N-Channel Power MOSFET

40V, 124A, 4.3mΩ

FEATURES

- Low $R_{DS(ON)}$ to minimize conductive losses
- Low gate charge for fast power switching
- 100% UIS and R_g Tested
- RoHS Compliant
- Halogen-free according to IEC 61249-2-21

APPLICATIONS

- BLDC Motor Control
- Battery Power Management
- DC-DC Converter

KEY PERFORMANCE PARAMETERS

PARAMETER		VALUE	UNIT
V_{DS}		40	V
$R_{DS(on)}$ (max)	V_{GS} = 10V	4.3	mΩ
	V_{GS} = 7V	6.7	
Q_g		74	nC

Pb-Free   RoHS COMPLIANT   HALOGEN FREE

TO-220

Drain Pin 2
Gate Pin 1
Source Pin 3
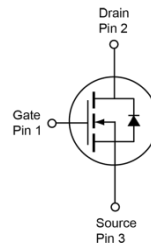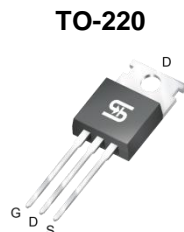
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [Note 1]	T_C = 25°C	I_D	124	A
	T_A = 25°C		16	
Pulsed Drain Current		I_{DM}	496	A
Single Pulse Avalanche Current [Note 2]		I_{AS}	36	A
Single Pulse Avalanche Energy [Note 2]		E_{AS}	194	mJ
Total Power Dissipation	T_C = 25°C	P_D	125	W
	T_C = 125°C		25	
Total Power Dissipation	T_A = 25°C	P_D	2	W
	T_A = 125°C		0.4	
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	$R_{\Theta JC}$	1	°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. $R_{\Theta JC}$ is guaranteed by design while $R_{\Theta CA}$ 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 = 250µA	BV_{DSS}	40	--	--	V
Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250µA	$V_{GS(TH)}$	2	2.8	4	V
Gate-Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Drain-Source Leakage Current	V_{GS} = 0V, V_{DS} = 40V	I_{DSS}	--	--	1	µA
	V_{GS} = 0V, V_{DS} = 40V T_J = 125°C		--	--	100	
Drain-Source On-State Resistance (Note 3)	V_{GS} = 10V, I_D = 16A	$R_{DS(on)}$	--	3.1	4.3	mΩ
	V_{GS} = 7V, I_D = 13A		--	3.5	6.7	
Forward Transconductance (Note 3)	V_{DS} = 10V, I_D = 16A	g_{fs}	--	62	--	S
Dynamic (Note 4)						
Total Gate Charge	V_{GS} = 10V, V_{DS} = 20V, I_D = 16A	Q_g	--	74	--	nC
Total Gate Charge	V_{GS} = 7V, V_{DS} = 20V, I_D = 13A	Q_g	--	54	--	
Gate-Source Charge		Q_{gs}	--	23	--	
Gate-Drain Charge		Q_{gd}	--	16	--	
Input Capacitance	V_{GS} = 0V, V_{DS} = 20V, f = 1.0MHz	C_{iss}	--	4928	--	pF
Output Capacitance		C_{oss}	--	457	--	
Reverse Transfer Capacitance		C_{rss}	--	223	--	
Gate Resistance	f = 1.0MHz	R_g	0.5	1.6	3.2	Ω
Switching (Note 4)						
Turn-On Delay Time	V_{GS} = 10V, V_{DS} = 20V, I_D = 16A, R_G = 2Ω	$t_{d(on)}$	--	17	--	ns
Turn-On Rise Time		t_r	--	74	--	
Turn-Off Delay Time		$t_{d(off)}$	--	45	--	
Turn-Off Fall Time		t_f	--	49	--	
Source-Drain Diode						
Forward Voltage (Note 3)	V_{GS} = 0V, I_S = 16A	V_{SD}	--	--	1	V
Reverse Recovery Time	I_S = 16A, dI/dt = 100A/µs	t_{rr}	--	27	--	ns
Reverse Recovery Charge		Q_{rr}	--	21	--	nC

Notes:

1. Silicon limited current only.
2. L = 0.3mH, V_{GS} = 10V, V_{DD} = 25V, R_G = 25Ω, I_{AS} = 36A, Starting T_J = 25°C
3. Pulse test: Pulse Width ≤ 300µs, duty cycle ≤ 2%.
4. Switching time is essentially independent of operating temperature.

