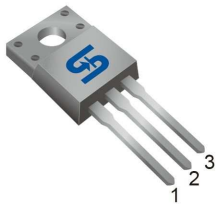
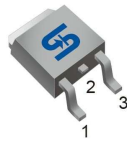




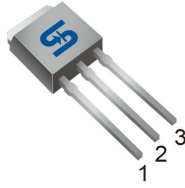
ITO-220



TO-252 (DPAK)



TO-251 (IPAK)



**Pin Definition:**

1. Gate
2. Drain
3. Source

**PRODUCT SUMMARY**

V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)
500	1.4 @ V <sub>GS</sub> =10V	2.8

**General Description**

The TSM6N50 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.

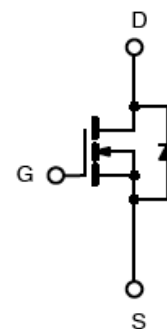
**Features**

- Low R<sub>DS(ON)</sub> 1.4Ω (Max.)
- Low gate charge typical @ 25nC (Typ.)
- Low Crss typical @ 15pF (Typ.)
- Fast Switching

**Ordering Information**

Part No.	Package	Packing
TSM6N50CI C0	ITO-220	50pcs / Tube
TSM6N50CP RO	TO-252	2.5Kpcs / 13" Reel
TSM6N50CH C5	TO-251	75pcs / Tube

**Block Diagram**



N-Channel MOSFET

**Absolute Maximum Rating** (Ta = 25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	500	V
Gate-Source Voltage	V <sub>GS</sub>	±30	V
Continuous Drain Current	I <sub>D</sub>	Ta = 25°C	5
		Ta = 100°C	3
Pulsed Drain Current *	I <sub>DM</sub>	15	A
Single Pulse Avalanche Energy (Note 2)	E <sub>AS</sub>	180	mJ
Avalanche Current (Repetitive) (Note 1)	I <sub>AR</sub>	5	A
Total Power Dissipation @ T <sub>C</sub> = 25°C	P <sub>TOT</sub>	ITO-220	25
		TO-252, TO-251	90
Operating Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 to +150	°C

\* Limited by maximum junction temperature

**Thermal Performance**

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	R <sub>θJC</sub>	ITO-220	5
		TO-252, TO-251	2.78
Thermal Resistance - Junction to Ambient	R <sub>θJA</sub>	62.5	°C/W

**Notes:** Surface mounted on FR4 board t ≤ 10sec

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

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	500	--	--	V
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 2.8A$	$R_{DS(ON)}$	--	1.15	1.4	$\Omega$
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2.0	--	4.0	V
Zero Gate Voltage Drain Current	$V_{DS} = 500V, V_{GS} = 0V$	$I_{DSS}$	--	--	1	$\mu A$
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 10$	$\mu A$
Forward Transfer Conductance	$V_{DS} = 8V, I_D = 1A$	$g_{fs}$	--	2.6	--	S
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$V_{DS} = 400V, I_D = 5A,$ $V_{GS} = 10V$	$Q_g$	--	25	33	nC
Gate-Source Charge		$Q_{gs}$	--	5	--	
Gate-Drain Charge		$Q_{gd}$	--	10	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	$C_{iss}$	--	680	900	pF
Output Capacitance		$C_{oss}$	--	85	110	
Reverse Transfer Capacitance		$C_{rss}$	--	15	20	
<b>Switching<sup>c</sup></b>						
Turn-On Delay Time	$V_{GS} = 10V, I_D = 5A,$ $V_{DD} = 250V, R_G = 25\Omega$	$t_{d(on)}$	--	20	50	nS
Turn-On Rise Time		$t_r$	--	40	90	
Turn-Off Delay Time		$t_{d(off)}$	--	90	190	
Turn-Off Fall Time		$t_f$	--	45	100	
<b>Source-Drain Diode Ratings and Characteristic</b>						
Source Current	Integral reverse diode in the MOSFET	$I_S$	--	--	5	A
Source Current (Pulse)		$I_{SM}$	--	--	15	A
Diode Forward Voltage	$I_S = 5A, V_{GS} = 0V$	$V_{SD}$	--	--	1.6	V
Reverse Recovery Time	$V_{GS} = 0V, I_S = 5A,$	$t_{fr}$	--	430	--	nS
Reverse Recovery Charge	$dI_F/dt = 100A/\mu s$	$Q_{fr}$	--	2	--	$\mu C$

