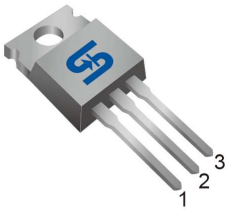
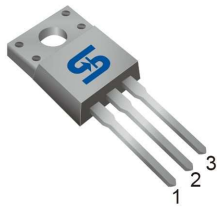


TO-220



ITO-220



Pin Definition:

1. Gate
2. Drain
3. Source

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
800	3 @ $V_{GS}=10V$	4

General Description

The TSM4N80 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, electronic lamp ballast based on half bridge.

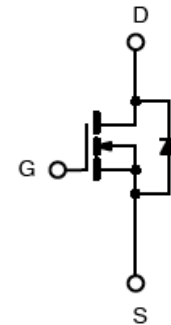
Features

- Low $R_{DS(on)}$ 3 Ω (Max.)
- Low gate charge typical @ 25nC (Typ.)
- Improve dv/dt capability

Ordering Information

Part No.	Package	Packing
TSM4N80CZ C0	TO-220	50pcs / Tube
TSM4N80CI C0	ITO-220	50pcs / Tube

Block Diagram



N-Channel MOSFET

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

Parameter	Symbol	TO-220	ITO-220	Unit
Drain-Source Voltage	V_{DS}	800		V
Gate-Source Voltage	V_{GS}	± 30		V
Continuous Drain Current	I_D	4	4 *	A
		2.5	2.5 *	
Pulsed Drain Current *	I_{DM}	16	16 *	A
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.5		V
Single Pulse Avalanche Energy (Note 2)	E_{AS}	85		mJ
Avalanche Current (Repetitive) (Note 1)	I_{AR}	4		A
Repetitive Avalanche Energy (Note 1)	E_{AR}	12.3		mJ
Power Dissipation	P_D	123	38.7	W
		0.98	0.3	$^\circ\text{C/W}$
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	TO-220	ITO-220	Unit
Thermal Resistance - Junction to Case	$R\theta_{JC}$	1.01	3.23	$^{\circ}\text{C/W}$
Thermal Resistance - Junction to Ambient	$R\theta_{JA}$	62.5		

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

Electrical Specifications ($T_c = 25^{\circ}\text{C}$ unless otherwise noted)

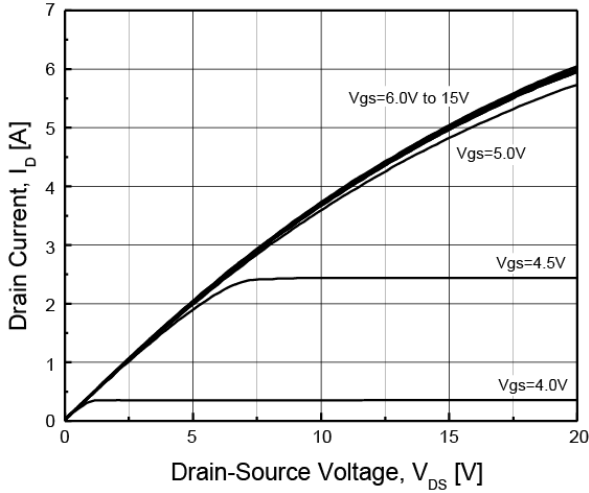
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	BV_{DSS}	800	--	--	V
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 2.0A$	$R_{DS(ON)}$	--	2.5	3.0	Ω
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2.0	--	4.0	V
Zero Gate Voltage Drain Current	$V_{DS} = 800V, V_{GS} = 0V$	I_{DSS}	--	--	10	μA
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Forward Transconductance	$V_{DS} = 30V, I_D = 2.0A$	g_{fs}	--	7.1	--	S
Diode Forward Voltage	$I_S = 4A, V_{GS} = 0V$	V_{SD}	--	--	1.5	V
Dynamic ^b						
Total Gate Charge	$V_{DS} = 640V, I_D = 4A,$ $V_{GS} = 10V$	Q_g	--	20	--	nC
Gate-Source Charge		Q_{gs}	--	3.7	--	
Gate-Drain Charge		Q_{gd}	--	8.2	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	C_{iss}	--	955	--	pF
Output Capacitance		C_{oss}	--	80	--	
Reverse Transfer Capacitance		C_{rss}	--	13	--	
Switching ^c						
Turn-On Delay Time	$V_{GS} = 10V, I_D = 4A,$ $V_{DD} = 400V, R_G = 25\Omega$	$t_{d(on)}$	--	49	--	nS
Turn-On Rise Time		t_r	--	38	--	
Turn-Off Delay Time		$t_{d(off)}$	--	146	--	
Turn-Off Fall Time		t_f	--	50	--	
Reverse Recovery Time	$V_{GS} = 0V, I_S = 4A,$	t_{fr}	--	487	--	nS
Reverse Recovery Charge	$di_F/dt = 100A/us$	Q_{fr}	--	2.8	--	μC

