

N-Channel Power MOSFET

500V, 13A, 0.48Ω

FEATURES

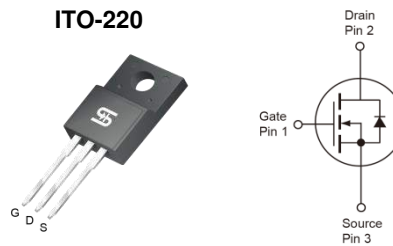
- 100% UIS and R_g tested
- Advanced planar process
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

KEY PERFORMANCE PARAMETERS

PARAMETER	VALUE	UNIT
V _{DS}	500	V
R _{DS(on)} (max)	0.48	Ω
Q _g	39	nC

APPLICATIONS

- Power Supply
- AC/DC LED Lighting



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

PARAMETER	SYMBOL	Limit	UNIT
Drain-Source Voltage	V _{DS}	500	V
Gate-Source Voltage	V _{GS}	±30	V
Continuous Drain Current ^(Note 1)	I _D	T _C = 25°C	13
		T _C = 100°C	8
Pulsed Drain Current ^(Note 2)	I _{DM}	52	A
Total Power Dissipation @ T _C = 25°C	P _{DTOT}	57	W
Single Pulse Avalanche Energy ^(Note 3)	E _{AS}	608	mJ
Single Pulse Avalanche Current ^(Note 3)	I _{AS}	7.8	A
Operating Junction and Storage Temperature Range	T _J , T _{STG}	- 55 to +150	°C

THERMAL PERFORMANCE

PARAMETER	SYMBOL	Limit	UNIT
Junction to Case Thermal Resistance	R _{θJC}	2.2	°C/W
Junction to Ambient Thermal Resistance	R _{θJA}	62	°C/W

Thermal Performance Note: R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistances. The case-thermal reference is defined at the solder mounting surface of the drain pins. R_{θJA} is guaranteed by design while R_{θCA} is determined by the user's board design.

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$	BV_{DSS}	500	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	$V_{GS(TH)}$	2.5	3	3.8	V
Gate Body Leakage	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = 500\text{V}, V_{GS} = 0\text{V}$	I_{DSS}	--	--	1	μA
Drain-Source On-State Resistance (Note 4)	$V_{GS} = 10\text{V}, I_D = 3.3\text{A}$	$R_{DS(on)}$	--	0.37	0.48	Ω
Dynamic (Note 5)						
Total Gate Charge	$V_{DS} = 400\text{V}, I_D = 6.5\text{A},$ $V_{GS} = 10\text{V}$	Q_g	--	39	--	nC
Gate-Source Charge		Q_{gs}	--	10	--	
Gate-Drain Charge		Q_{gd}	--	12	--	
Input Capacitance	$V_{DS} = 50\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$	C_{iss}	--	1877	--	pF
Output Capacitance		C_{oss}	--	128	--	
Reverse Transfer Capacitance		C_{rss}	--	7	--	
Gate Resistance		R_g	--	1.1	2.2	Ω
Switching (Note 6)						
Turn-On Delay Time	$V_{DD} = 250\text{V}, R_G = 5\Omega,$ $I_D = 6.5\text{A}, V_{GS} = 10\text{V}$	$t_{d(on)}$	--	11	--	ns
Turn-On Rise Time		t_r	--	21	--	
Turn-Off Delay Time		$t_{d(off)}$	--	32	--	
Turn-Off Fall Time		t_f	--	22	--	
Source-Drain Diode						
Body-Diode Continuous Forward Current		I_S	--	--	13	A
Body-Diode Pulsed Current		I_{SM}	--	--	52	A
Forward Voltage (Note 4)	$I_S = 6.5\text{A}, V_{GS} = 0\text{V}$	V_{SD}	--	--	1.2	V
Reverse Recovery Time	$I_S = 6.5\text{A}$	t_{rr}	--	282	--	ns
Reverse Recovery Charge	$di_f/dt = 100\text{A}/\mu\text{s}$	Q_{rr}	--	2.9	--	μC

Notes:

- Current limited by package
- Pulse width limited by the maximum junction temperature
- $L = 20\text{mH}, I_{AS} = 7.8\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
- Pulse test: $PW \leq 300\mu\text{s}$, duty cycle $\leq 2\%$
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

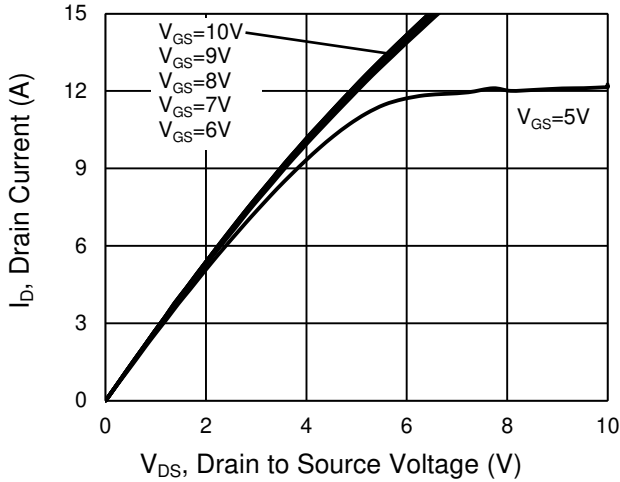
ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TSM13ND50CI C0G	ITO-220	50pcs / Tube

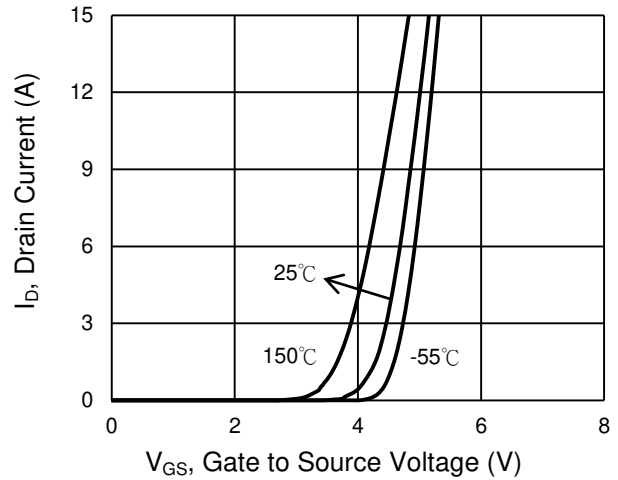
CHARACTERISTICS CURVES

($T_C = 25^\circ\text{C}$ unless otherwise noted)