**Note 1:** Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

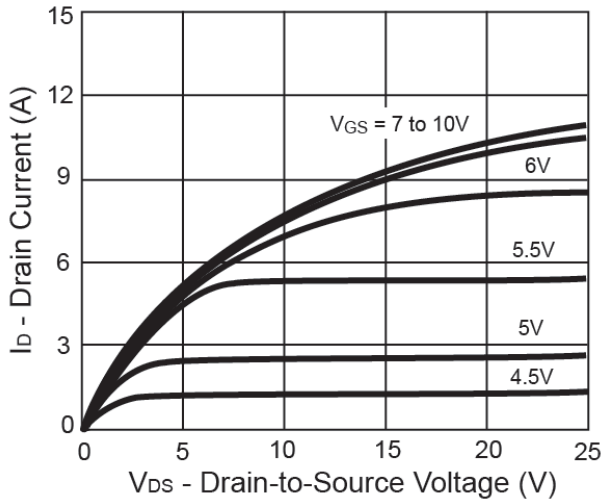
**Note 2:**  $V_{DD} = 50V, I_{AS} = 5A, L = 10mH, \text{Starting } T_J = 25^\circ C$

**Note 3:** Pulse test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$

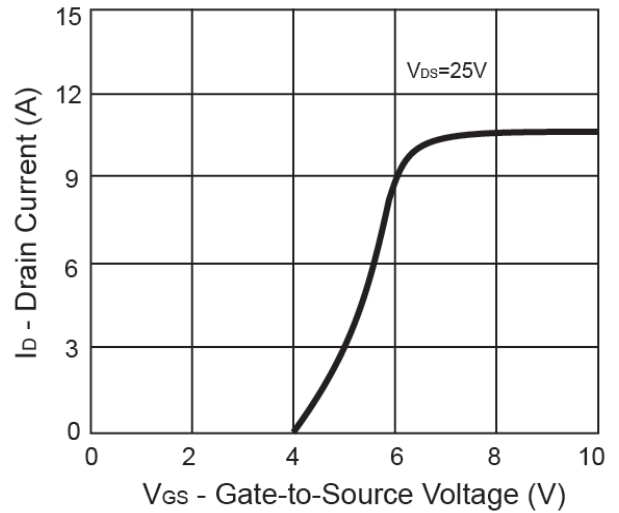
**Note 4:** Essentially Independent of Operating Temperature

