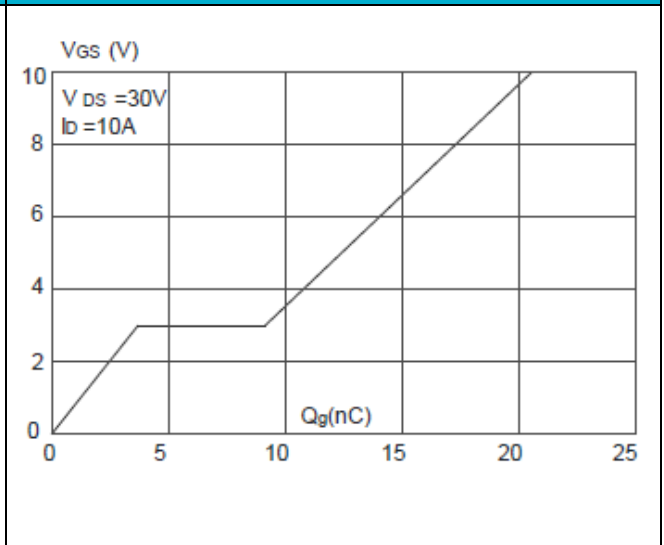


Figure 9: Maximum Safe Operating Area

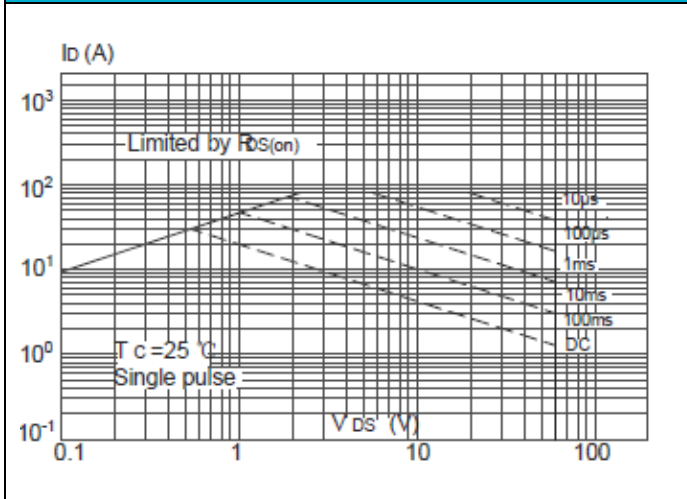


Figure 10: Normalized Breakdown Voltage vs. Junction Temperature

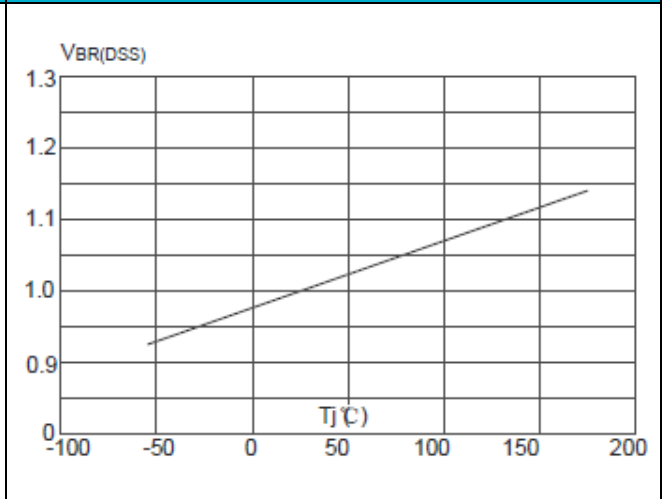
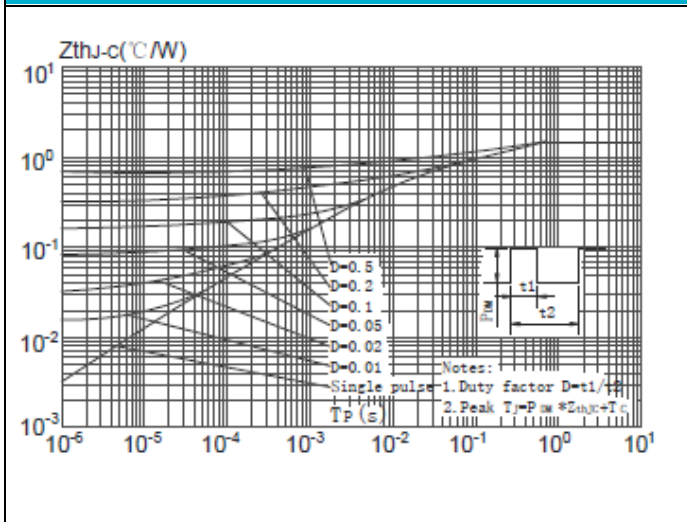


