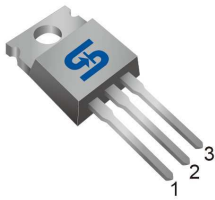
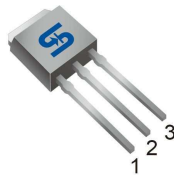


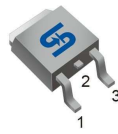
TO-220



TO-251
(IPAK)



TO-252
(DPAK)



Pin Definition:

1. Gate
2. Drain
3. Source

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
700	6.5 @ $V_{GS}=10V$	1

General Description

The TSM2N70 N-Channel enhancement mode Power MOSFET is produced by planar stripe DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switch mode power supply, power factor correction, electronic lamp ballast based on half bridge.

Features

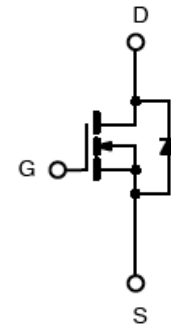
- Low $R_{DS(on)}$ 6.5 Ω (Max.)
- Low gate charge typical @ 9.5nC (Typ.)
- Low C_{rss} typical @ 4.5pF (Typ.)
- Fast Switching

Ordering Information

Part No.	Package	Packing
TSM2N70CZ C0	TO-220	50pcs / Tube
TSM2N70CH C5	TO-251	70pcs / Tube
TSM2N70CH C5G	TO-251	70pcs / Tube
TSM2N70CP RO	TO-252	2.5Kpcs / 13" Reel
TSM2N70CP ROG	TO-252	2.5Kpcs / 13" Reel

Note: "G" denote for Halogen Free Product

Block Diagram



N-Channel MOSFET

Absolute Maximum Rating ($T_a = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	700	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current	I_D	2	A
Pulsed Drain Current *	I_{DM}	8	A
Repetitive avalanche Current	I_{AR}	2	A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	110	mJ
Maximum Power Dissipation @ $T_c = 25^\circ\text{C}$	P_{TOT}	45	W
Operating Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ\text{C}$

* Limited by maximum junction temperature

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R\theta_{JC}$	2.78	$^\circ\text{C/W}$
Thermal Resistance - Junction to Ambient	$R\theta_{JA}$	100	$^\circ\text{C/W}$

Notes: Surface mounted on FR4 board $t \leq 10\text{sec}$

Electrical Specifications (Ta = 25°C unless otherwise noted)

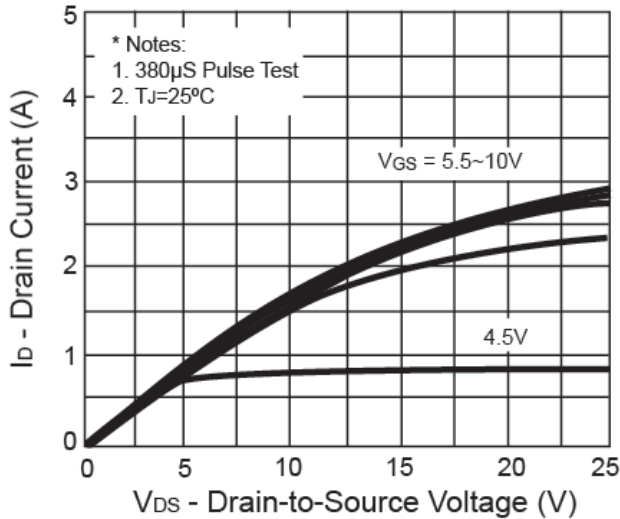
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 1mA	BV _{DSS}	700	--	--	V
Drain-Source On-State Resistance	V _{GS} = 10V, I _D = 1A	R _{DS(ON)}	--	5.25	6.5	Ω
Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 50uA	V _{GS(TH)}	2	--	4	V
Zero Gate Voltage Drain Current	V _{DS} = 700V, V _{GS} = 0V	I _{DSS}	--	--	1	uA
Gate Body Leakage	V _{GS} = ±20V, V _{DS} = 0V	I _{GSS}	--	--	±100	nA
Forward Transconductance	V _{DS} = 15V, I _D = 0.8A	g _{fs}	--	1.7	--	S
Diode Forward Voltage	I _S = 1.6A, V _{GS} = 0V	V _{SD}	--	--	1.6	V
Dynamic ^b						
Total Gate Charge	V _{DS} = 480V, I _D = 2A, V _{GS} = 10V	Q _g	--	9.5	13	nC
Gate-Source Charge		Q _{gs}	--	1.6	--	
Gate-Drain Charge		Q _{gd}	--	4.0	--	
Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	C _{iss}	--	320	--	pF
Output Capacitance		C _{oss}	--	35	--	
Reverse Transfer Capacitance		C _{rss}	--	4.5	--	
Switching ^c						
Turn-On Delay Time	V _{GS} = 10V, I _D = 0.8A, V _{DD} = 350V, R _G = 4.7Ω	t _{d(on)}	--	18.4	--	nS
Turn-On Rise Time		t _r	--	35	--	
Turn-Off Delay Time		t _{d(off)}	--	32	--	
Turn-Off Fall Time		t _f	--	34	--	
Reverse Recovery Time	V _{GS} = 0V, I _S = 1.3A,	t _{fr}	--	474.2	--	nS
Reverse Recovery Charge	V _{DD} = 25V	Q _{fr}	--	2067.8	--	uC
Reverse Recovery Current	dl _F /dt = 100A/us	I _{R_{RM}}	--	5.16	--	A

