

N-Channel Enhancement Mode Power MOSFET

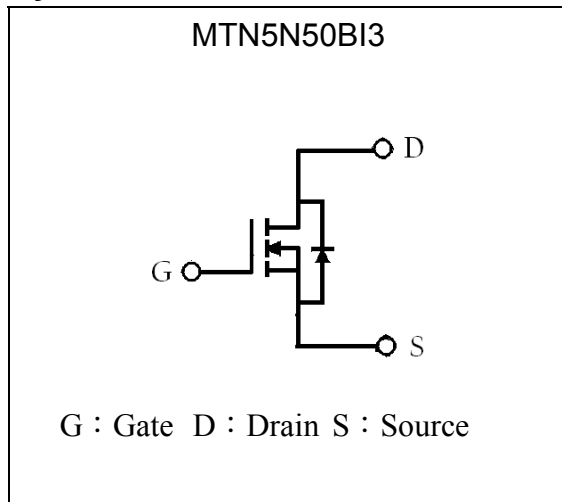
MTN5N50BI3

BV_{DSS}	500V
$I_D @ V_{GS}=10V, T_C=25^\circ C$	4.5A
$R_{DSON(TYP)} @ V_{GS}=10V, I_D=2.25A$	1.1 Ω

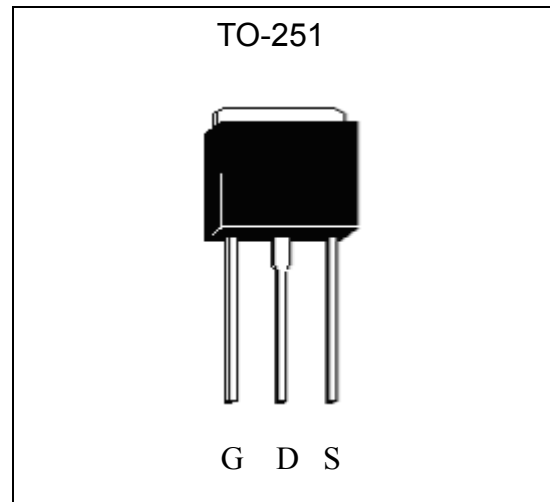
Features

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

Symbol

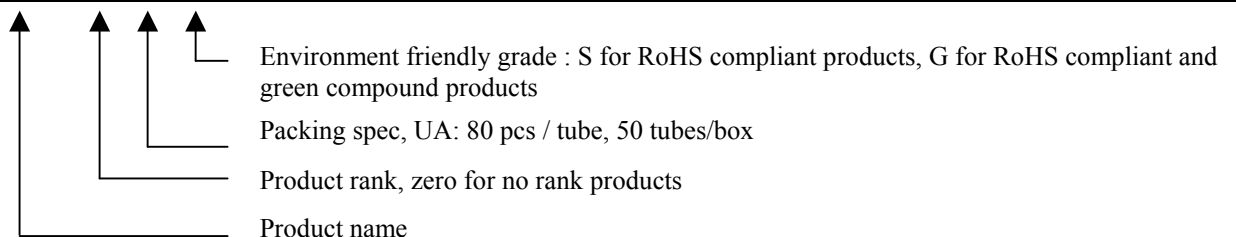


Outline



Ordering Information

Device	Package	Shipping
MTN5N50BI3-0-UA-G	TO-251 (Pb-free lead plating and halogen-free package)	80 pcs/tube, 50 tubes/box





Absolute Maximum Ratings (T_C=25°C)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	V _{DS}	500	V
Gate-Source Voltage	V _{GS}	±30	
Continuous Drain Current @T _C =25°C, V _{GS} =10V	I _D	4.5	A
Continuous Drain Current @T _C =100°C, V _{GS} =10V		2.8	
Pulsed Drain Current (Note 1)	I _{DM}	18	
Single Pulse Avalanche Energy (Note 2)	E _{AS}	90	mJ
Avalanche Current (Note 1)	I _{AS}	4.5	A
Repetitive Avalanche Energy (Note 1)	E _{AR}	4.8	mJ
Maximum Temperature for Soldering @ Lead at 0.125 in(0.318mm) from case for 10 seconds	T _L	300	°C
Total Power Dissipation (T _A =25°C) (Note 4)	P _D	2	W
Total Power Dissipation (T _C =25°C)		48	W
Linear Derating Factor		0.38	W/°C
Operating Junction and Storage Temperature	T _j , T _{stg}	-55~+150	°C

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	R _{th,j-c}	2.6	°C/W
Thermal Resistance, Junction-to-ambient, max (Note 4)	R _{th,j-a}	50	
Thermal Resistance, Junction-to-ambient, max		110	

