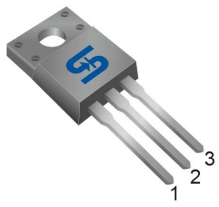
TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TSM12N65

650V N-Channel Power MOSFET

ITO-220



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

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$(Ω)	I_D (A)
650	0.8 @ V_{GS} =10V	6

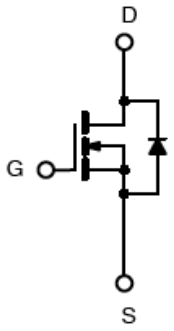
General Description

The TSM12N65 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 $R_{DS(ON)}$ 0.68Ω (Typ.)
- Low gate charge typical @ 41nC (Typ.)
- Low Crss typical @ 14.6pF (Typ.)
- Fast Switching

Block Diagram



N-Channel MOSFET

Ordering Information

Part No.	Package	Packing
TSM12N65CI C0	ITO-220	50pcs / Tube

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

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current	Tc = 25ºC	I_D	12	A
	Tc = 100ºC		4.5	A
Pulsed Drain Current *		I_{DM}	48	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	273	mJ
Avalanche Current (Repetitive) (Note 2		I_{AS}	12	A
Single Pulse Avalanche Energy (Note 1)		E_{AR}	7.6	mJ
Avalanche Current (Repetitive) (Note 1)		I_{AR}	12	A
Total Power Dissipation @ T_C = 25°C		P_{TOT}	45	W
Operating Junction Temperature		T_J	150	ºC
Storage Temperature Range		T_{STG}	-55 to +150	°C

Note: Limited by maximum junction temperature

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R\Theta_{JC}$	2.7	°C/W
Thermal Resistance - Junction to Ambient	$R\Theta_{JA}$	62.5	°C/W

Notes: Surface mounted on FR4 board t ≤ 10sec

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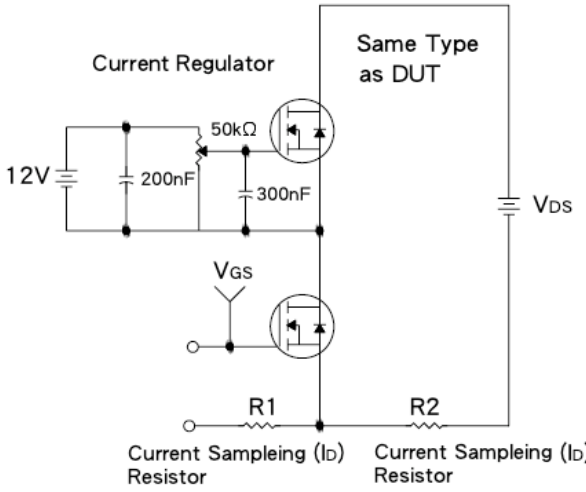
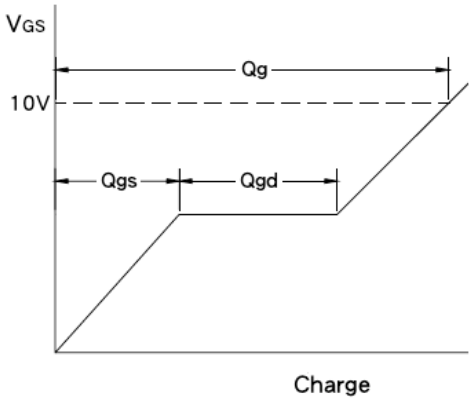
Electrical Specifications (Ta = 25°C unless otherwise noted)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250uA	BV_{DSS}	650	--	--	V
Drain-Source On-State Resistance	V_{GS} = 10V, I_D = 6A	$R_{DS(ON)}$	--	0.68	0.8	Ω
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250uA	$V_{GS(TH)}$	2.0	--	4.0	V
Zero Gate Voltage Drain Current	V_{DS} = 650V, V_{GS} = 0V	I_{DSS}	--	--	1	uA
Gate Body Leakage	V_{GS} = ±30V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Forward Transfer Conductance	V_{DS} = 10V, I_D = 6A	g_{fs}	--	10	--	S
Dynamic [b]						
Total Gate Charge	V_{DS} = 480V, I_D = 12A, V_{GS} = 10V	Q_g	--	41	--	nC
Gate-Source Charge		Q_{gs}	--	13	--	
Gate-Drain Charge		Q_{gd}	--	10.5	--	
Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	C_{iss}	--	2162	--	pF
Output Capacitance		C_{oss}	--	183	--	
Reverse Transfer Capacitance		C_{rss}	--	14.6	--	
Switching [c]						
Turn-On Delay Time	V_{GS} = 10V, I_D = 12A, V_{DD} = 300V, R_G =25Ω	$t_{d(on)}$	--	30	--	nS
Turn-On Rise Time		t_r	--	85	--	
Turn-Off Delay Time		$t_{d(off)}$	--	140	--	
Turn-Off Fall Time		t_f	--	90	--	
Source-Drain Diode Ratings and Characteristic						
Source Current	Integral reverse diode in the MOSFET	I_S	--	--	12	A
Source Current (Pulse)		I_{SM}	--	--	48	A
Diode Forward Voltage	I_S = 12A, V_{GS} = 0V	V_{SD}	--	--	1.4	V
Reverse Recovery Time	V_{GS} = 0V, I_S =12A, dI_F/dt = 100A/us	t_{fr}	--	510	--	nS
Reverse Recovery Charge		Q_{fr}	--	4.3	--	uC

