

N-Channel Power MOSFET

600V, 18A, 0.19Ω

FEATURES

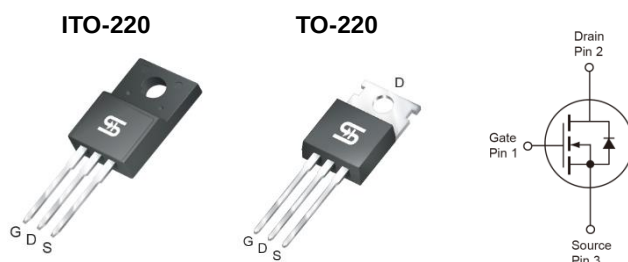
- Super-Junction technology
- High performance, small $R_{DS(on)} \cdot Q_g$ figure of merit (FOM)
- High ruggedness performance
- 100% UIS tested
- High commutation performance
- Pb-free plating
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

KEY PERFORMANCE PARAMETERS

PARAMETER	VALUE	UNIT
V_{DS}	600	V
$R_{DS(on)}$ (max)	0.19	Ω
Q_g	31	nC

APPLICATIONS

- Power Supply
- AC/DC LED Lighting



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

PARAMETER	SYMBOL	ITO-220	TO-220	UNIT
Drain-Source Voltage	V_{DS}	600		V
Gate-Source Voltage	V_{GS}	±30		V
Continuous Drain Current (Note 1)	I_D	18		A
		10.8		A
Pulsed Drain Current (Note 2)	I_{DM}	54		A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_{DTOT}	33.8	150.6	W
Single Pulsed Avalanche Energy (Note 3)	E_{AS}	212.9		mJ
Single Pulsed Avalanche Current (Note 3)	I_{AS}	2.6		A
Operating Junction and Storage Temperature Range	T_J, T_{STG}	- 55 to +150		°C

THERMAL PERFORMANCE

PARAMETER	SYMBOL	ITO-220	TO-220	UNIT
Junction to Case Thermal Resistance	$R_{\theta JC}$	3.7	0.83	°C/W
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	62		°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 with minimum recommended footprint in still air.

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	BV_{DSS}	600	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2.0	3.0	4.0	V
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = 600V, V_{GS} = 0V$	I_{DSS}	--	--	1	μA
Drain-Source On-State Resistance (Note 4)	$V_{GS} = 10V, I_D = 6A$	$R_{DS(on)}$	--	0.17	0.19	Ω
Dynamic (Note 5)						
Total Gate Charge	$V_{DS} = 380V, I_D = 18A,$ $V_{GS} = 10V$	Q_g	--	31	--	nC
Gate-Source Charge		Q_{gs}	--	8	--	
Gate-Drain Charge		Q_{gd}	--	12.6	--	
Input Capacitance	$V_{DS} = 100V, V_{GS} = 0V,$ $f = 1.0MHz$	C_{iss}	--	1273	--	pF
Output Capacitance		C_{oss}	--	92	--	
Gate Resistance	$F = 1MHz, \text{open drain}$	R_g	--	3.1	--	Ω
Switching (Note 6)						
Turn-On Delay Time	$V_{DD} = 380V,$ $R_{GEN} = 25\Omega,$ $I_D = 18A, V_{GS} = 10V,$	$t_{d(on)}$	--	36	--	ns
Turn-On Rise Time		t_r	--	21	--	
Turn-Off Delay Time		$t_{d(off)}$	--	95	--	
Turn-Off Fall Time		t_f	--	21	--	
Source-Drain Diode						
Forward On Voltage (Note 4)	$I_S = 18A, V_{GS} = 0V$	V_{SD}	--	--	1.4	V
Reverse Recovery Time	$V_R = 100V, I_S = 18A$ $dI_F/dt = 100A/\mu s$	t_{rr}	--	359.4	--	ns
Reverse Recovery Charge		Q_{rr}	--	4.54	--	μC

Notes:

- Current limited by package.
- Pulse width limited by the maximum junction temperature.
- $L = 63mH, I_{AS} = 2.6A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
- Pulse test: $PW \leq 300\mu s, \text{duty cycle} \leq 2\%$.
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