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

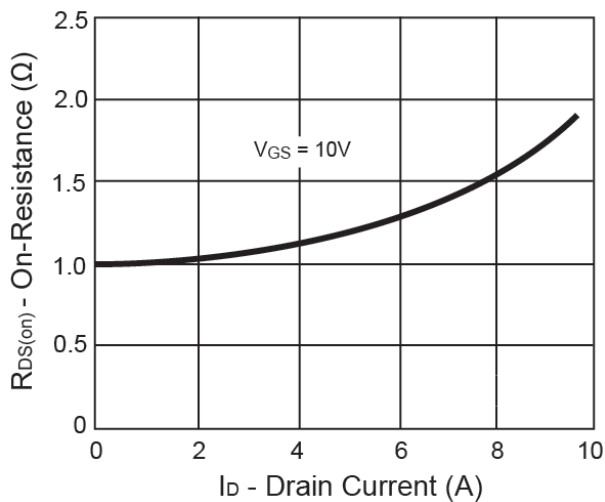
**Output Characteristics**



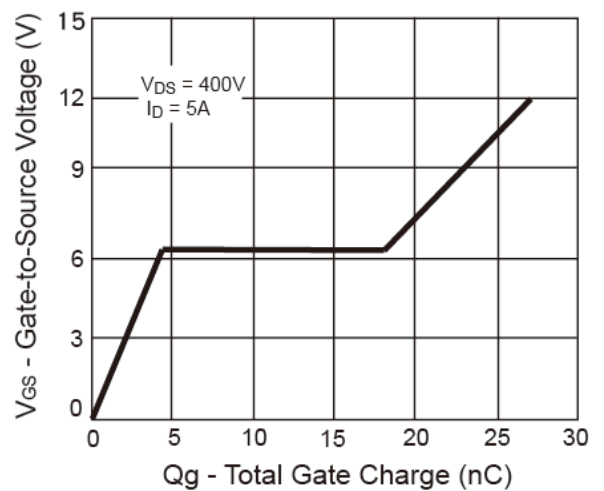
**Transfer Characteristics**



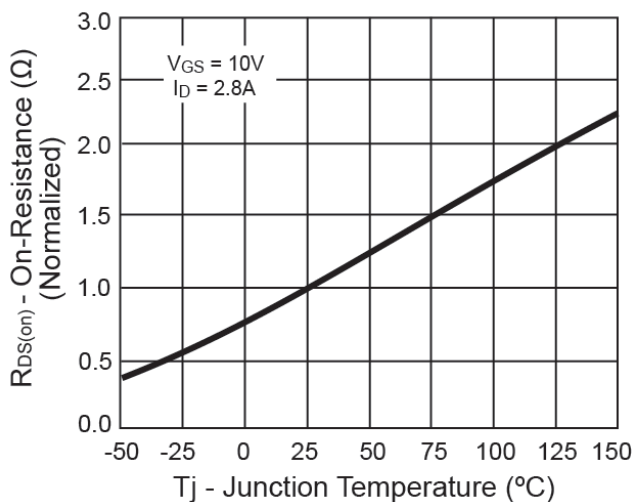
**On-Resistance vs. Drain Current**



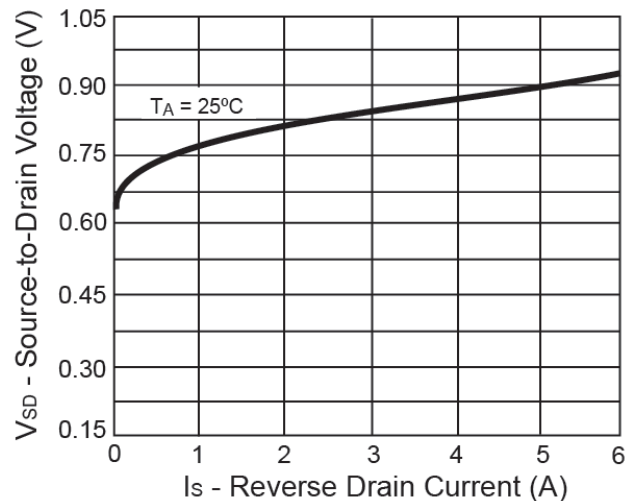