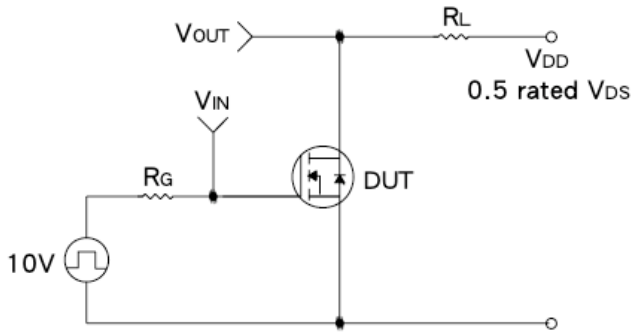
Note 1: Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
Note 2: V_{DD} = 50V, I_{AS}=12A, L=3.5mH, R_G =25Ω, Starting T_J=25ºC
Note 3: Pulse test: pulse width ≤300uS, duty cycle ≤2%
Note 4: Essentially Independent of Operating Temperature

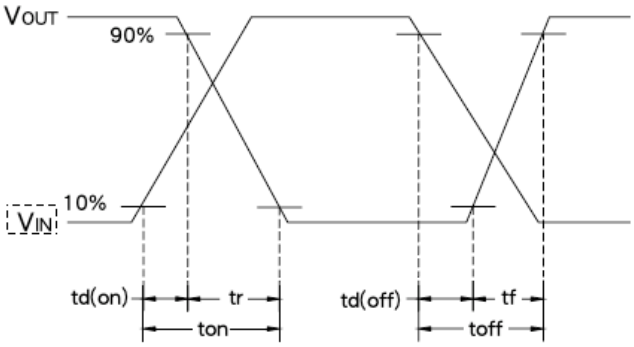
Gate Charge Test Circuit & Waveform



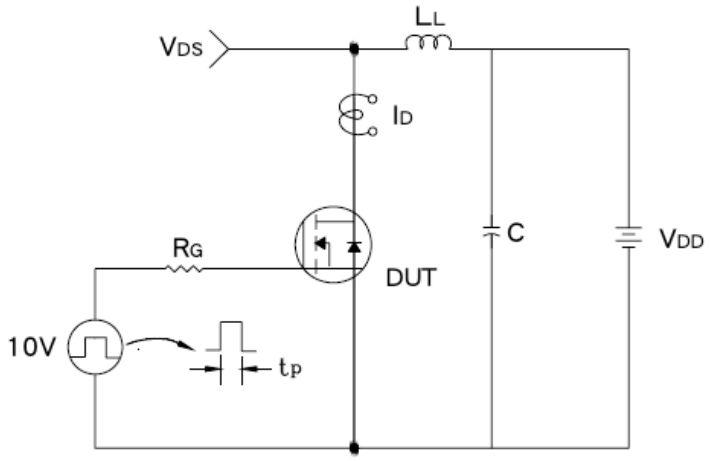


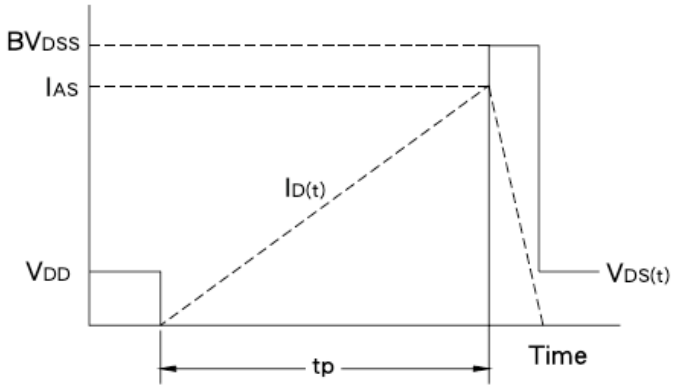
Resistive Switching Test Circuit & Waveform



