N-Channel Power MOSFET

500V, 5A, 1.38Ω

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

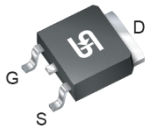
KEY PERFORMANCE PARAMETERS		
PARAMETER	**VALUE**	**UNIT**
V_{DS}	500	V
$R_{DS(on)}$ (max)	1.38	Ω
Q_g	15	nC

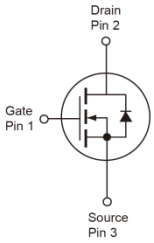
APPLICATIONS

- AC/DC LED Lighting
- Power Supply
- Charger

Pb-Free RoHS COMPLIANT HALOGEN FREE

TO-252 (DPAK)





Notes: MSL 3 (Moisture Sensitivity Level) per J-STD-020

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)	T_C = 25°C	I_D	5	A
	T_C = 100°C		2.2	
Pulsed Drain Current (Note 2)		I_{DM}	20	A
Total Power Dissipation @ T_C = 25°C		P_{DTOT}	83	W
Single Pulse Avalanche Energy (Note 3)		E_{AS}	122.5	mJ
Single Pulse Avalanche Current (Note 3)		I_{AS}	3.5	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	$R_{\Theta JC}$	1.5	°C/W
Junction to Ambient Thermal Resistance	$R_{\Theta JA}$	62	°C/W

Thermal Performance Note: $R_{\Theta JA}$ 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. $R_{\Theta JA}$ is guaranteed by design while $R_{\Theta CA}$ is determined by the user's board design. $R_{\Theta JA}$ shown below for single device operation on FR-4 PCB in still air.

ELECTRICAL SPECIFICATIONS (T_A = 25°C unless otherwise noted)						
PARAMETER	**CONDITIONS**	**SYMBOL**	**MIN**	**TYP**	**MAX**	**UNIT**
Static						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	BV_{DSS}	500	--	--	V
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	$V_{GS(TH)}$	2.5	3.3	4.5	V
Gate Body Leakage	V_{GS} = ±30V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Zero Gate Voltage Drain Current	V_{DS} = 500V, V_{GS} = 0V	I_{DSS}	--	--	1	μA
Drain-Source On-State Resistance **(Note 4)**	V_{GS} = 10V, I_D = 2.4A	$R_{DS(on)}$	--	1.2	1.38	Ω
Dynamic **(Note 5)**						
Total Gate Charge	V_{DS} = 400V, I_D = 4.8A, V_{GS} = 10V	Q_g	--	15	--	nC
Gate-Source Charge		Q_{gs}	--	4	--	
Gate-Drain Charge		Q_{gd}	--	7	--	
Input Capacitance	V_{DS} = 50V, V_{GS} = 0V, f = 1.0MHz	C_{iss}	--	586	--	pF
Output Capacitance		C_{oss}	--	45	--	
Reverse Transfer Capacitance		C_{rss}	--	1	--	
Gate Resistance	f = 1.0MHz	R_g	--	2.9	5.8	Ω
Switching **(Note 6)**						
Turn-On Delay Time	V_{DD} = 250V, R_G = 5Ω, I_D = 4.8A, V_{GS} = 10V	$t_{d(on)}$	--	8.2	--	ns
Turn-On Rise Time		t_r	--	20.4	--	
Turn-Off Delay Time		$t_{d(off)}$	--	15.4	--	
Turn-Off Fall Time		t_f	--	20	--	
Source-Drain Diode						
Forward Voltage **(Note 4)**	I_S = 4.8A, V_{GS} = 0V	V_{SD}	--	--	1.3	V
Reverse Recovery Time	I_S = 4.8A dI_F/dt = 100A/μs	t_{rr}	--	205	--	ns
Reverse Recovery Charge		Q_{rr}	--	1.5	--	μC

Notes:

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. L = 20mH, I_{AS} = 3.5A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
4. Pulse test: PW ≤ 300μs, duty cycle ≤ 2%
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