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

2. I_{AS}=4.5A, V_{DD}=50V, L=8mH, R_G=25Ω, starting T_J=+25°C.

3. I_{SD}≤4.5A, dI/dt≤100A/μs, V_{DD}≤BV_{DSS}, starting T_J=+25°C.

4. When the device is mounted on 1 in² FR-4 board with 2 oz. copper, in a still air environment with T_A=25°C.

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	500	-	-	V	V _{GS} =0V, I _D =250μA, T _J =25°C
ΔBV _{DSS} /ΔT _J	-	0.6	-	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}	-	5	-	S	V _{DS} =15V, I _D =2.25A
I _{GSS}	-	-	±100	nA	V _{GS} =±30V
I _{DSS}	-	-	1	μA	V _{DS} =500V, V _{GS} =0V
	-	-	10		V _{DS} =400V, V _{GS} =0V, T _C =125°C
*R _{DS(ON)}	-	1.1	1.5	Ω	V _{GS} =10V, I _D =2.25A
Dynamic					
*Q _g	-	17.4	-	nC	I _D =4.5A, V _{DD} =400V, V _{GS} =10V
*Q _{gs}	-	3.4	-		
*Q _{gd}	-	7.6	-		

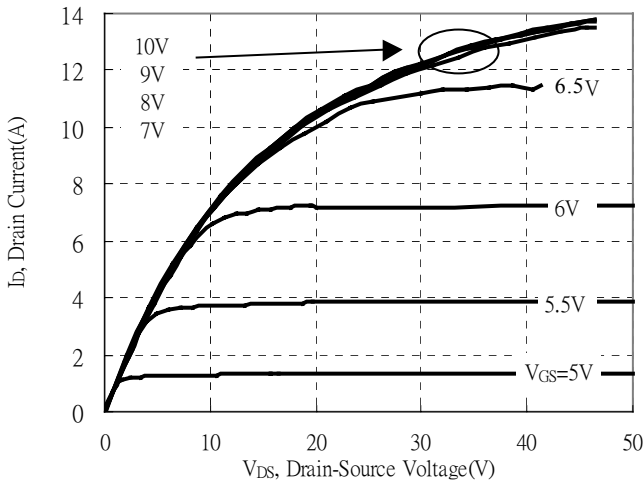


*t _{d(ON)}	-	10.6	-	ns	V _{DD} =250V, I _D =4.5A, V _{GS} =10V, R _G =25Ω
*t _r	-	10	-		
*t _{d(OFF)}	-	35	-		
*t _f	-	31.2	-		
C _{iss}	-	572	-	pF	V _{GS} =0V, V _{DS} =25V, f=1MHz
C _{oss}	-	65	-		
C _{rss}	-	32	-		
Source-Drain Diode					
*I _S	-	-	4.5	A	
*I _{SM}	-	-	18		
*V _{SD}	-	-	1.5	V	I _S =4.5A, V _{GS} =0V
*t _{rr}	-	260	-	ns	V _{GS} =0, I _F =4.5A, dI _F /dt=100A/μs
*Q _{rr}	-	1.1	-	μC	

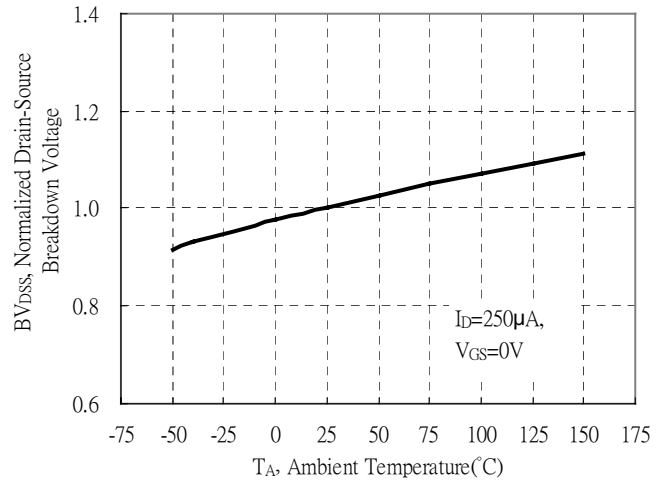
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Typical Characteristics