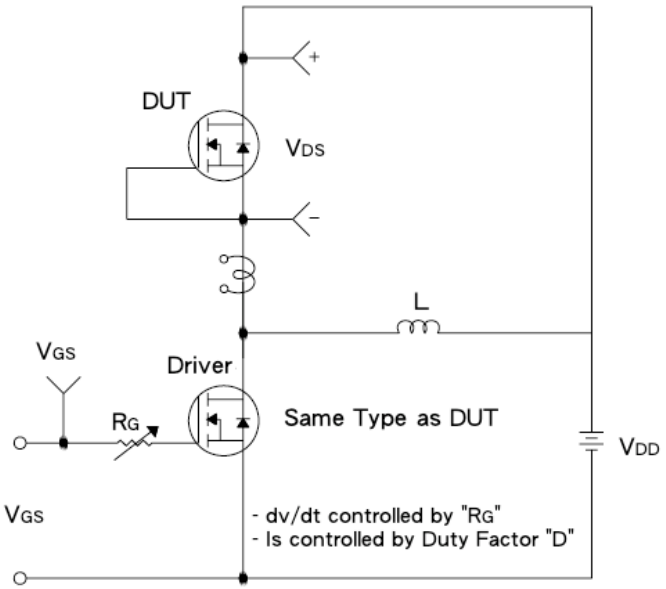


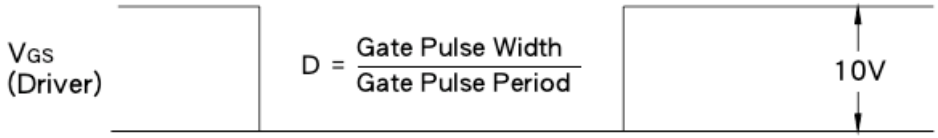
E_{AS} Test Circuit & Waveform

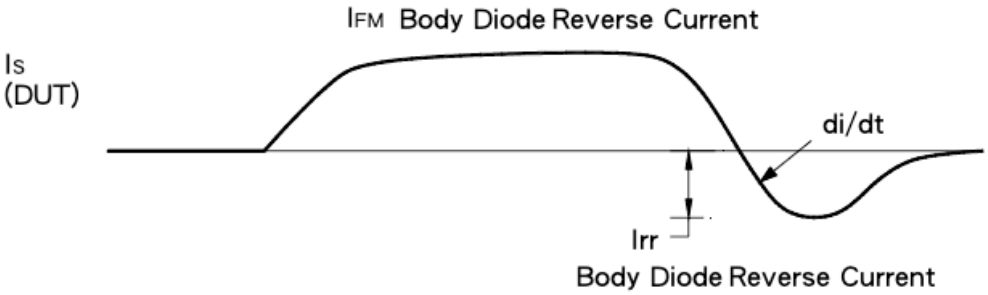


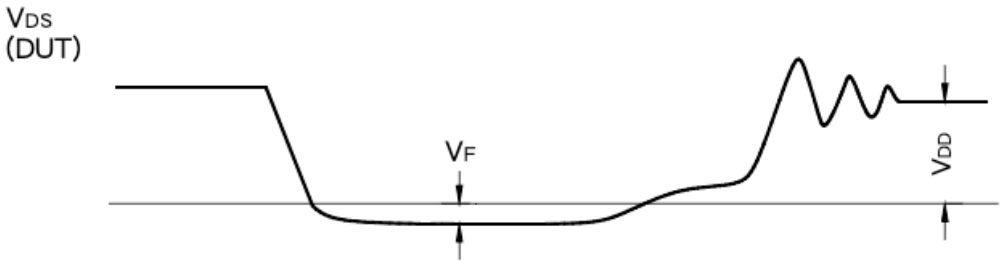


Diode Reverse Recovery Time Test Circuit & Waveform



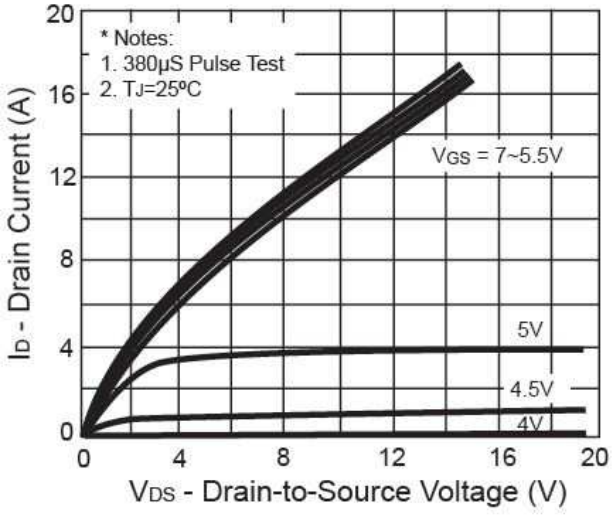




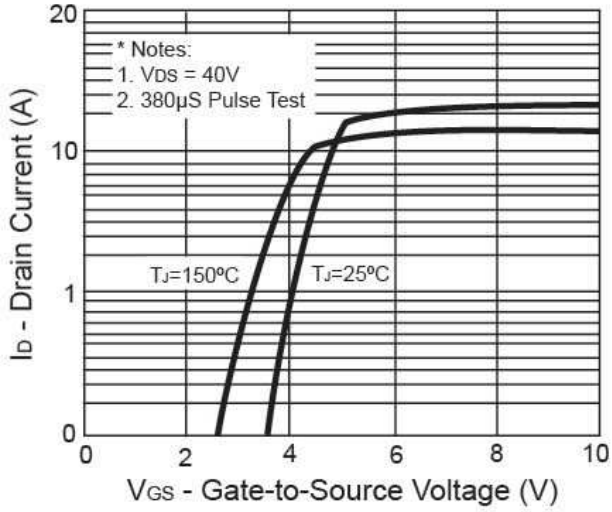