**Gate Charge**



**On-Resistance vs. Junction Temperature**

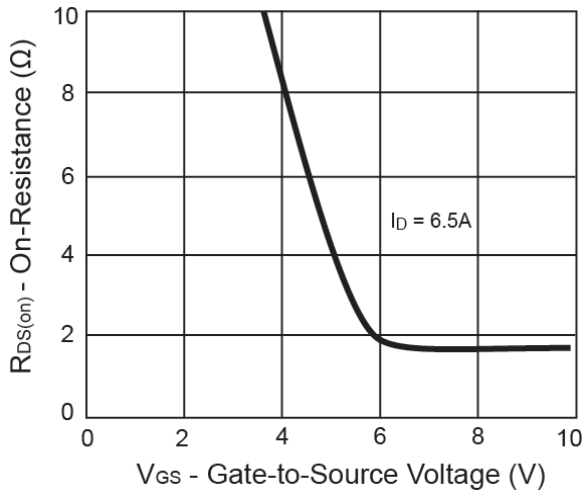


**Source-Drain Diode Forward Voltage**

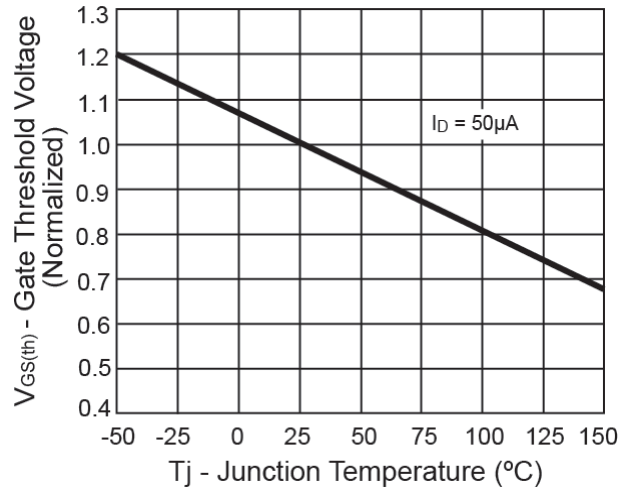


**Electrical Characteristics Curve** (Ta = 25°C, unless otherwise noted)

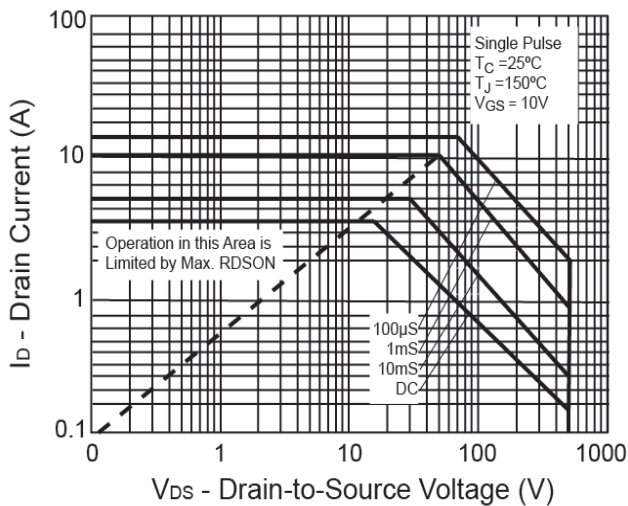
**On-Resistance vs. Gate-Source Voltage**