Figure 11: Normalized Maximum Transient Thermal Impedance



Test Circuit

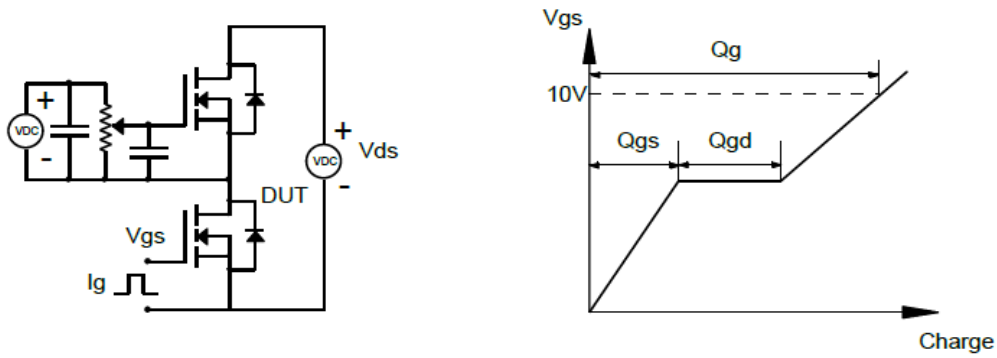


Figure1: Gate Charge Test Circuit & Waveforms

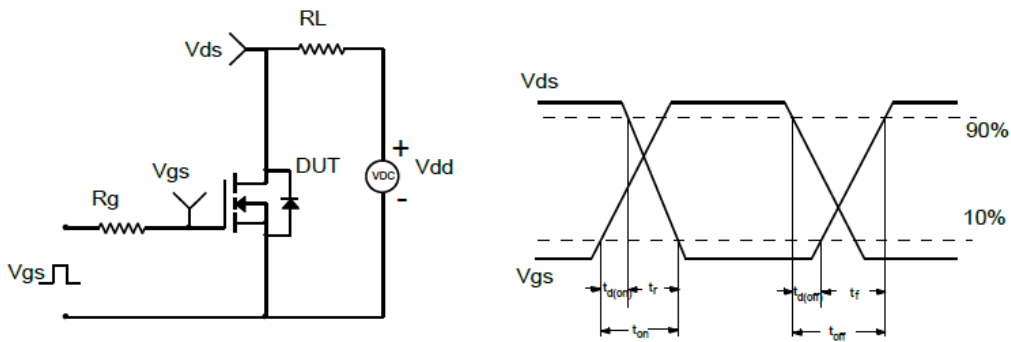


Figure2: Resistive Switching Test Circuit & Waveforms

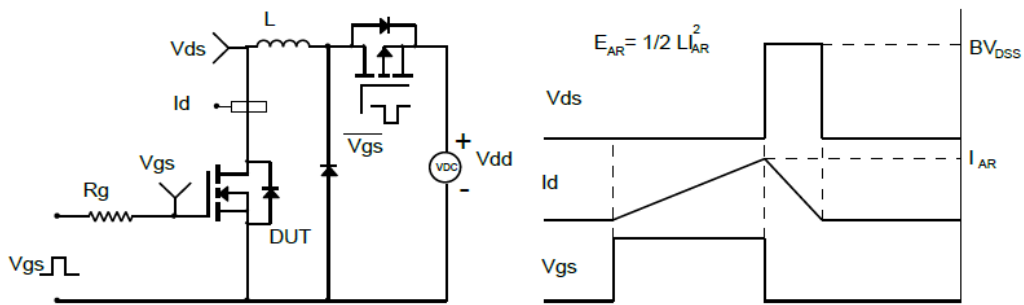


Figure3: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