Notes:

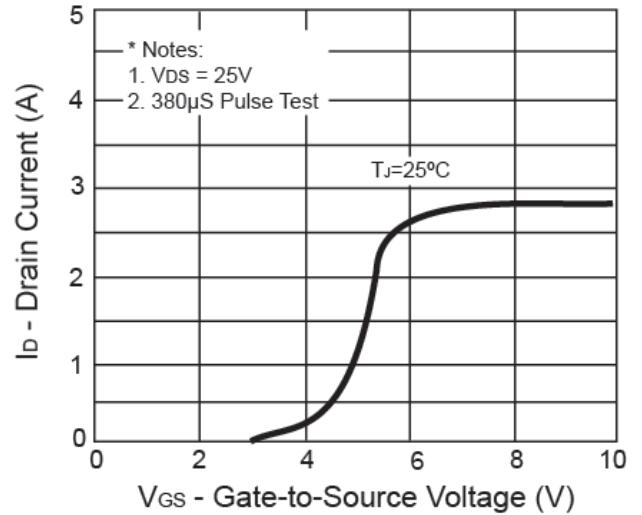
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. $V_{DD} = 50V, I_{AS} = 2A, L = 56mH, R_G = 25\Omega$
3. Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 1.5\%$
4. Essentially Independent of Operating Temperature
5. For design reference only, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