ORDERING INFORMATION
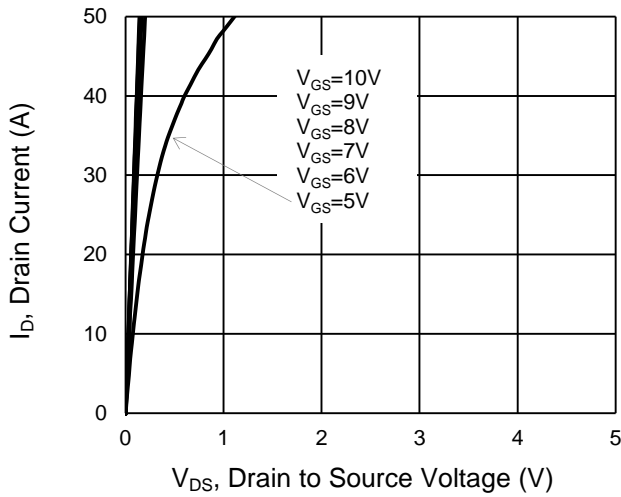
ORDERING CODE	PACKAGE	PACKING
TSM043NB04CZ C0G	TO-220	50pcs / Tube

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CHARACTERISTICS CURVES

(T_A = 25°C unless otherwise noted)

Output Characteristics

I_D, Drain Current (A)

V_{GS}=10V
V_{GS}=9V
V_{GS}=8V
V_{GS}=7V
V_{GS}=6V
V_{GS}=5V

V_{DS}, Drain to Source Voltage (V)

Transfer Characteristics

I_D, Drain Current (A)

25℃

150℃

-55℃

V_{GS}, Gate to Source Voltage (V)
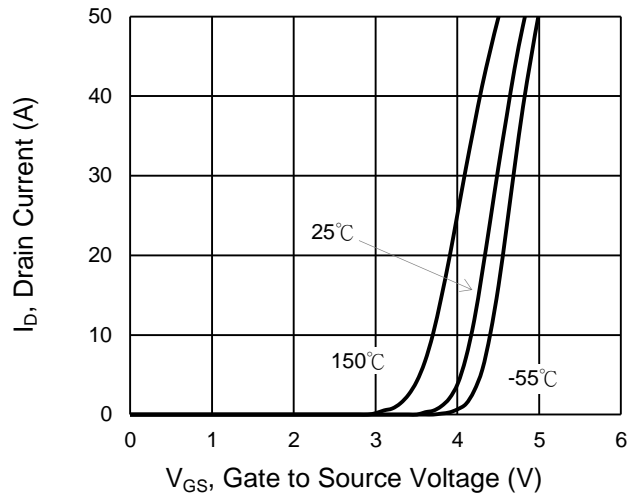
On-Resistance vs. Drain Current

$R_{DS(on)}$, Drain-Source On-Resistance (Ω)

