

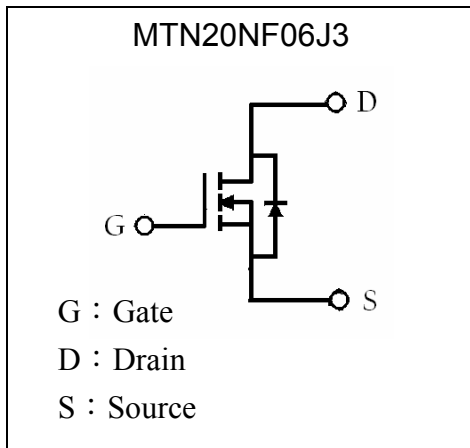
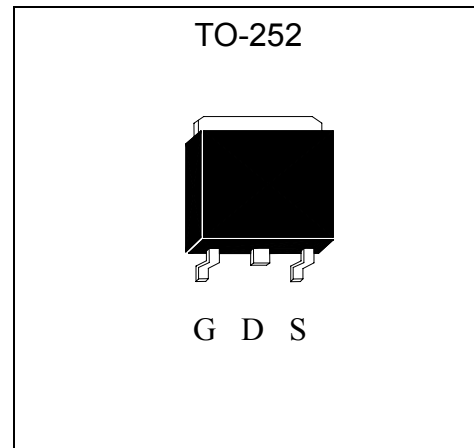
**N-Channel Logic Level Enhancement Mode Power MOSFET**

# MTN20NF06J3

$BV_{DSS}$	60V
$I_D$	50A
$R_{DSON}$	22m $\Omega$

**Features**

- $V_{DS}=60V$ ,  $I_D=50A$ ,  $R_{DS(ON)}=22m\Omega$
- Low Gate Charge
- Simple Drive Requirement
- RoHS compliant package
- Repetitive Avalanche Rated
- Fast Switching Characteristic

**Symbol**

**Outline**

**Absolute Maximum Ratings** ( $T_C=25^\circ C$ )

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current @ $T_C=25^\circ C$	$I_D$	50	A
Continuous Drain Current @ $T_C=100^\circ C$		35	
Pulsed Drain Current (Note 1)	$I_{DM}$	200	
Avalanche Current (Note 1)	$I_{AR}$	50	
Avalanche Energy (Note 2)	$E_{AS}$	447	mJ
Repetitive Avalanche Energy (Note 1)	$E_{AR}$	6	
Peak Diode Recovery $dv/dt$ (Note 3)	$dv/dt$	7	V/ns
Power Dissipation ( $T_C=25^\circ C$ )	$P_D$	60	W
Derates above $25^\circ C$		0.4	W/ $^\circ C$
Operating Junction and Storage Temperature	$T_j, T_{stg}$	-55~+175	$^\circ C$

Note : \*1. Repetitive Rating : Pulse width limited by maximum junction temperature

 \*2.  $L=230\mu H$ ,  $I_{AS}=50A$ ,  $V_{DD}=25V$ , starting  $T_J=+25^\circ C$ 

 \*3.  $ISD \leq 50A$ ,  $dI/dt < 100A/\mu s$ ,  $V_{DD} \leq BV_{DSS}$ ,  $T_J \leq T_{j(max)}$ .



**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	2.5	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{th,j-a}$	100	°C/W
Maximum Lead Temperature for Soldering purpose (Note)	$T_J$	275	°C

Note : 1.6mm from case, for 10 seconds

**Characteristics (Tc=25°C, unless otherwise specified)**

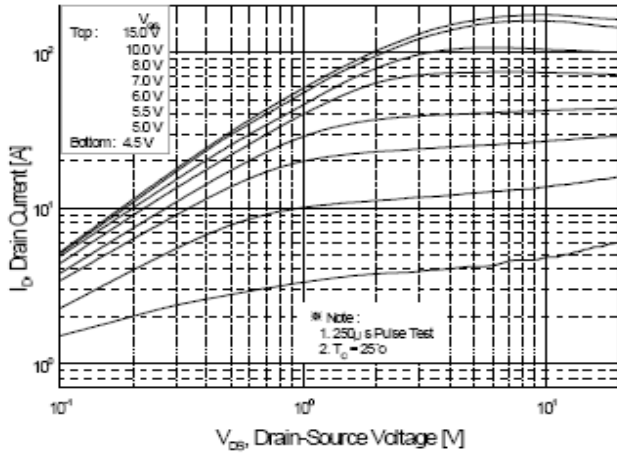
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
$BV_{DSS}$	60	-	-	V	$V_{GS}=0, I_D=250\mu A$
$\Delta BV_{DSS}/\Delta T_j$	-	0.06	-	V/°C	Reference to 25°C, $I_D=250\mu A$
$V_{GS(th)}$	2	2.8	4	V	$V_{DS} = V_{GS}, I_D=250\mu A$
$G_{FS}$	-	28	-	S	$V_{DS} = 10V, I_D=25A$
$I_{GSS}$	-	-	±100	nA	$V_{GS}=\pm 20$
$I_{DSS}$	-	-	1	$\mu A$	$V_{DS} = 60V, V_{GS} = 0$
	-	-	10		$V_{DS} = 48V, V_{GS} = 0, T_C=150^\circ C$
* $R_{DS(ON)}$	-	19	22	mΩ	$V_{GS} = 10V, I_D=30A$
	-	19	22		$V_{GS} = 10V, I_D=12A$
<b>Dynamic</b>					
* $Q_g$	-	31	41	nC	$I_D=50A, V_{DS}=48V, V_{GS}=10V$
* $Q_{gs}$	-	8	-		
* $Q_{gd}$	-	13	-		
* $t_{d(ON)}$	-	15	40	ns	$V_{DD}=30V, I_D=25A, V_{GS}=10V, R_G=25\Omega$
* $t_r$	-	105	220		
* $t_{d(OFF)}$	-	60	130		
* $t_f$	-	65	140		
$C_{iss}$	-	1180	1540	pF	$V_{GS}=0V, V_{DS}=25V, f=1MHz$
$C_{oss}$	-	440	580		
$C_{rss}$	-	65	90		
<b>Source-Drain Diode</b>					
* $I_S$	-	-	50	A	
* $I_{SM}$	-	-	200		
* $V_{SD}$	-	-	1.5	V	$I_S=50A, V_{GS}=0$
* $t_{rr}$	-	52	-	ns	$I_S=50A, dI_F/dt=100A/\mu s, V_{GS}=0$
* $Q_{rr}$	-	75	-	nC	