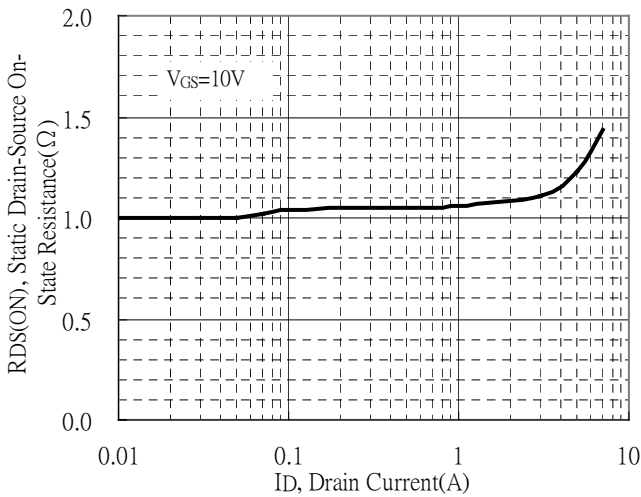
Typical Output Characteristics



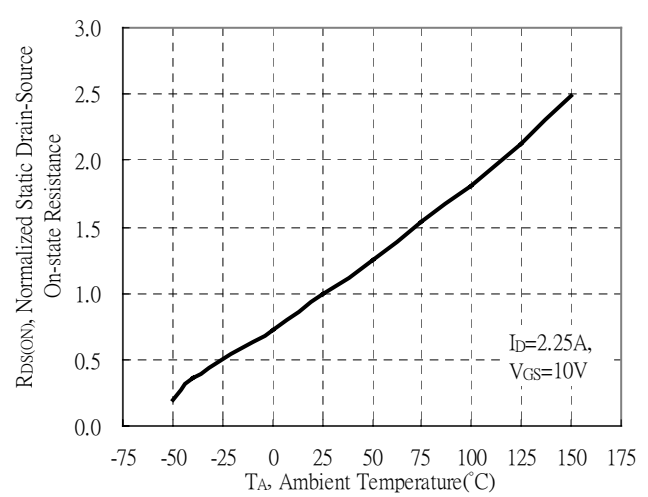
Brekdown Voltage vs Ambient Temperature



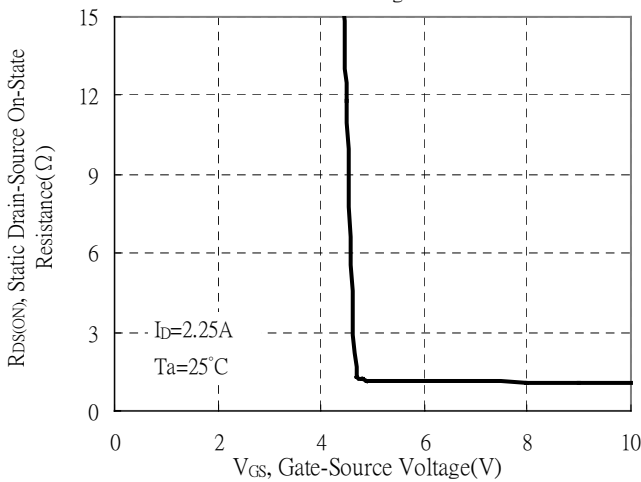
Static Drain-Source On-State resistance vs Drain Current



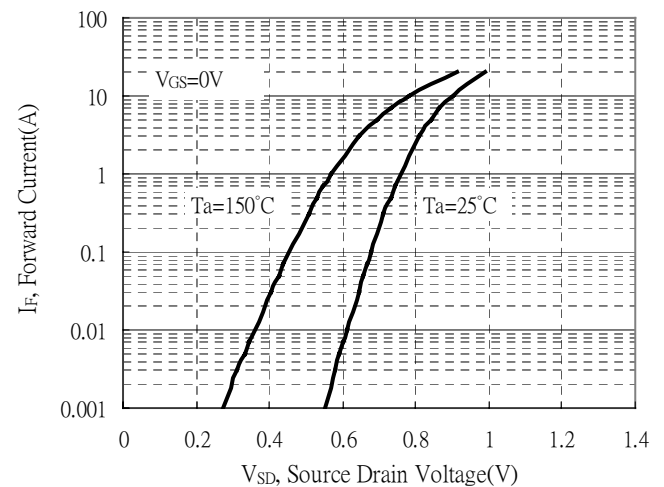
Static Drain-Source On-resistance vs Ambient Temperature