Notes:

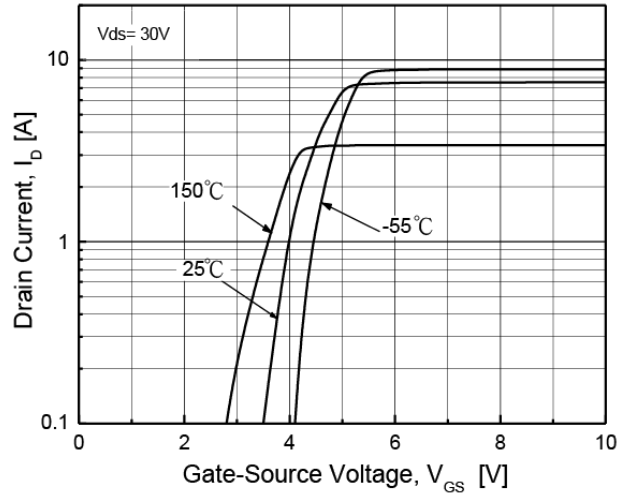
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. $V_{DD} = 50\text{V}, I_{AS} = 4\text{A}, L = 10\text{mH}, R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$
3. $I_{SD} \leq 8\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV$, Starting $T_J = 25^{\circ}\text{C}$
4. Pulse test: pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
5. b For design reference only, not subject to production testing.
6. c Switching time is essentially independent of operating temperature.