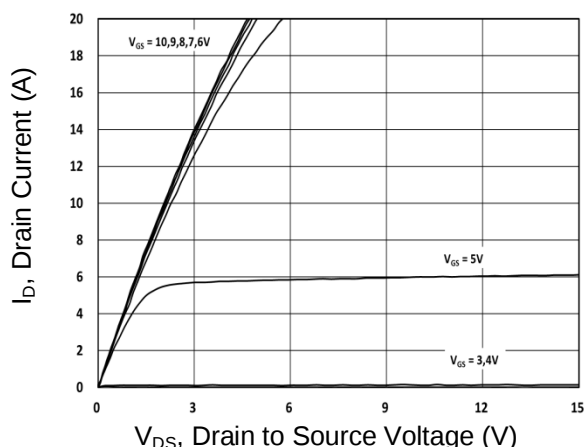
ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TSM60NB190CI C0G	ITO-220	50pcs / Tube
TSM60NB190CZ C0G	TO-220	50pcs / Tube

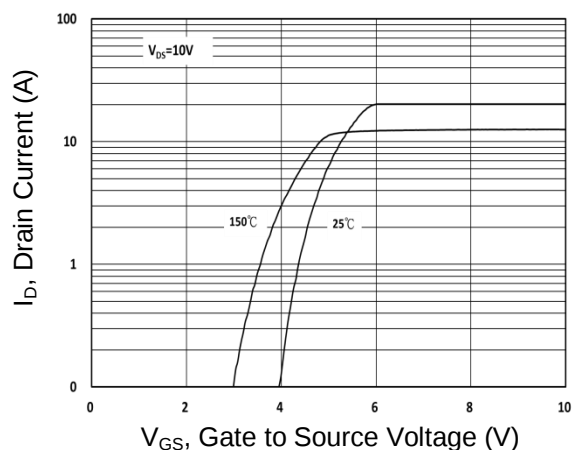
CHARACTERISTICS CURVES

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

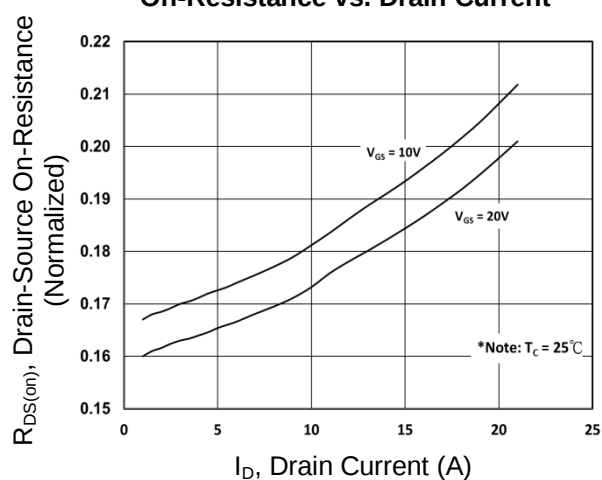
Output Characteristics



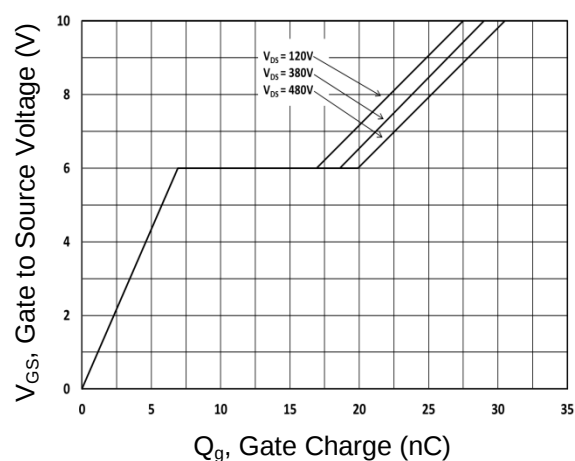
Transfer Characteristics