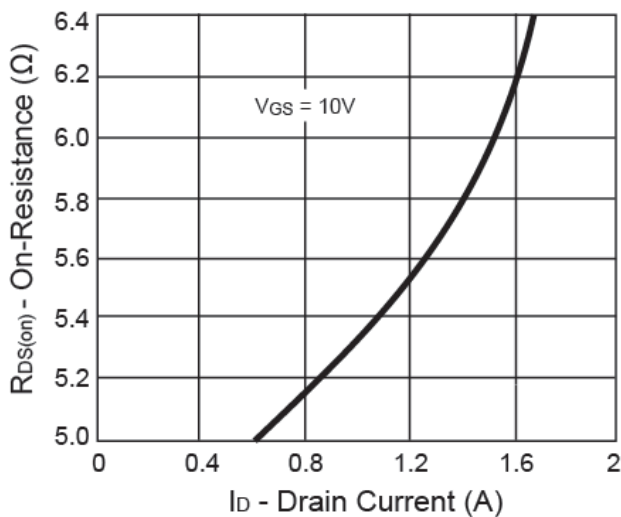
Output Characteristics



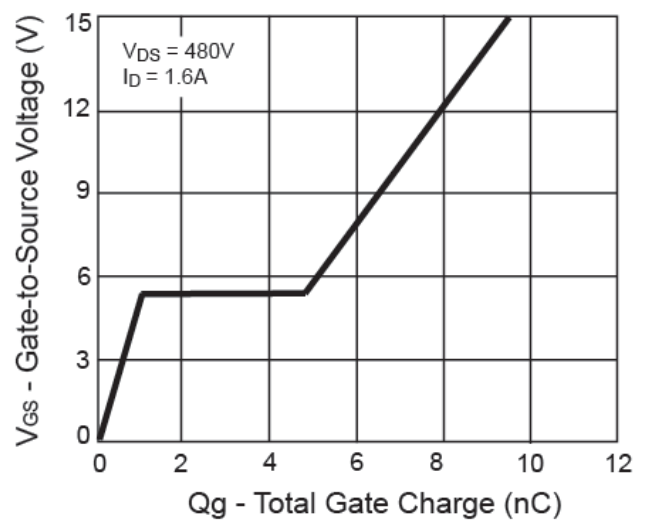
Transfer Characteristics



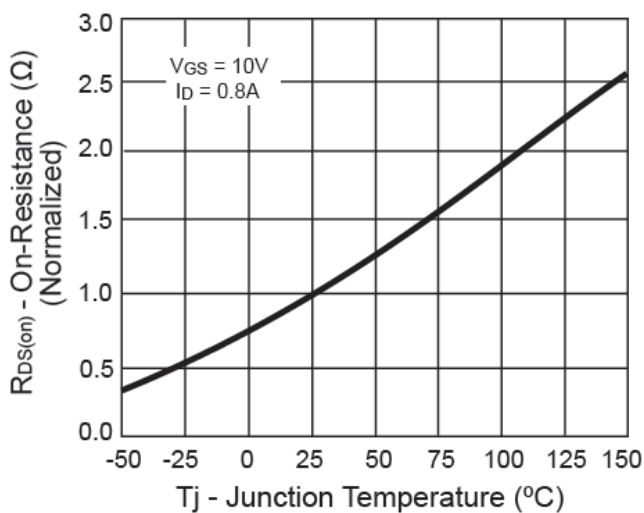
On-Resistance vs. Drain Current



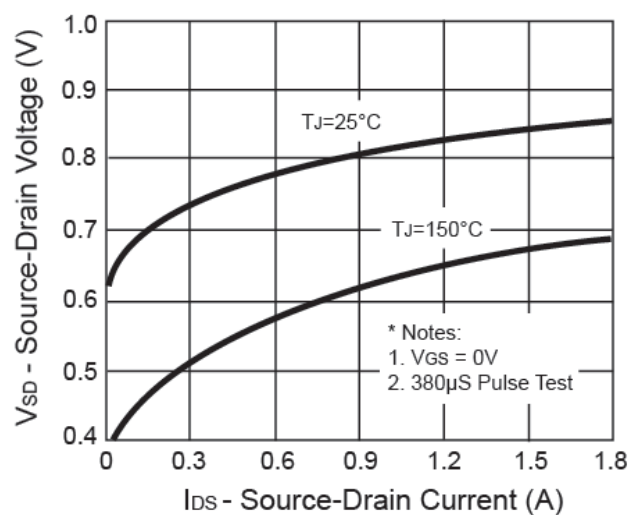
Gate Charge



On-Resistance vs. Junction Temperature

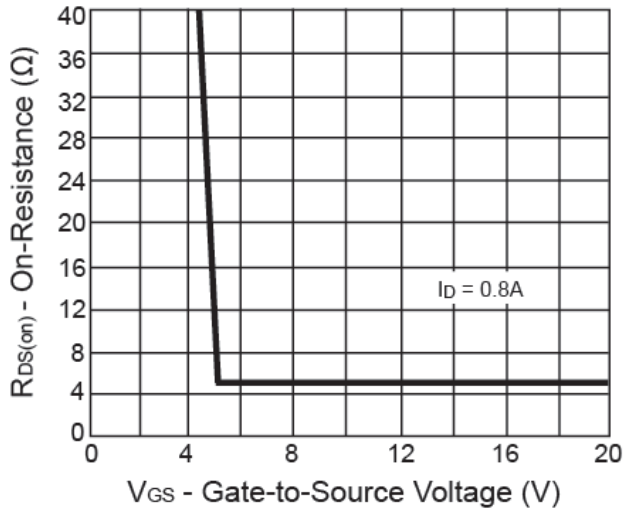


Source-Drain Diode Forward Voltage

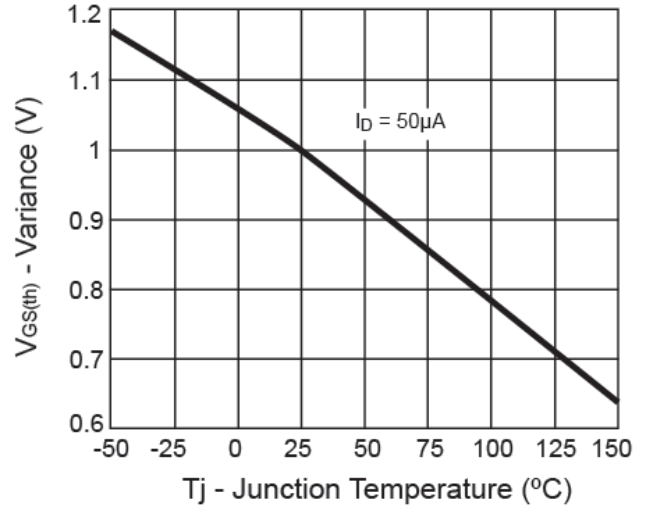


Electrical Characteristics Curve ($T_a = 25^\circ\text{C}$, unless otherwise noted)