\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

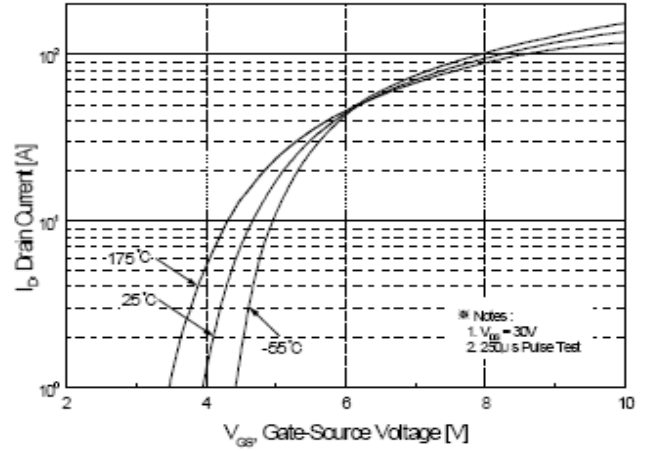
**Ordering Information**

Device	Package	Shipping	Marking
MTN20NF06J3	TO-252 (RoHS compliant)	2500 pcs / Tape & Reel	20NF06

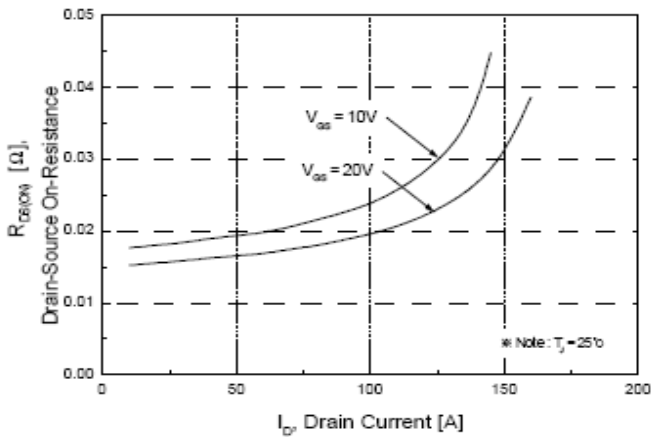
**Characteristic Curves**



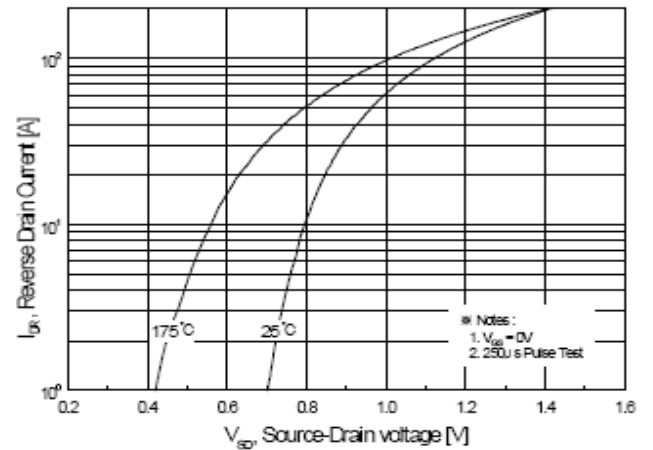
**Figure 1. On-Region Characteristics**



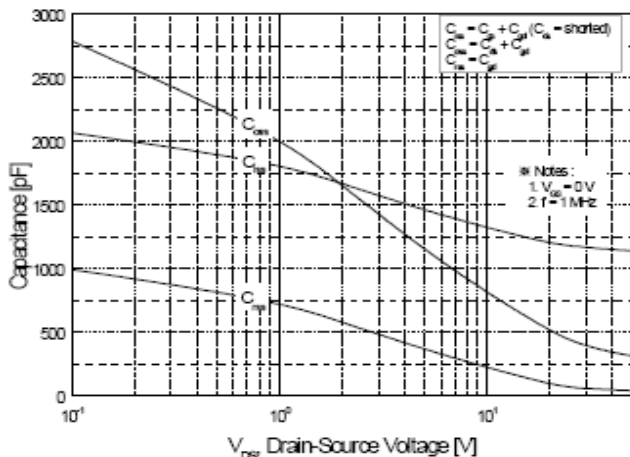