V_{GS}=7V

V_{GS}=10V

I_D, Drain Current (A)
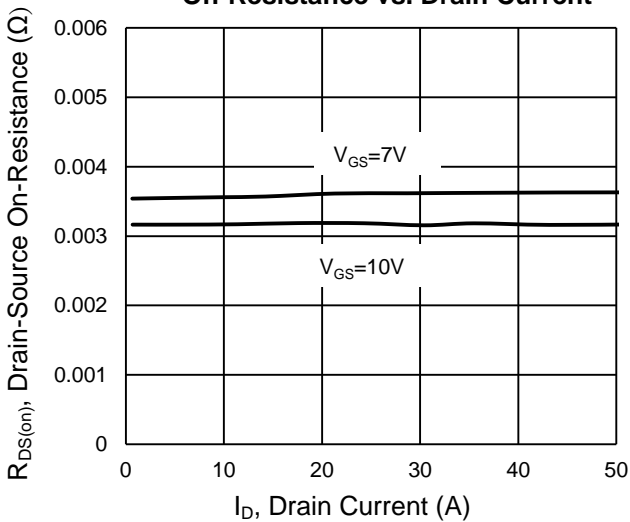
Gate-Source Voltage vs. Gate Charge

V_{GS}, Gate to Source Voltage (V)

V_{DS}=20V
I_D=16A

Q_g, Gate Charge (nC)
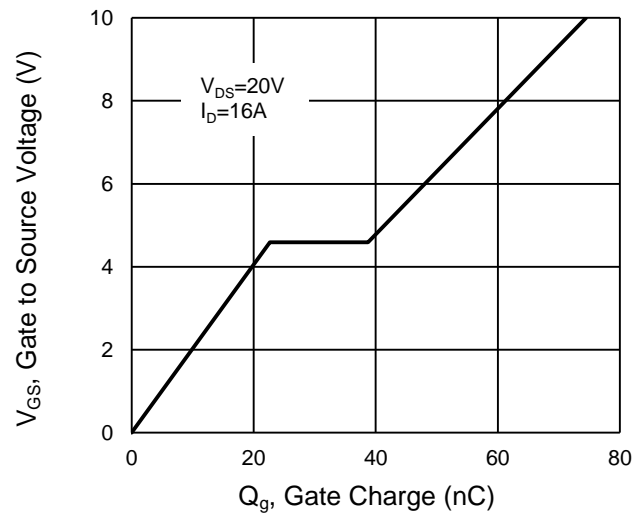
On-Resistance vs. Junction Temperature

$R_{DS(on)}$, Drain-Source On-Resistance (Normalized)
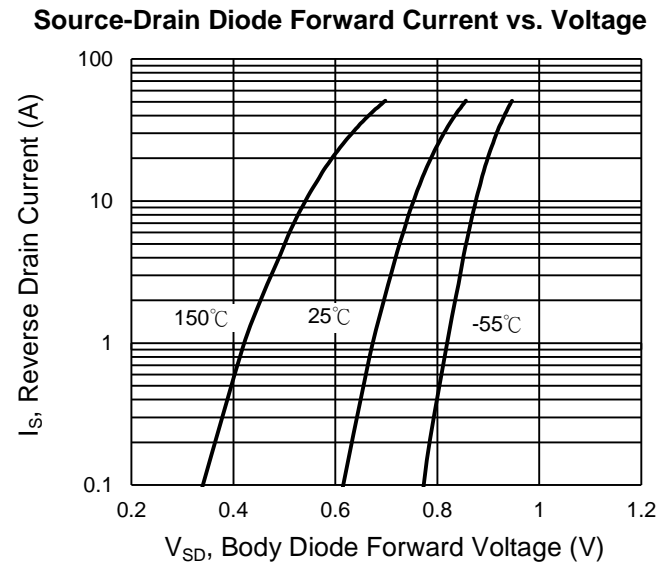
V_{GS}=10V
I_D=16A

