

N-Channel Power MOSFET

FEATURES

- Super-Junction technology
- High performance good FOM
- High ruggedness performance
- 100% UIS & R_g tested
- High commutation performance
- ROHS Compliant
- Halogen-free

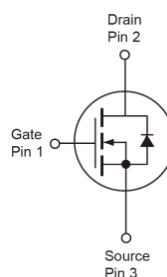
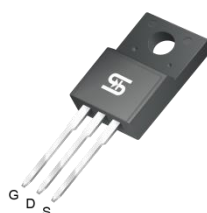
APPLICATIONS

- Power Supply
- AC/DC LED Lighting

KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
V _{DS} @ T _{j,max}	650	V
R _{DS(on)} (max)	196	mΩ
Q _{g,typ}	38	nC



ITO-220



ABSOLUTE MAXIMUM RATINGS (T _A = 25°C unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V _{DS}	600	V
Gate-Source Voltage	static	V _{GS}	±20	V
	AC(f>1Hz)		±30	
Continuous Drain Current (Note 1)	T _C = 25°C	I _D	20	A
	T _C = 100°C		12	A
Pulsed Drain Current (Note 2)		I _{DM}	60	A
Total Power Dissipation @ T _C = 25°C		P _D	70	W
Single Pulse Avalanche Energy (Note 3)		E _{AS}	450	mJ
Single Pulse Avalanche Current (Note 3)		I _{AS}	4.2	A
Operating Junction and Storage Temperature Range		T _J , T _{STG}	- 55 to +150	°C

THERMAL PERFORMANCE			
PARAMETER	SYMBOL	MAXIMUM	UNIT
Junction to Case Thermal Resistance	R _{θJC}	1.8	°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. R_{θJA} is guaranteed by design while R_{θJA} is determined by the user's board design.

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 = 1mA	BV _{DSS}	600	--	--	V
Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 1mA	V _{GS(TH)}	3	4.3	5	V
Gate Body Leakage	V _{GS} = ±20V, V _{DS} = 0V	I _{GSS}	--	--	±100	nA
Zero Gate Voltage Drain Current	V _{DS} = 600V, V _{GS} = 0V	I _{DSS}	--	--	100	μA
Drain-Source On-State Resistance (Note 4)	V _{GS} = 10V, I _D = 9.5A	R _{DS(on)}	--	170	196	mΩ
Dynamic (Note 5)						
Total Gate Charge	V _{DS} = 300V, I _D = 20A, V _{GS} = 10V	Q _g	--	39	--	nC
Gate-Source Charge		Q _{gs}	--	12	--	
Gate-Drain Charge		Q _{gd}	--	18	--	
Input Capacitance	V _{DS} = 300V, V _{GS} = 0V, f = 1.0MHz	C _{iss}	--	1535	--	pF
Output Capacitance		C _{oss}	--	47	--	
Reverse Transfer Capacitance		C _{rss}	--	10	--	
Gate Resistance	f = 1.0MHz	R _g	--	1.9	3.8	Ω
Switching (Note 6)						
Turn-On Delay Time	V _{DD} = 300V, R _G = 10Ω, I _D = 10A, V _{GS} = 10V,	t _{d(on)}	--	31	--	ns
Turn-On Rise Time		t _r	--	31	--	
Turn-Off Delay Time		t _{d(off)}	--	56	--	
Turn-Off Fall Time		t _f	--	12	--	
Source-Drain Diode						
Body-Diode Continuous Forward Current		I _S	--	--	20	A
Body-Diode Pulsed Current		I _{SM}	--	--	60	A
Forward Voltage (Note 4)	I _S = 20A, V _{GS} = 0V	V _{SD}	--	--	1.5	V
Reverse Recovery Time	I _S = 20A	t _{rr}	--	411	--	ns
Reverse Recovery Charge	di _F /dt = 100A/μs	Q _{rr}	--	8.13	--	μC

Notes:

- Current limited by package.
- Pulse width limited by the maximum junction temperature.
- $L = 50mH, I_{AS} = 4.2A, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
- Pulse test: $PW \leq 300\mu s$, duty cycle $\leq 2\%$.
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

