N-Channel Enhancement Mode Power MOSFET

MTN4N60I3

BV_{DSS} : 600V
$R_{DS(ON)}$: 2.8Ω(typ.)
I_D : 4A

Description

The MTN4N60I3 is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness. The TO-251 package is universally preferred for all commercial-industrial applications

Features

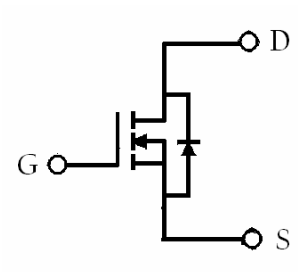
- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- Pb-free lead plating package

Applications

- Open Framed Power Supply
- Adapter
- STB

Symbol

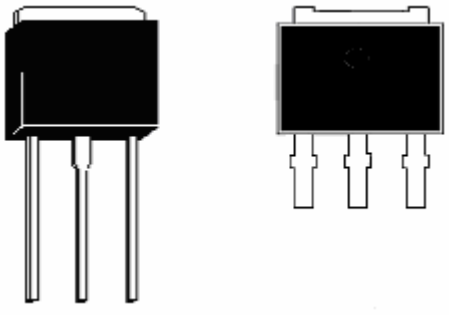
MTN4N60I3



G：Gate
D：Drain
S：Source

Outline

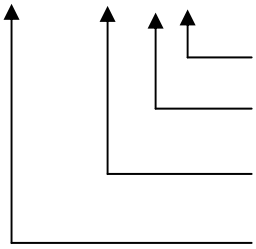
TO-251 TO-251S



G D S G D S

Ordering Information

Device	Package	Shipping
MTN4N60I3-0-UA-G	TO-251 (RoHS compliant and halogen-free package)	80 pcs/tube, 50 tubes/box
MTN4N60I3S-0-UA-G	TO-251S (RoHS compliant and halogen-free package)	80 pcs/tube, 50 tubes/box



Environment friendly grade : S for RoHS compliant products, G for RoHS compliant and green compound products

Packing spec, UA : 80 pcs / tube, 50 tubes/box

Product rank, zero for no rank products

Product name

Absolute Maximum Ratings (T_C=25°C)

Parameter		Symbol	Limits	Unit
Drain-Source Voltage		V_{DS}	600	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current		I_D	4*	A
Continuous Drain Current @T_C=100°C		I_D	2.4*	A
Pulsed Drain Current @ V_{GS}=10V	(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	°C
Total Power Dissipation (T_C=25℃)		Pd	50	W
Linear Derating Factor			0.4	W/°C
Operating Junction and Storage Temperature		Tj, Tstg	-55~+150	°C

*Drain current limited by maximum junction temperature

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

2. I_{AS}=4A, V_{DD}=50V, L=4mH, V_G=10V, starting TJ=+25℃.

3. I_{SD}≤4A, dI/dt≤100A/μs, V_{DD}≤BV_{DSS}, starting TJ=+25℃.

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	$R_{th,j-a}$	110	°C/W

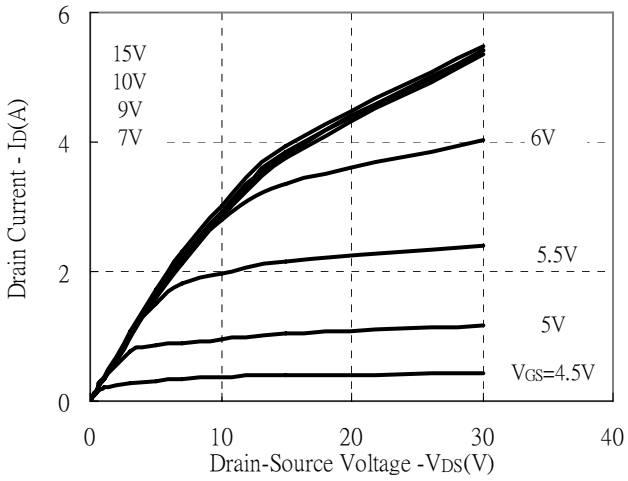
Characteristics (T_C=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	600	-	-	V	V_{GS}=0, I_D=250μA, Tj=25℃
$\Delta BV_{DSS}/\Delta Tj$	-	0.65	-	V/°C	Reference to 25°C, I_D=250μA
$V_{GS(th)}$	2.0	-	4.0	V	V_{DS} = V_{GS}, I_D=250μA
*G_{FS}	-	2	-	S	V_{DS} =15V, I_D=2A
I_{GSS}	-	-	±100	nA	V_{GS}=±30
I_{DSS}	-	-	1	μA	V_{DS} =600V, V_{GS} =0
	-	-	10	μA	V_{DS} =480V, V_{GS} =0, Tj=125°C
*$R_{DS(ON)}$	-	2.8	3.2	Ω	V_{GS} =10V, I_D=2A
Dynamic					
*Qg	-	12.8	-	nC	I_D=4A, V_{DD}=480V, V_{GS}=10V
*Qgs	-	2.4	-		
*Qgd	-	7.1	-		
*$t_{d(ON)}$	-	15	-	ns	V_{DD}=300V, I_D=4A, V_{GS}=10V, R_G=25Ω, R_D=75Ω
*tr	-	21	-		
*$t_{d(OFF)}$	-	30	-		
*t_f	-	22	-		
Ciss	-	560	-	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Coss	-	51	-		
Crss	-	7.2	-		
Source-Drain Diode					
*I_S	-	-	4	A	
*I_{SM}	-	-	16		
*V_{SD}	-	-	1.5	V	I_S=4A, V_{GS}=0V
*trr	-	277	-	ns	V_{GS}=0, I_F=4A, dI/dt=100A/μs
*Qrr	-	2.1	-	μC	