T_J, Junction Temperature (°C)
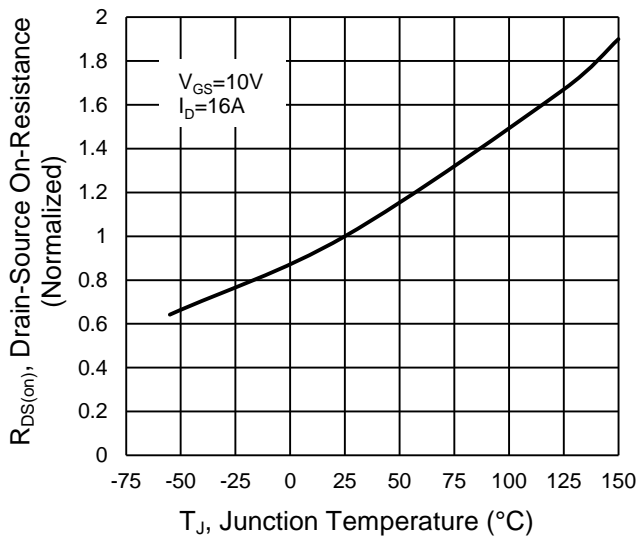
On-Resistance vs. Gate-Source Voltage

$R_{DS(on)}$, Drain-Source On-Resistance (Ω)

I_D=16A

V_{GS}, Gate to Source Voltage (V)