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

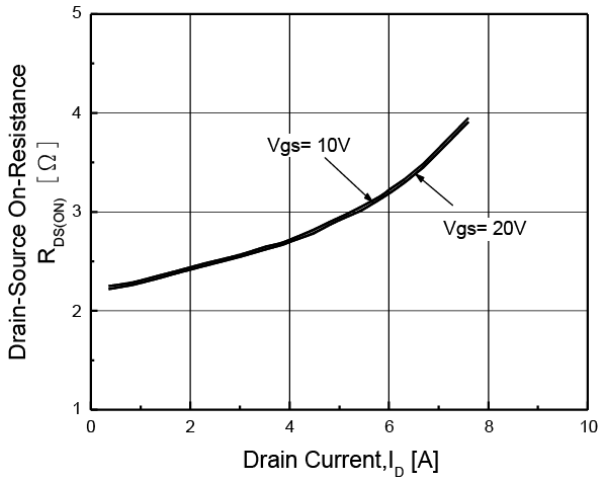
Output Characteristics



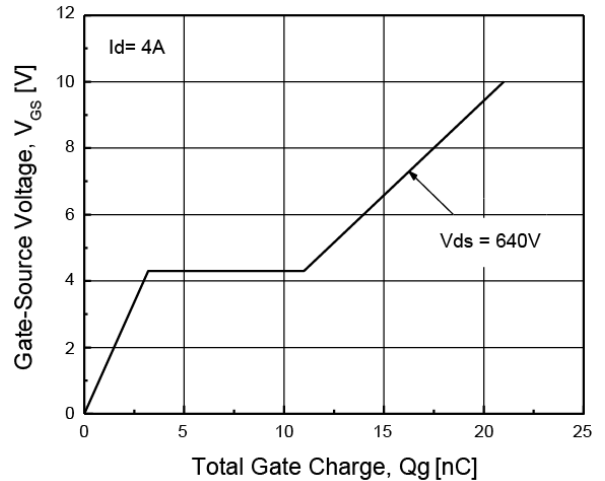
Transfer Characteristics



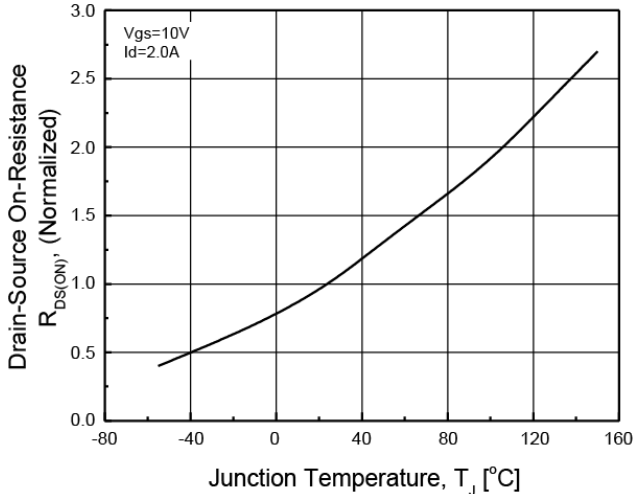
On-Resistance vs. Drain Current



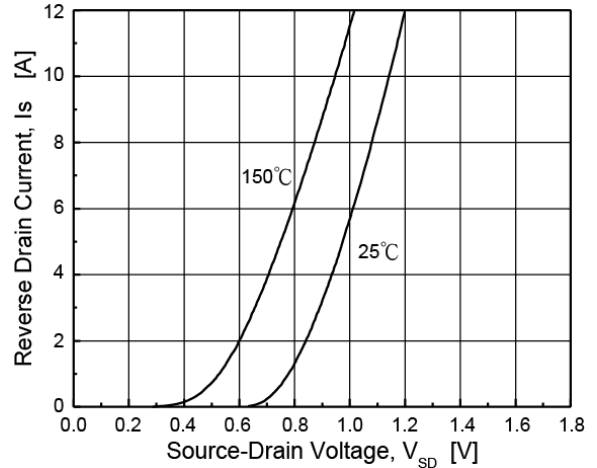
Gate Charge



On-Resistance vs. Junction Temperature

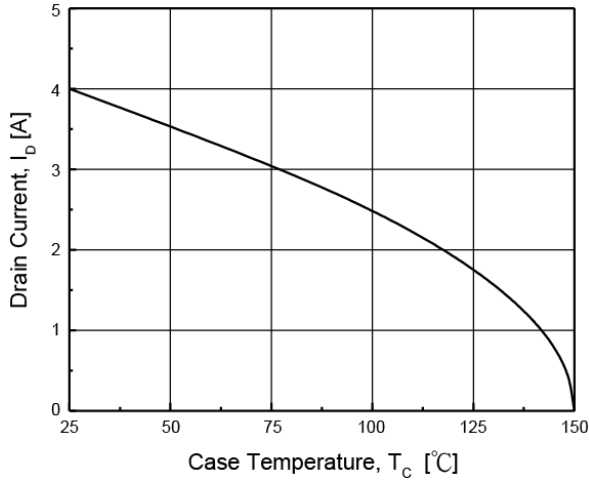