**Figure 2. Transfer Characteristics**



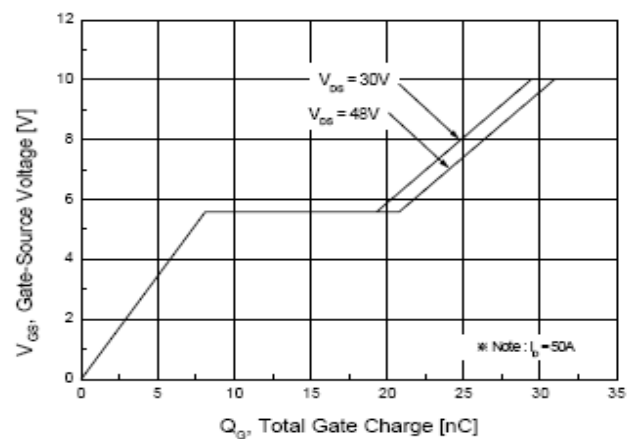
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**

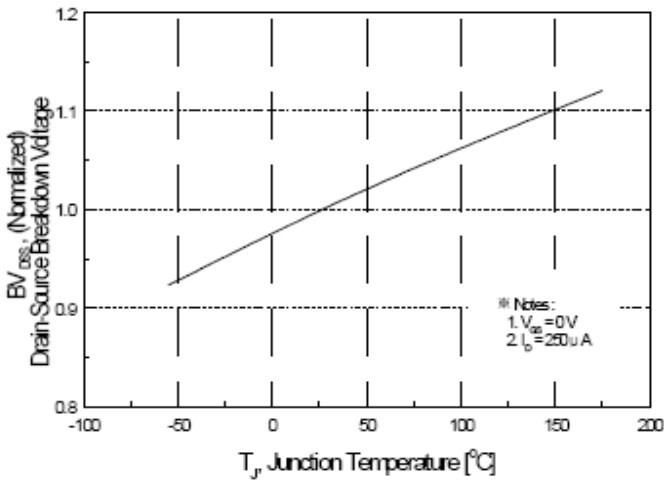


**Figure 5. Capacitance Characteristics**

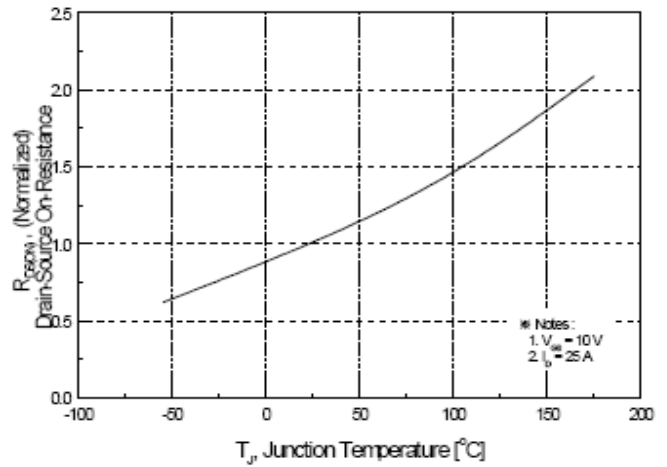


**Figure 6. Gate Charge Characteristics**

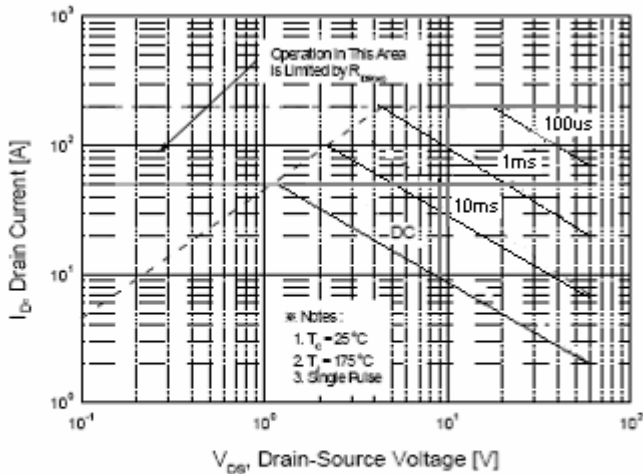
**Characteristic Curves(Cont.)**



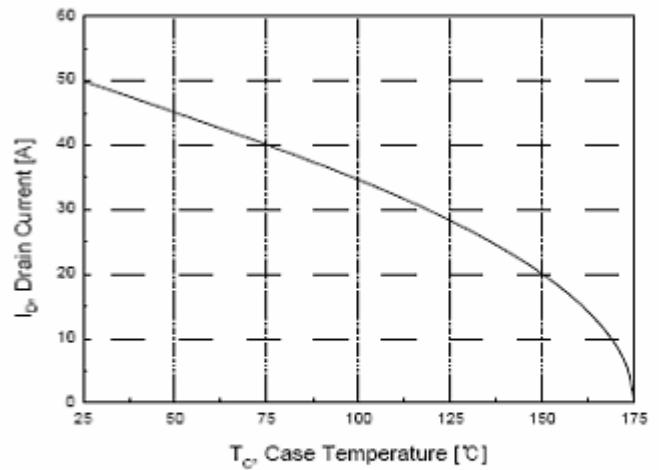
**Figure 7. Breakdown Voltage Variation vs. Temperature**