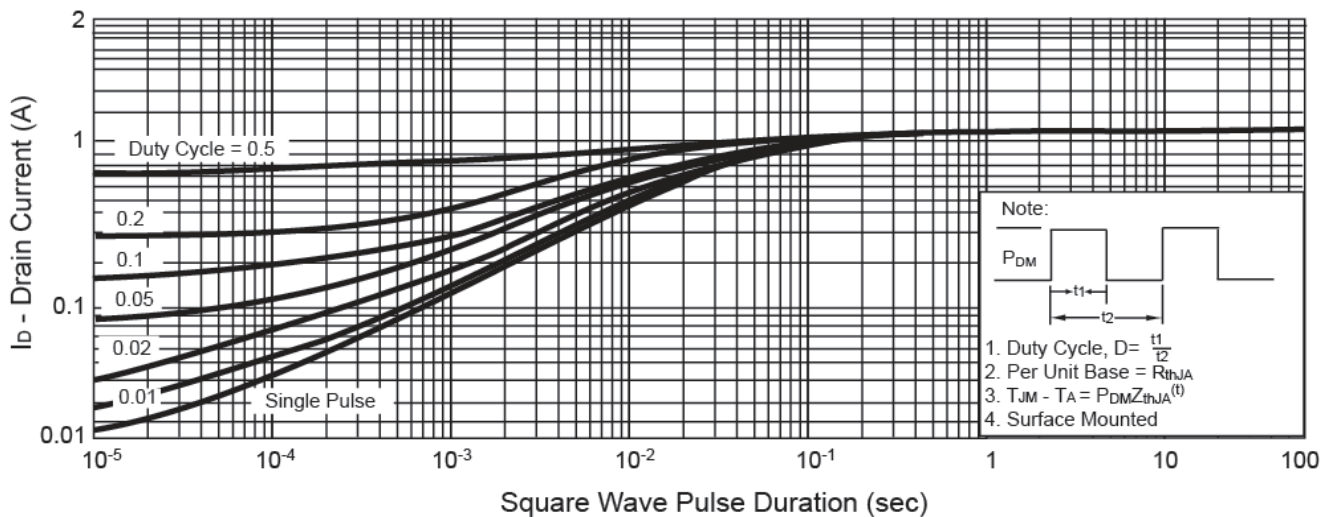
**Threshold Voltage**



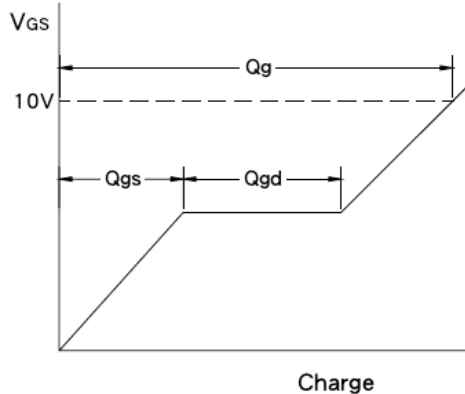
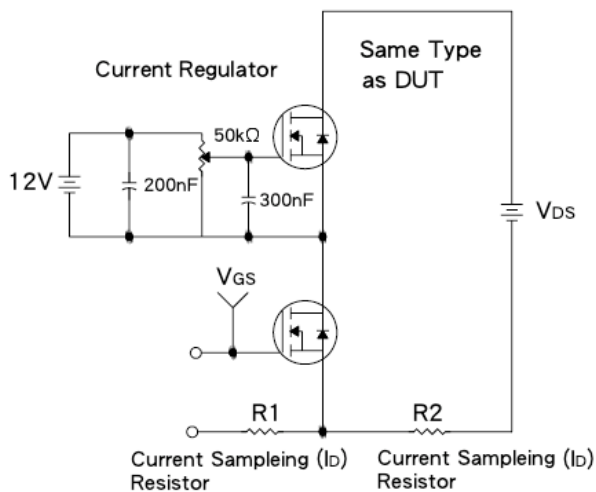
**Maximum Safe Operating Area**



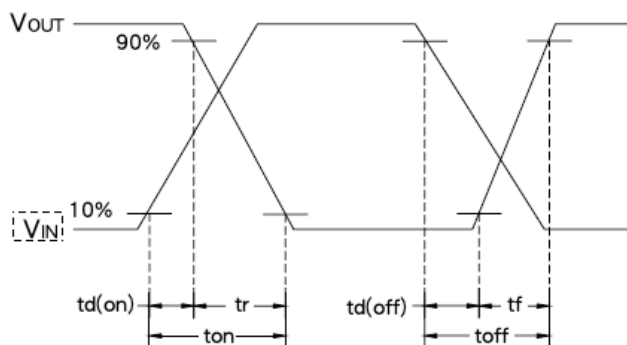
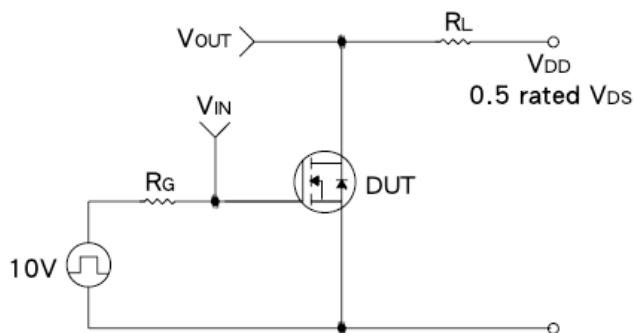
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



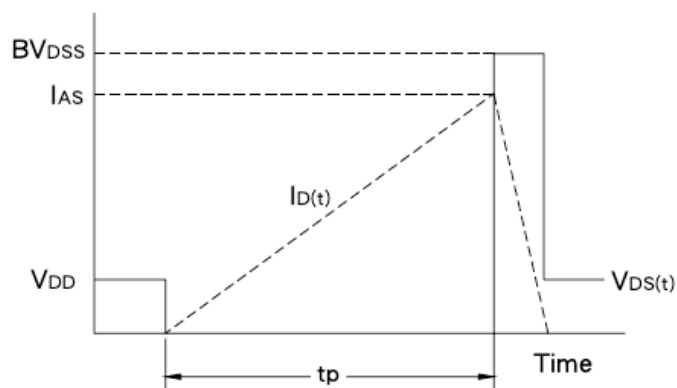
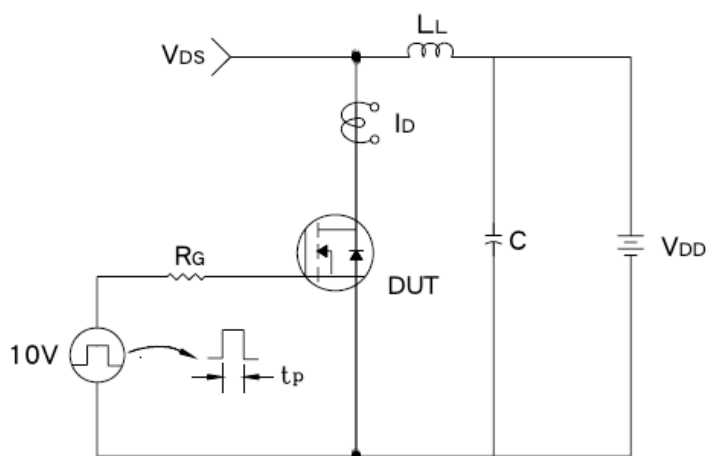
### Gate Charge Test Circuit & Waveform