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

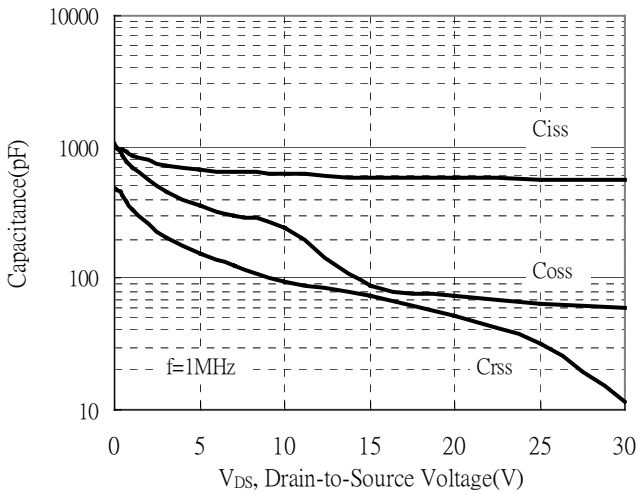


Forward Drain Current vs Source-Drain Voltage

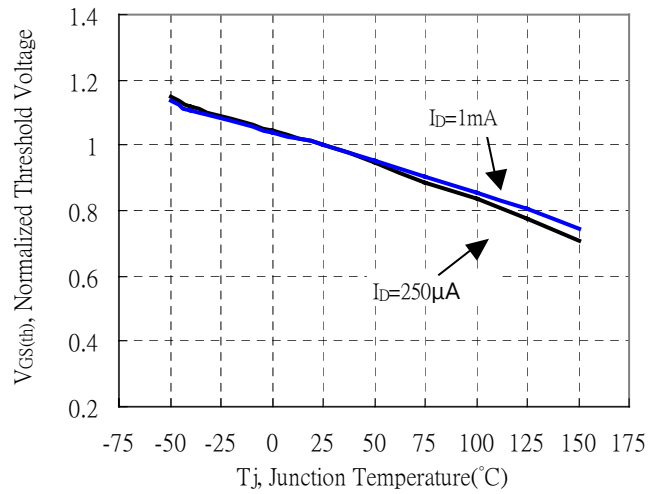


Typical Characteristics(Cont.)

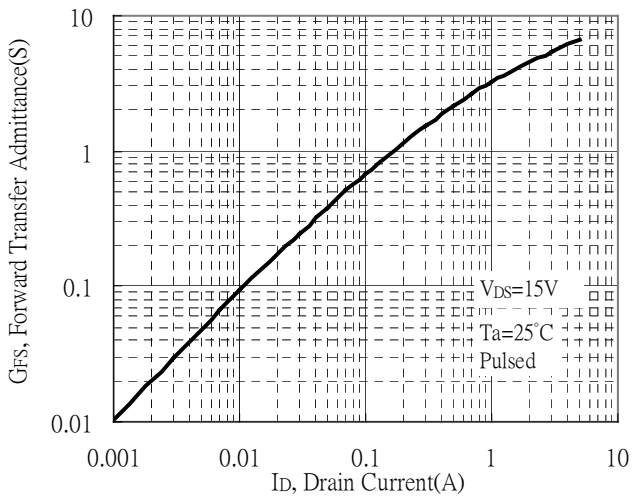
Capacitance vs Reverse Voltage



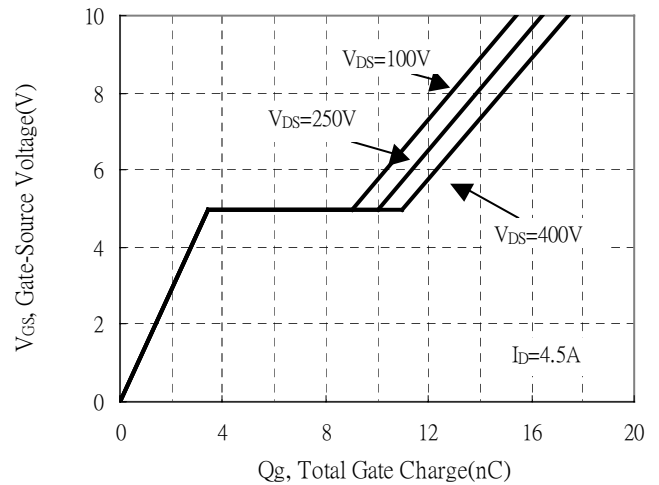
Threshold Voltage vs Junction Temperature



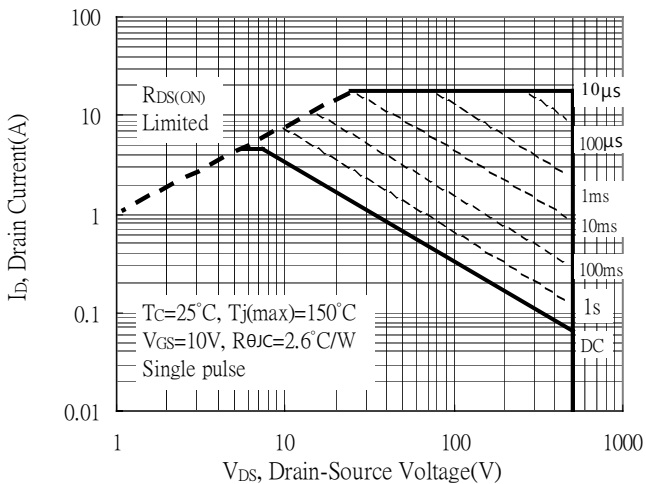
Forward Transfer Admittance vs Drain Current