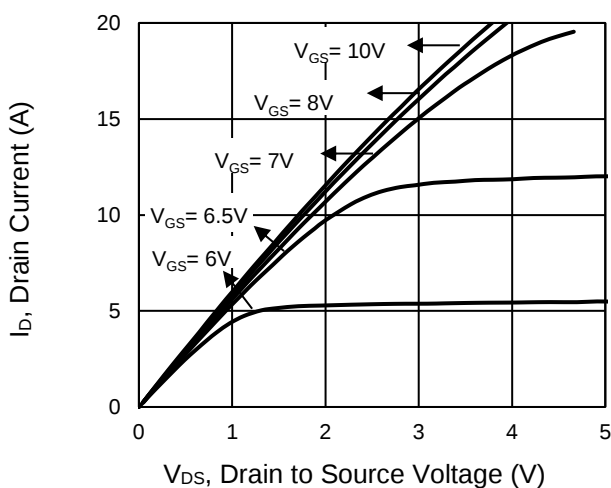
ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
TSM60NC196CI C0G	ITO-220	50pcs / Tube

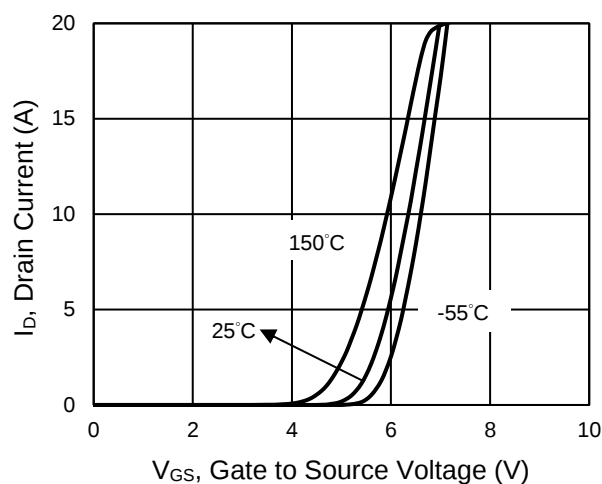
CHARACTERISTICS CURVES

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

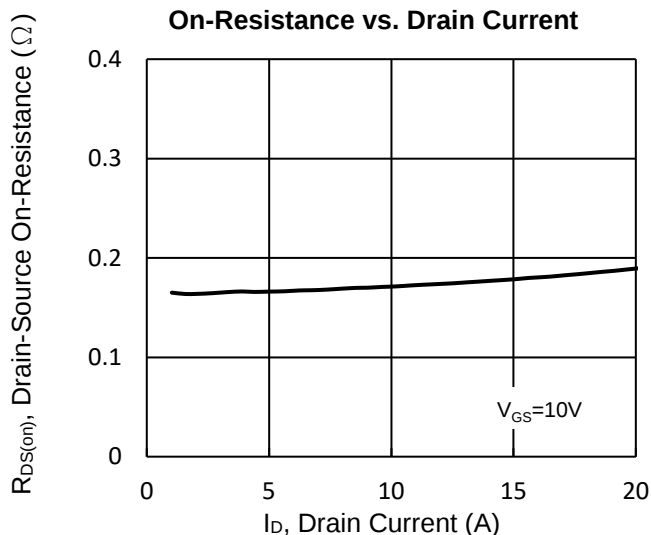
Output Characteristics



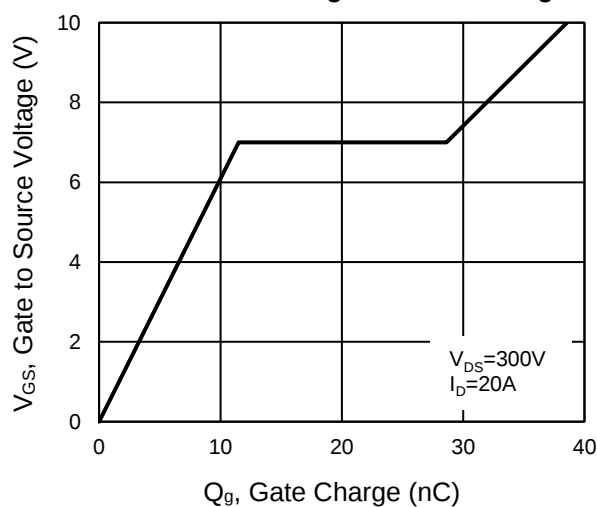
Transfer Characteristics



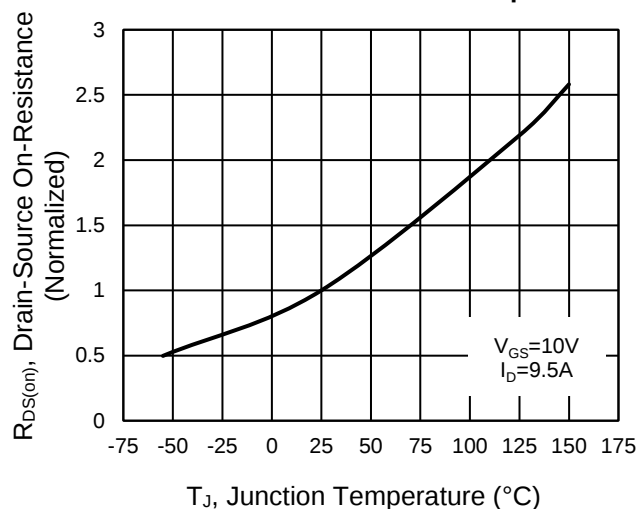
On-Resistance vs. Drain Current



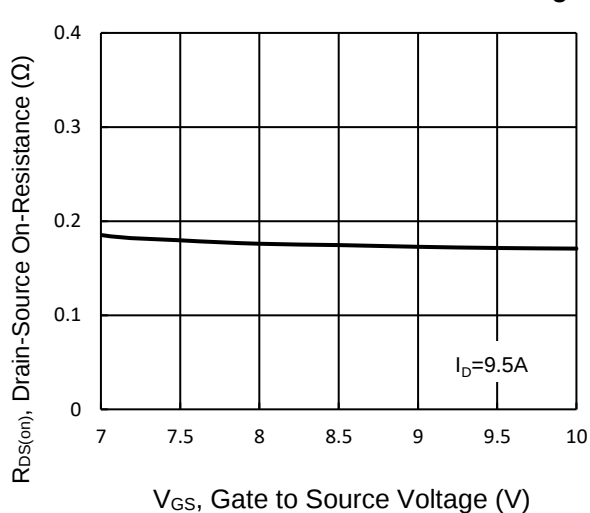
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