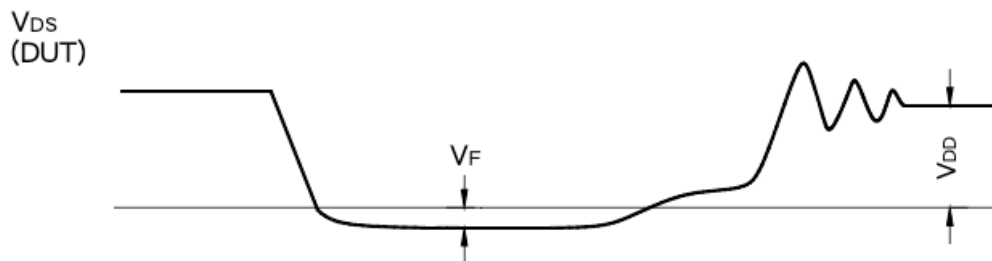
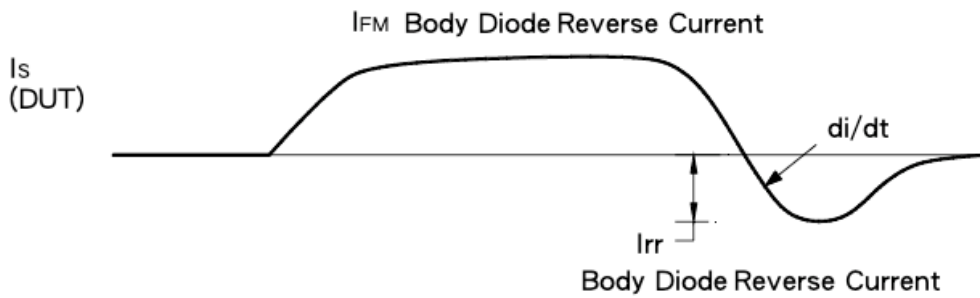
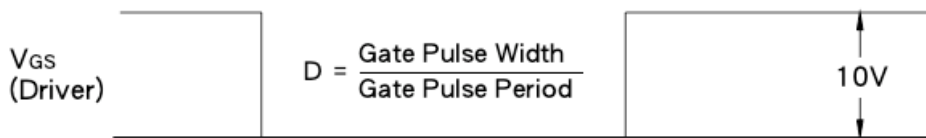
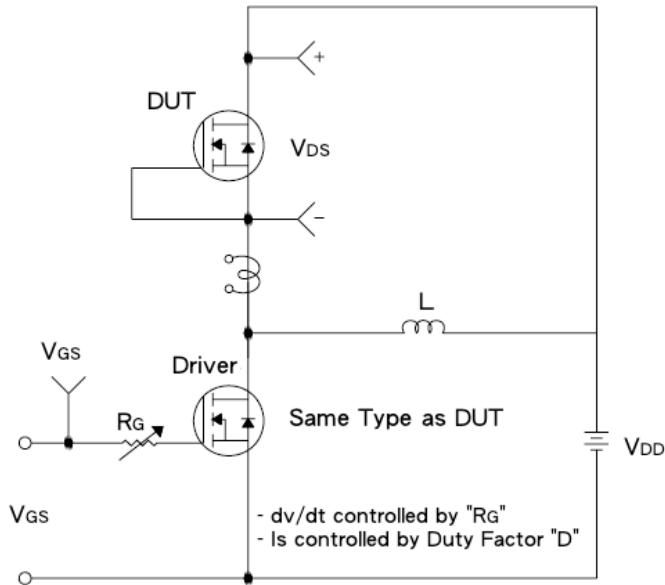
### Resistive Switching Test Circuit & Waveform