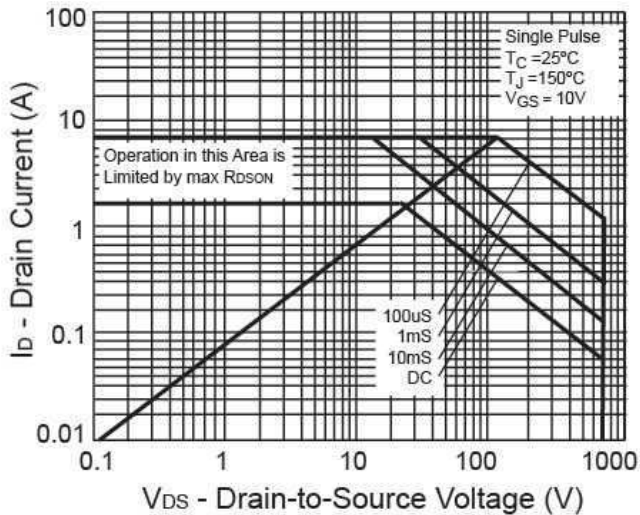
On-Resistance vs. Gate-Source Voltage



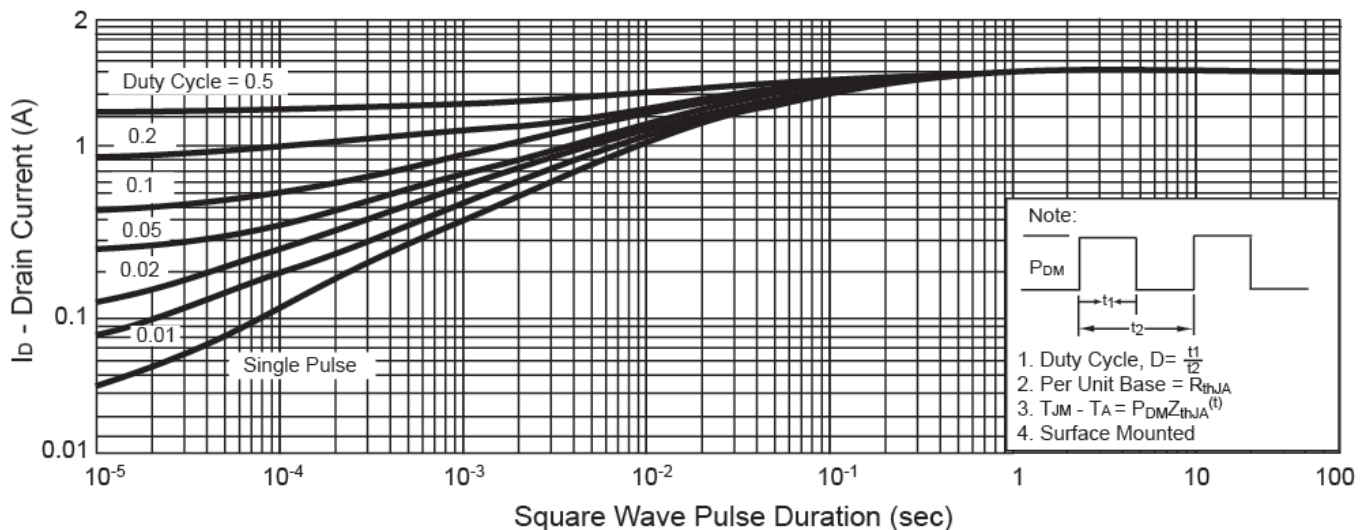
Threshold Voltage



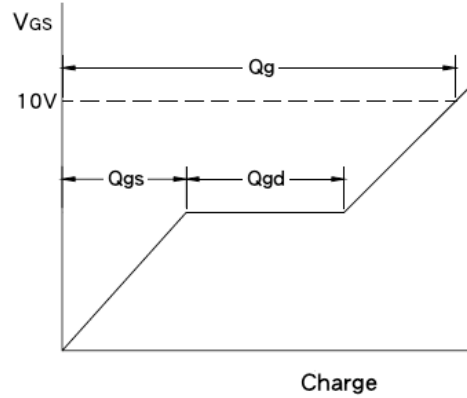
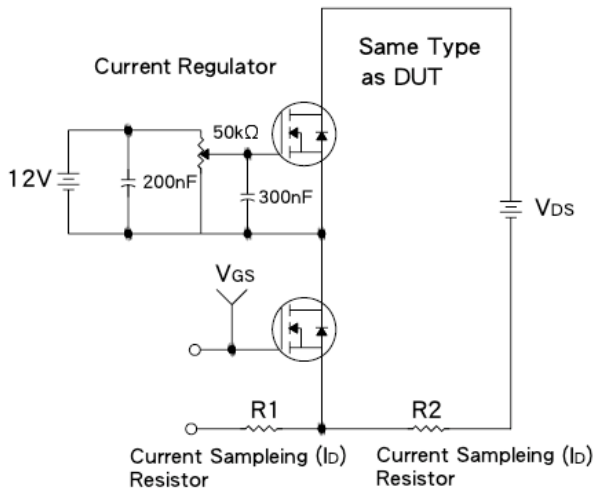
Maximum Safe Operating Area