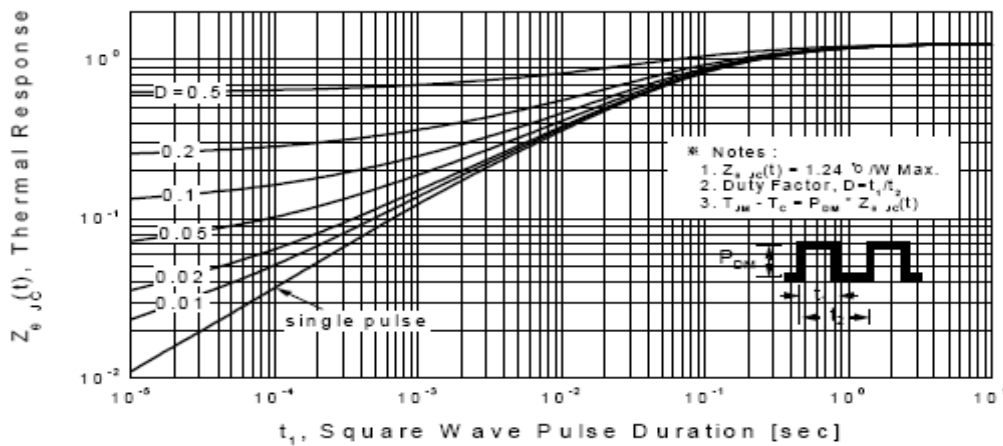
**Figure 8. On-Resistance Variation vs. Temperature**



**Figure 9. Maximum Safe Operating Area**



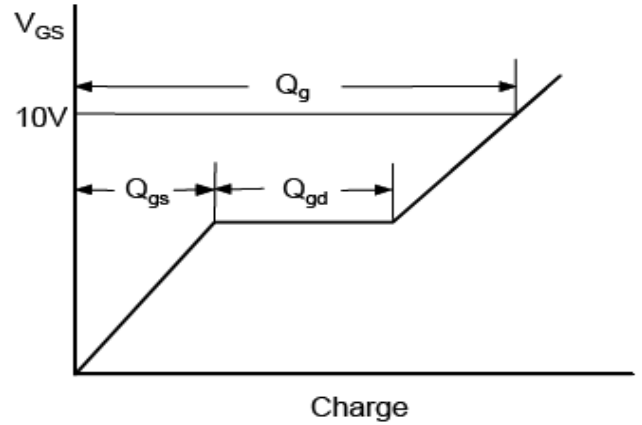
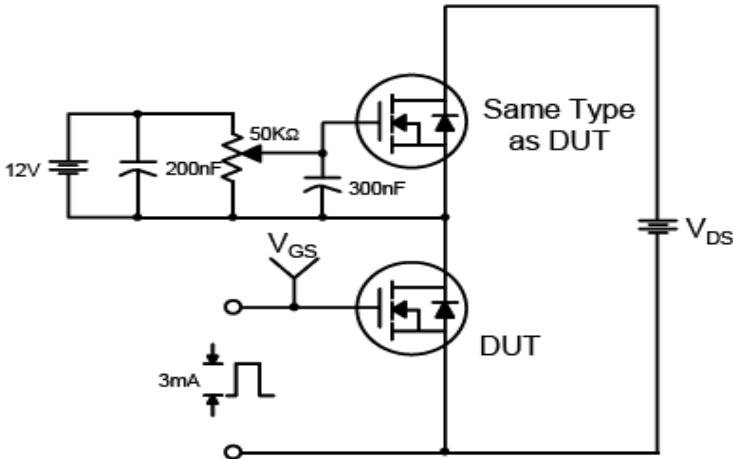
**Figure 10. Maximum Drain Current vs. Case Temperature**



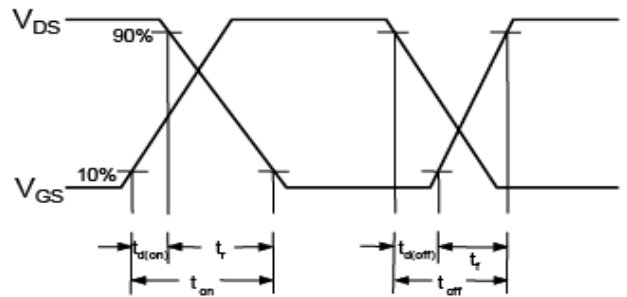
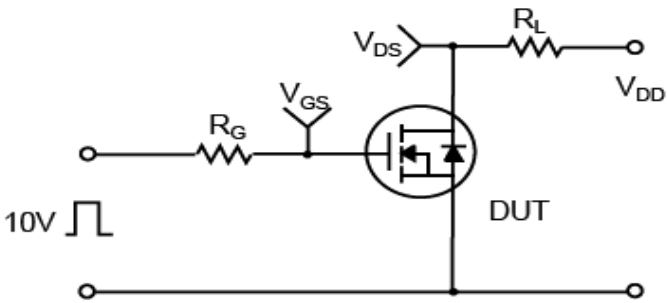
**Figure 11. Transient Thermal Response Curve**