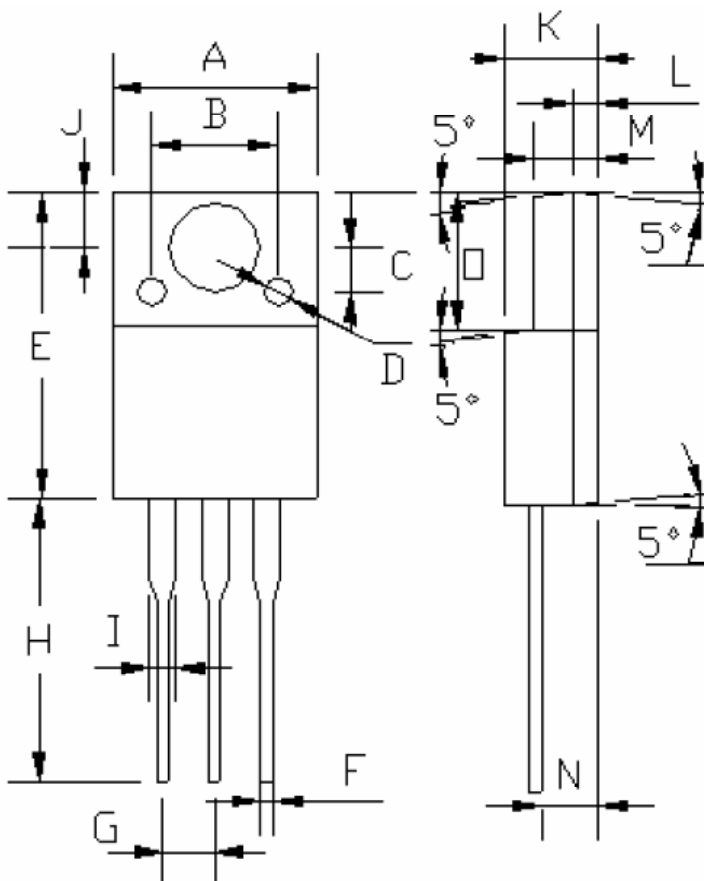
### E<sub>AS</sub> Test Circuit & Waveform



### Diode Reverse Recovery Time Test Circuit & Waveform

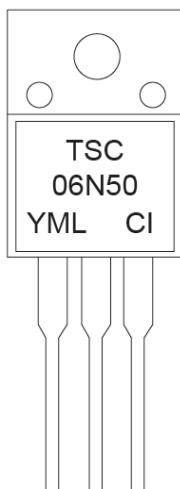


### ITO-220 Mechanical Drawing



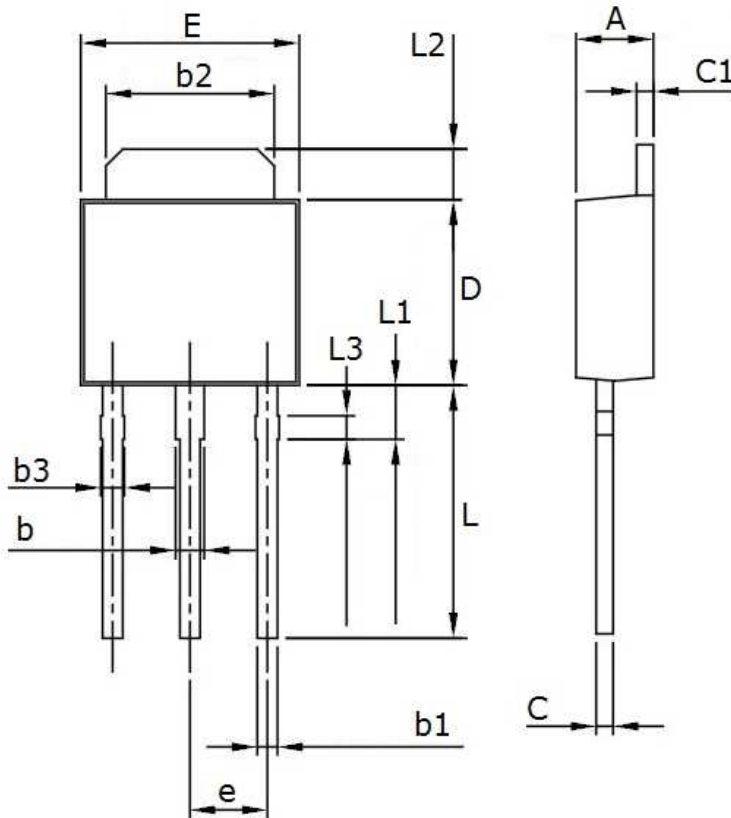
ITO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.04	10.07	0.395	0.396
B	6.20 (typ.)		0.244 (typ.)	
C	2.20 (typ.)		0.087 (typ.)	
D	∅ 1.40 (typ.)		∅ 0.055 (typ.)	
E	15.0	15.20	0.591	0.598
F	0.52	0.54	0.020	0.021
G	2.35	2.73	0.093	0.107
H	13.50	13.55	0.531	0.533
I	1.11	1.49	0.044	0.058
J	2.60	2.80	0.102	0.110
K	4.49	4.50	0.176	0.177
L	1.15 (typ.)		0.045 (typ.)	
M	3.03	3.05	0.119	0.120
N	2.60	2.80	0.102	0.110
O	6.55	6.65	0.258	0.262