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

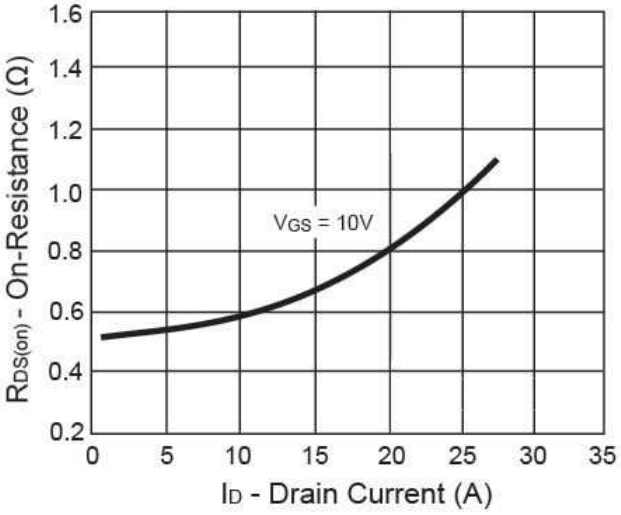
Output Characteristics



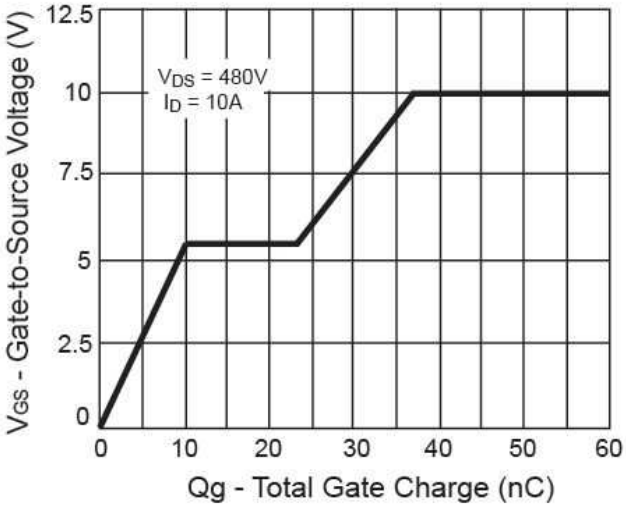
Transfer Characteristics



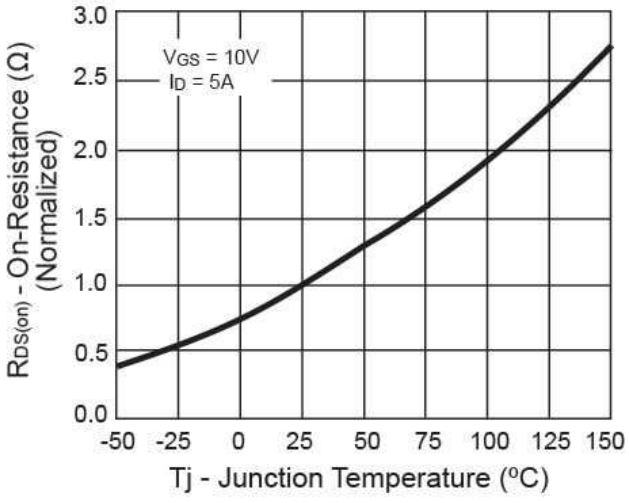
On-Resistance vs. Drain Current



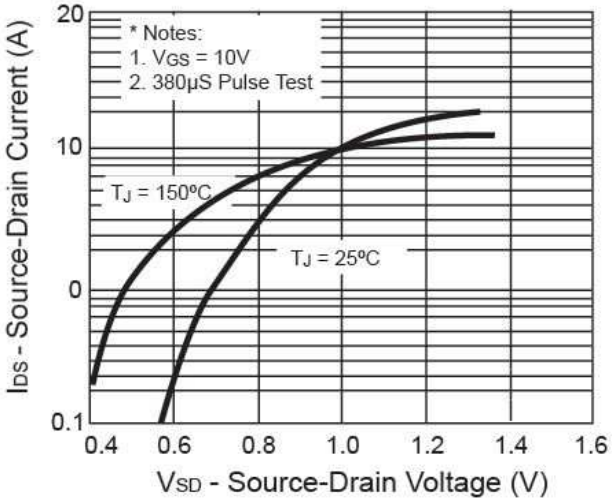
Gate Charge



On-Resistance vs. Junction Temperature