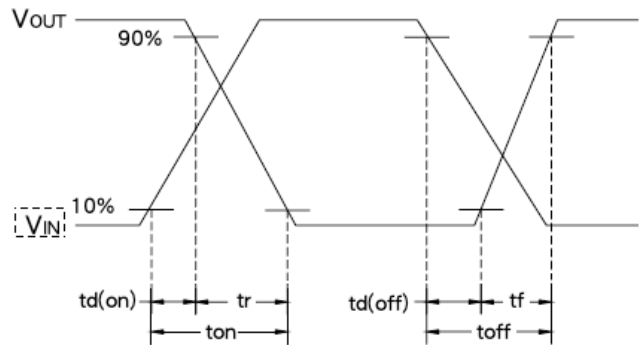
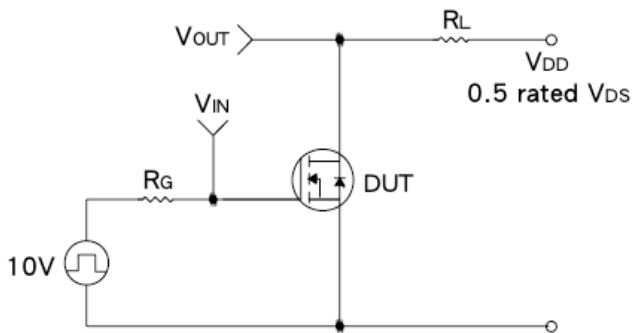
Normalized Thermal Transient Impedance, Junction-to-Ambient



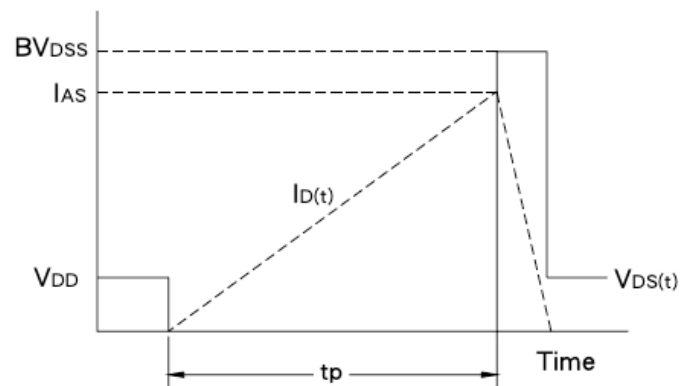
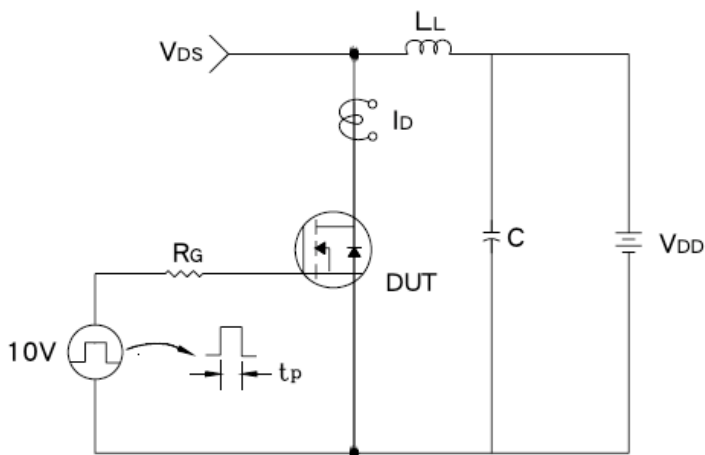
Gate Charge Test Circuit & Waveform