Source-Drain Diode Forward Voltage

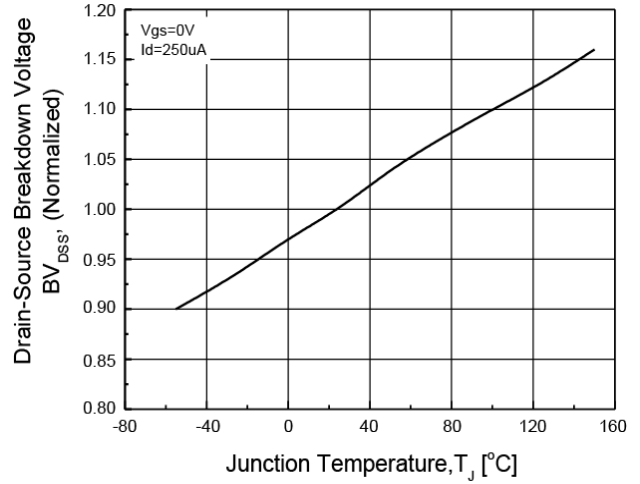


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

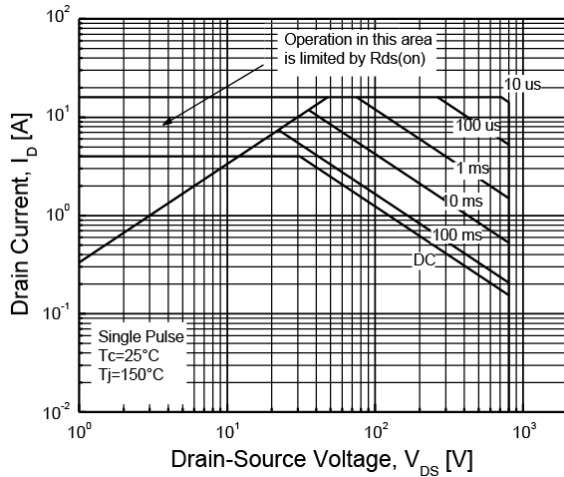
Drain Current vs. Case Temperature



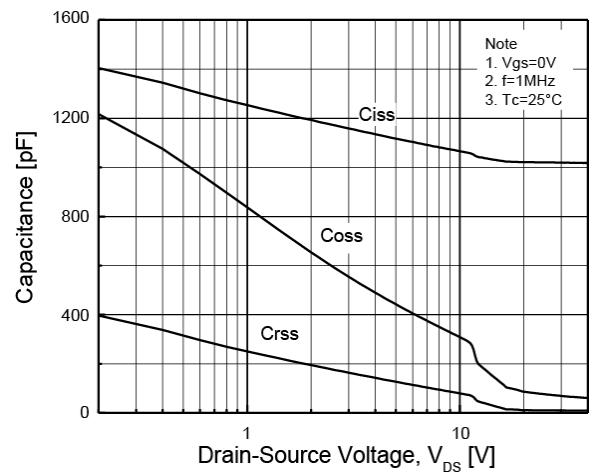
BV_{DSS} vs. Junction Temperature



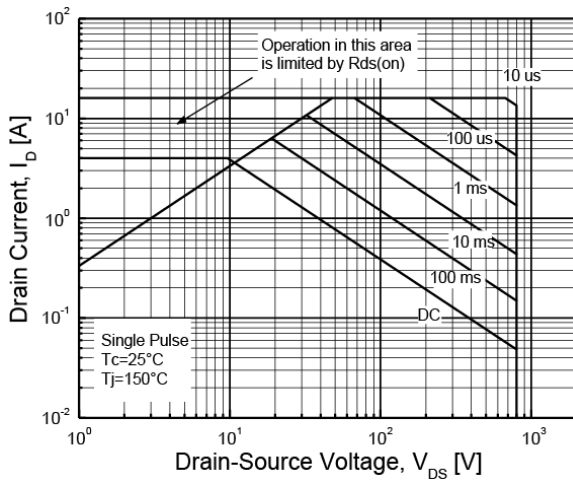
Maximum Safe Operating Area (TO-220)