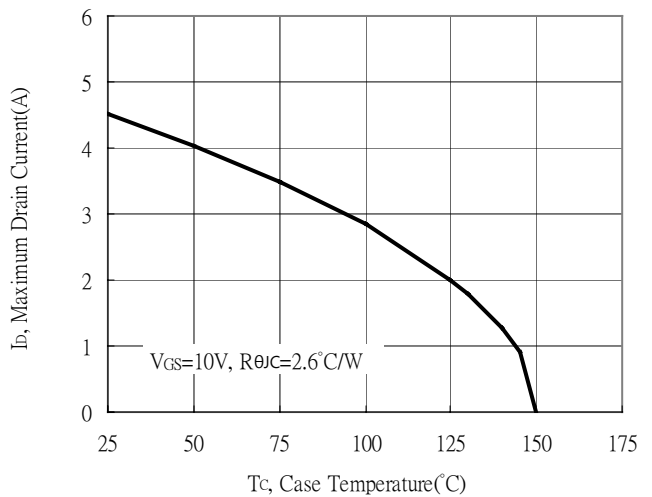
Gate Charge Characteristics



Maximum Safe Operating Area

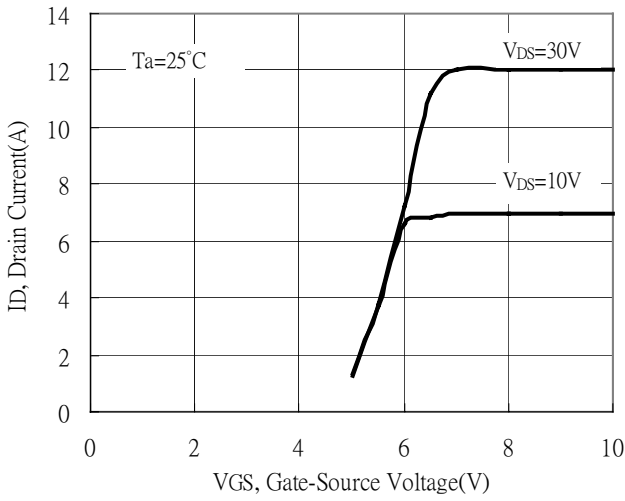


Maximum Drain Current vs Case Temperature

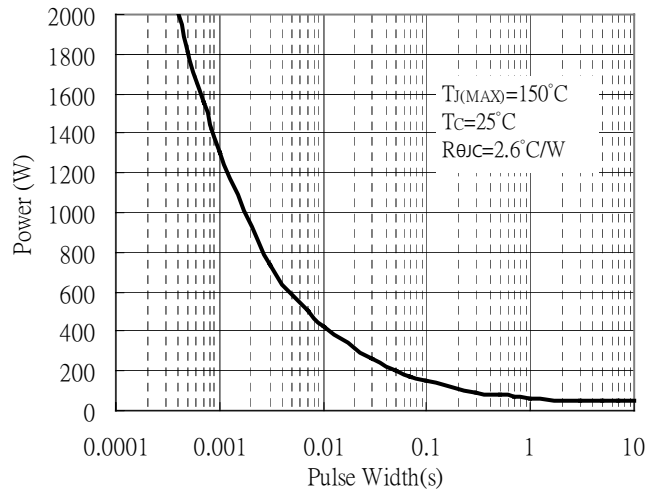


Typical Characteristics(Cont.)

