

## N-Channel Power MOSFET

700V, 3.5A, 3.3Ω

### FEATURES

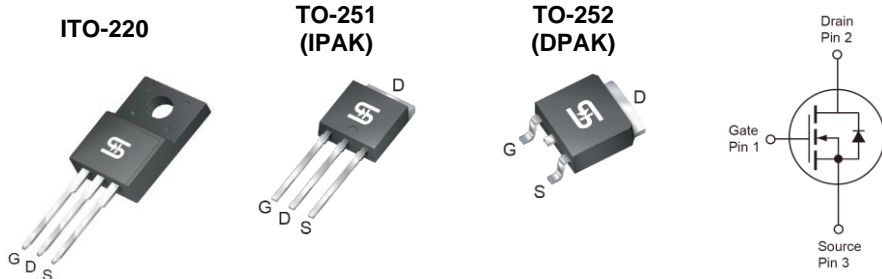
- High power and current handling capability
- Pb-free plating
- RoHS compliant
- Halogen-free mold compound

### APPLICATION

- Power Supply
- Lighting

### KEY PERFORMANCE PARAMETERS

PARAMETER	VALUE	UNIT
$V_{DS}$	700	V
$R_{DS(on)}$ (max)	3.3	Ω
$Q_g$	14	nC



**Notes:** Moisture sensitivity level: level 3. Per J-STD-020

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

PARAMETER	SYMBOL	LIMIT		UNIT
		ITO-220	IPAK/DPAK	
Drain-Source Voltage	$V_{DS}$	700		V
Gate-Source Voltage	$V_{GS}$	$\pm 30$		V
Continuous Drain Current (Note 1)	$I_D$	2	3.5	A
		1.3	1.6	
Pulsed Drain Current (Note 2)	$I_{DM}$	8	14	A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	$P_{DTOT}$	38	56	W
Single Pulsed Avalanche Energy (Note 3)	$E_{AS}$	43		mJ
Single Pulsed Avalanche Current (Note 3)	$I_{AS}$	3.5		A
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	- 55 to +150		$^\circ\text{C}$

### THERMAL PERFORMANCE

PARAMETER	SYMBOL	LIMIT		UNIT
		ITO-220	IPAK/DPAK	
Junction to Case Thermal Resistance	$R_{\theta JC}$	3.6	2.2	$^\circ\text{C/W}$
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	62	50	$^\circ\text{C/W}$

**Notes:**  $R_{\theta JA}$  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** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static <sup>(Note 4)</sup>						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	BV <sub>DSS</sub>	700	--	--	V
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	V <sub>GS(TH)</sub>	2	--	4	V
Gate Body Leakage	V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	±100	nA
Zero Gate Voltage Drain Current	V <sub>DS</sub> = 700V, V <sub>GS</sub> = 0V	I <sub>DSS</sub>	--	--	25	μA
Drain-Source On-State Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 2A	R <sub>DS(on)</sub>	--	2.5	3.3	Ω
Dynamic <sup>(Note 5)</sup>						
Total Gate Charge	V <sub>DS</sub> = 480V, I <sub>D</sub> = 4A, V <sub>GS</sub> = 10V	Q <sub>g</sub>	--	14	--	nC
Gate-Source Charge		Q <sub>gs</sub>	--	3	--	
Gate-Drain Charge		Q <sub>gd</sub>	--	6	--	
Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	C <sub>iss</sub>	--	595	--	pF
Output Capacitance		C <sub>oss</sub>	--	80	--	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	20	--	
Switching <sup>(Note 6)</sup>						
Turn-On Delay Time	V <sub>DD</sub> = 300V, R <sub>GEN</sub> = 25Ω, I <sub>D</sub> = 4A, V <sub>GS</sub> = 10V,	t <sub>d(on)</sub>	--	18	--	ns
Turn-On Rise Time		t <sub>r</sub>	--	17	--	
Turn-Off Delay Time		t <sub>d(off)</sub>	--	40.5	--	
Turn-Off Fall Time		t <sub>f</sub>	--	19	--	
Source-Drain Diode <sup>(Note 4)</sup>						
Forward On Voltage	I <sub>S</sub> = 2.5A, V <sub>GS</sub> = 0V	V <sub>SD</sub>	--	--	1.5	V