Capacitance vs. Drain-Source Voltage

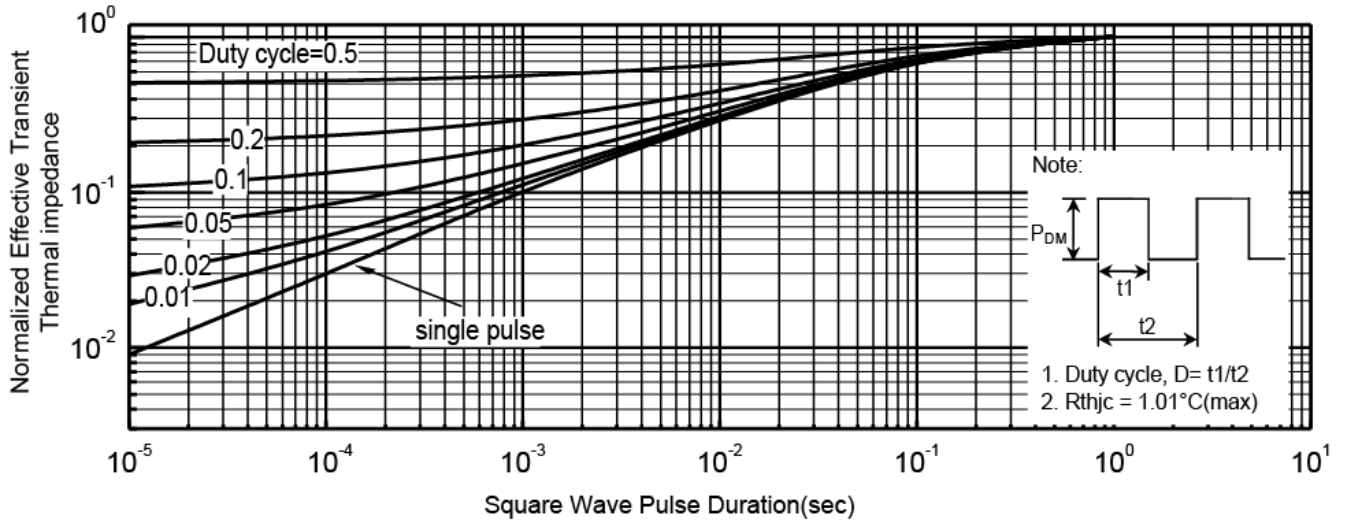


Maximum Safe Operating Area (ITO-220)

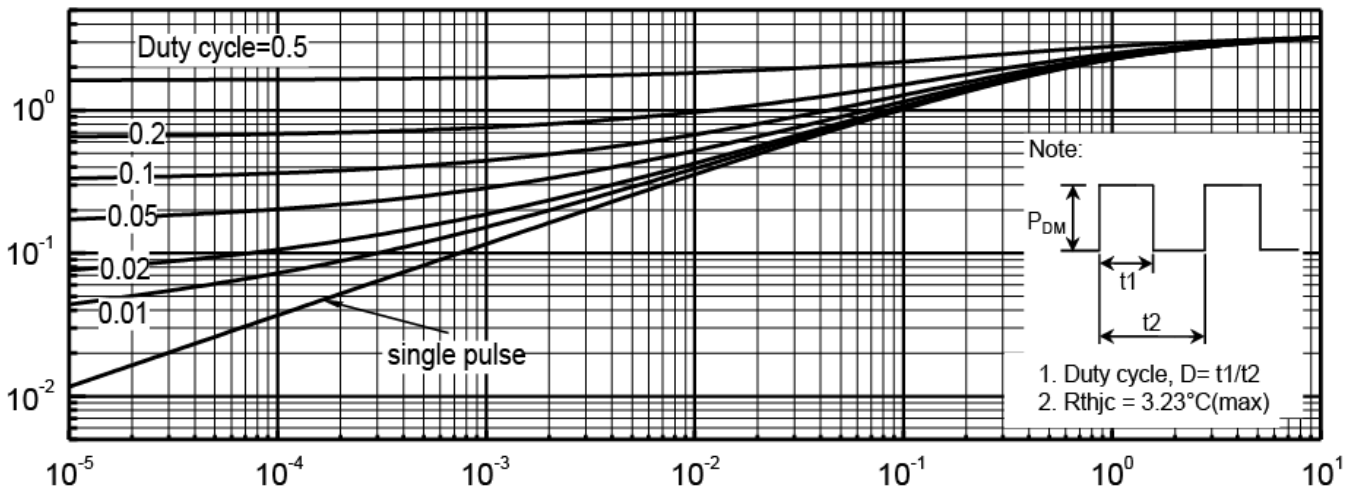


Electrical Characteristics Curve ($T_a = 25^\circ\text{C}$, unless otherwise noted)

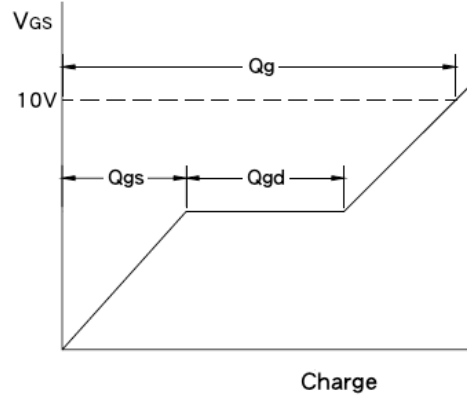
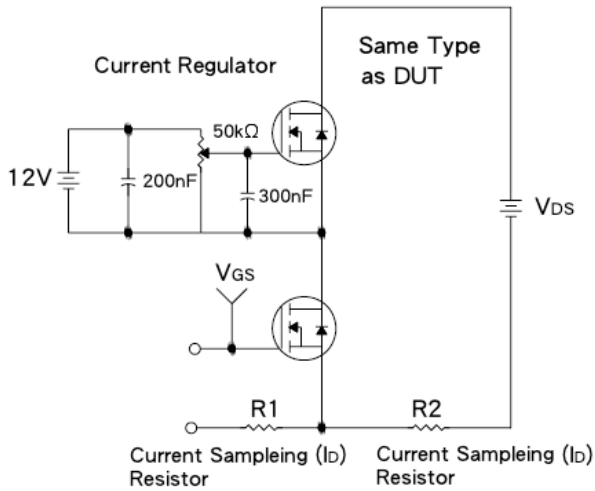
Normalized Thermal Transient Impedance, Junction-to-Ambient