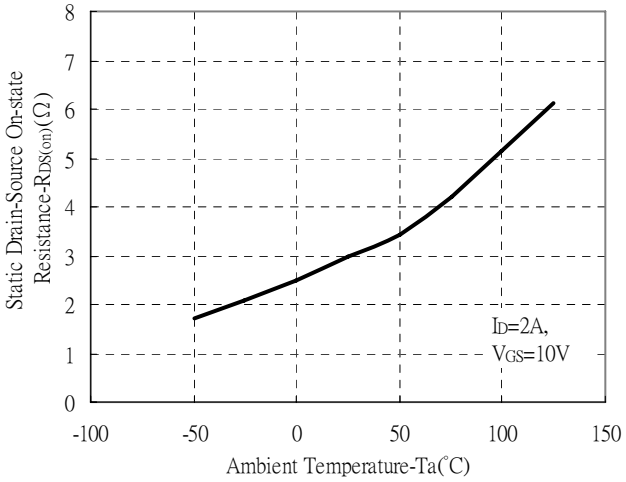
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Typical Characteristics

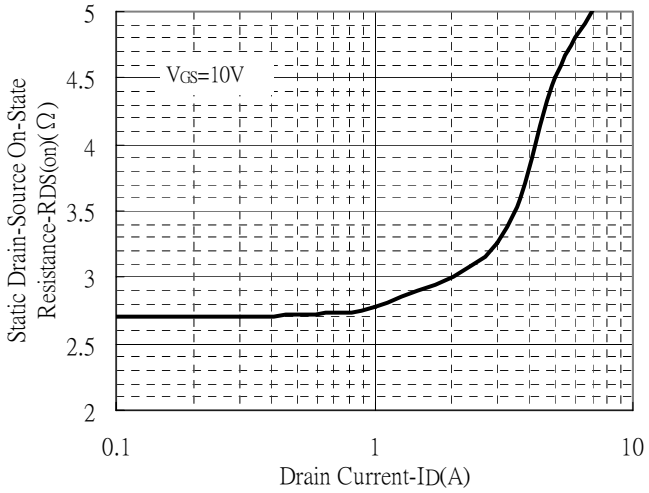
Typical Output Characteristics



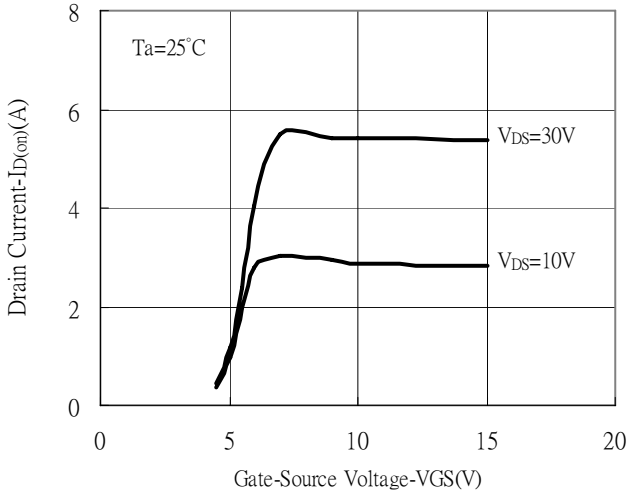
Static Drain-Source On-resistance vs Ambient Temperature



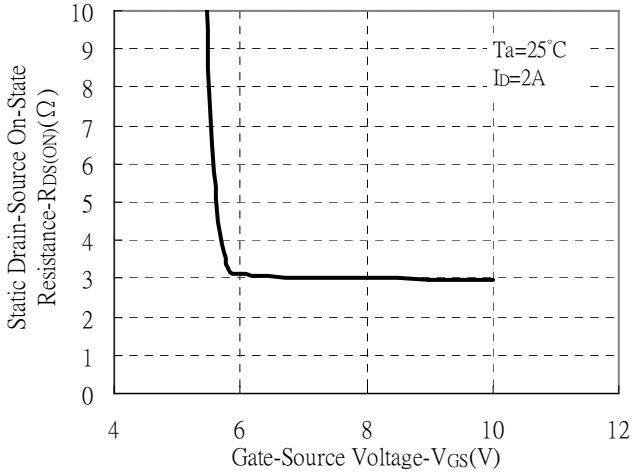
Static Drain-Source On-State resistance vs Drain Current