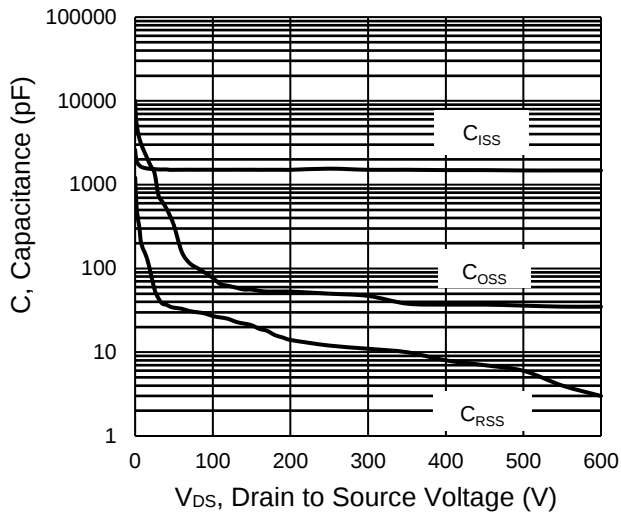
On-Resistance vs. Gate-Source Voltage



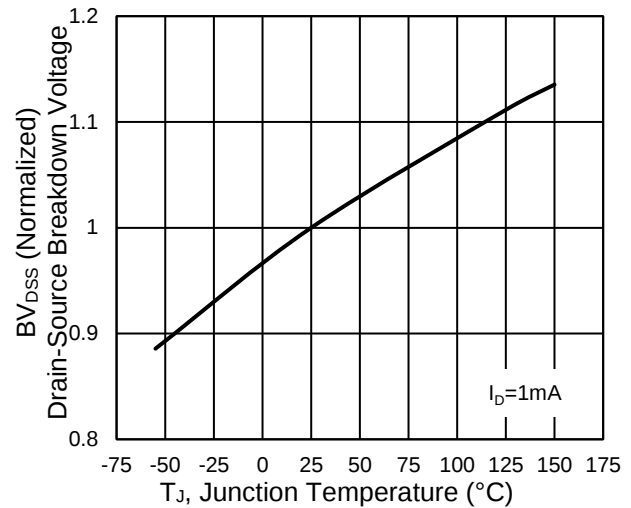
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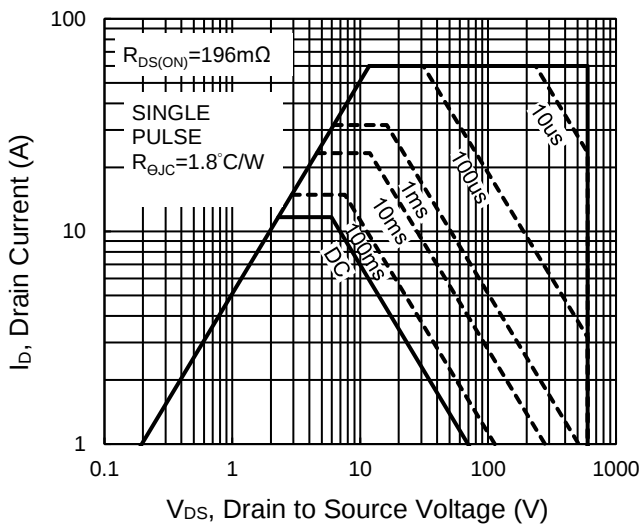