**Notes:**

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3.  $L = 7mH, I_{AS} = 3.5A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse test:  $PW \leq 300\mu s$ , duty cycle  $\leq 2\%$
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

**ORDERING INFORMATION**

<b>PART NO.</b>	<b>PACKAGE</b>	<b>PACKING</b>
TSM4N70CI C0G	ITO-220	50pcs / Tube
TSM4N70CH C5G	TO-251 (IPAK)	75pcs / Tube
TSM4N70CP ROG	TO-252 (DPAK)	2,500pcs / 13" Reel

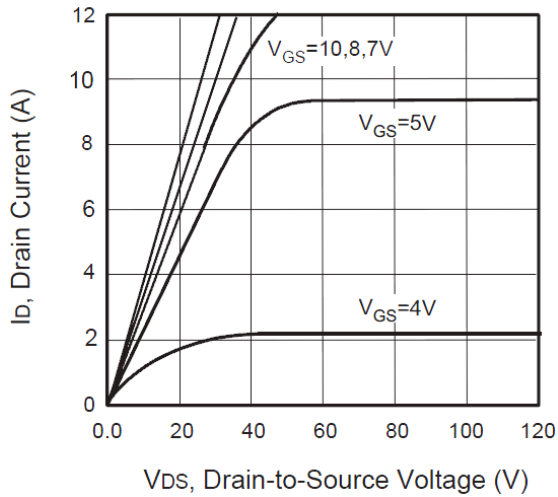
**Note:**

1. Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
2. Halogen-free according to IEC 61249-2-21 definition