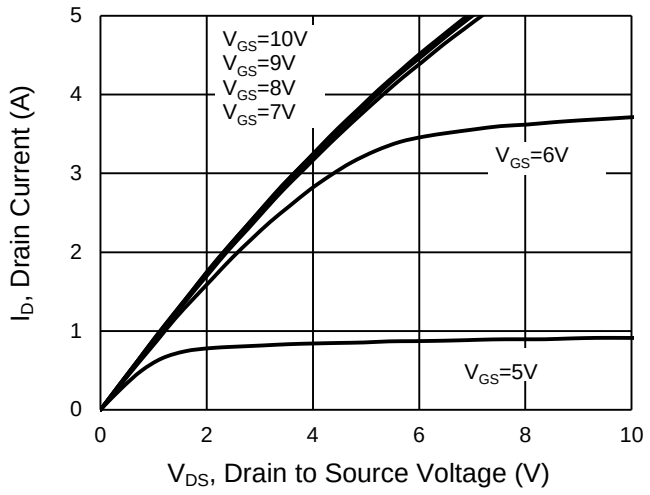
ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TSM5NC50CP ROG	TO-252 (DPAK)	2,500pcs / 13” Reel

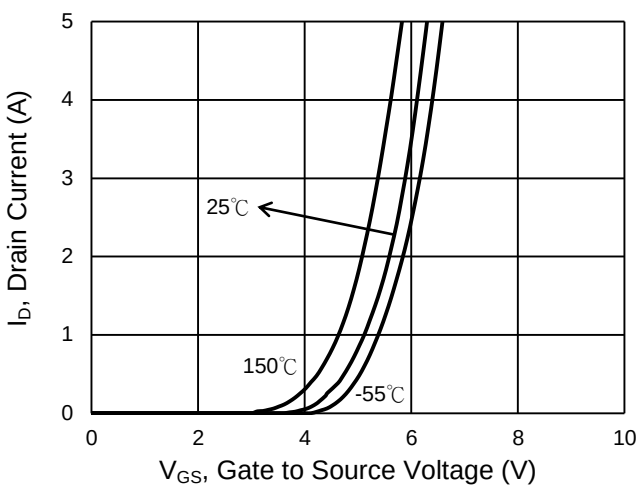
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