Capacitance vs. Drain-Source Voltage



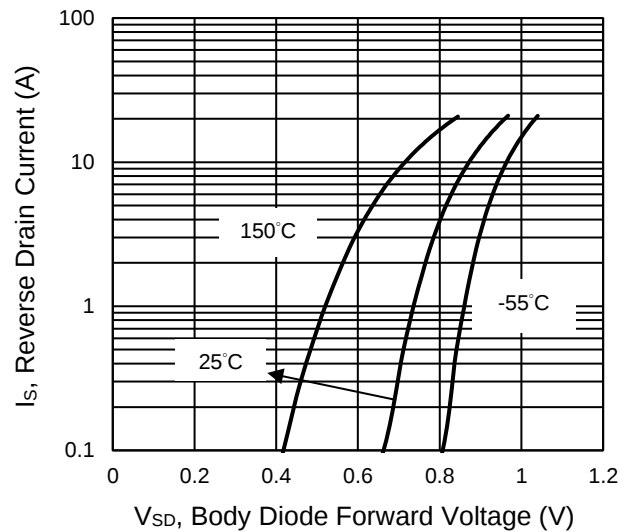
BV_{DSS} vs. Junction Temperature



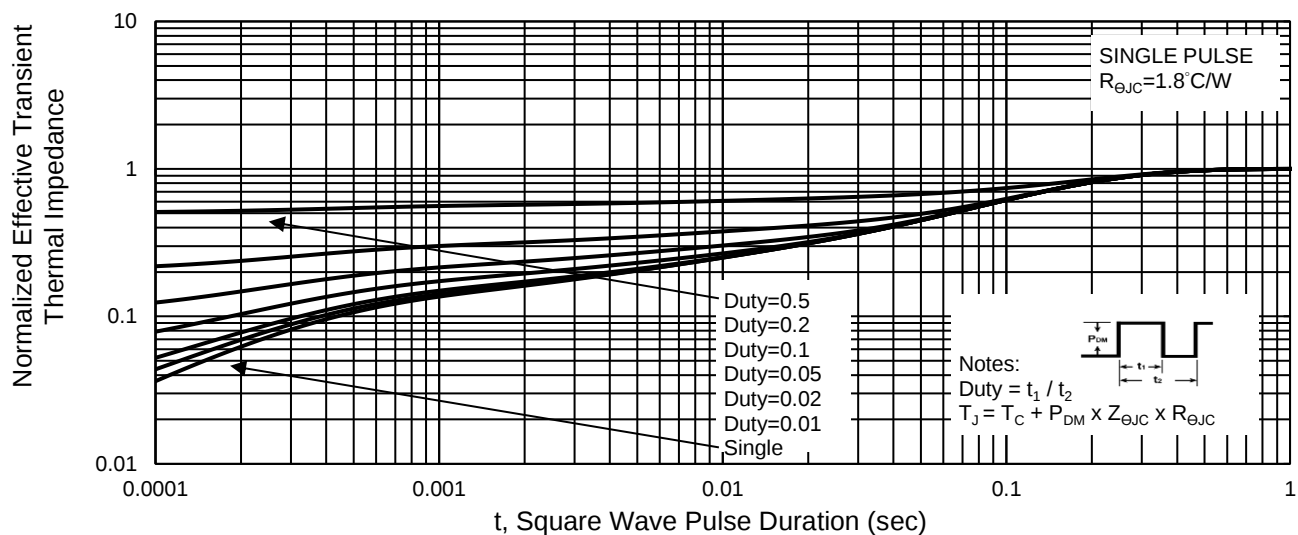
Maximum Safe Operating Area, Junction-to-Case