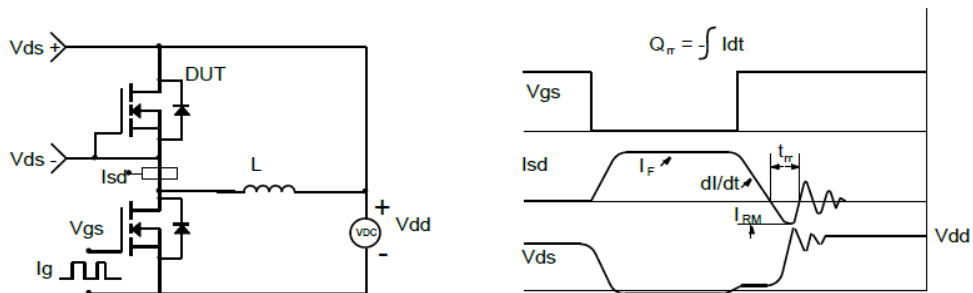
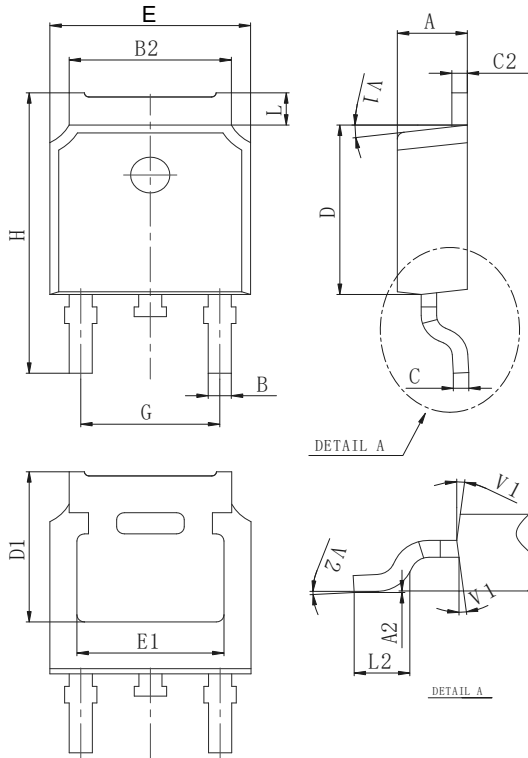


Figure4: Diode Recovery Test Circuit & Waveforms

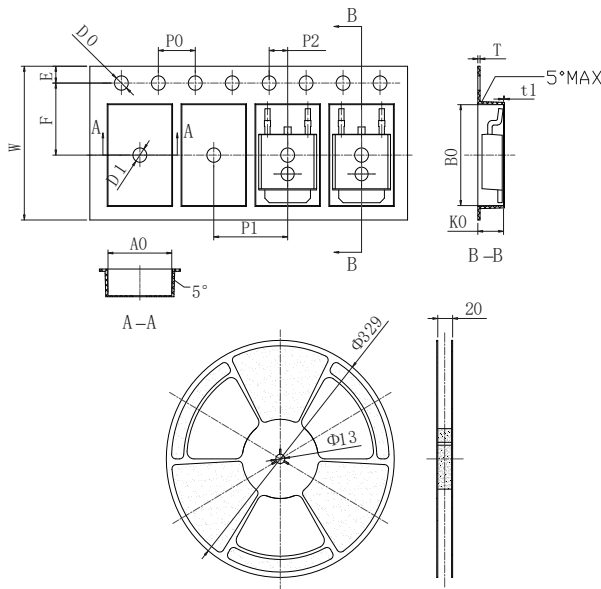
**TO-252 Package Information**

**Package Mechanical**



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**



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

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