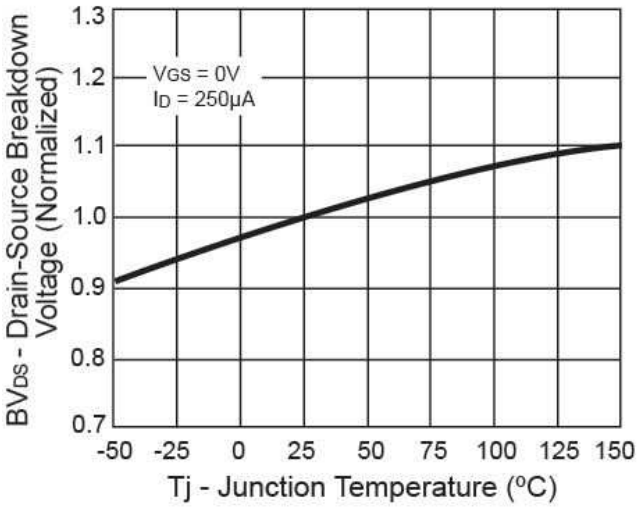


Source-Drain Diode Forward Voltage

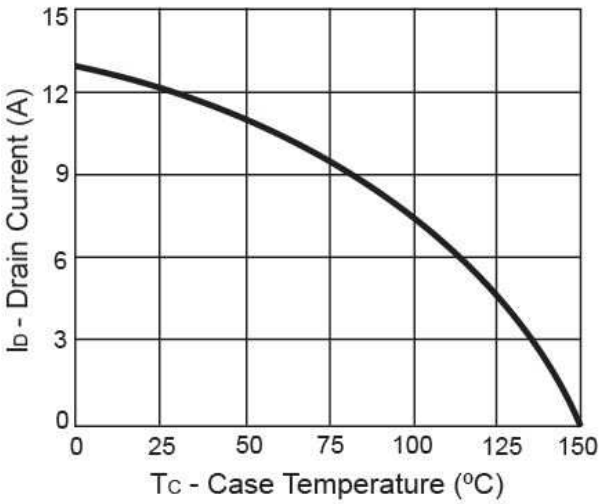


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

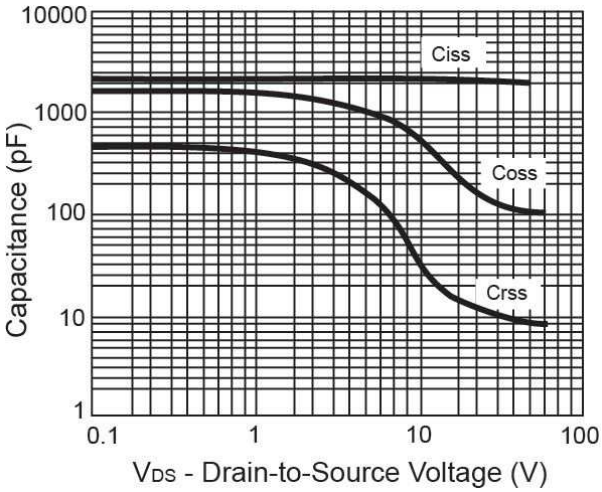
BV_{DS} vs. Junction Temperature



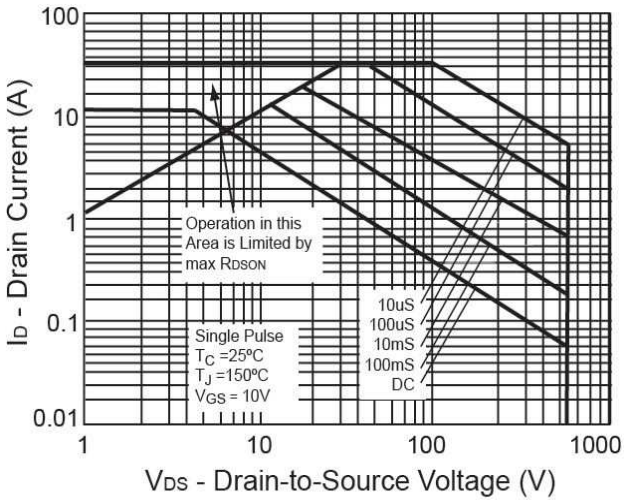
Drain Current vs., Case Temperature



Capacitance



Maximum Safe Operating Area