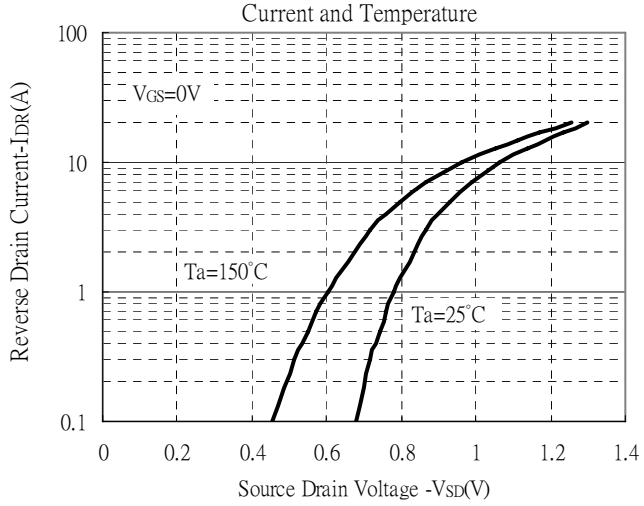
Drain Current vs Gate-Source Voltage



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

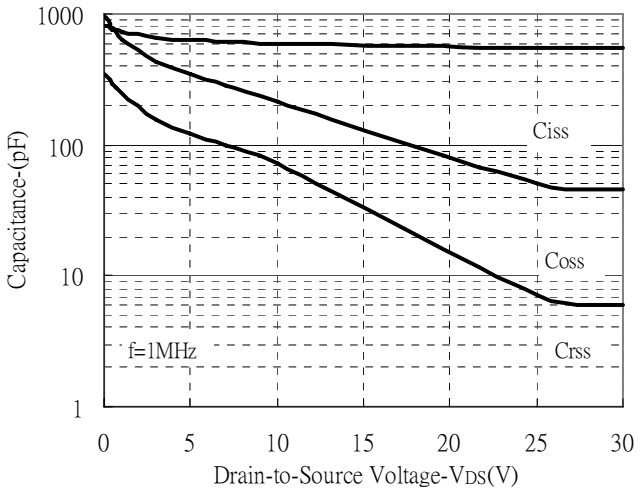


Body Diode Forward Voltage Variation vs Source Current and Temperature

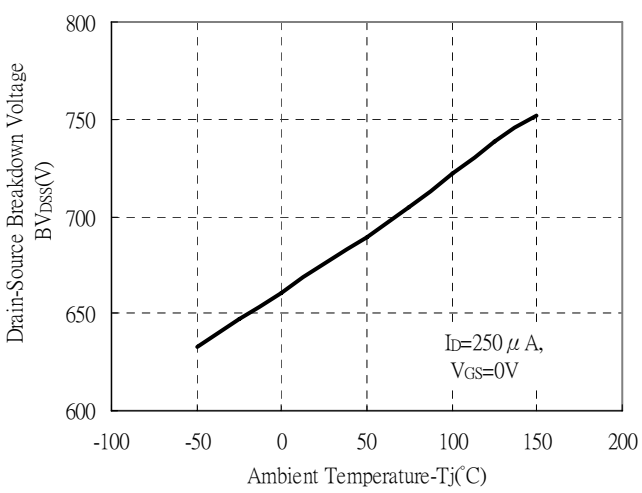


Typical Characteristics(Cont.)