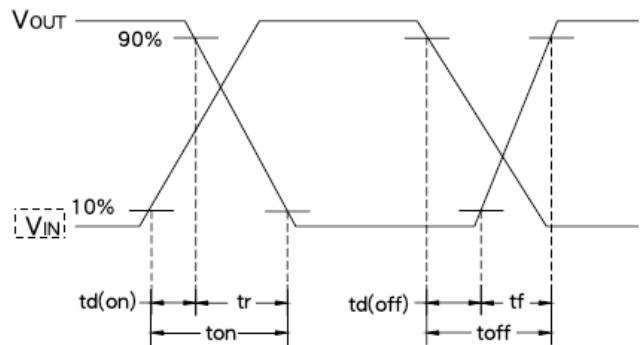
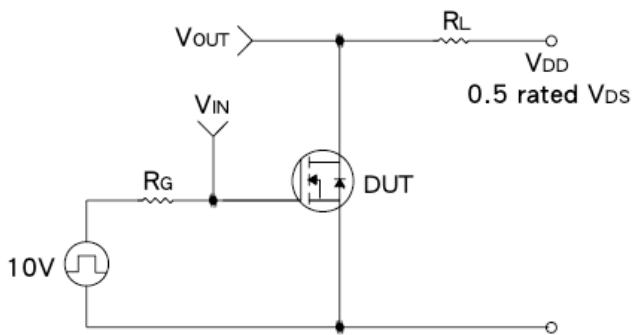
Normalized Thermal Transient Impedance, Junction-to-Ambient(ITO-220)



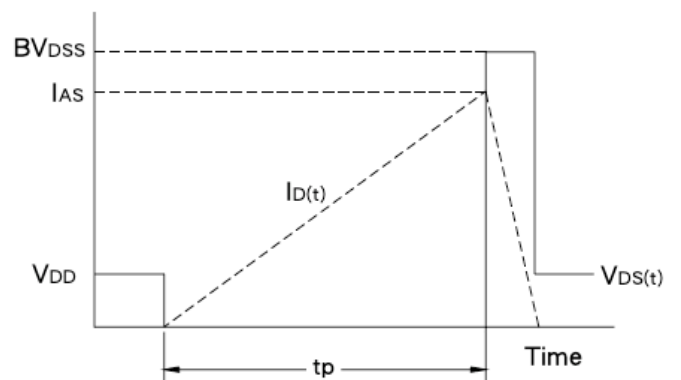
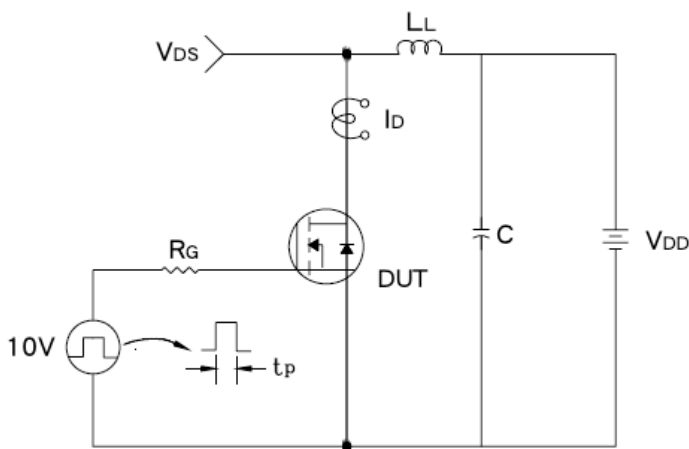
Gate Charge Test Circuit & Waveform