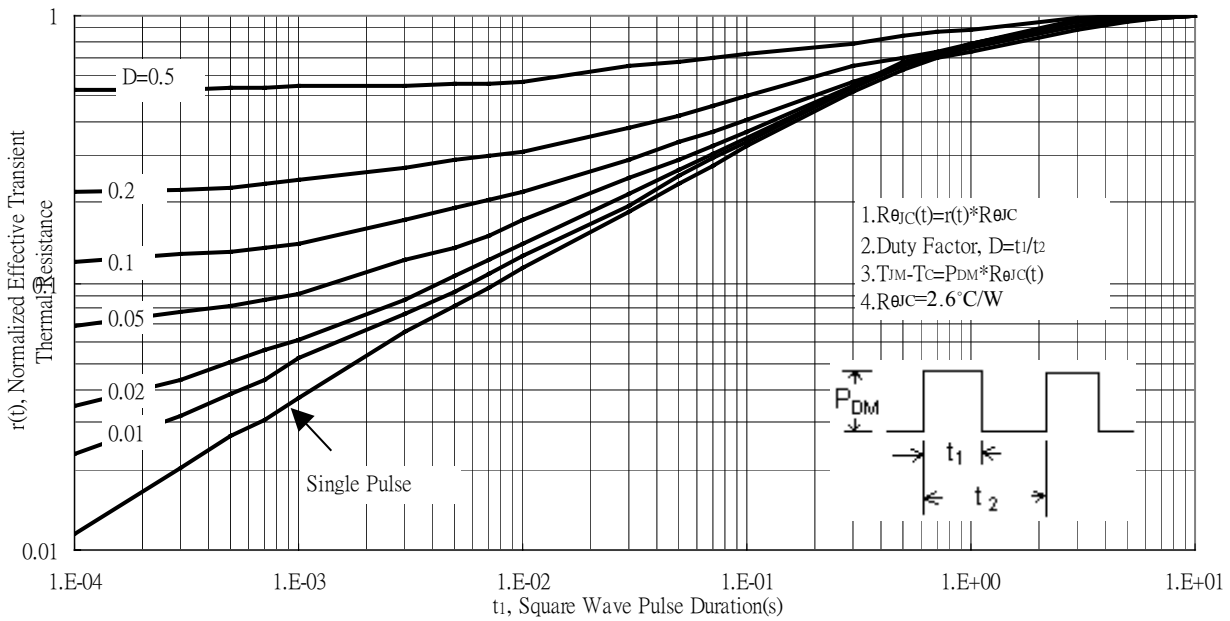
Drain Current vs Gate-Source Voltage



Single Pulse Power Rating, Junction to Case



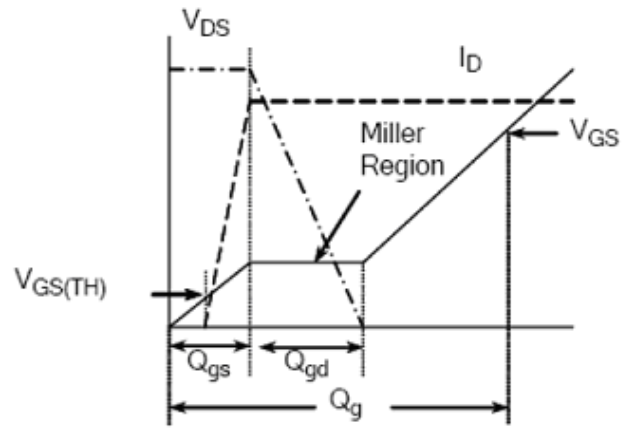
Transient Thermal Response Curves



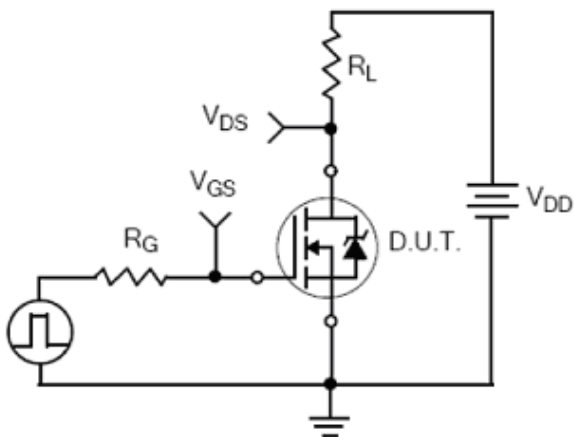
Test Circuit and Waveforms



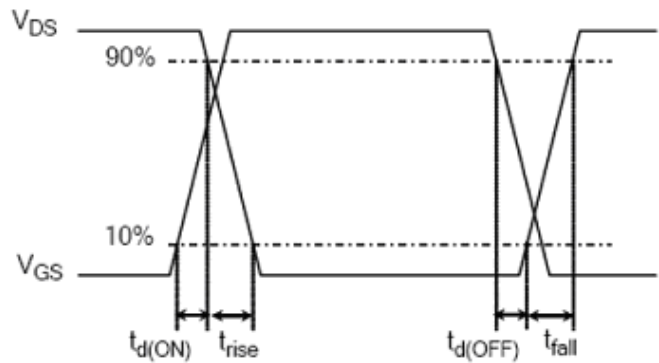
Gate Charge Test Circuit



Gate Charge Waveform



Resistive Switching Test Circuit

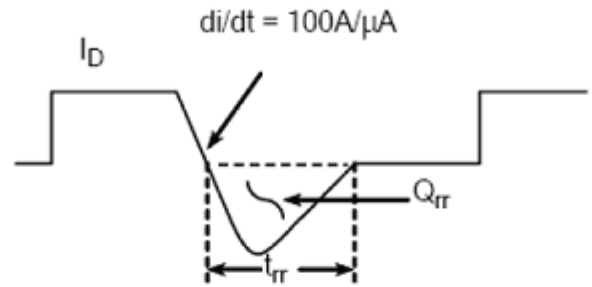


Resistive Switching Waveforms

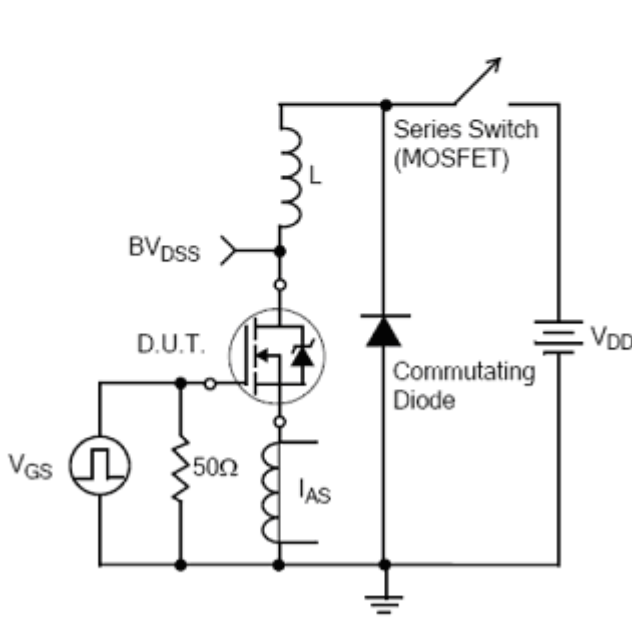
Test Circuit and Waveforms(Cont.)