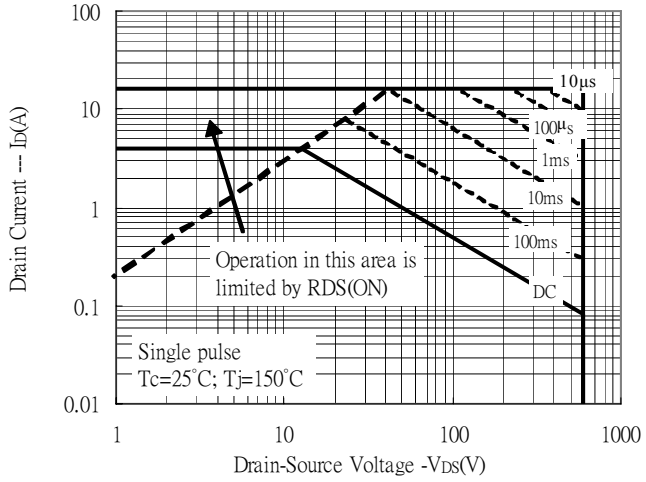
Capacitance vs Reverse Voltage



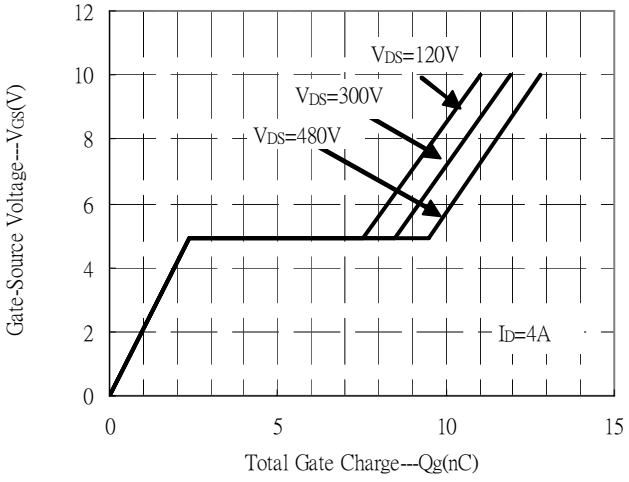
Brekdown Voltage vs Ambient Temperature



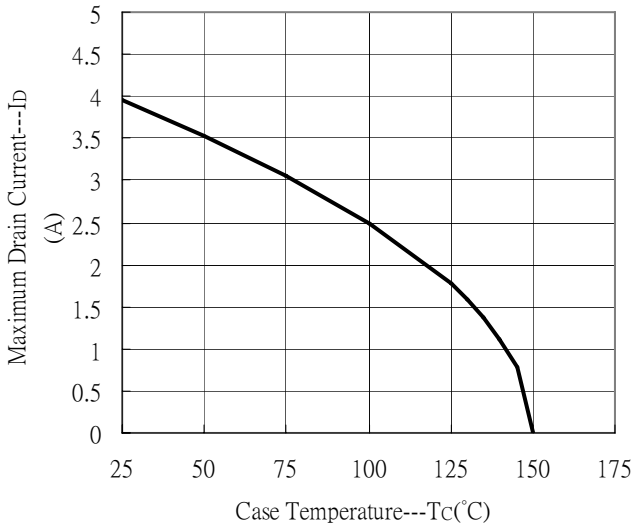
Maximum Safe Operating Area



