

# N-Channel Enhancement Mode Power MOSFET

# MTN4N60J3

<b>BV<sub>DSS</sub> : 600V</b>
<b>R<sub>DS(ON)</sub> : 2.8Ω (typ.)</b>
<b>I<sub>D</sub> : 4A</b>

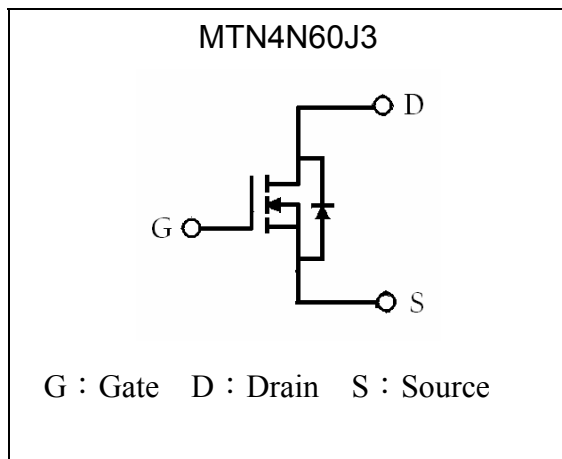
## Features

- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- Pb-free lead plating package

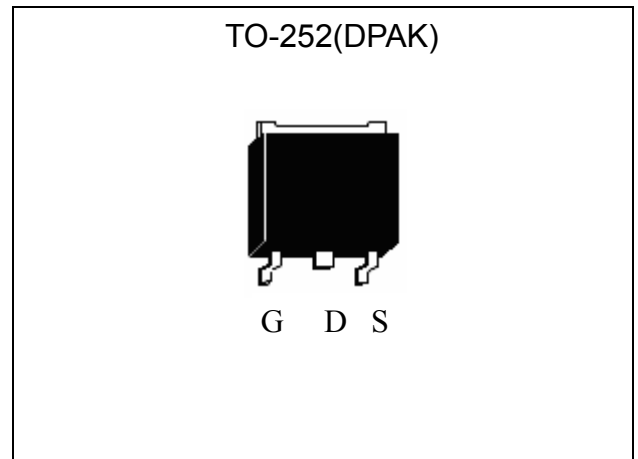
## Applications

- Open Framed Power Supply
- Adapter
- STB

## Symbol

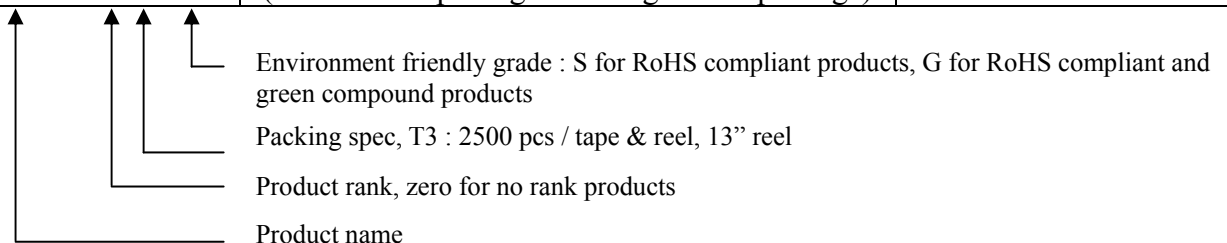


## Outline



## Ordering Information

Device	Package	Shipping
MTN4N60J3-0-T3-G	TO-252 (Pb-free lead plating and halogen-free package)	2500 pcs / Tape & Reel



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

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	$V_{DS}$	600	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current @ $V_{GS}=10\text{V}$ , $T_C=25^{\circ}\text{C}$	$I_D$	4*	A
Continuous Drain Current @ $V_{GS}=10\text{V}$ , $T_C=100^{\circ}\text{C}$	$I_D$	2.4*	A
Pulsed Drain Current @ $V_{GS}=10\text{V}$ (Note 1)	$I_{DM}$	16*	A
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	34.9	mJ
Avalanche Current (Note 1)	$I_{AR}$	4	A
Repetitive Avalanche Energy (Note 1)	$E_{AR}$	5	mJ
Peak Diode Recovery $dv/dt$ (Note 3)	$dv/dt$	4.5	V/ns
Maximum Temperature for Soldering @ Lead at 0.125 in(0.318mm) from case for 10 seconds	$T_L$	300	$^{\circ}\text{C}$
Total Power Dissipation ( $T_C=25^{\circ}\text{C}$ )	$P_d$	50	W
Linear Derating Factor		0.4	W/ $^{\circ}\text{C}$
Operating Junction and Storage Temperature	$T_j, T_{stg}$	-55~+150	$^{\circ}\text{C}$

\*Drain current limited by maximum junction temperature

Note : 1.Repetitive rating; pulse width limited by maximum junction temperature.