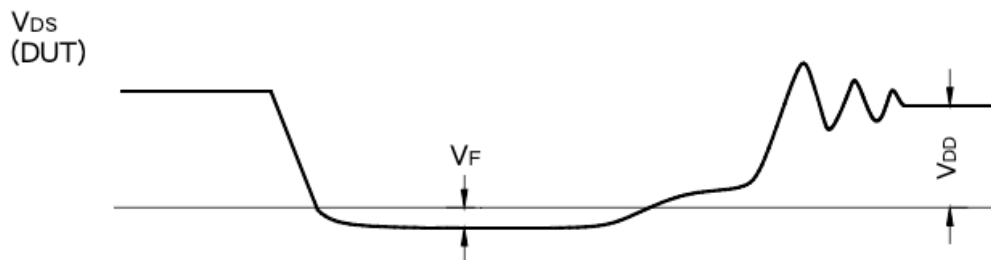
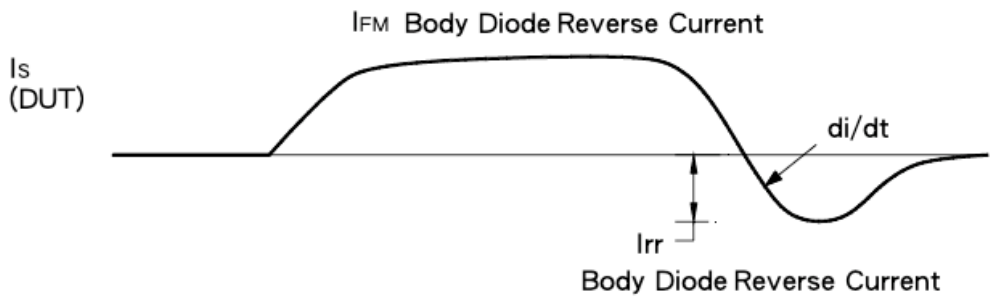
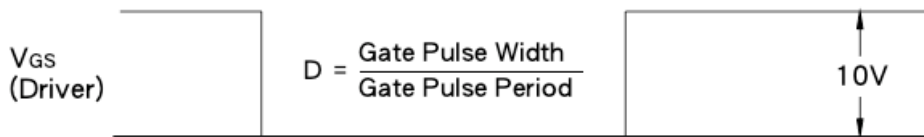
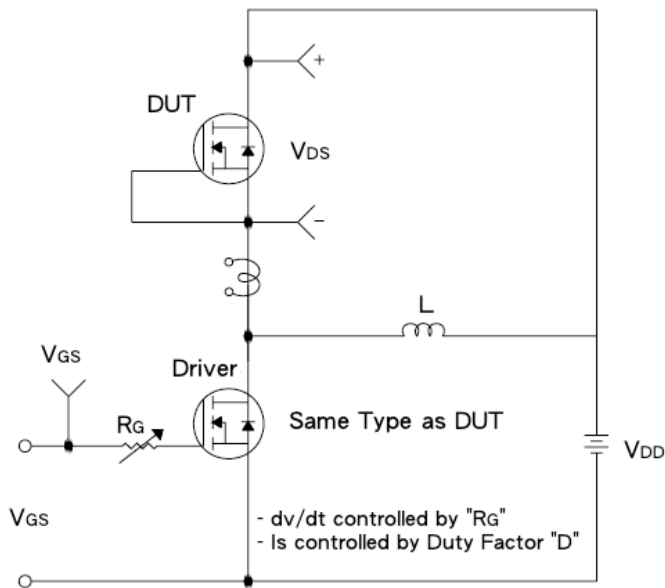
Resistive Switching Test Circuit & Waveform