**Test Circuit and Waveforms**

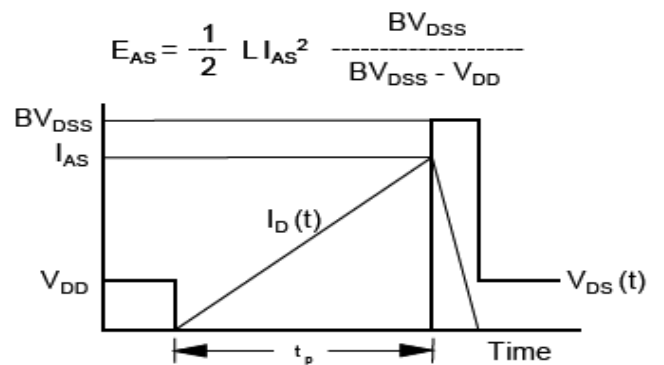
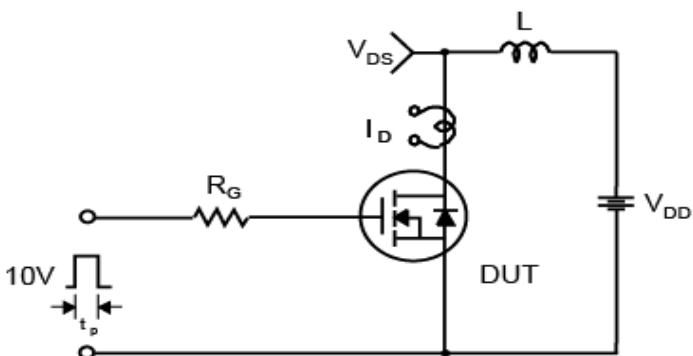
**Gate Charge Test Circuit & Waveform**



**Resistive Switching Test Circuit & Waveforms**

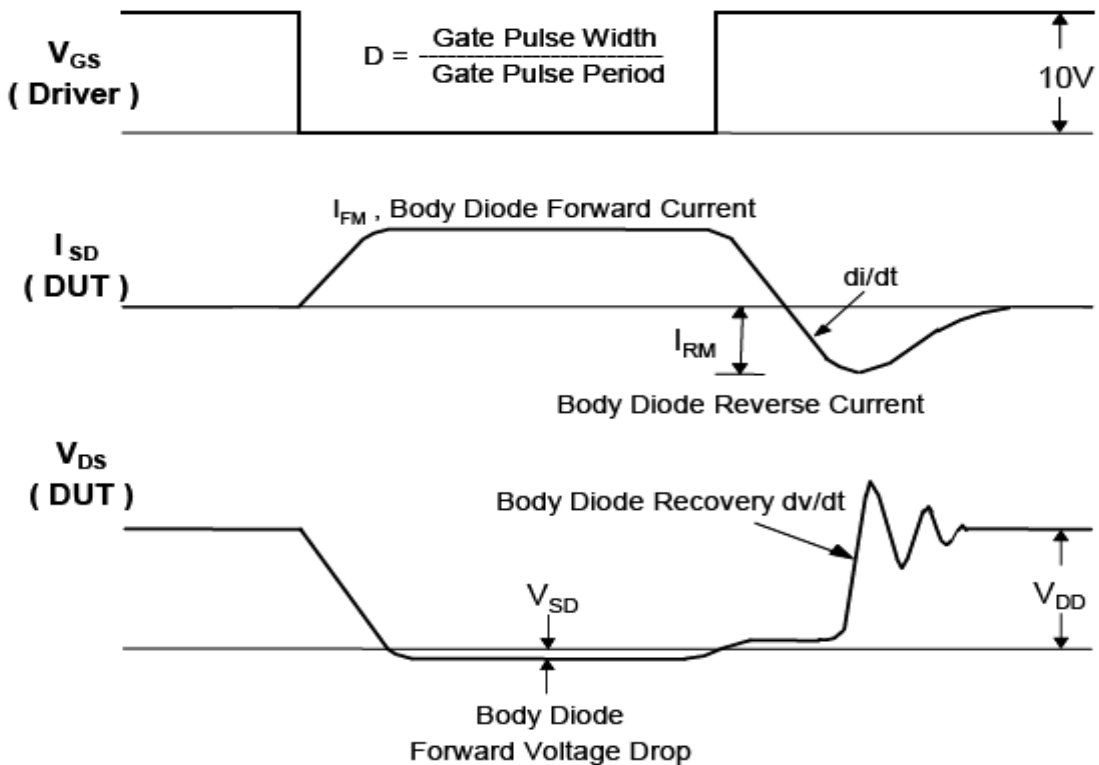
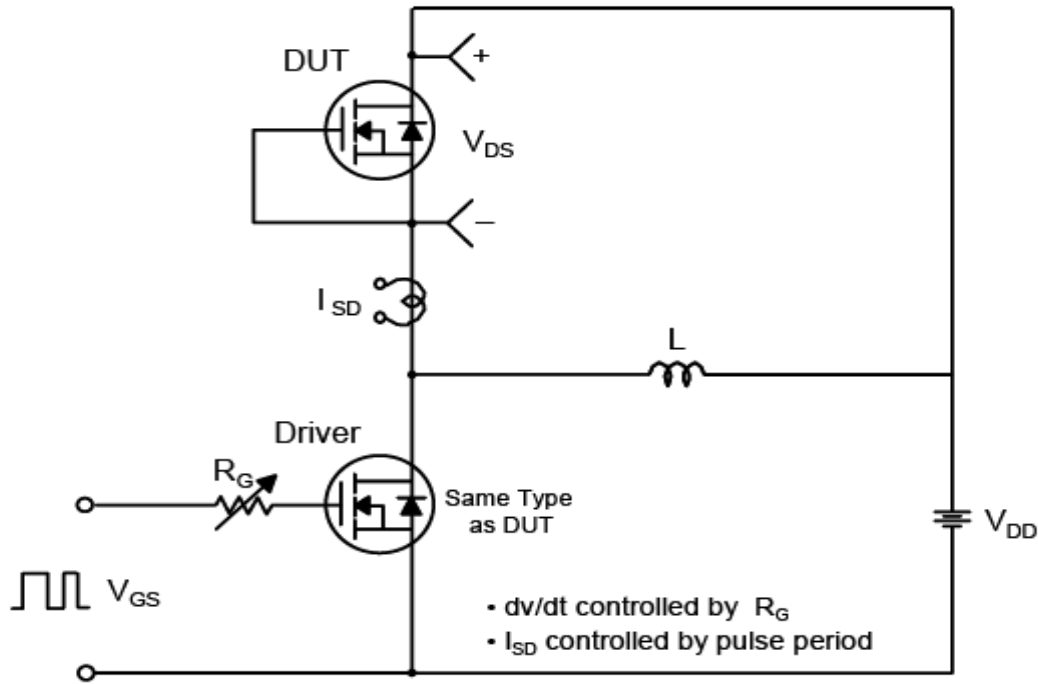