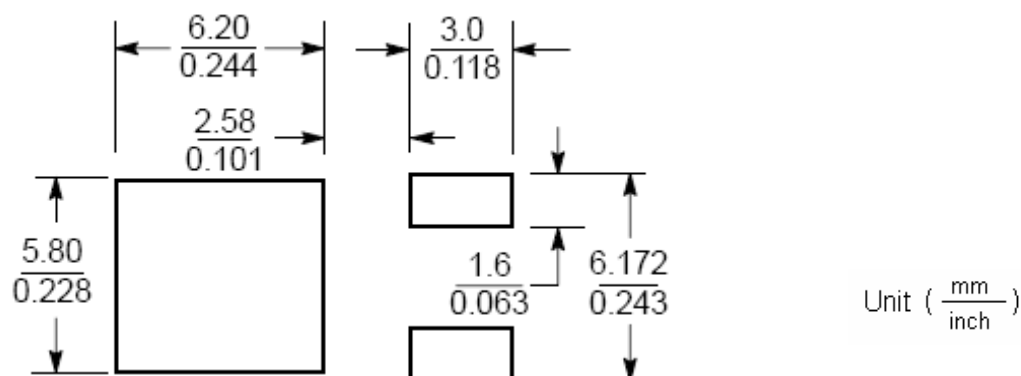
2.  $I_{AS}=4\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $L=4\text{mH}$ ,  $V_G=10\text{V}$ , starting  $T_J=+25^{\circ}\text{C}$ .3.  $I_{SD}\leq 4\text{A}$ ,  $dI/dt\leq 100\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , starting  $T_J=+25^{\circ}\text{C}$ .**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	2.5	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-ambient, max	$R_{th,j-a}$	110	$^{\circ}\text{C}/\text{W}$

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	600	-	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =250μA, T <sub>j</sub> =25°C
ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	-	0.65	-	V/°C	Reference to 25°C, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	2.0	-	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA
*G <sub>FS</sub>	-	2	-	S	V <sub>DS</sub> =15V, I <sub>D</sub> =2A
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±30
I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =600V, V <sub>GS</sub> =0
	-	-	10	μA	V <sub>DS</sub> =480V, V <sub>GS</sub> =0, T <sub>j</sub> =125°C
*R <sub>DS(ON)</sub>	-	2.8	3.2	Ω	V <sub>GS</sub> =10V, I <sub>D</sub> =2A
<b>Dynamic</b>					
*Q <sub>g</sub>	-	12.8	-	nC	I <sub>D</sub> =4A, V <sub>DD</sub> =480V, V <sub>GS</sub> =10V
*Q <sub>gs</sub>	-	2.4	-		
*Q <sub>gd</sub>	-	7.1	-		
*t <sub>d(ON)</sub>	-	15	-	ns	V <sub>DD</sub> =300V, I <sub>D</sub> =4A, V <sub>GS</sub> =10V, R <sub>G</sub> =25 Ω, R <sub>D</sub> =75 Ω
*t <sub>r</sub>	-	21	-		
*t <sub>d(OFF)</sub>	-	30	-		
*t <sub>f</sub>	-	22	-		
C <sub>iss</sub>	-	560	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz
C <sub>oss</sub>	-	51	-		
C <sub>rss</sub>	-	7.2	-		
<b>Source-Drain Diode</b>					
*I <sub>S</sub>	-	-	4	A	
*I <sub>SM</sub>	-	-	16		
*V <sub>SD</sub>	-	-	1.5	V	I <sub>S</sub> =4A, V <sub>GS</sub> =0V
*t <sub>rr</sub>	-	277	-	ns	V <sub>GS</sub> =0, I <sub>F</sub> =4A, dI/dt=100A/μs
*Q <sub>rr</sub>	-	2.1	-	μC	

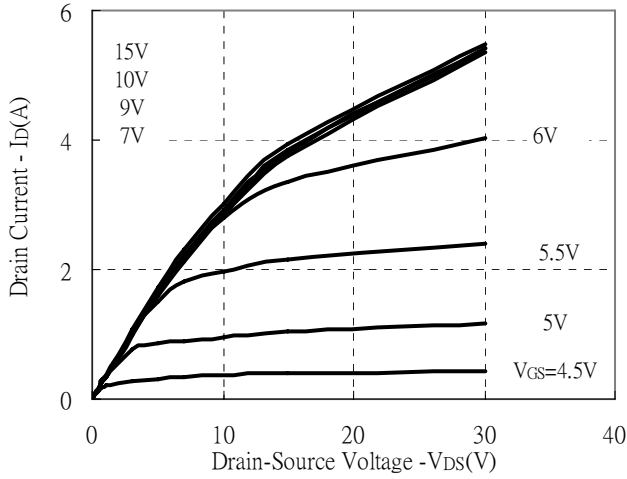
\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