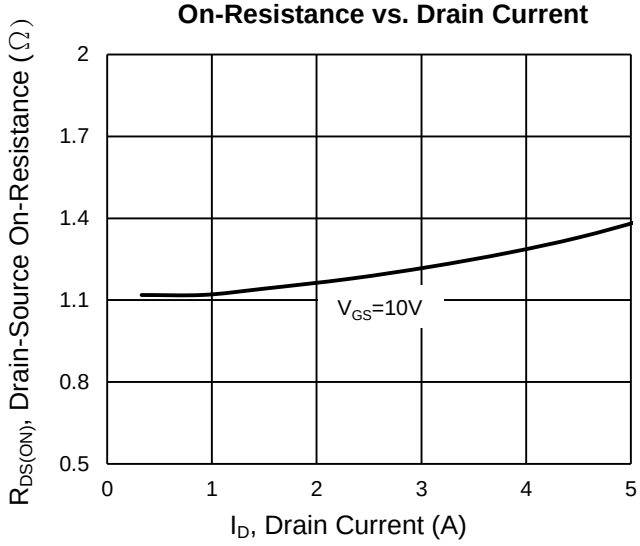
Output Characteristics



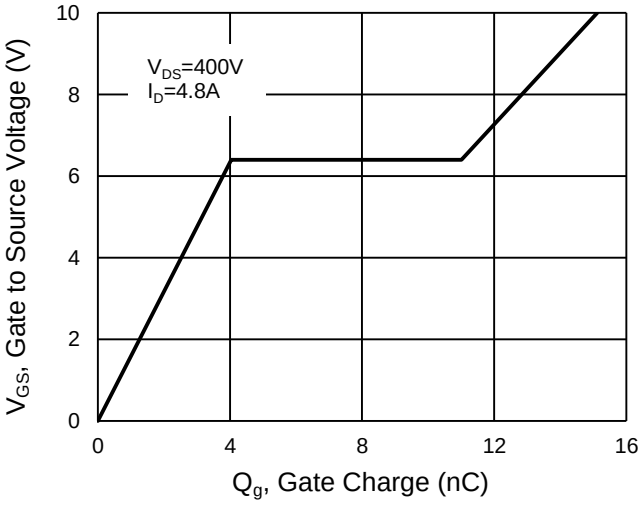
Transfer Characteristics



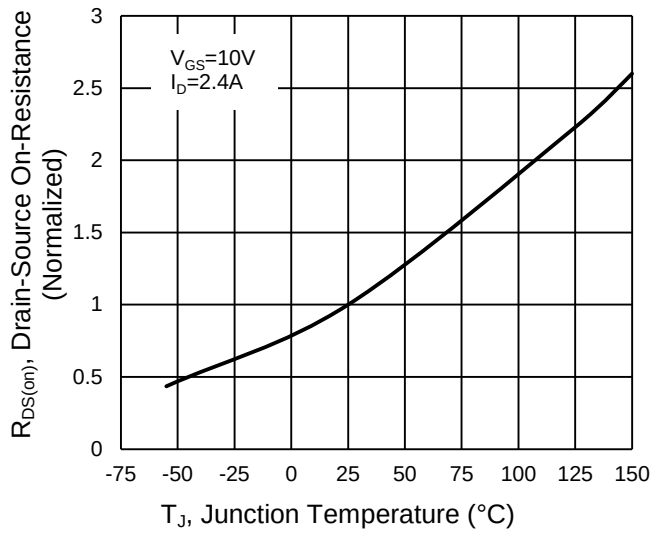
On-Resistance vs. Drain Current



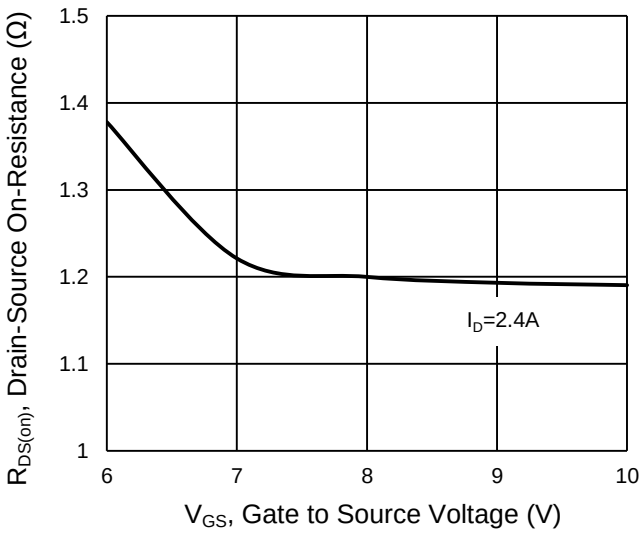
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