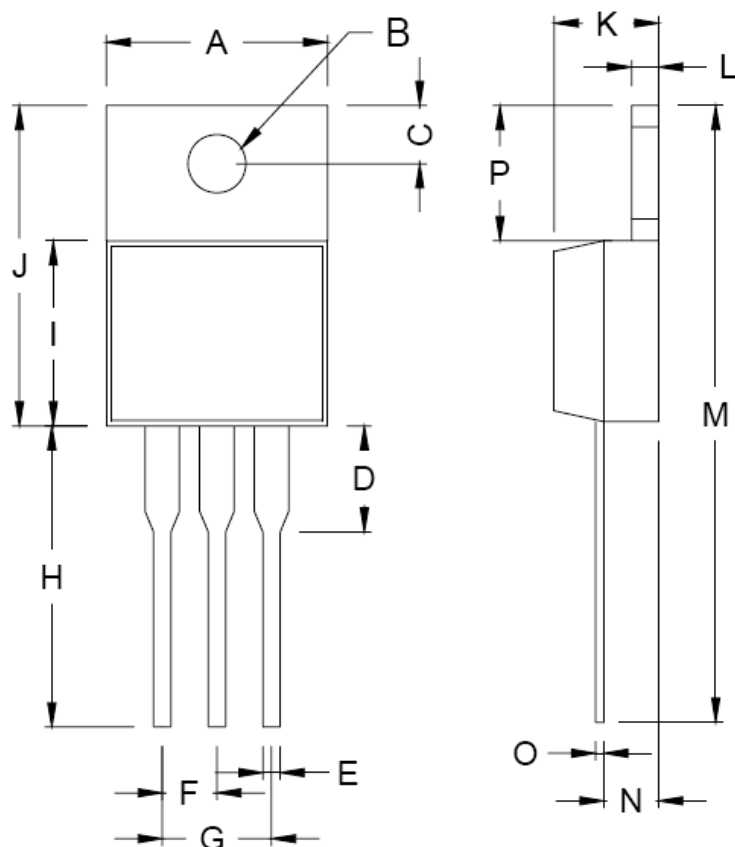
E_{AS} Test Circuit & Waveform



Diode Reverse Recovery Time Test Circuit & Waveform

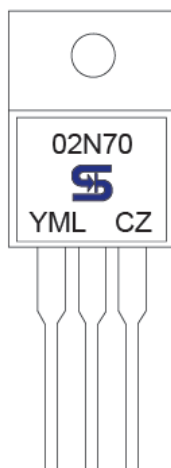


TO-220 Mechanical Drawing



DIM	TO-220 DIMENSION			
	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.000	10.500	0.394	0.413
B	3.740	3.910	0.147	0.154
C	2.440	2.940	0.096	0.116
D	-	6.350	-	0.250
E	0.381	1.106	0.015	0.040
F	2.345	2.715	0.092	0.058
G	4.690	5.430	0.092	0.107
H	12.700	14.732	0.500	0.581
J	14.224	16.510	0.560	0.650
K	3.556	4.826	0.140	0.190
L	0.508	1.397	0.020	0.055
M	27.700	29.620	1.060	1.230
N	2.032	2.921	0.080	0.115
O	0.255	0.610	0.010	0.024
P	5.842	6.858	0.230	0.270