**Recommended soldering footprint**


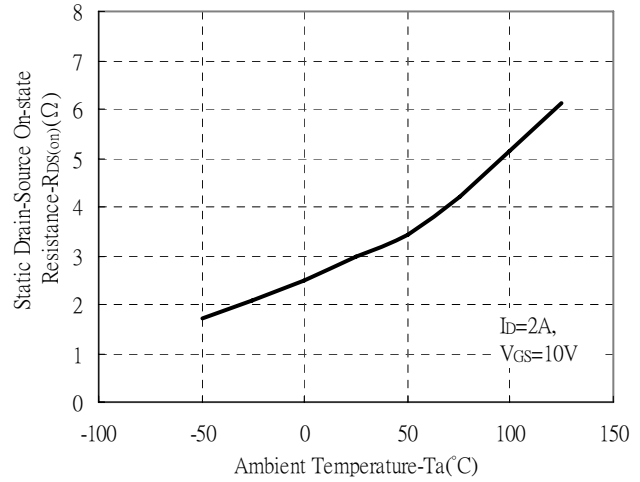


**Typical Characteristics**

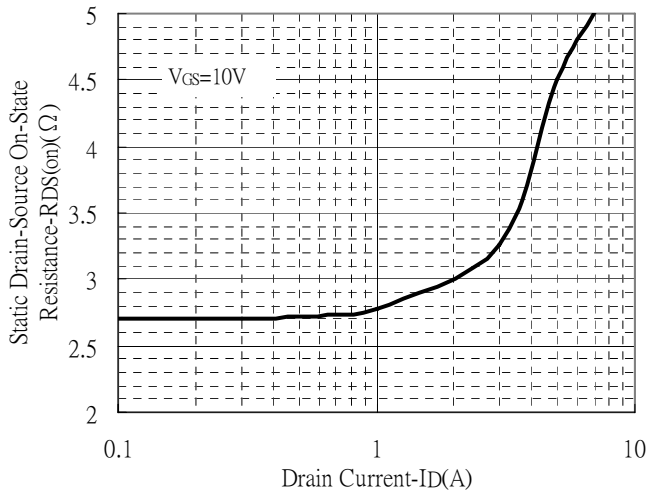
Typical Output Characteristics



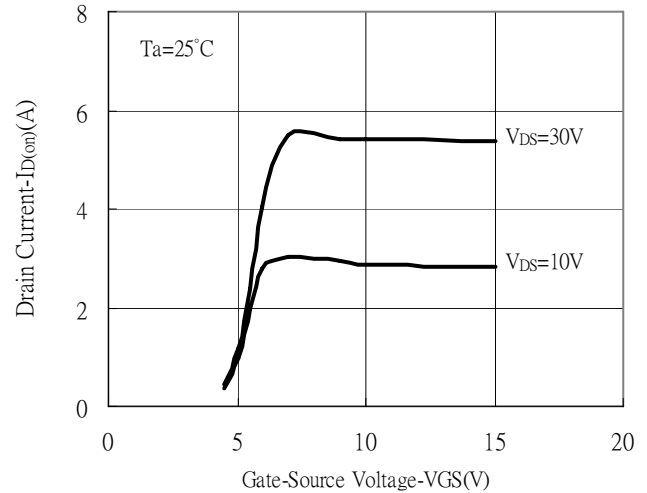
Static Drain-Source On-resistance vs Ambient Temperature



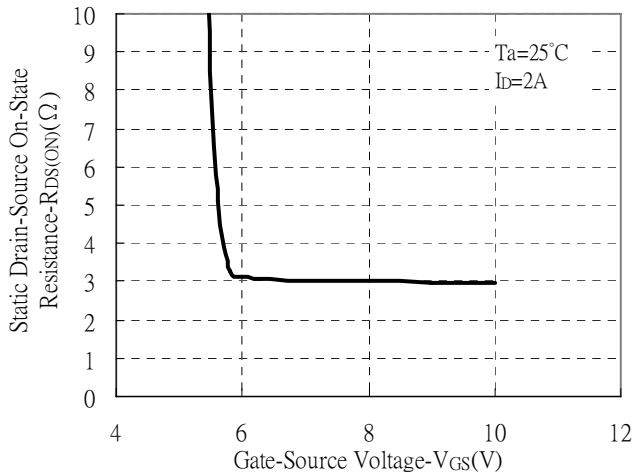
Static Drain-Source On-State resistance vs Drain Current



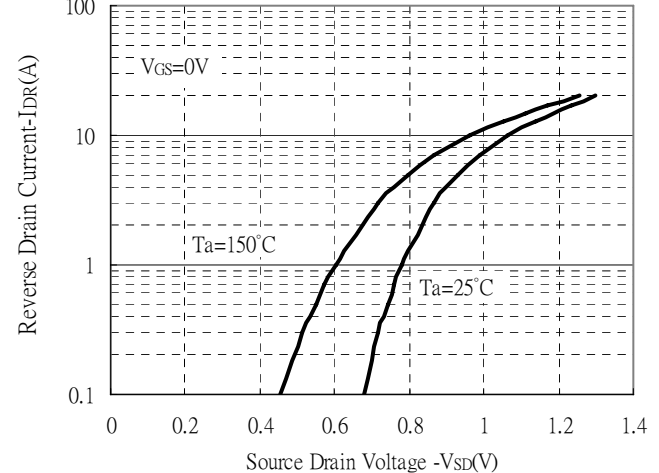
Drain Current vs Gate-Source Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage



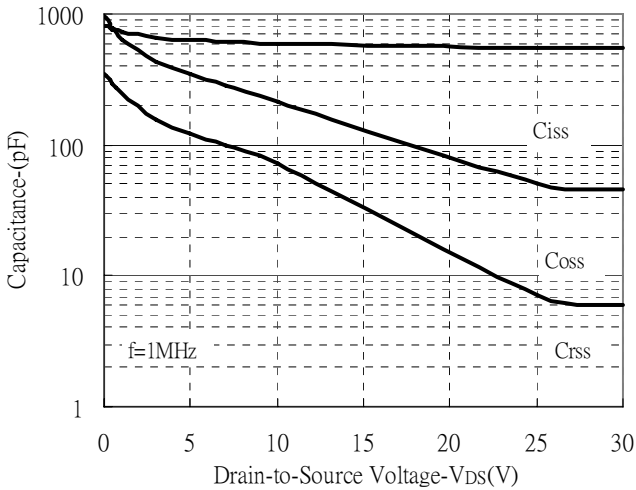
Body Diode Forward Voltage Variation vs Source Current and Temperature