**Unclamped Inductive Switching Test Circuit & Waveforms**

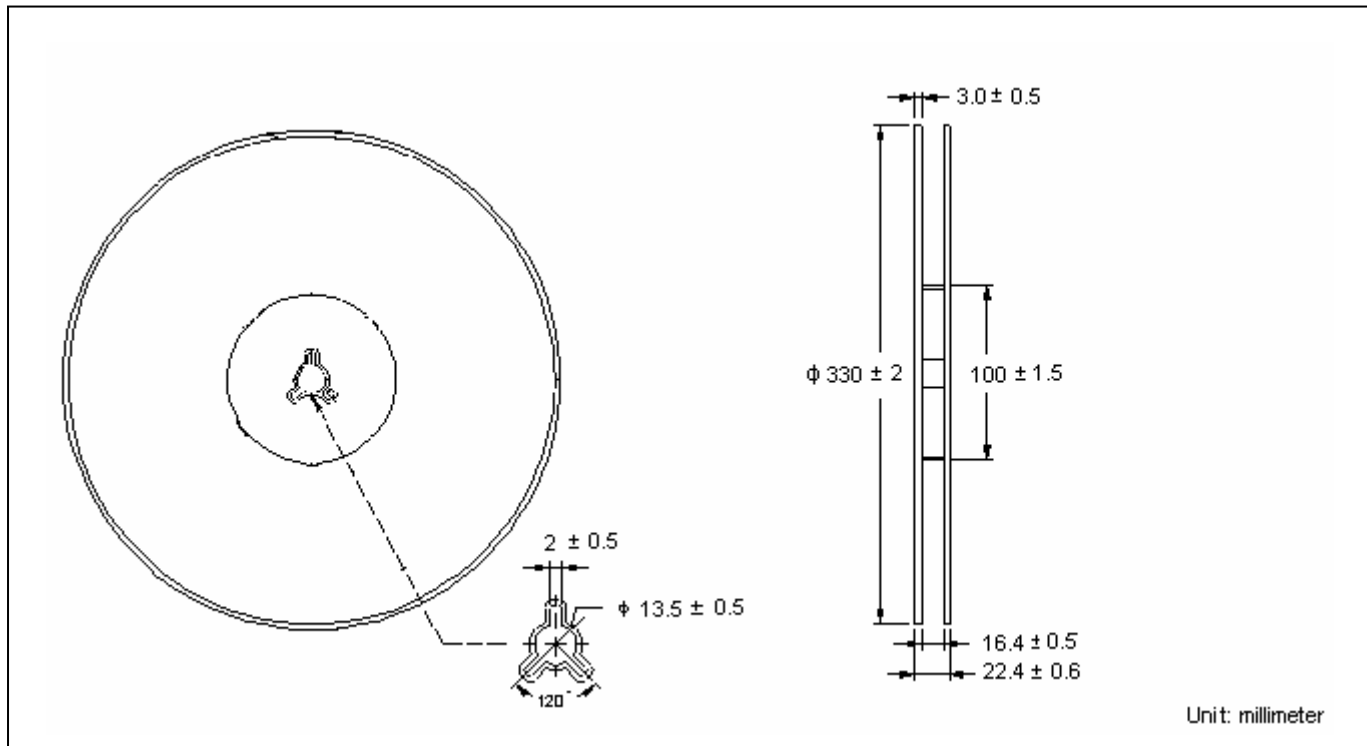


**Test Circuit and Waveforms(Cont.)**

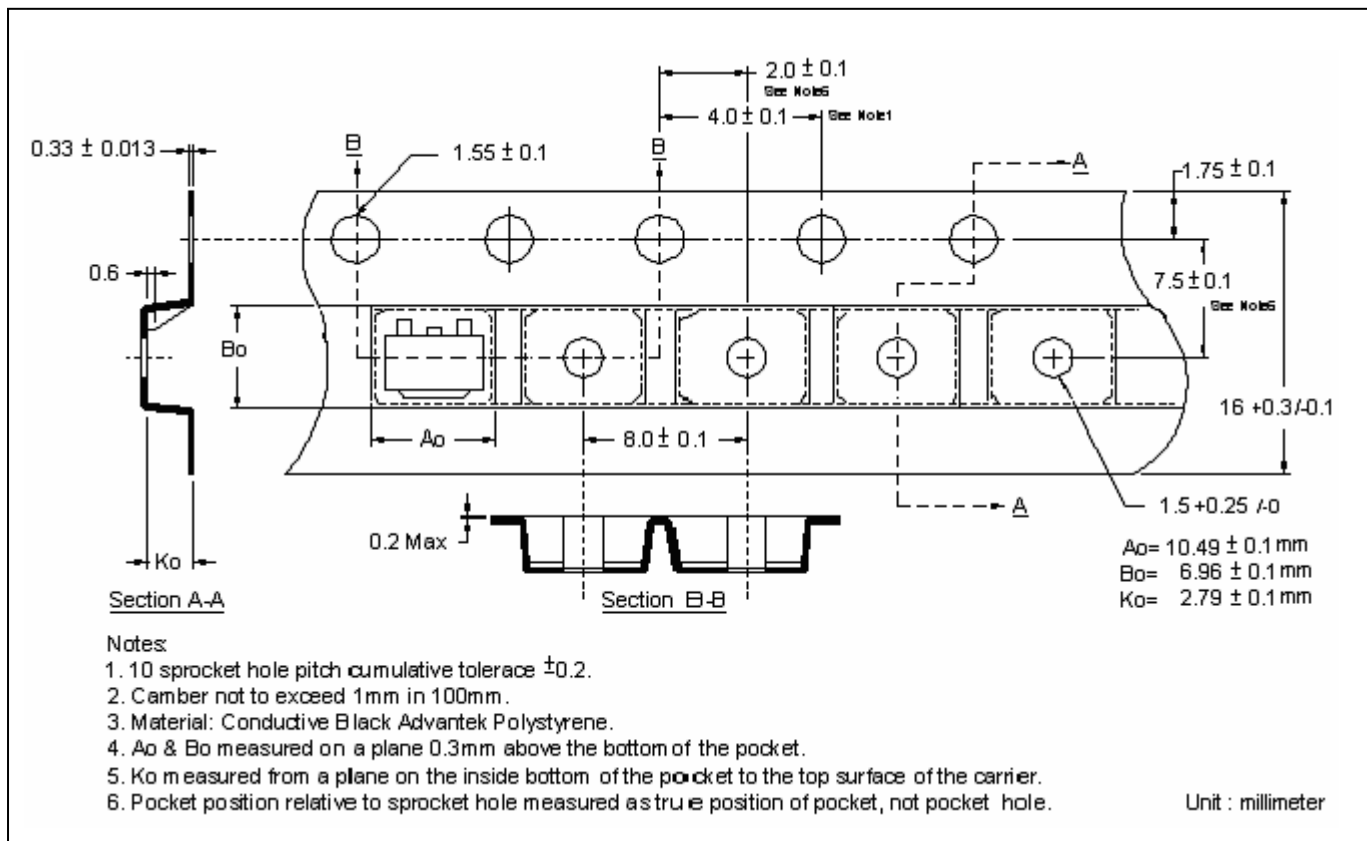
**Peak Diode Recovery dv/dt Test Circuit & Waveforms**