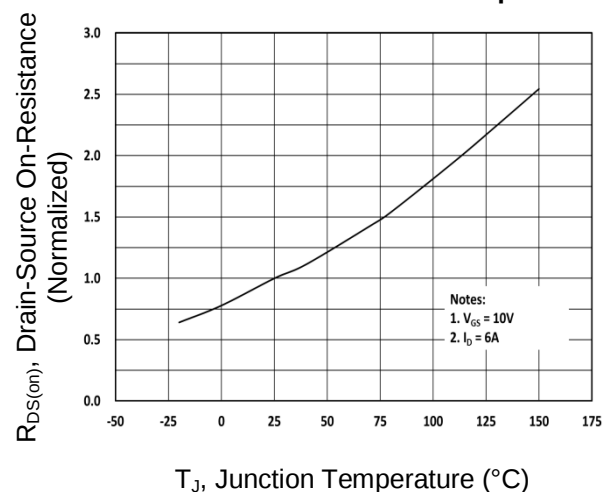
On-Resistance vs. Drain Current



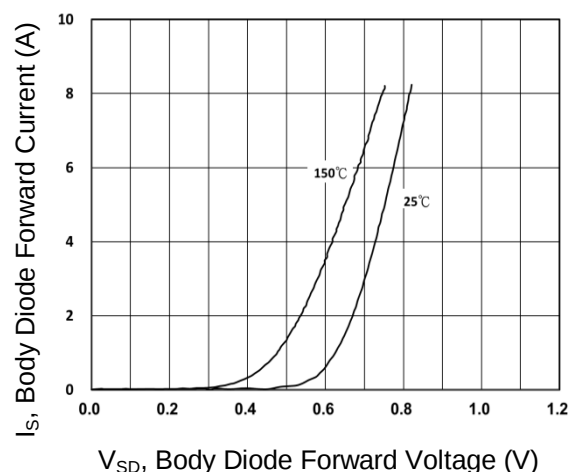
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



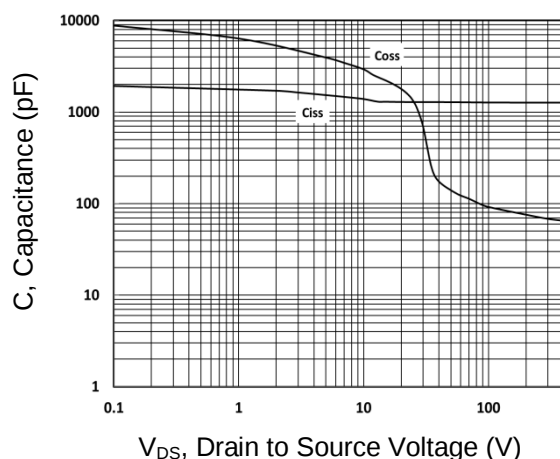
Source-Drain Diode Forward Current vs. Voltage



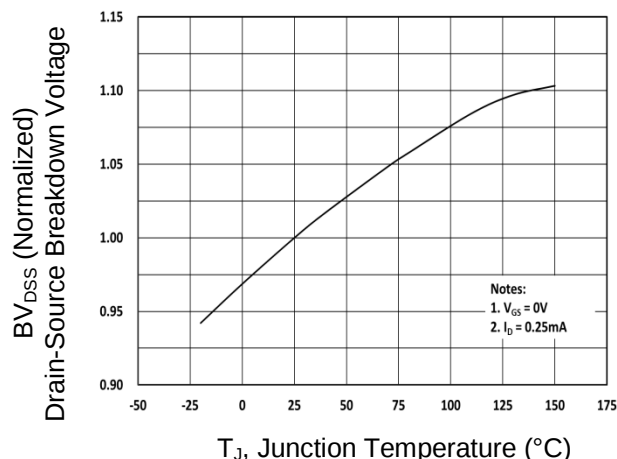
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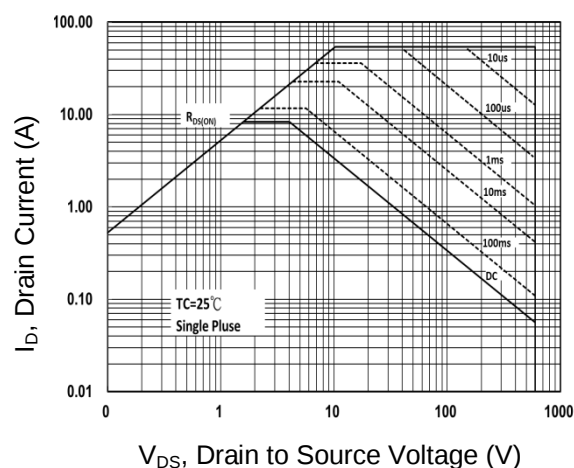
Capacitance vs. Drain-Source Voltage