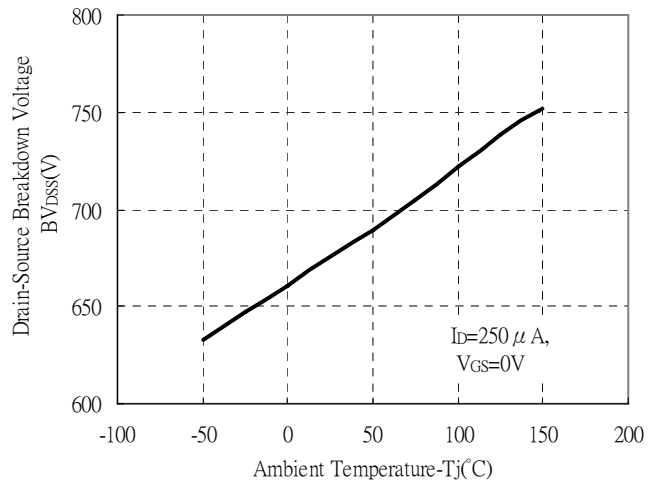


**Typical Characteristics(Cont.)**

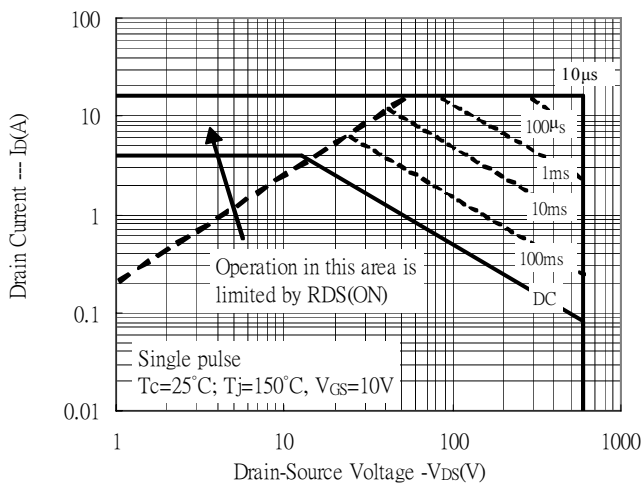
Capacitance vs Reverse Voltage



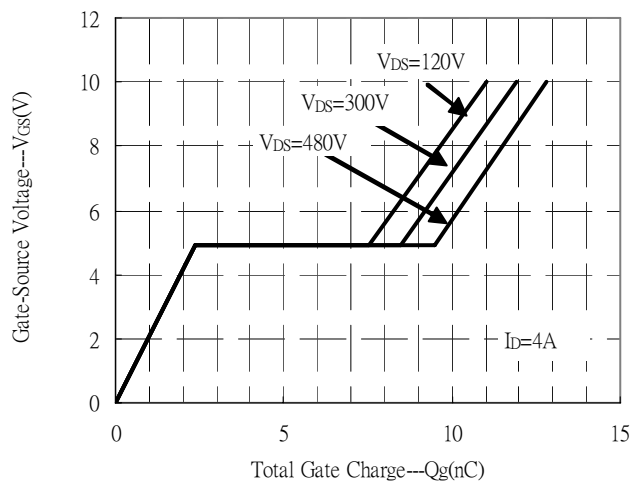
Breakdown Voltage vs Ambient Temperature