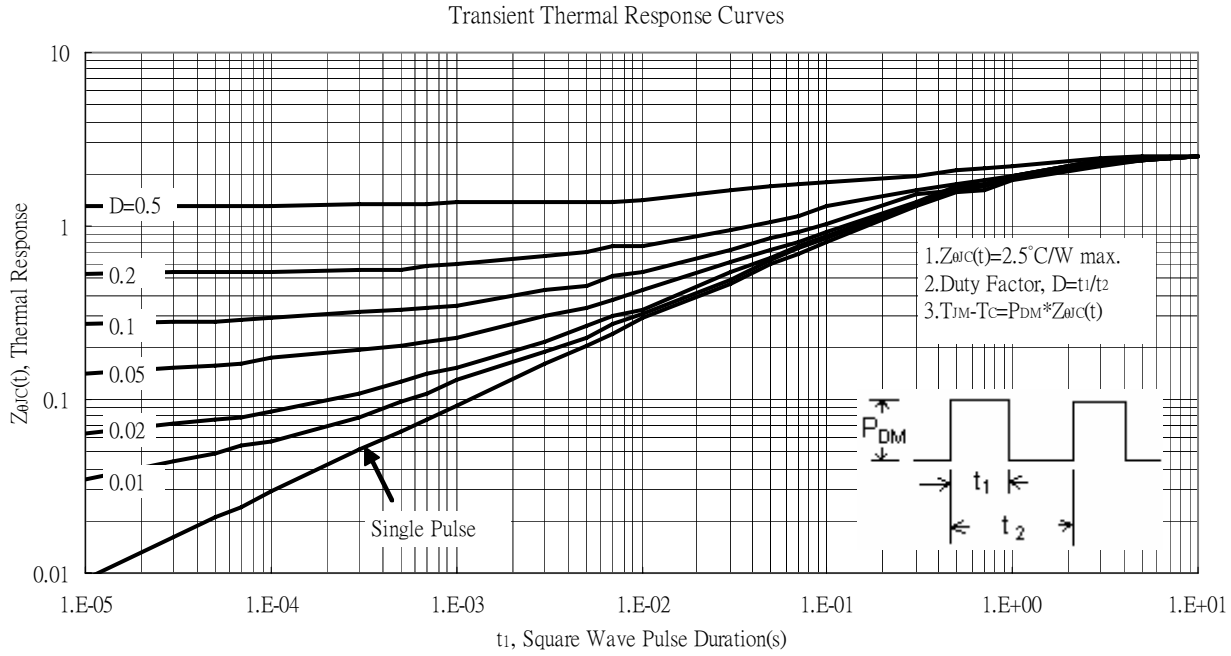
Gate Charge Characteristics



Maximum Drain Current vs Case Temperature

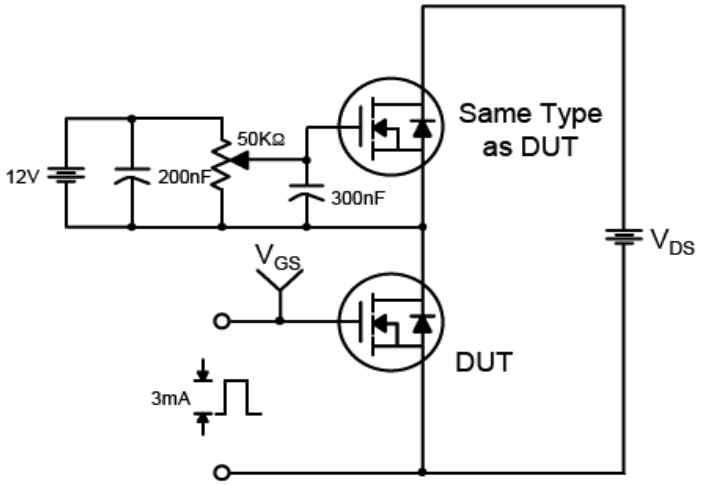


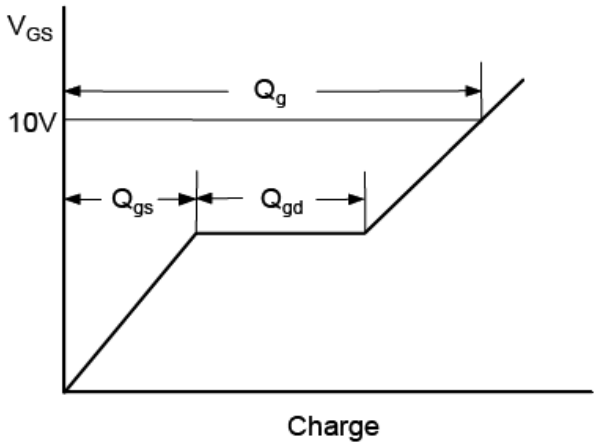
Typical Characteristics(Cont.)