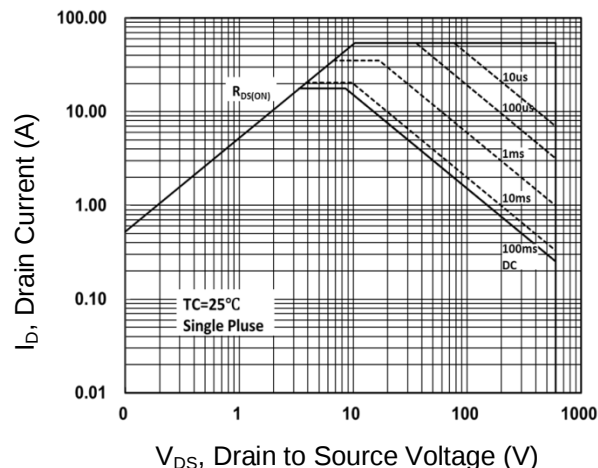
BV_{DSS} vs. Junction Temperature



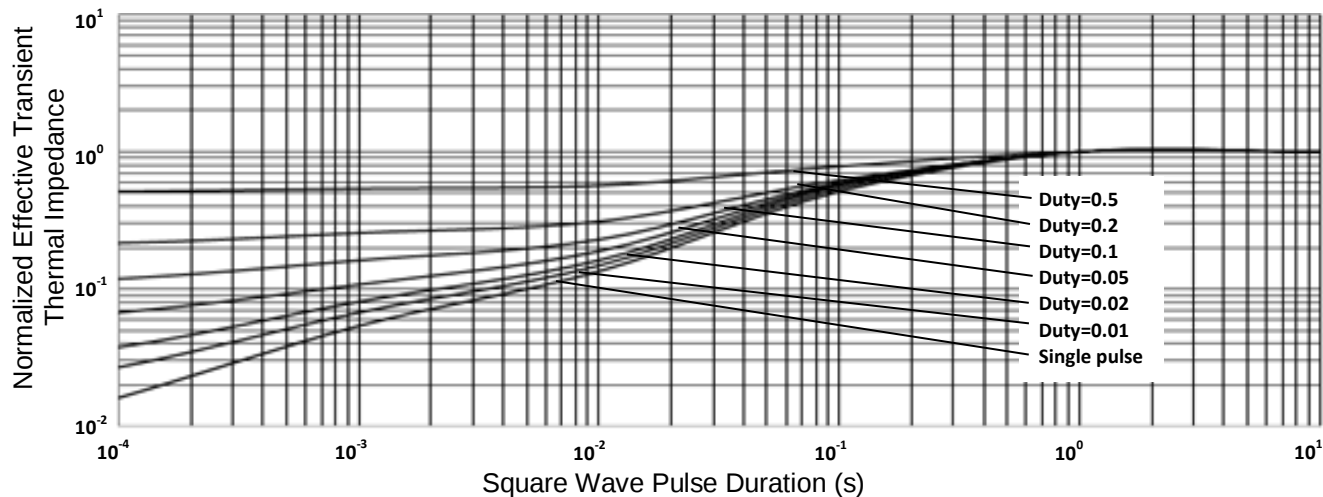
Maximum Safe Operating Area (ITO-220)