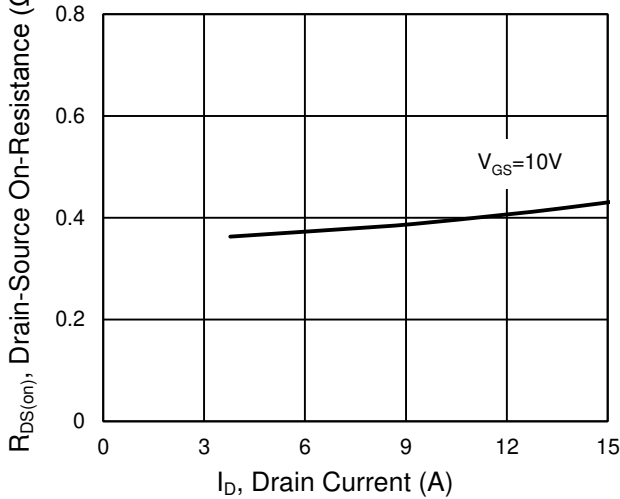
Output Characteristics



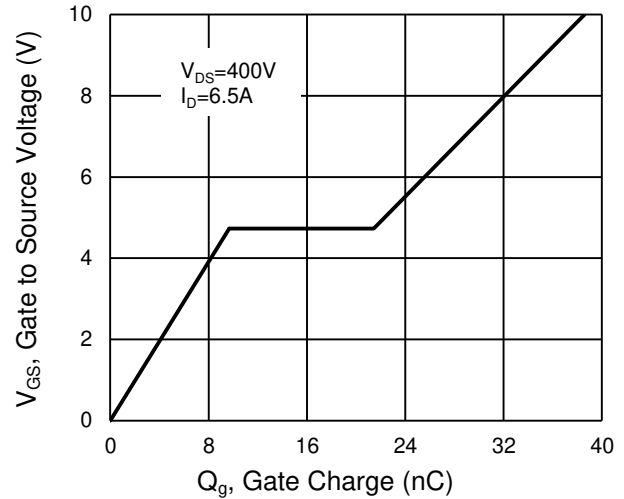
Transfer Characteristics



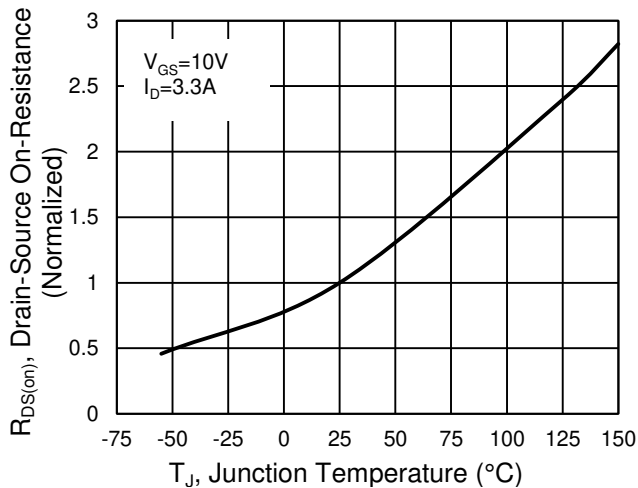
On-Resistance vs. Drain Current



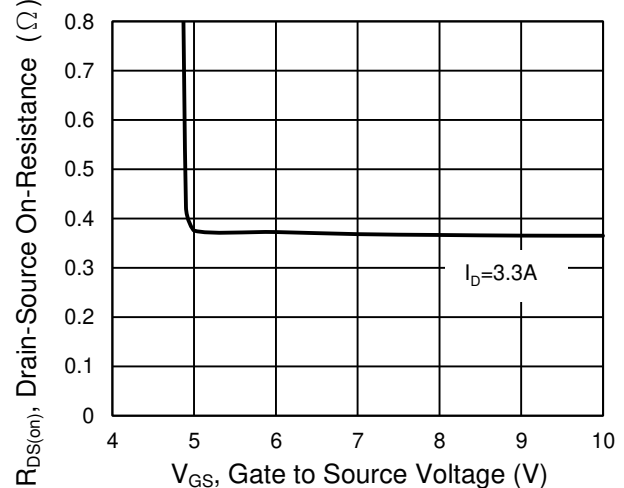
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