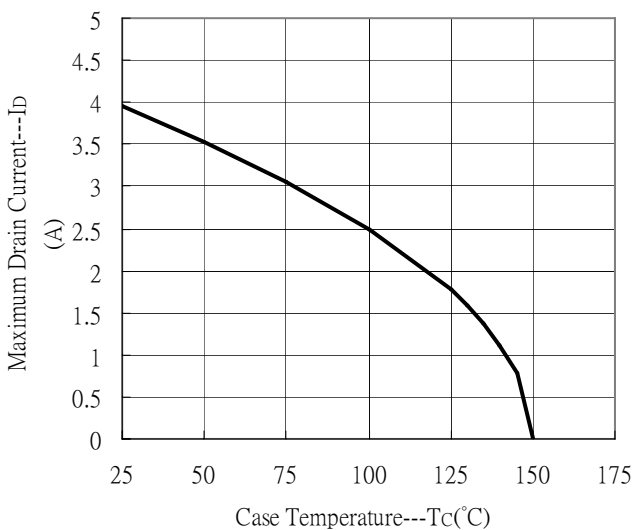
Maximum Safe Operating Area



Gate Charge Characteristics

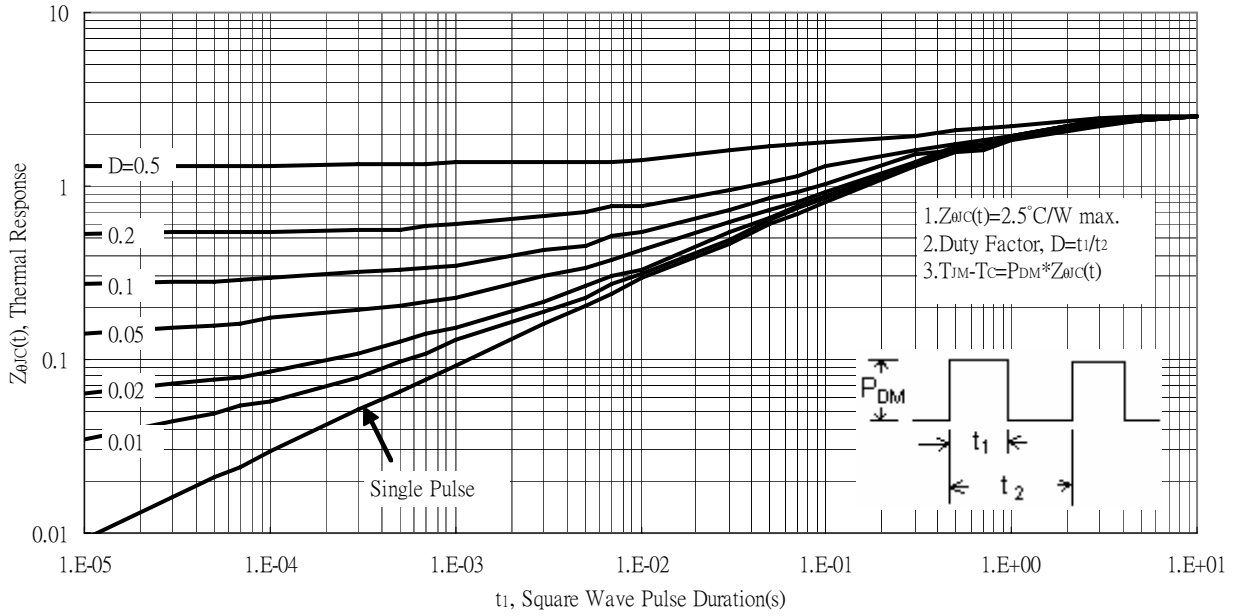


Maximum Drain Current vs Case Temperature



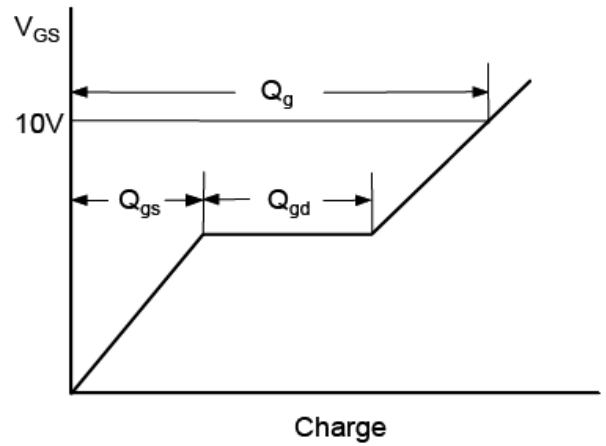
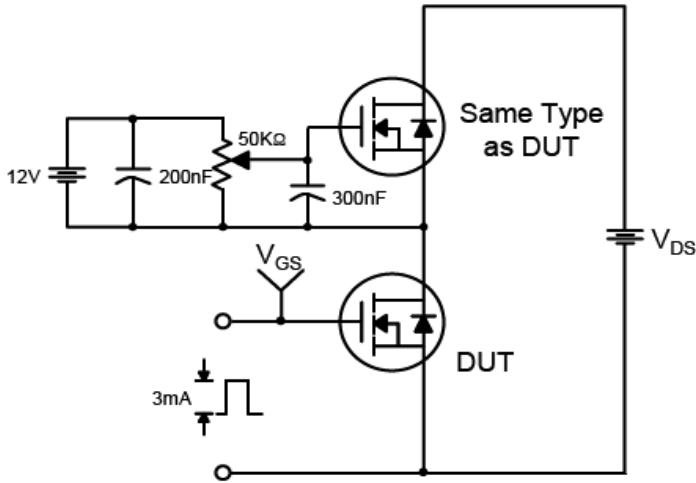
**Typical Characteristics(Cont.)**

Transient Thermal Response Curves

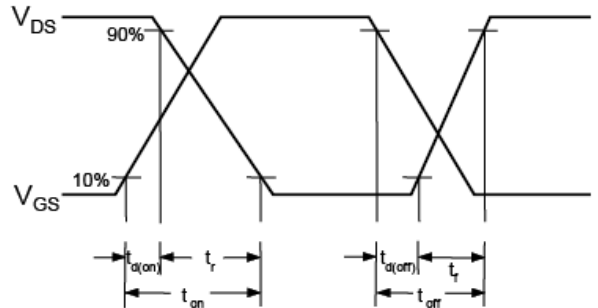
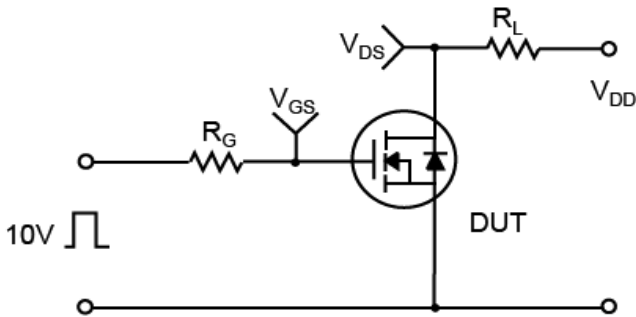