### Reel Dimension



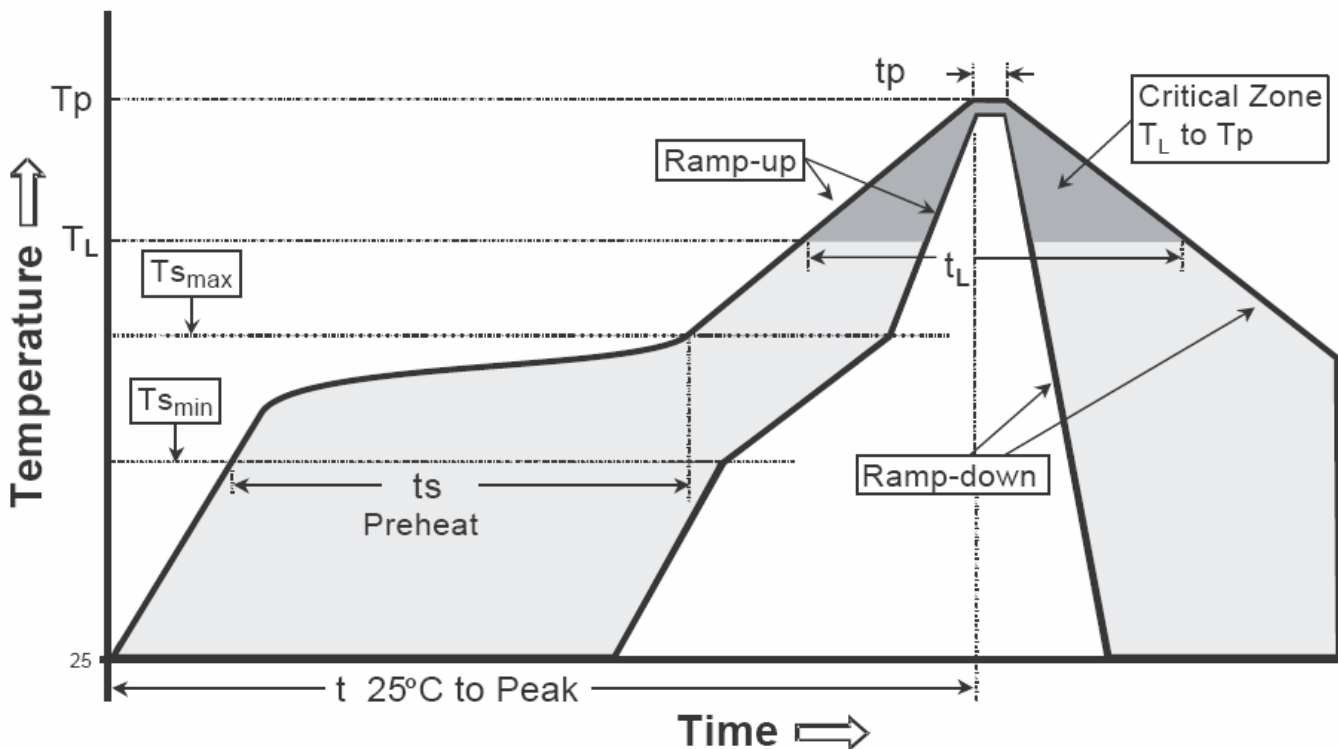
### Carrier Tape Dimension



**Recommended wave soldering condition**

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

**Recommended temperature profile for IR reflow**

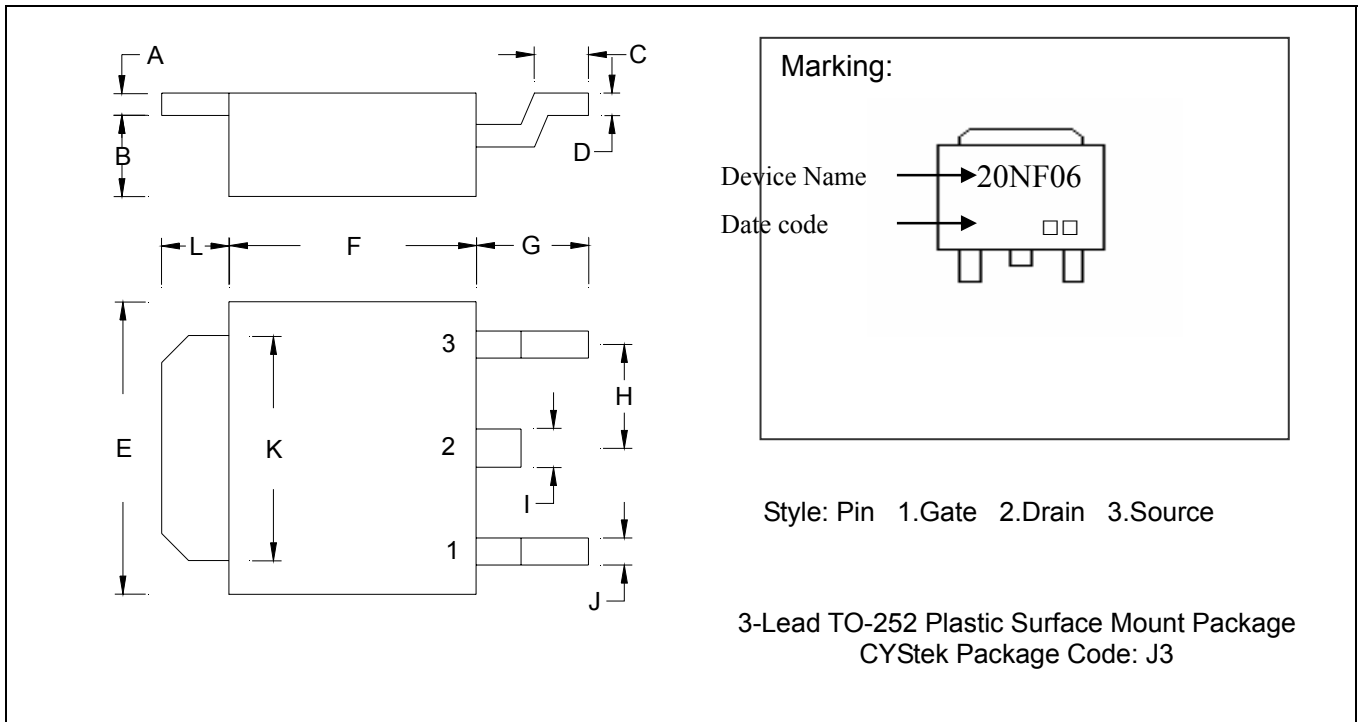


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(Ts min)	100°C	150°C
-Temperature Max(Ts max)	150°C	200°C
-Time(ts min to ts max)	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (TL)	183°C	217°C
- Time (tL)	60-150 seconds	60-150 seconds
Peak Temperature(TP)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.



**TO-252 Dimension**



\*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.0177	0.0217	0.45	0.55	G	0.0866	0.1102	2.20	2.80
B	0.0650	0.0768	1.65	1.95	H	-	*0.0906	-	*2.30
C	0.0354	0.0591	0.90	1.50	I	-	0.0449	-	1.14
D	0.0177	0.0236	0.45	0.60	J	-	0.0346	-	0.88
E	0.2441	0.2677	6.20	6.80	K	0.2047	0.2165	5.20	5.50
F	0.2125	0.2283	5.40	5.80	L	0.0551	0.0630	1.40	1.60

**Notes:** 1.Controlling dimension: millimeters.  
 2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.  
 3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

**Material:**

- Lead : KFC; tin plating
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

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