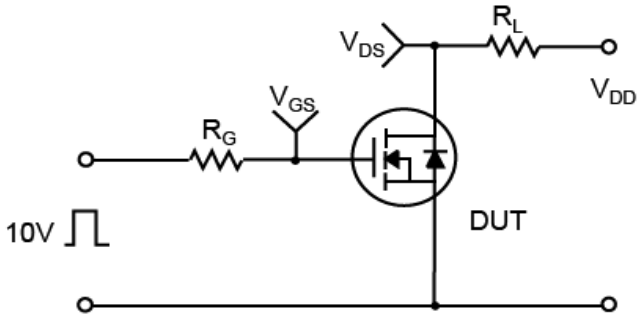
Test Circuits and Waveforms

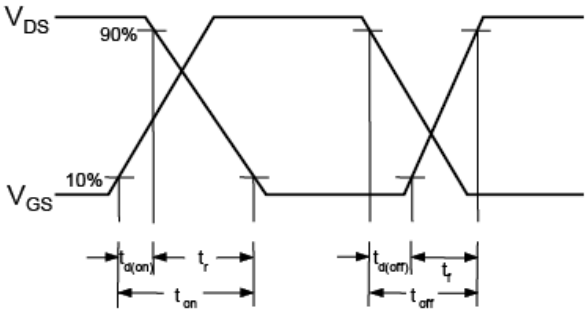
Gate Charge Test Circuit & Waveform



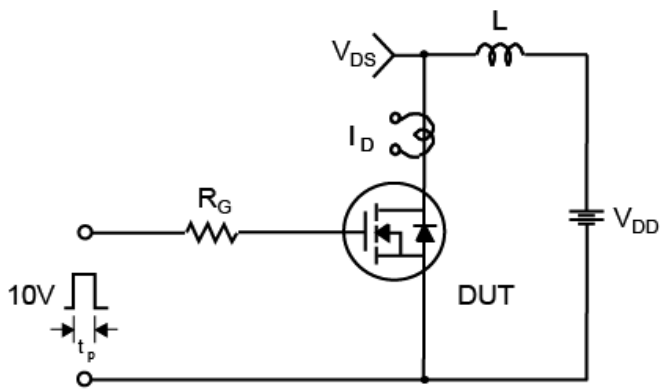


Resistive Switching Test Circuit & Waveforms

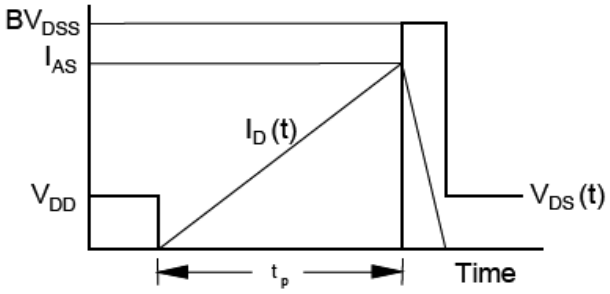




Unclamped Inductive Switching Test Circuit & Waveforms

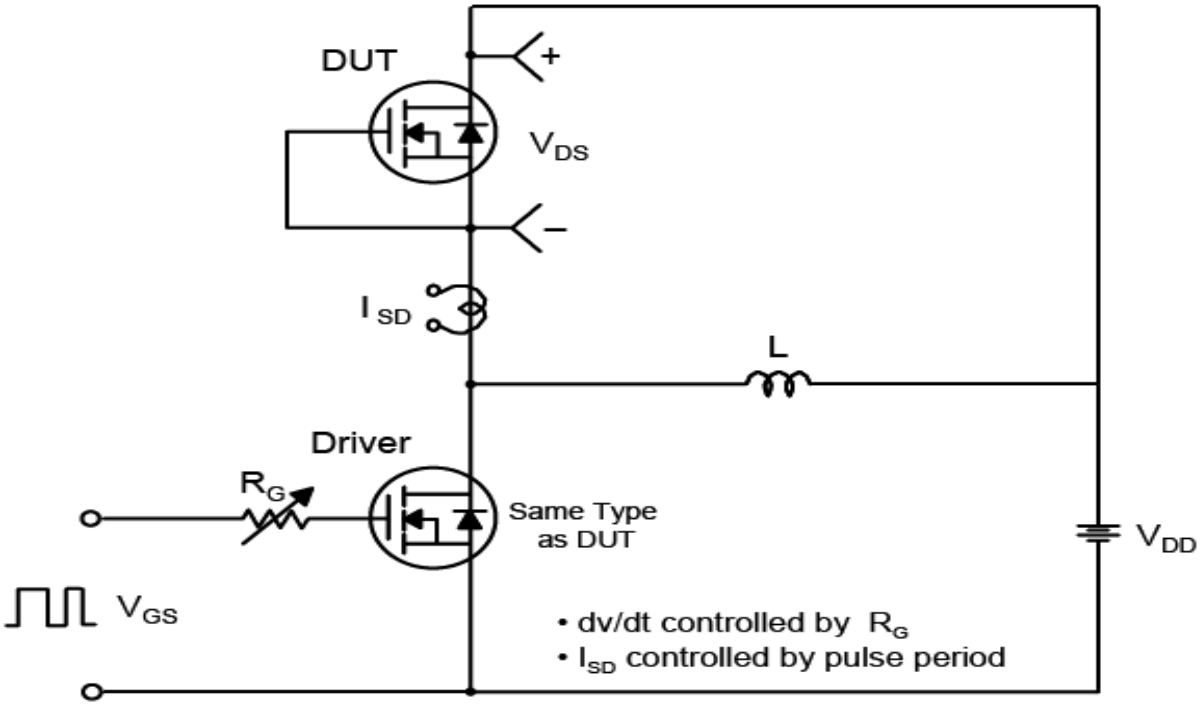


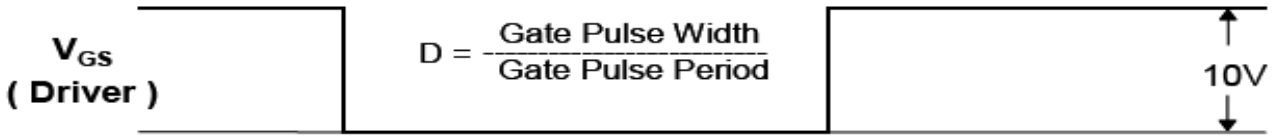
$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