**Test Circuits and Waveforms**

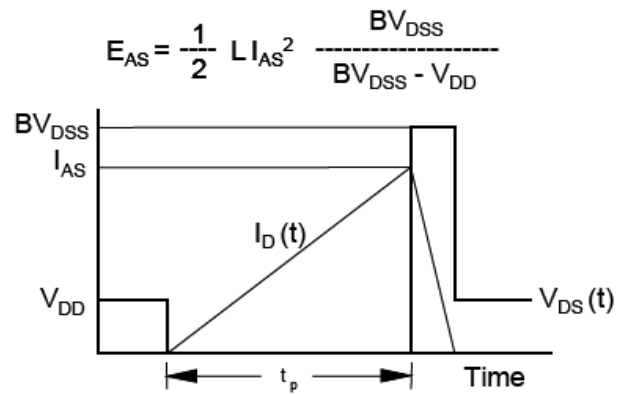
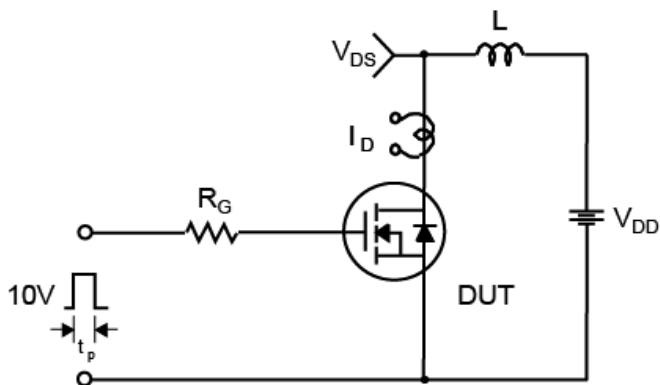
**Gate Charge Test Circuit & Waveform**



**Resistive Switching Test Circuit & Waveforms**

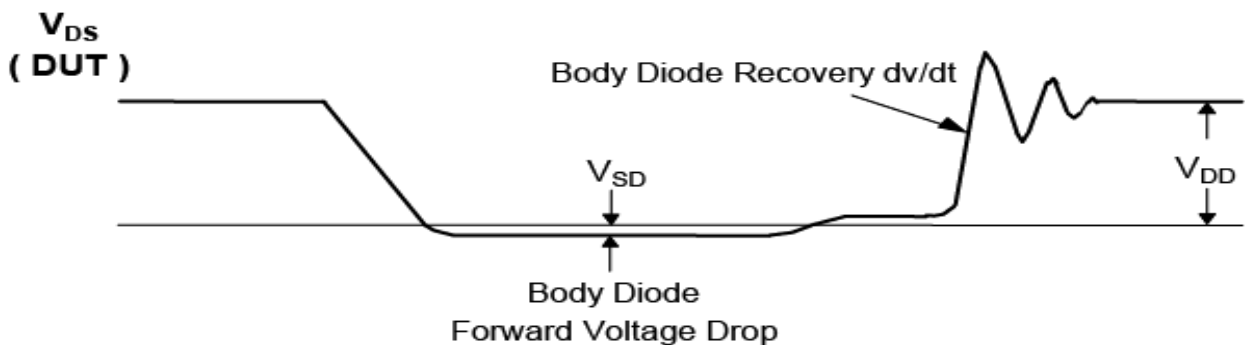
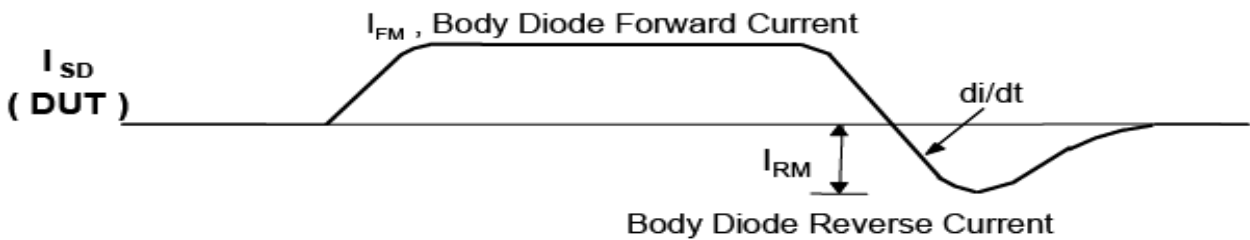
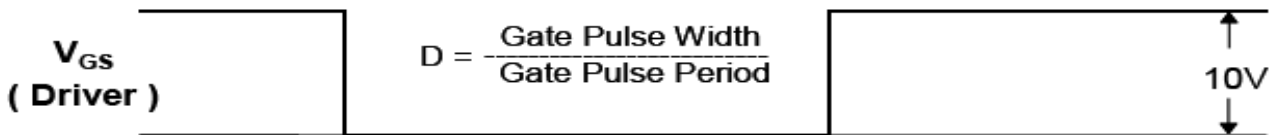
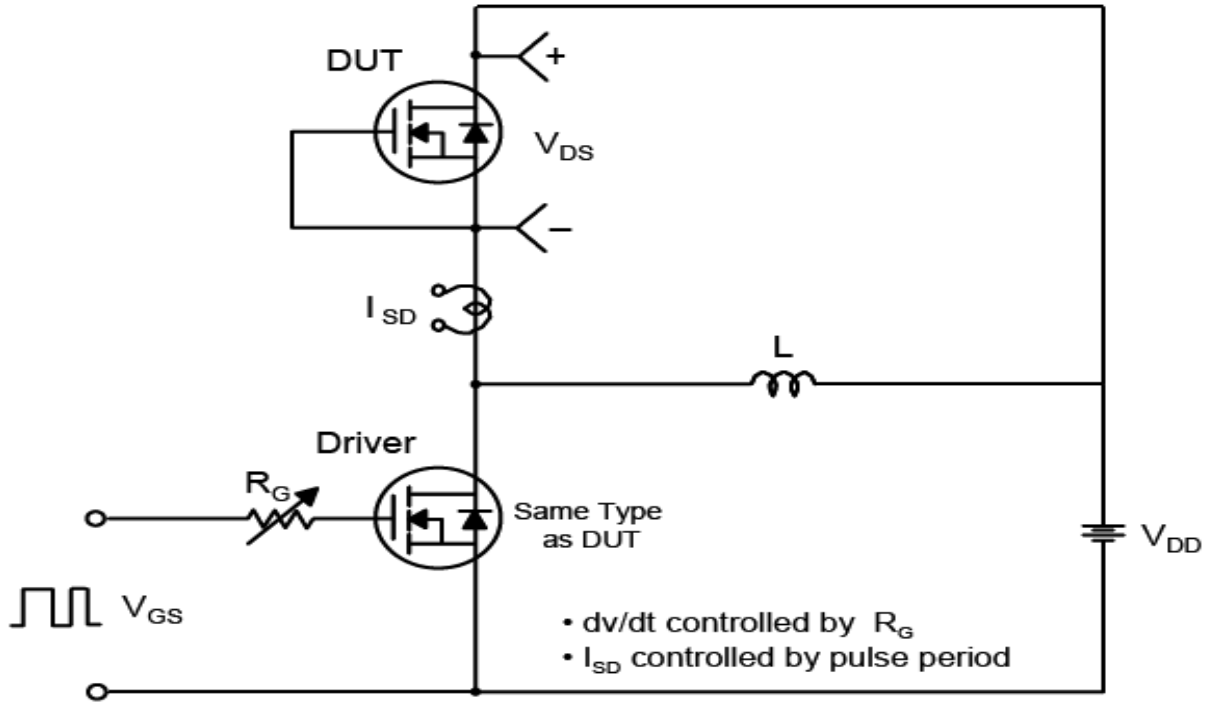