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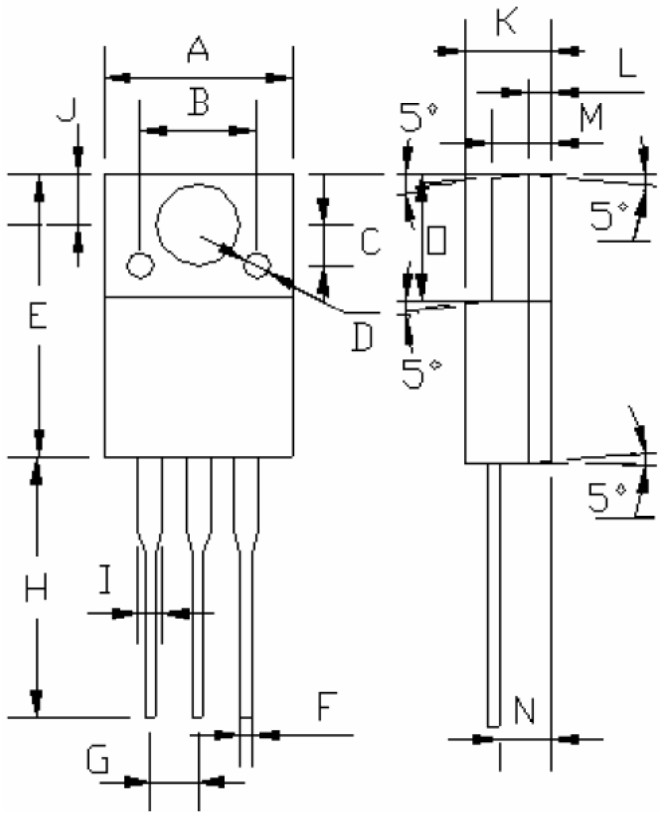
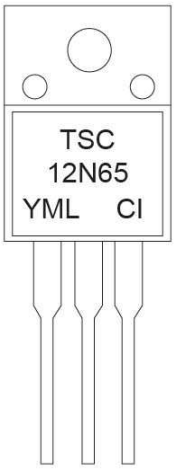
650V N-Channel Power MOSFET

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**=Apl, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)
L = Lot Code

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