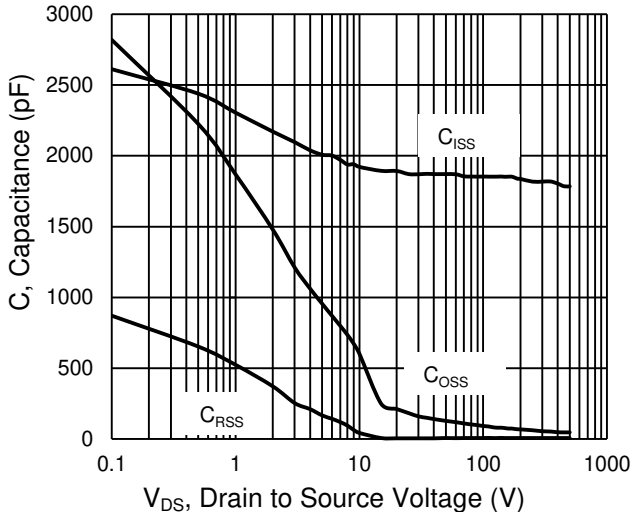
On-Resistance vs. Gate-Source Voltage



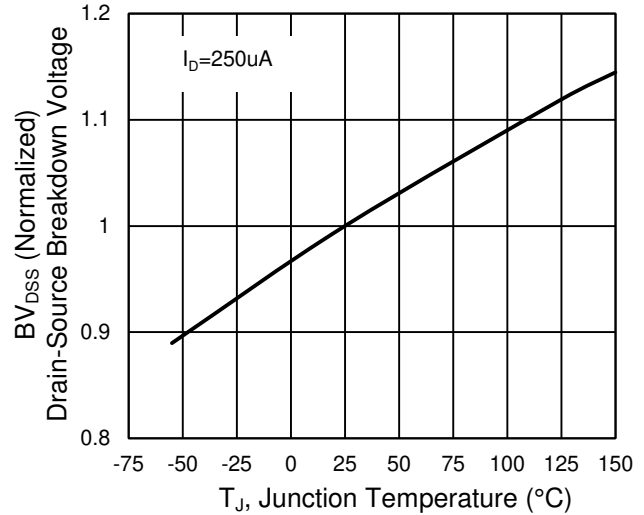
CHARACTERISTICS CURVES

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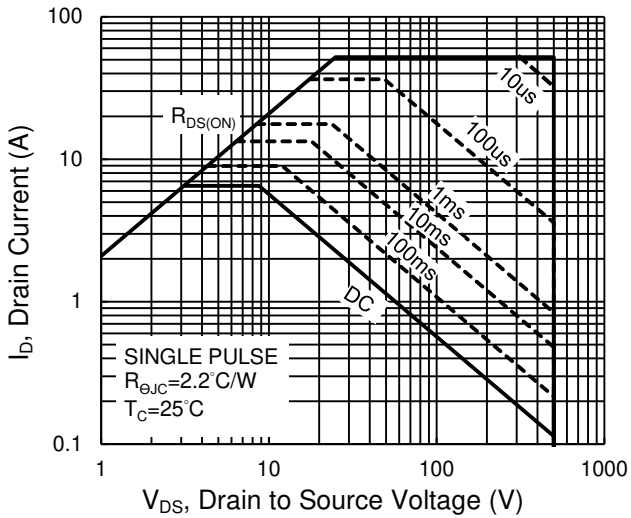
Capacitance vs. Drain-Source Voltage