**Unclamped Inductive Switching Test Circuit & Waveforms**



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

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



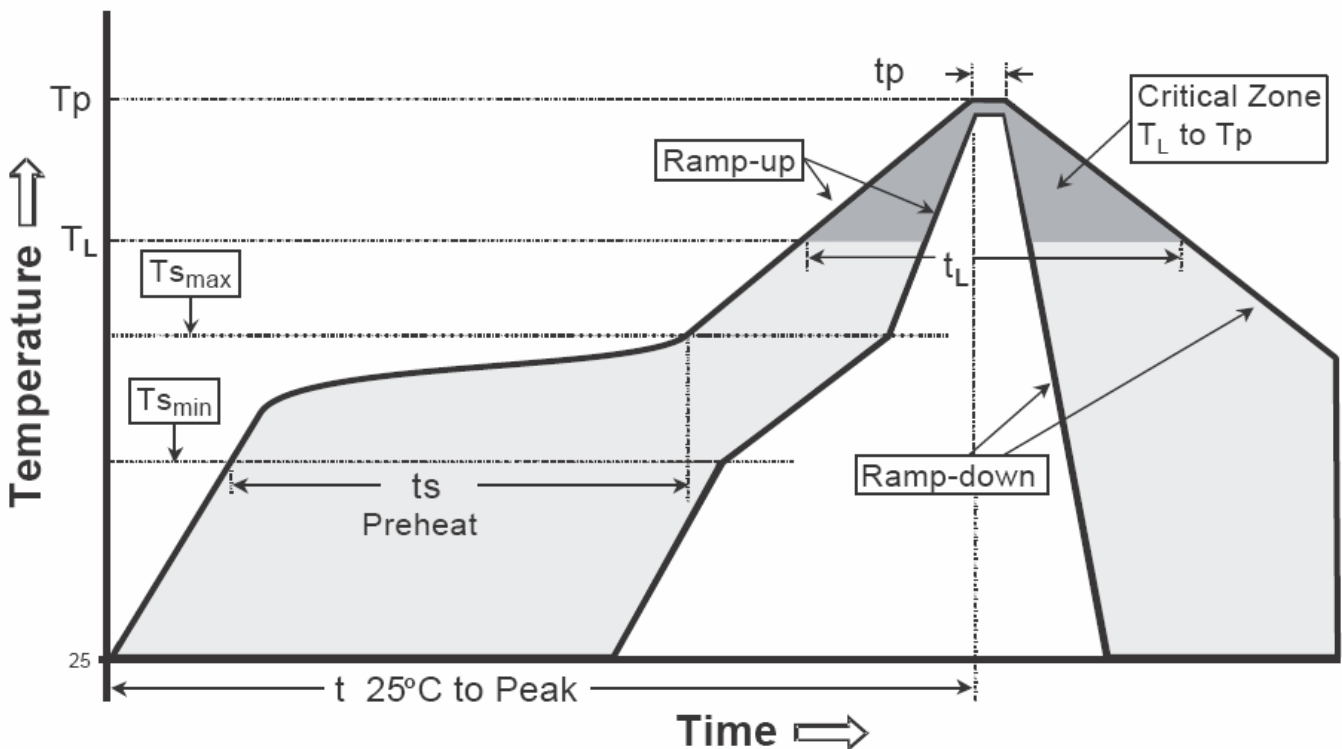




**Recommended wave soldering condition**

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

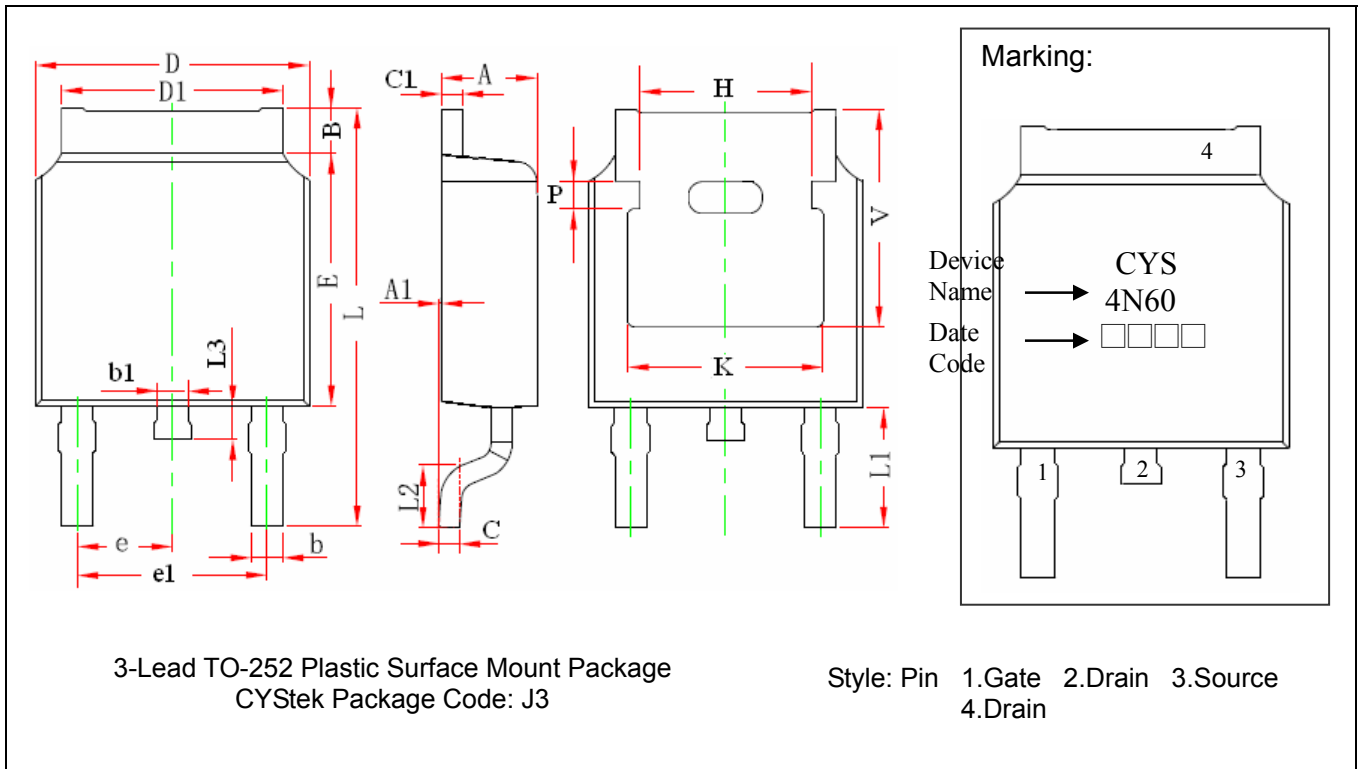
**Recommended temperature profile for IR reflow**



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T <sub>s min</sub> )	100°C	150°C
-Temperature Max(T <sub>s max</sub> )	150°C	200°C
-Time(t <sub>s min</sub> to t <sub>s max</sub> )	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60-150 seconds	60-150 seconds
Peak Temperature(T <sub>P</sub> )	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**



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.087	0.094	2.200	2.400	e	0.086	0.094	2.186	2.386
A1	0.000	0.005	0.000	0.127	e1	0.172	0.188	4.372	4.772
B	0.039	0.048	0.990	1.210	H	0.163	REF	4.140	REF
b	0.026	0.034	0.660	0.860	K	0.190	REF	4.830	REF
b1	0.026	0.034	0.660	0.860	L	0.386	0.409	9.800	10.400
C	0.018	0.023	0.460	0.580	L1	0.114	REF	2.900	REF
C1	0.018	0.023	0.460	0.580	L2	0.055	0.067	1.400	1.700
D	0.256	0.264	6.500	6.700	L3	0.024	0.039	0.600	1.000
D1	0.201	0.215	5.100	5.460	P	0.026	REF	0.650	REF
E	0.236	0.244	6.000	6.200	V	0.211	REF	5.350	REF

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 : Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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