### Marking Diagram



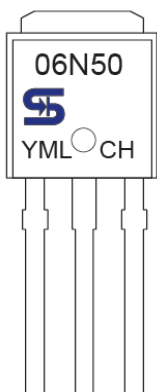
- Y** = Year Code
- M** = Month Code  
(A=Jan, B=Feb, C=Mar, D=Apr, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- L** = Lot Code

**TO-251 Mechanical Drawing**



TO-251 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.10	2.50	0.083	0.098
b	0.65	1.05	0.026	0.041
b1	0.58	0.62	0.023	0.024
b2	4.80	5.20	0.189	0.205
b3	0.68	0.72	0.027	0.028
C	0.35	0.65	0.014	0.026
C1	0.40	0.60	0.016	0.024
D	5.30	5.70	0.209	0.224
E	6.30	6.70	0.248	0.264
e	2.30 BSC		0.09 BSC	
L	7.00	8.00	0.276	0.315
L1	1.40	1.80	0.055	0.071
L2	1.30	1.70	0.051	0.067
L3	0.50	0.90	0.020	0.035

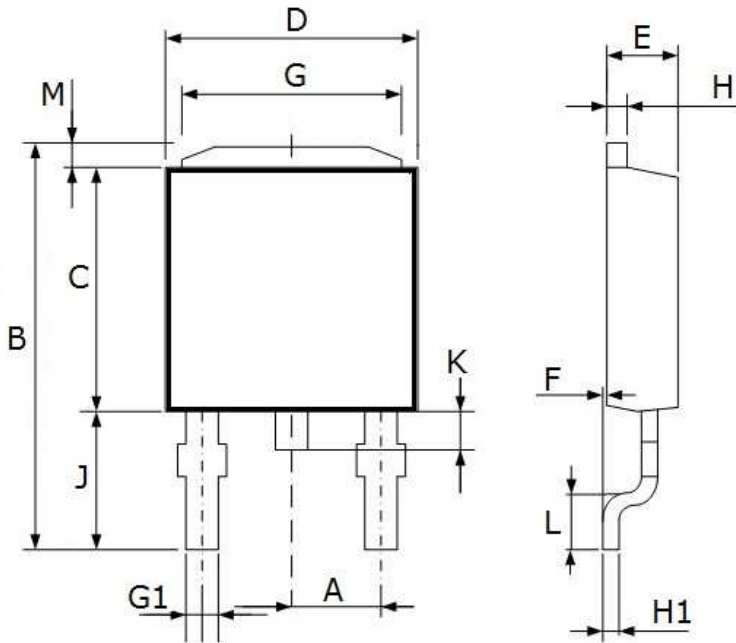
**Marking Diagram**



- Y** = Year Code
- M** = 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

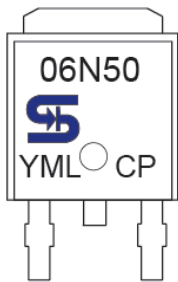


### TO-252 Mechanical Drawing



TO-252 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.30 BSC		0.090 BSC	
B	10.20	10.80	0.402	0.425
C	5.30	5.70	0.209	0.224
D	6.30	6.70	0.248	0.264
E	2.10	2.50	0.083	0.098
F	0.00	0.20	0.000	0.008
G	4.80	5.20	0.189	0.205
G1	0.40	0.80	0.016	0.031
H	0.40	0.60	0.016	0.024
H1	0.35	0.65	0.014	0.026
J	3.35	3.65	0.132	0.144
K	0.50	1.10	0.020	0.043
L	0.90	1.50	0.035	0.059
M	1.30	1.70	0.051	0.067

### Marking Diagram



- Y** = Year Code
- M** = Month Code for Halogen Free Product  
(O=Jan, P=Feb, Q=Mar, R=Apl, S=May, T=Jun, U=Jul, V=Aug, W=Sep, X=Oct, Y=Nov, Z=Dec)
- L** = Lot Code

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