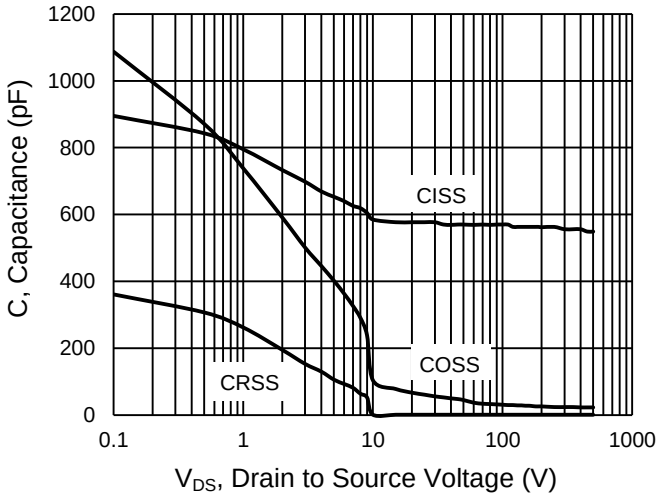
On-Resistance vs. Gate-Source Voltage



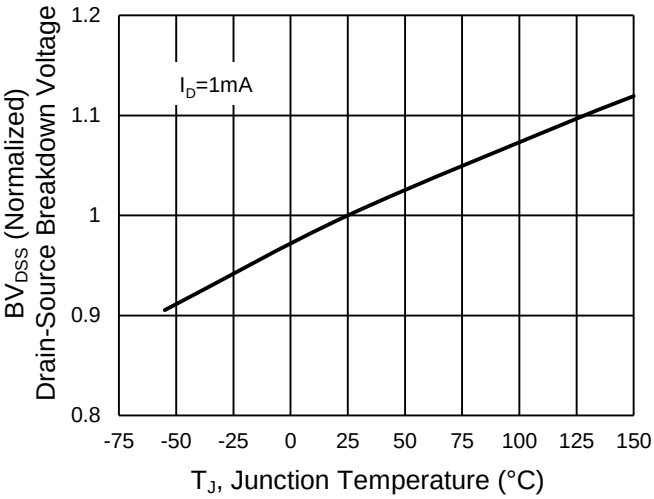
CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