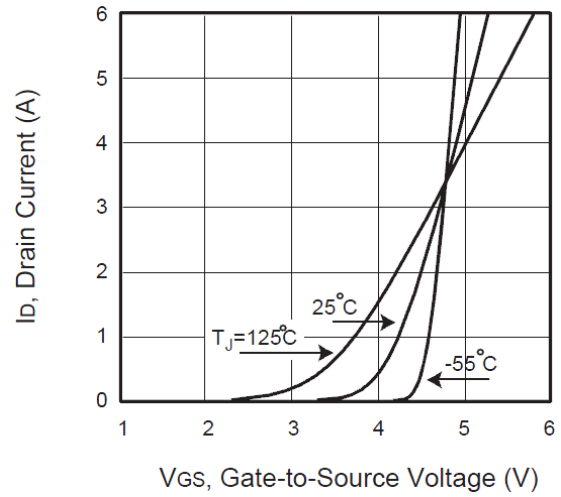
## CHARACTERISTICS CURVES

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

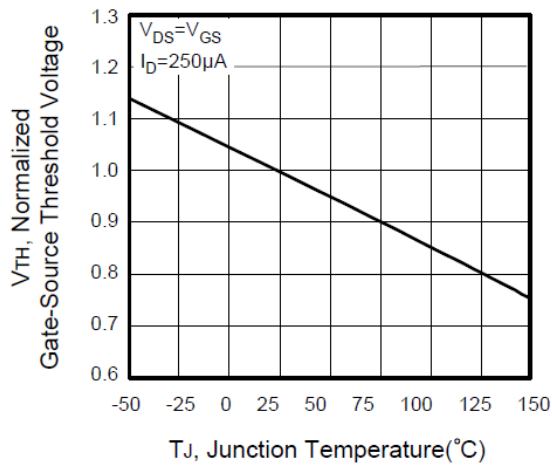
**Output Characteristics**



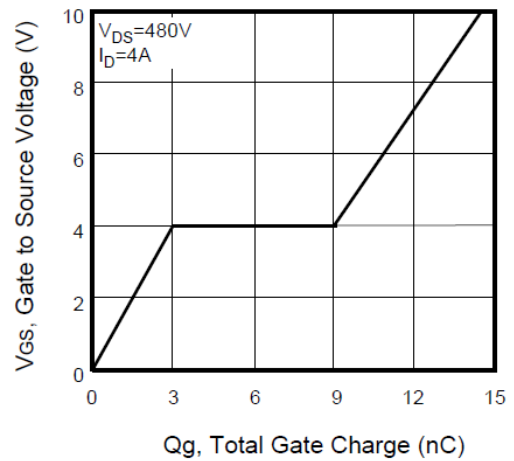
**Transfer Characteristics**



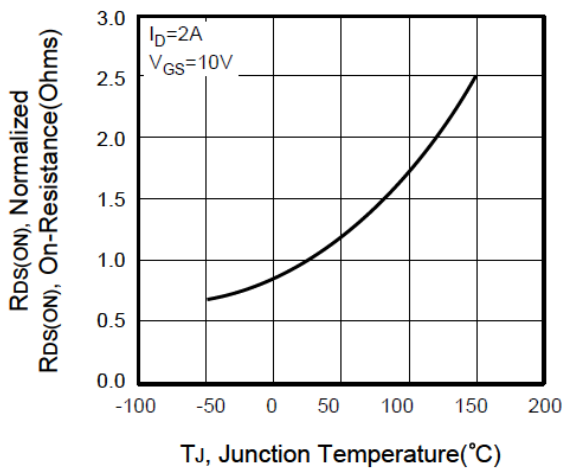
**Normalized  $V_{th}$  vs. Junction Temperature**



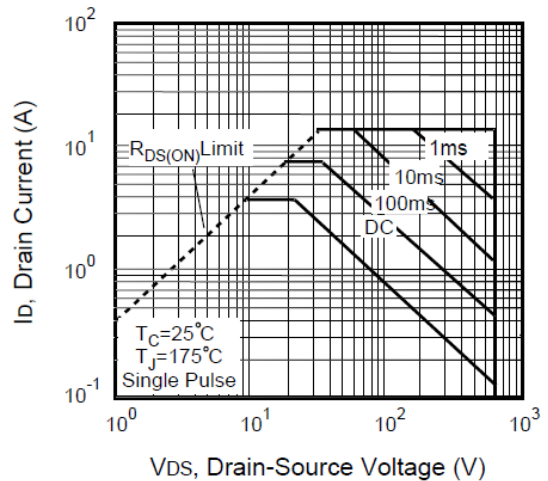
**Gate Charge**



**On-Resistance Variation vs. Temperature**



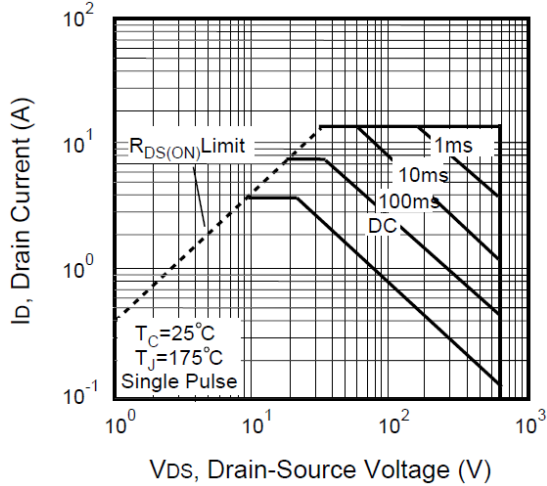
**Maximum Safe Operating Area (ITO-220)**