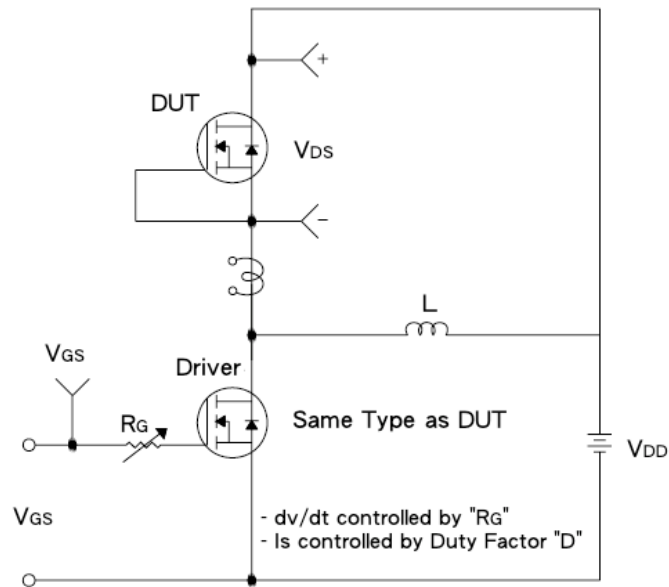
Resistive Switching Test Circuit & Waveform