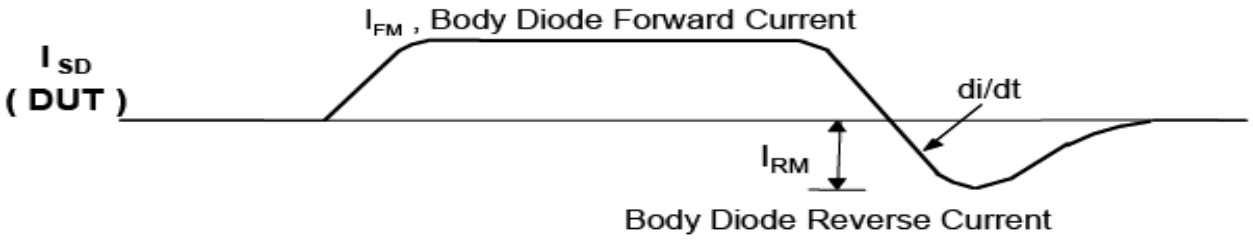


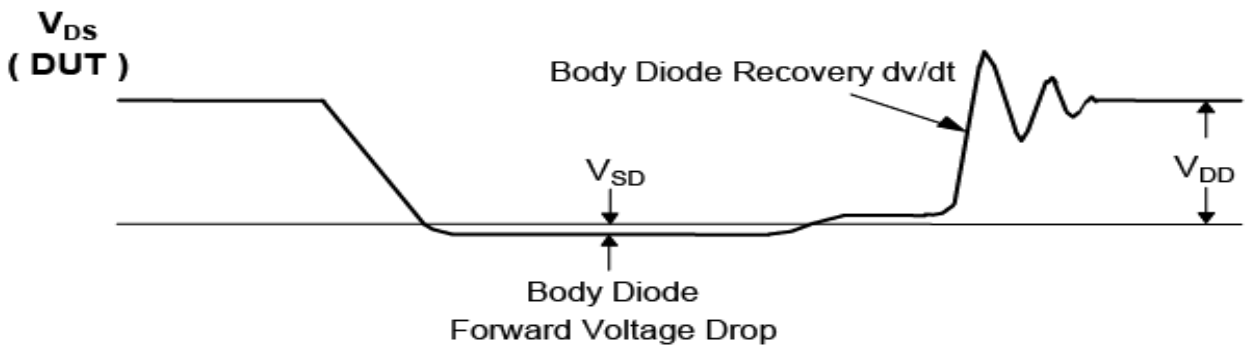
Test Circuits and Waveforms(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms





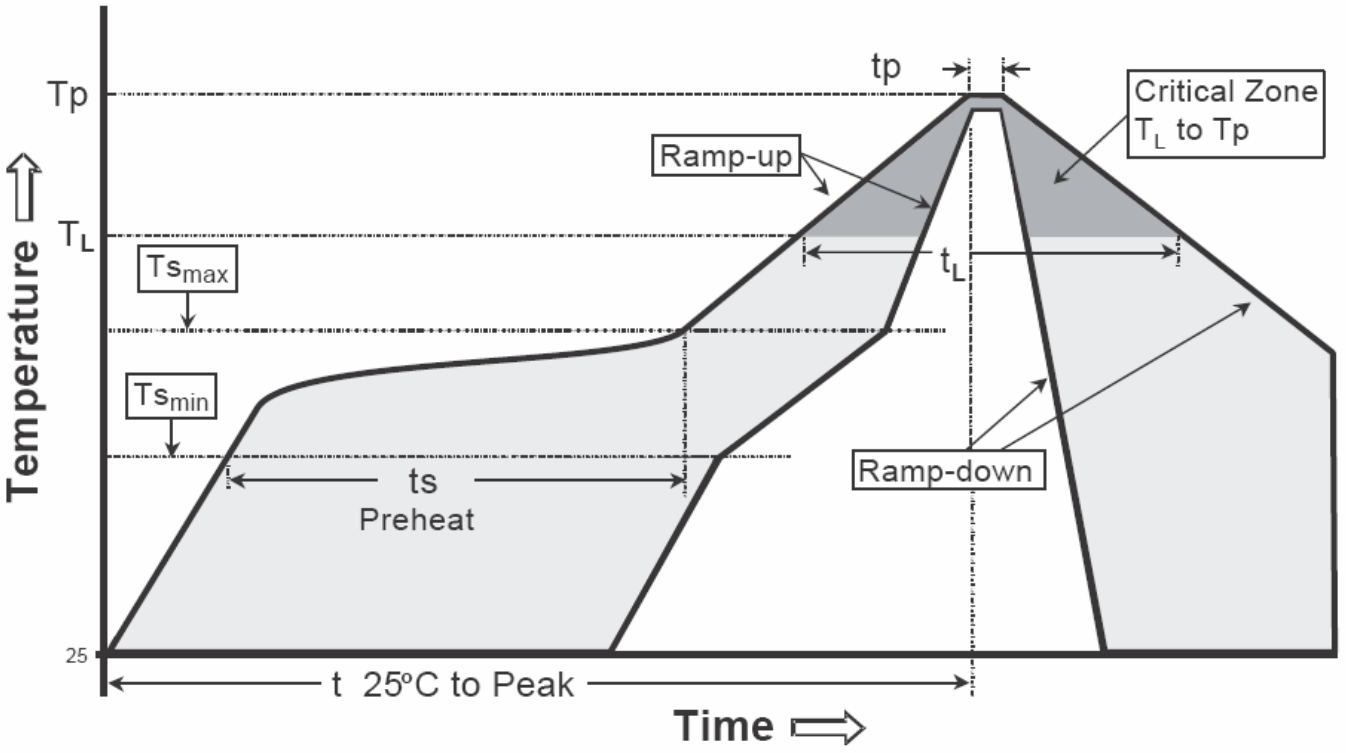




Recommended wave soldering condition

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

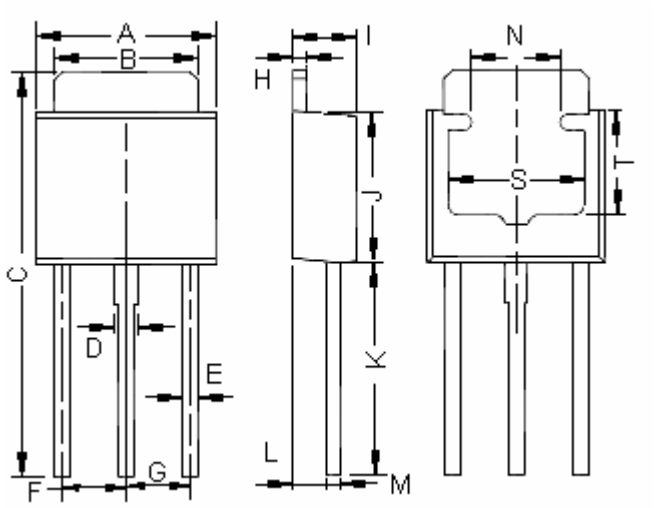
Recommended temperature profile for IR reflow