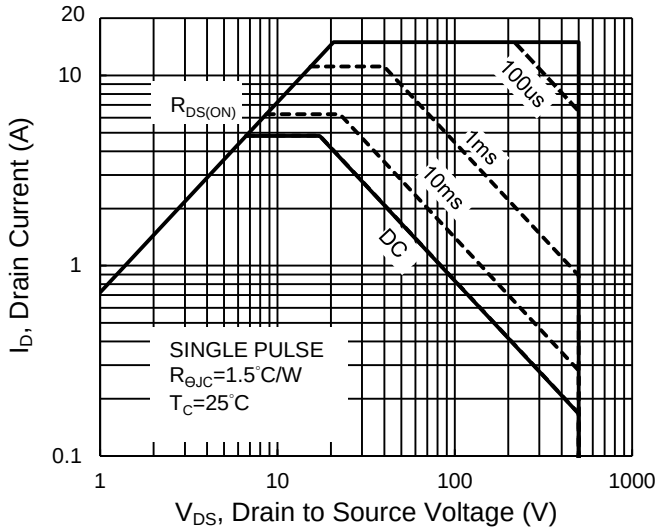
Capacitance vs. Drain-Source Voltage



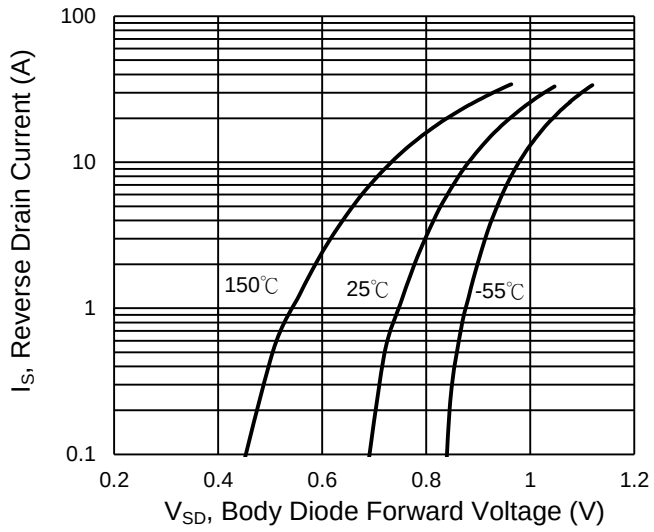
BV_{DSS} vs. Junction Temperature



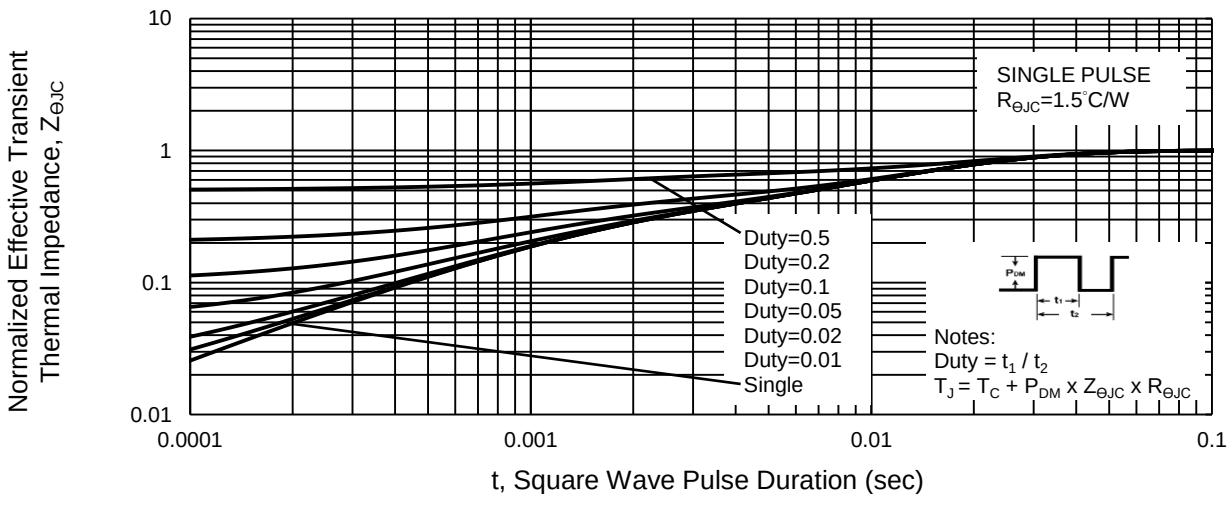
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage

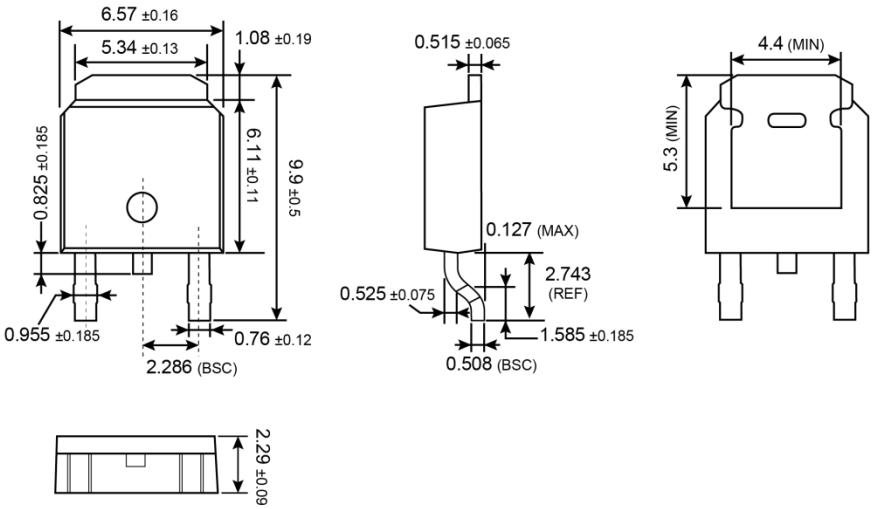


Normalized Thermal Transient Impedance, Junction-to-Case

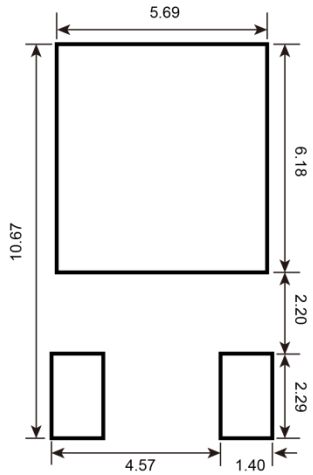


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

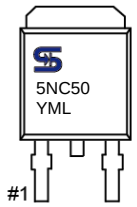
TO-252



SUGGESTED PAD LAYOUT (Unit: Millimeters)



MARKING DIAGRAM



Y = Year Code

M = Month Code

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 (1~9, A~Z)

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