Marking Diagram



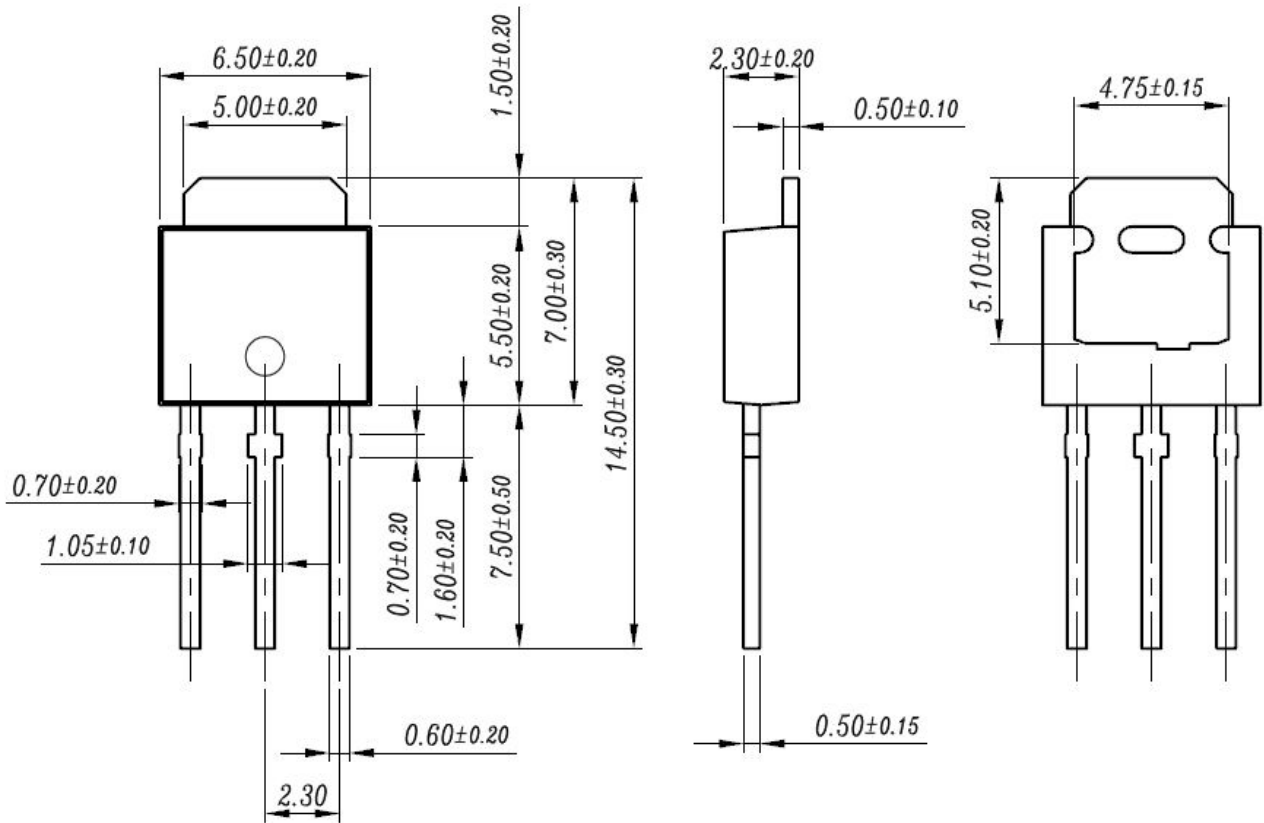
Y = Year Code

M = Month Code

(A=Jan, B=Feb, C=Mar, D=Apl, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)

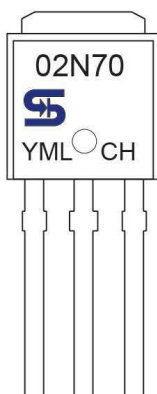
L = Lot Code

TO-251 Mechanical Drawing



Unit: Millimeters

Marking Diagram



Y = Year Code

M = Month Code

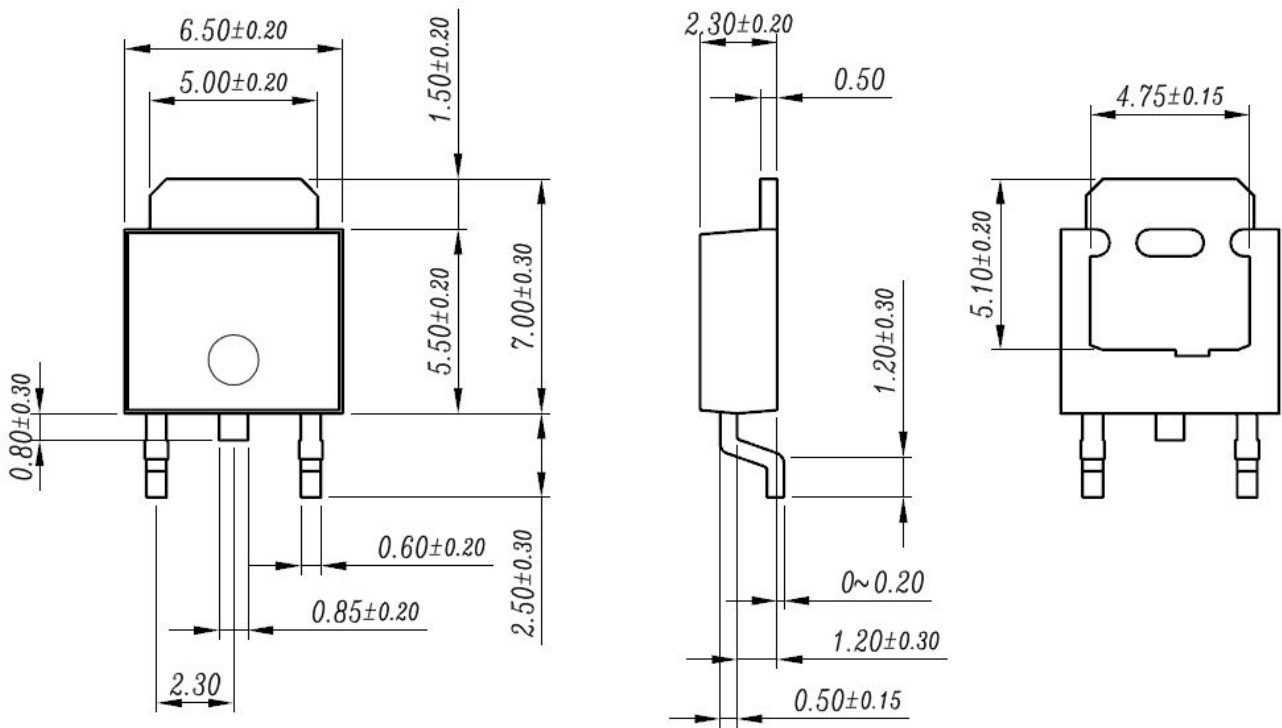
(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apr, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)

= Month Code for Halogen Free Product

(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)

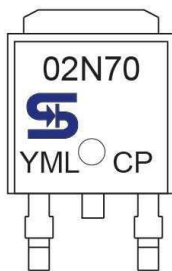
L = Lot Code

TO-252 Mechanical Drawing



Unit: Millimeters

Marking Diagram



Y = Year Code

M = Month Code

(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apr, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)

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L = Lot Code

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