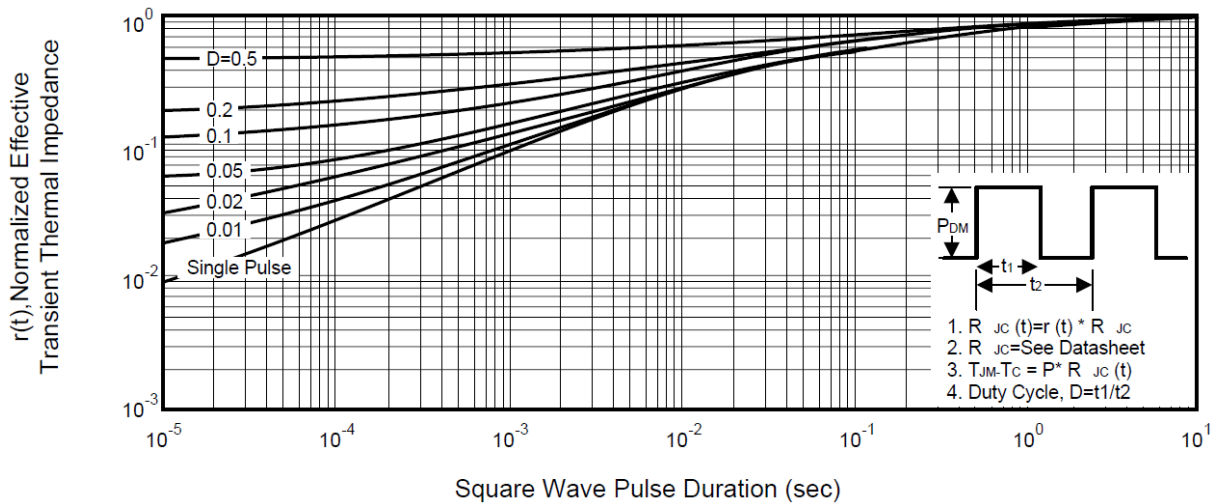
## CHARACTERISTICS CURVES

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

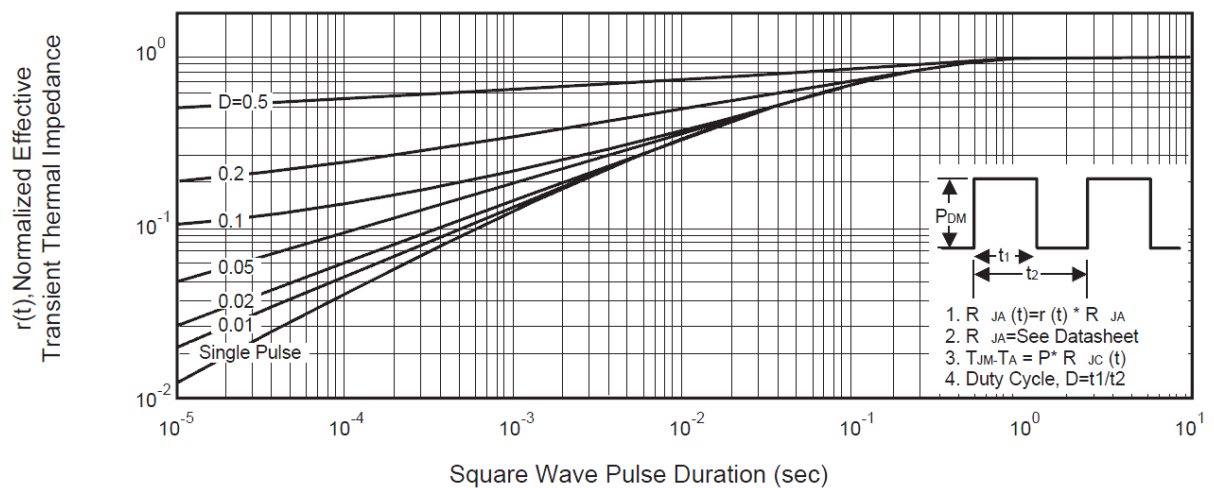
**Maximum Safe Operating Area (DPAK,IPAK)**