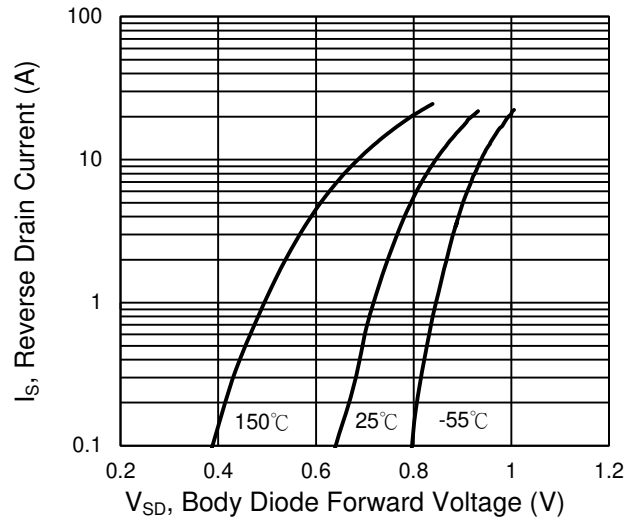
BV_{DSS} vs. Junction Temperature



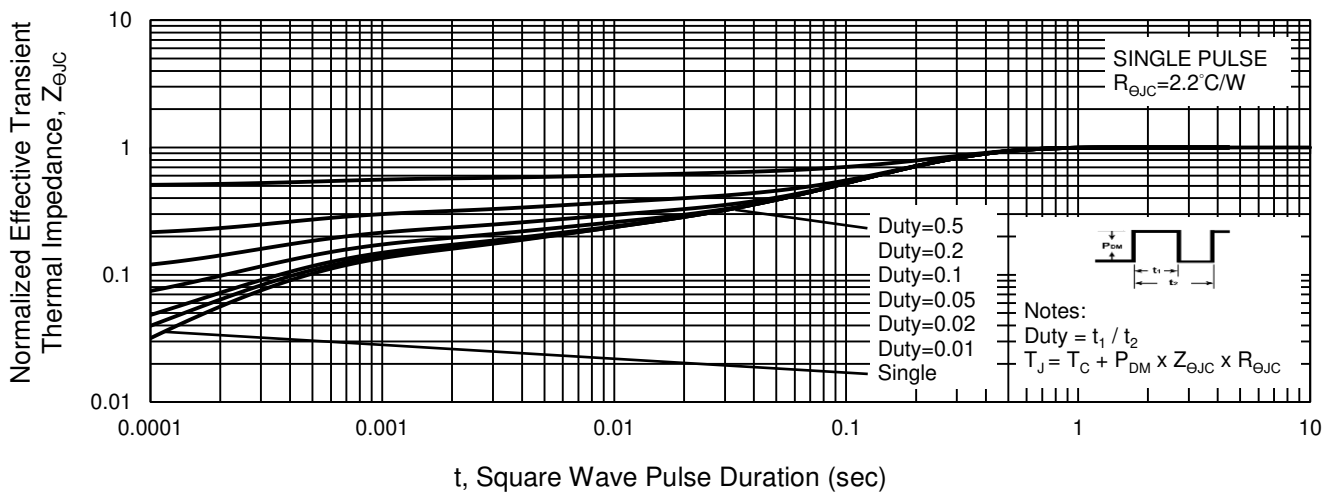
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage

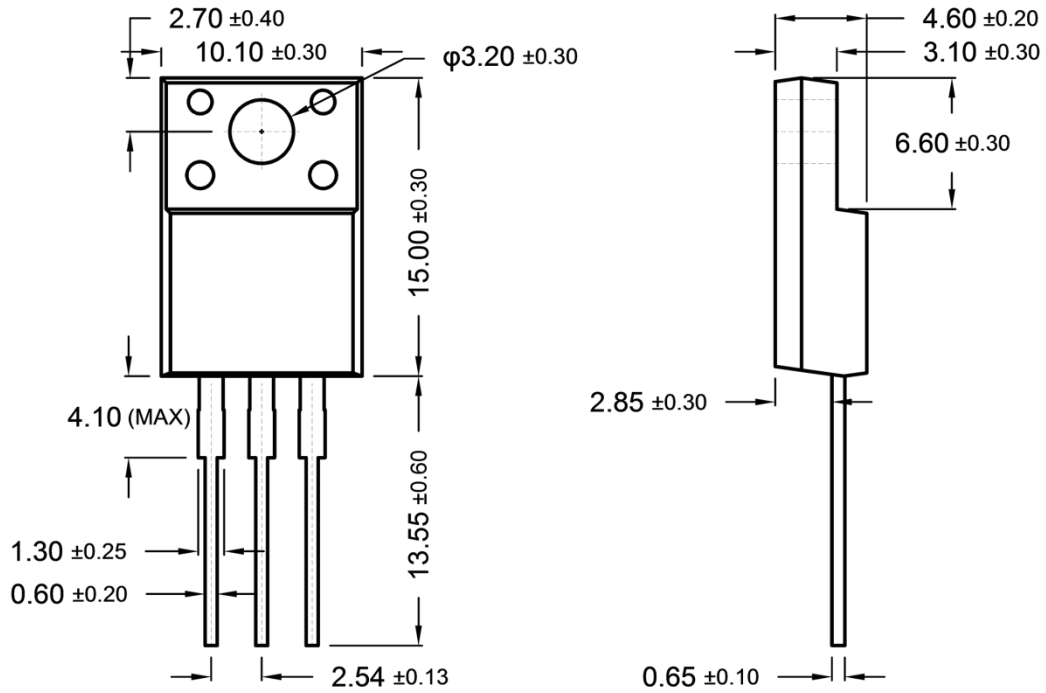


Normalized Thermal Transient Impedance, Junction-to-Case

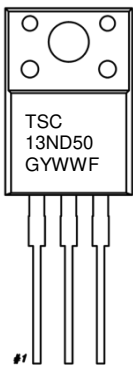


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

ITO-220



MARKING DIAGRAM



- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

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