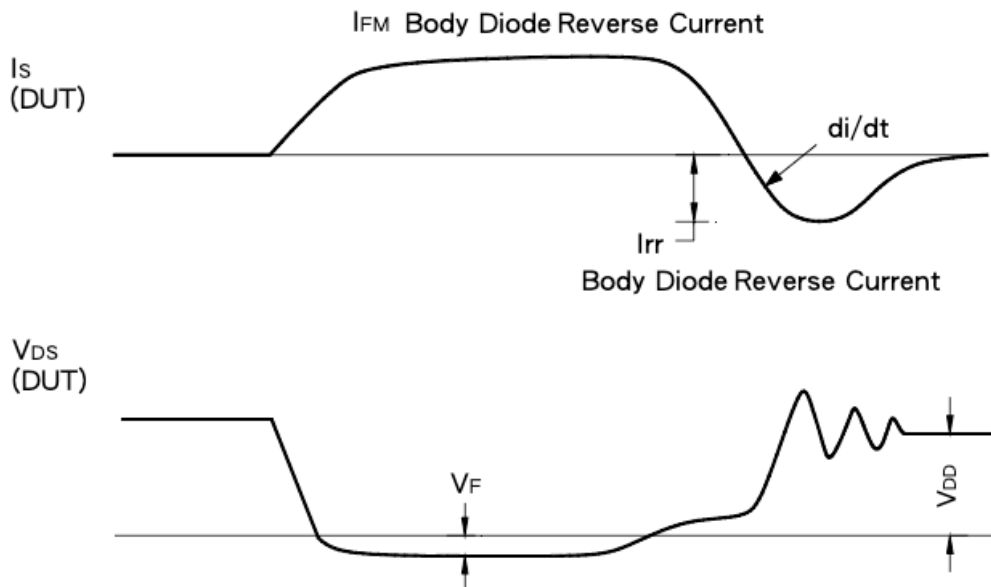
E_{AS} Test Circuit & Waveform



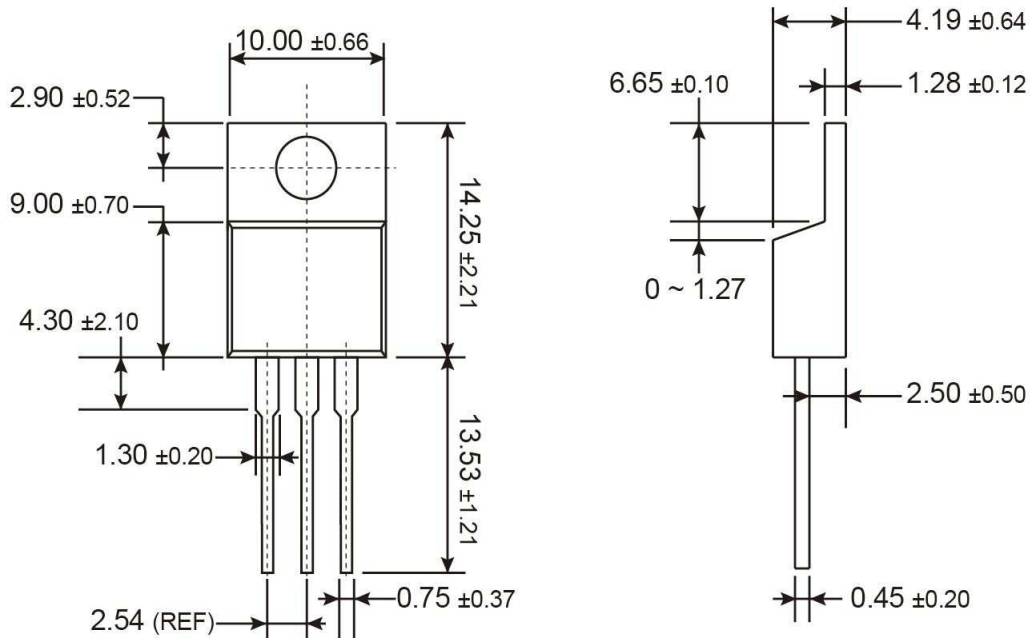
Diode Reverse Recovery Time Test Circuit & Waveform



$$D = \frac{\text{Gate Pulse Width}}{\text{Gate Pulse Period}}$$

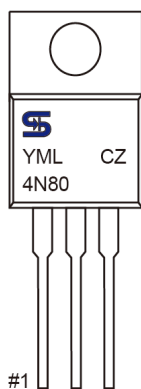


TO-220 Mechanical Drawing



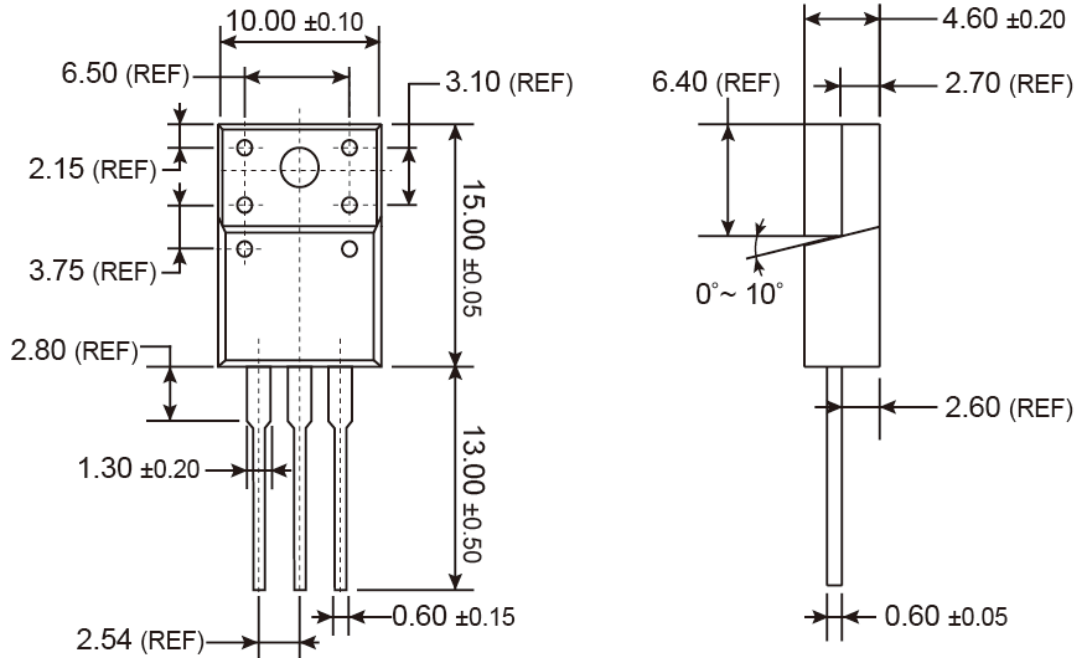
Unit: Millimeters

Marking Diagram



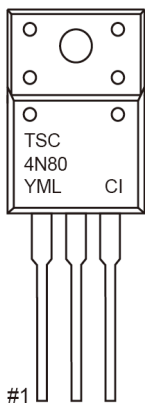
- Y** = Year Code
- M** = Month Code
 - (**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apr, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)
- L** = Lot Code

ITO-220 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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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

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