**Normalized Thermal Transient Impedance Curve (ITO-220)**

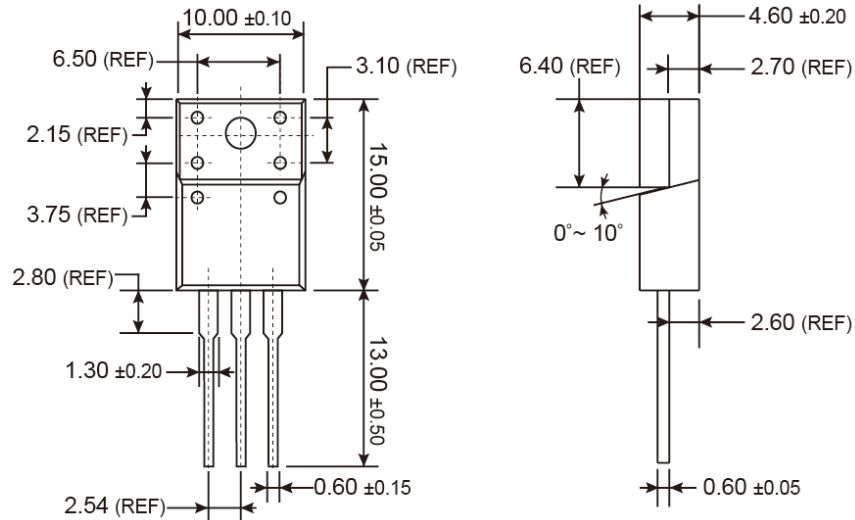


**Normalized Thermal Transient Impedance Curve (DPAK,IPAK)**

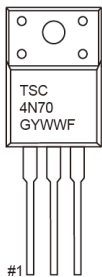


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**ITO-220**



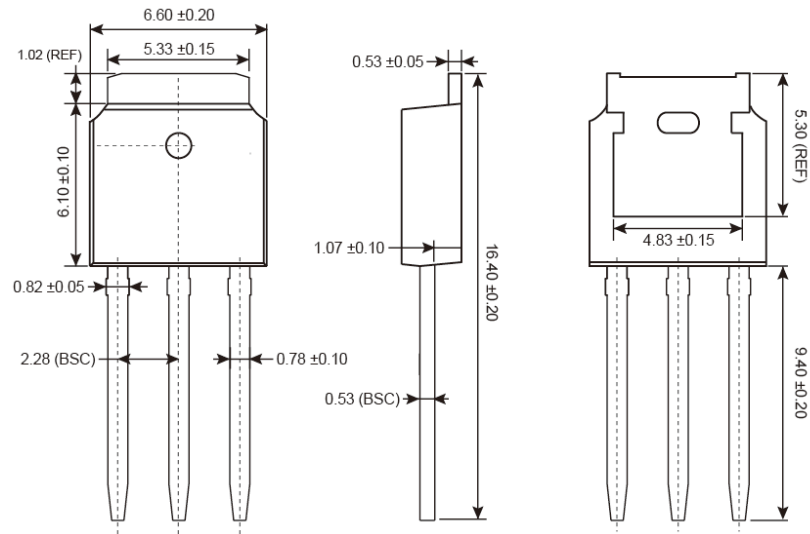
**MARKING DIAGRAM**



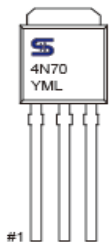
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**TO-251 (IPAK)**



**MARKING DIAGRAM**



**Y** = Year Code

**M** = Month Code for Halogen Free Product

**O** =Jan **P** =Feb **Q** =Mar **R** =Apr

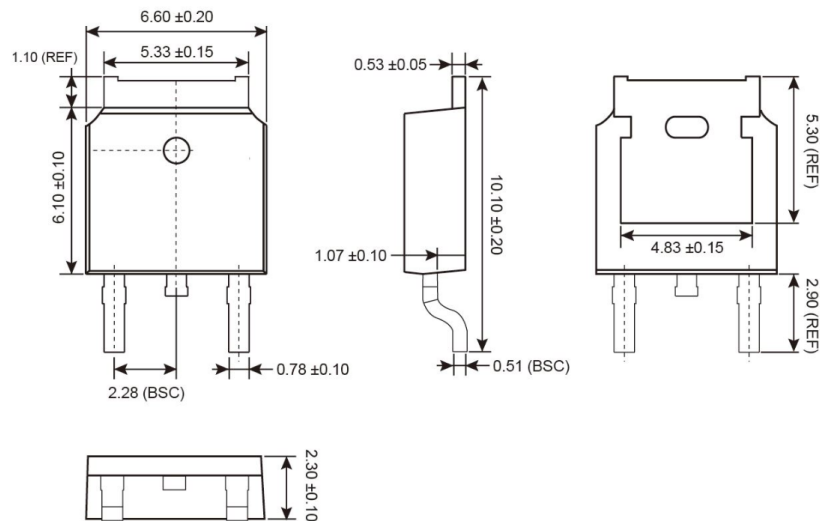
**S** =May **T** =Jun **U** =Jul **V** =Aug

**W** =Sep **X** =Oct **Y** =Nov **Z** =Dec

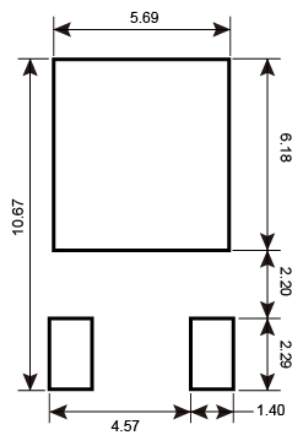
**L** = Lot Code (1~9, A~Z)

**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

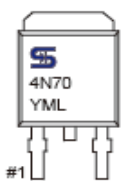
**TO-252 (DPAK)**



**SUGGESTED PAD LAYOUT** (Unit: Millimeters)



**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

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