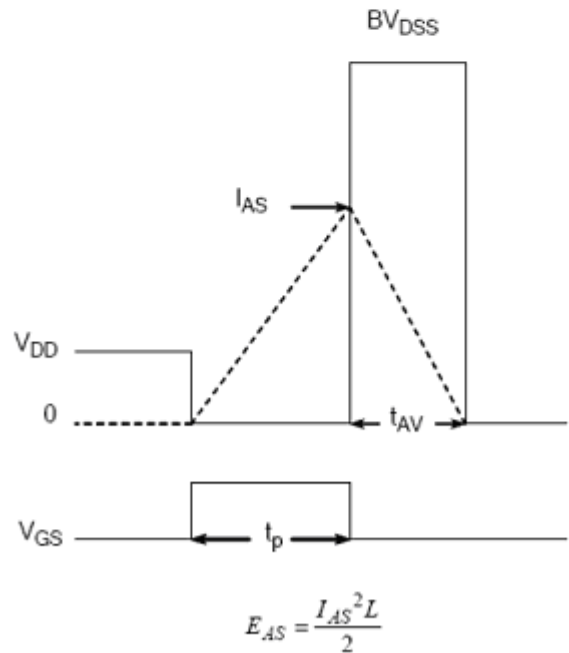
Diode Reverse Recovery Test Circuit



Diode Reverse Recovery Waveform



Unclamped Inductive Switching Test Circuit

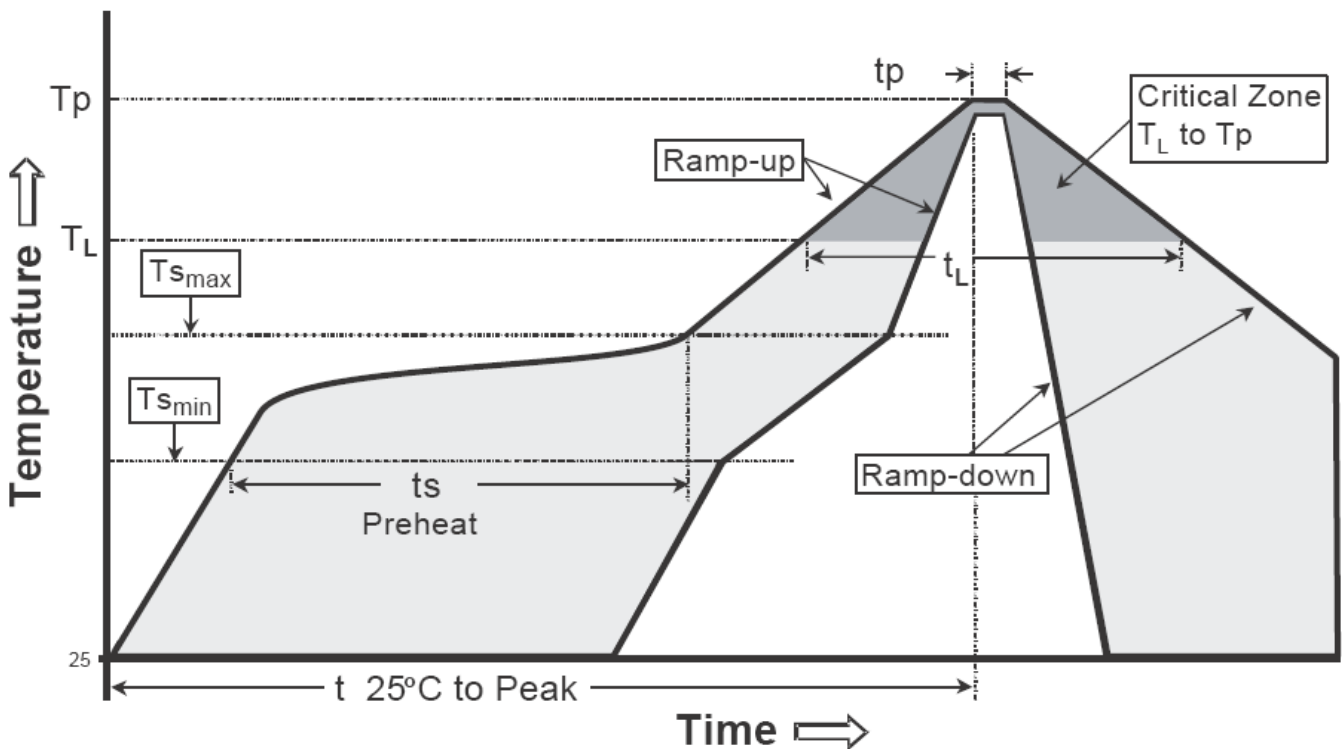


Unclamped Inductive Switching Waveforms

Recommended wave soldering condition

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

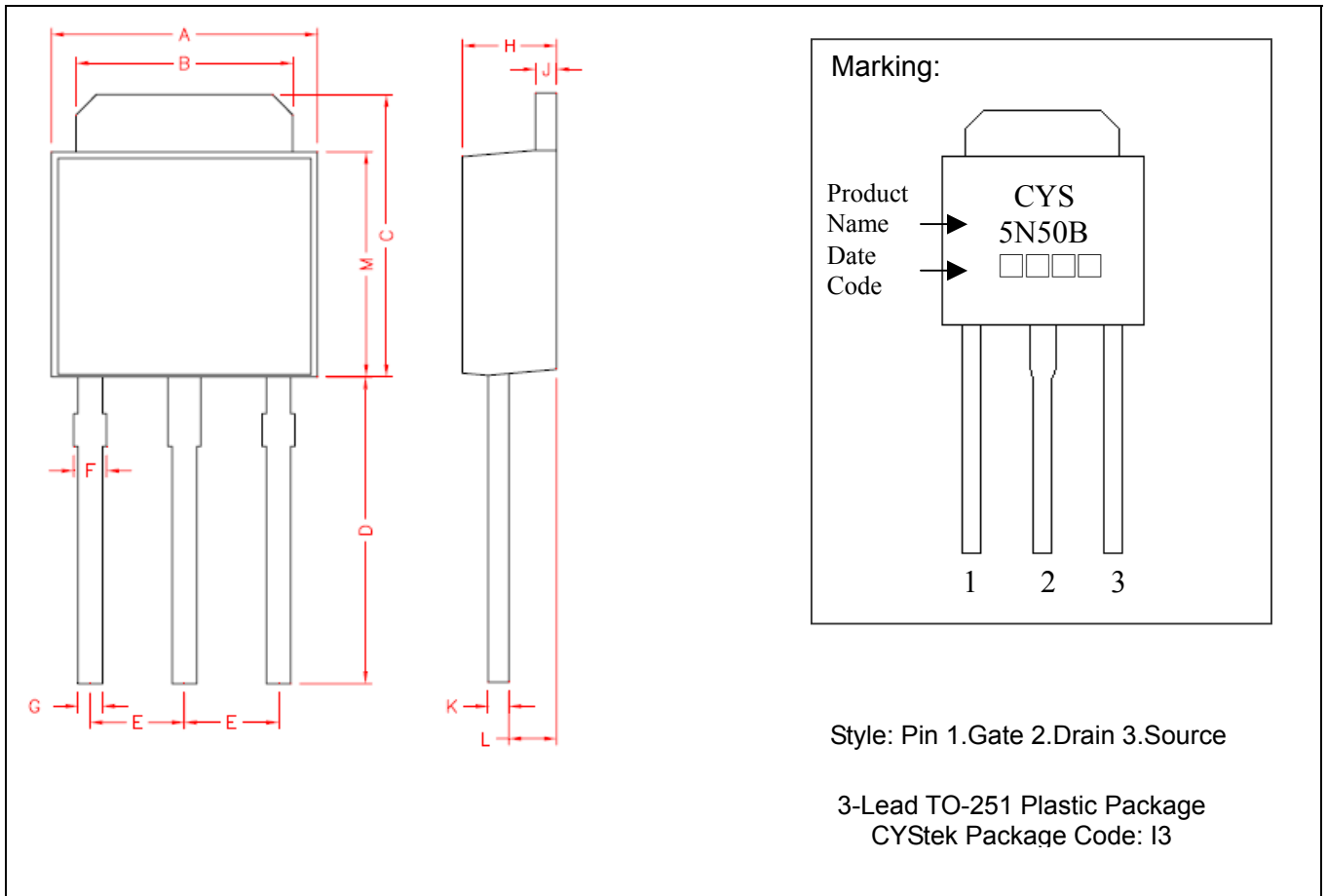
Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T _{smax} to T _p)	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T _{s min})	100°C	150°C
-Temperature Max(T _{s max})	150°C	200°C
-Time(t _{s min} to t _{s max})	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T _L)	183°C	217°C
- Time (t _L)	60-150 seconds	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



DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	6.40	6.80	0.252	0.268	G	0.50	0.70	0.020	0.028
B	5.20	5.50	0.205	0.217	H	2.20	2.40	0.087	0.094
C	6.80	7.20	0.268	0.283	J	0.45	0.55	0.018	0.022
D	7.20	7.80	0.283	0.307	K	0.45	0.60	0.018	0.024
E	2.30 REF		0.091 REF		L	0.90	1.50	0.035	0.059
F	0.60	0.90	0.024	0.035	M	5.40	5.80	0.213	0.228

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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