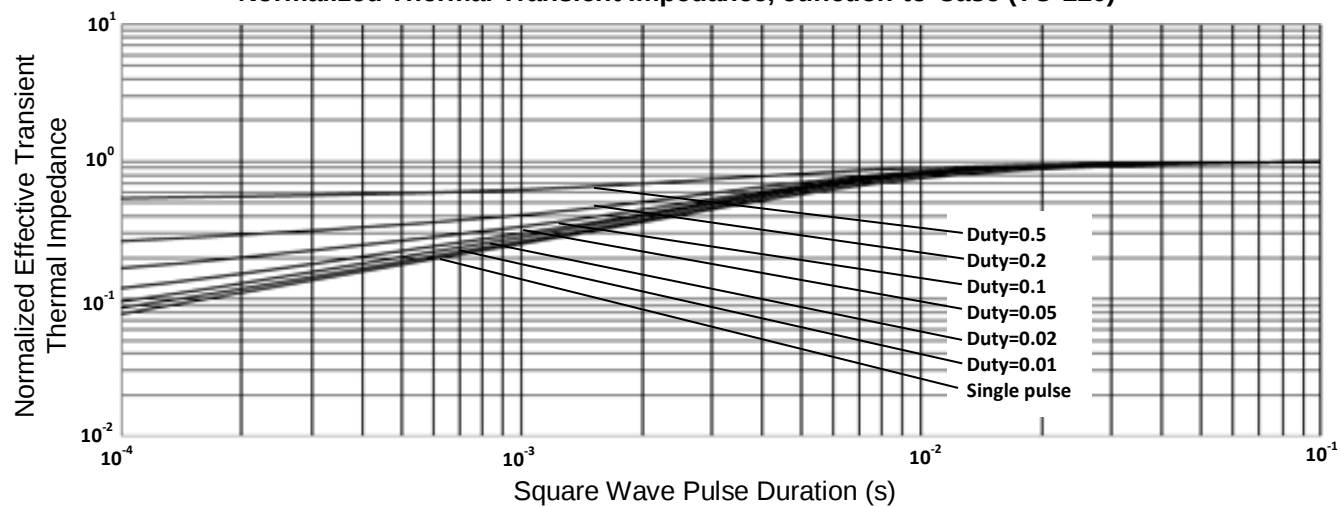
Maximum Safe Operating Area (TO-220)



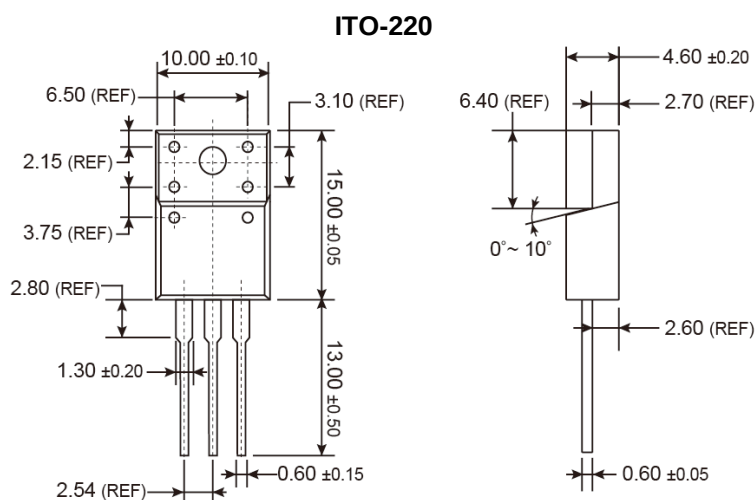
Normalized Thermal Transient Impedance, Junction-to-Case (ITO-220)



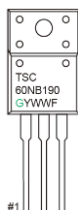
Normalized Thermal Transient Impedance, Junction-to-Case (TO-220)



PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)



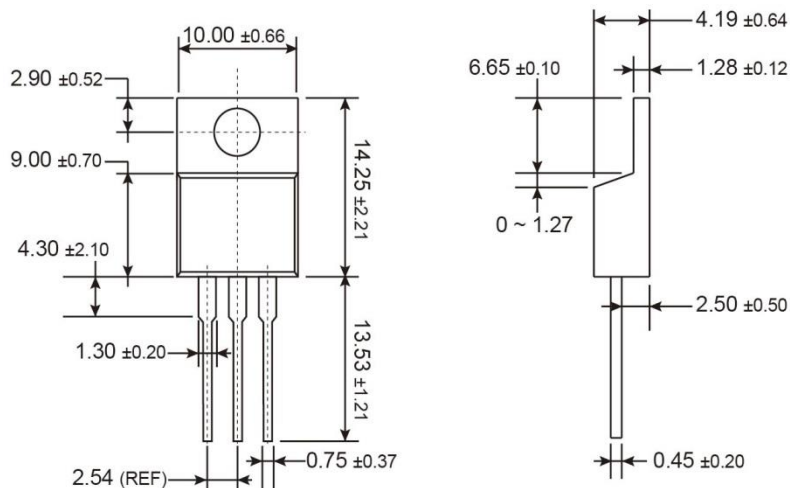
MARKING DIAGRAM



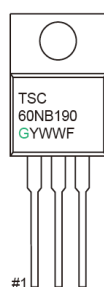
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-220



MARKING DIAGRAM



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