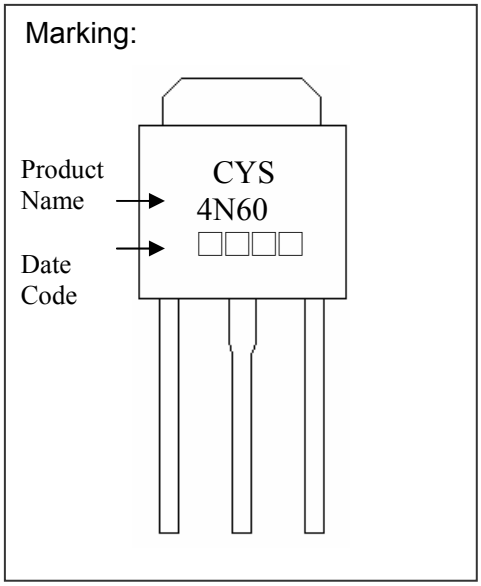


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 60-150 seconds
Peak Temperature(T_P)	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-251 Dimension





Style: Pin 1.Gate 2.Drain 3.Source

3-Lead TO-251 Plastic Package
CYStek Package Code: I3

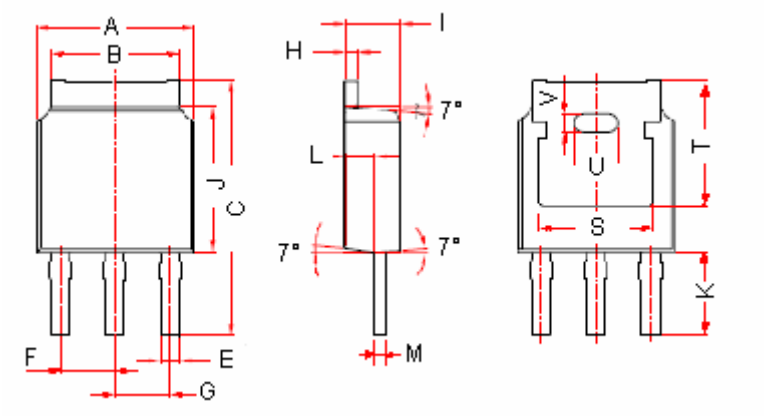
DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.2500	0.2618	6.35	6.65	I	0.0866	0.0945	2.20	2.40
B	0.2047	0.2126	5.20	5.40	J	0.2126	0.2244	5.40	5.70
C	0.5709	0.5866	14.50	14.90	K	0.2992	0.3071	7.60	7.80
D	0.0276	0.0354	0.70	0.90	L	0.0453	0.0492	1.15	1.25
E	0.0199	0.0276	0.50	0.70	M	0.0169	0.0228	0.43	0.58
F	0.0886	0.0925	2.25	2.35	N	0.1181 REF		3.00 REF	
G	0.0886	0.0925	2.25	2.35	S	0.1969 REF		5.00 REF	
H	0.0169	0.0228	0.43	0.58	T	0.1496 REF		3.80 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.

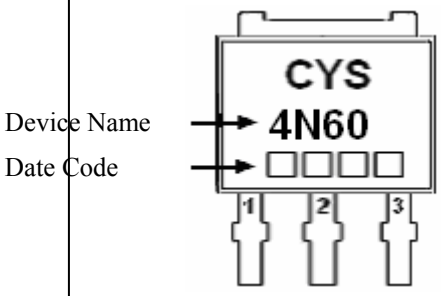
Material:

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

TO-251S Dimension



Marking :



3-Lead TO-251S Plastic Package
CYStek Package Code: I3

Style : Pin 1. Gate 2. Drain 3. Source

*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.2559	0.2638	6.50	6.70	J	0.2362	0.2441	6.00	6.20
B	0.2020	0.2126	5.13	5.46	K	0.1299	0.1457	3.30	3.70
C	0.4094	0.4331	10.40	11.00	L	0.0358	0.0437	0.91	1.11
E	0.0280	0.0319	0.71	0.81	M	0.0181	0.0220	0.46	0.56
F	0.0858	0.0941	2.18	2.39	S	0.1902 REF		4.83 REF	
G	0.0858	0.0941	2.18	2.39	T	0.2106 REF		5.35 REF	
H	0.0181	0.0220	0.46	0.56	U	0.0701 REF		1.78 REF	
I	0.0902	0.0937	2.29	2.38	V	0.0299 REF		0.76 REF	

Notes: 1.Controlling dimension: inch.
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