Source-Drain Diode Forward Current vs. Voltage

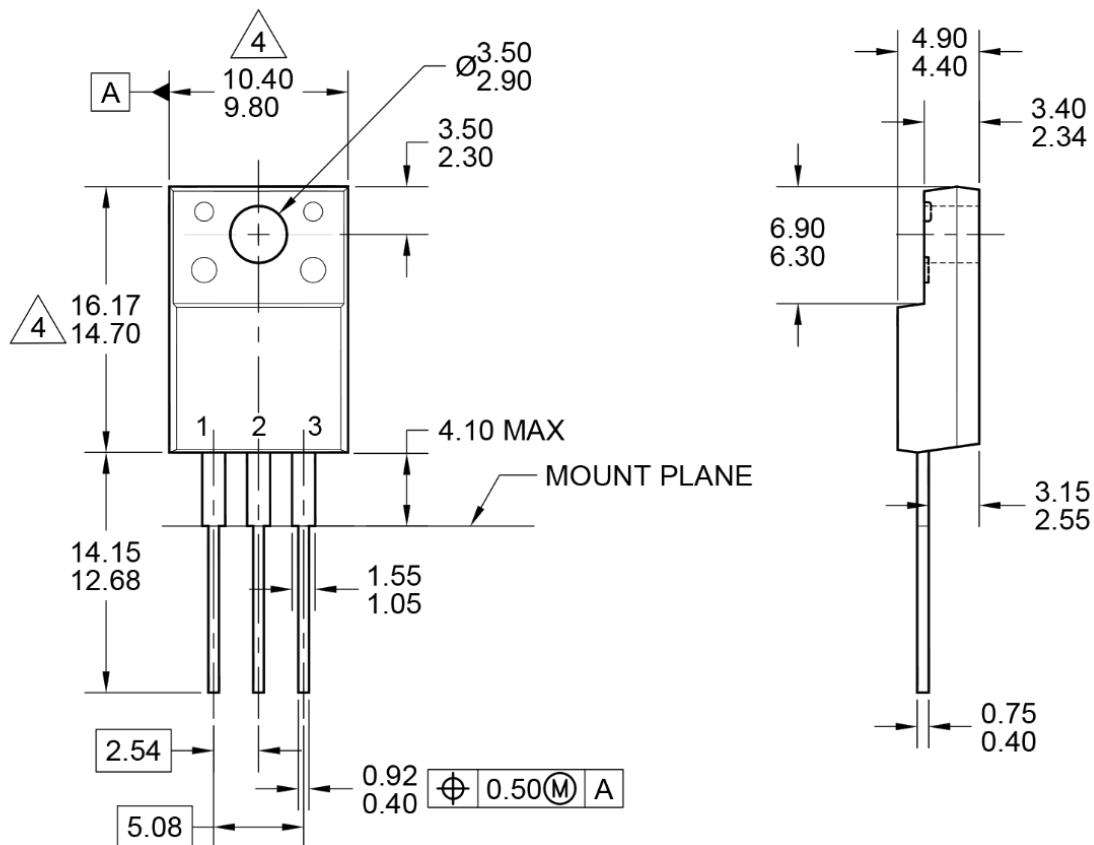


Normalized Thermal Transient Impedance, Junction-to-Case



PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

ITO-220

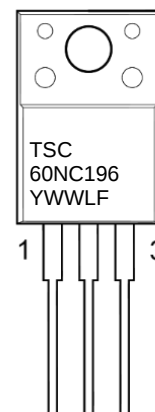


NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. PACKAGE OUTLINE REFERENCE: EIAJ ED-7500A-1, SC-91.

4 MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREME OF THE PLASTIC BODY.

5. DWG NO. REF: HQ2SD07-ITO220-072 REV B.



MARKING DIAGRAM

60NC196 = Device marking
Y = Year Code
WW = Week Code (01~52)
L = Lot Code (1~9,A~Z)
F = Factory Code

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