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

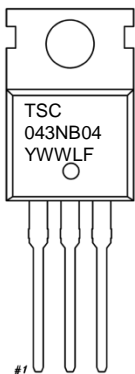**Normalized Thermal Transient Impedance, Junction-to-Case**
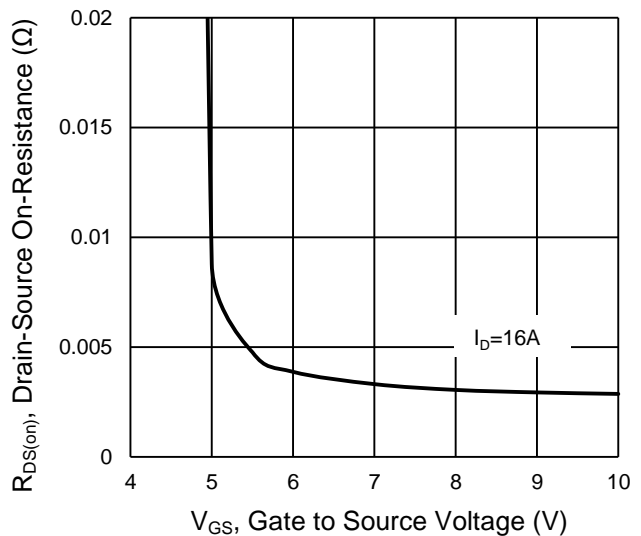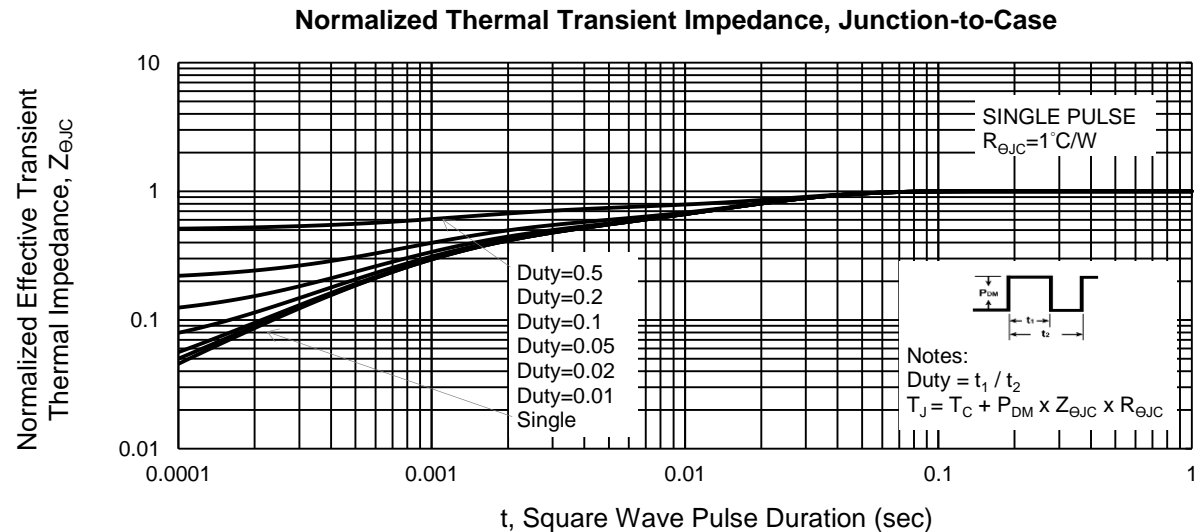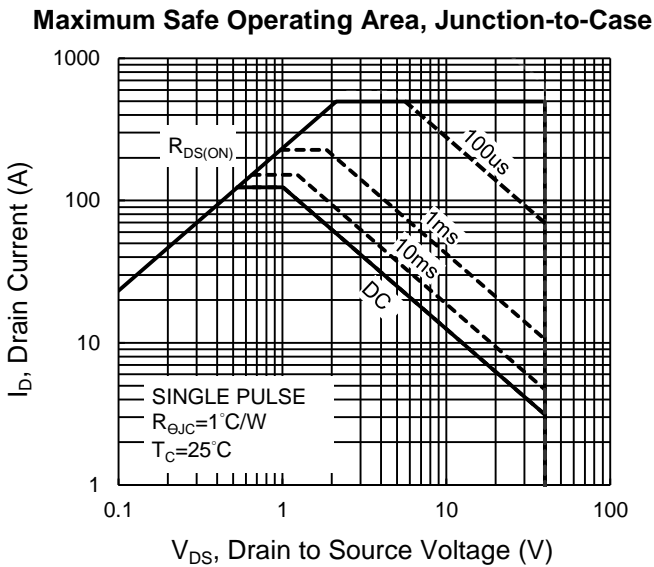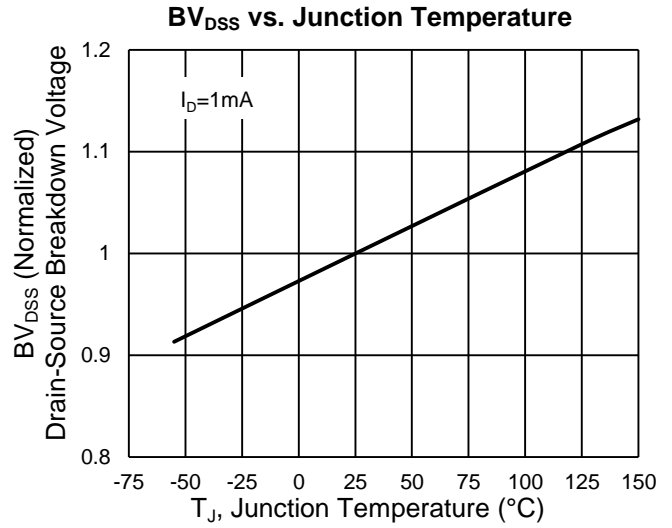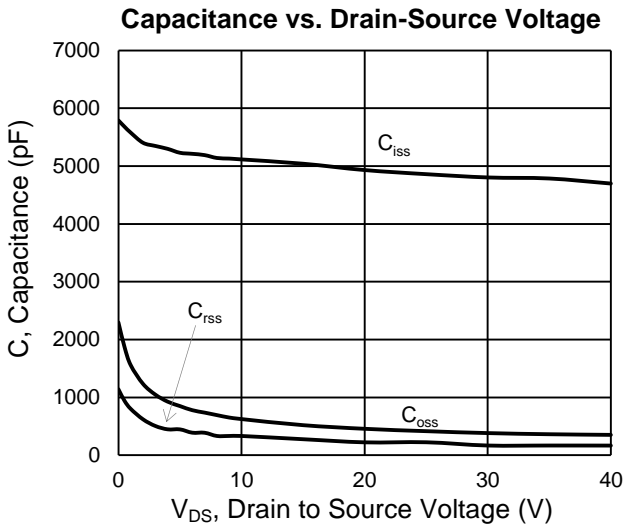
PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-220
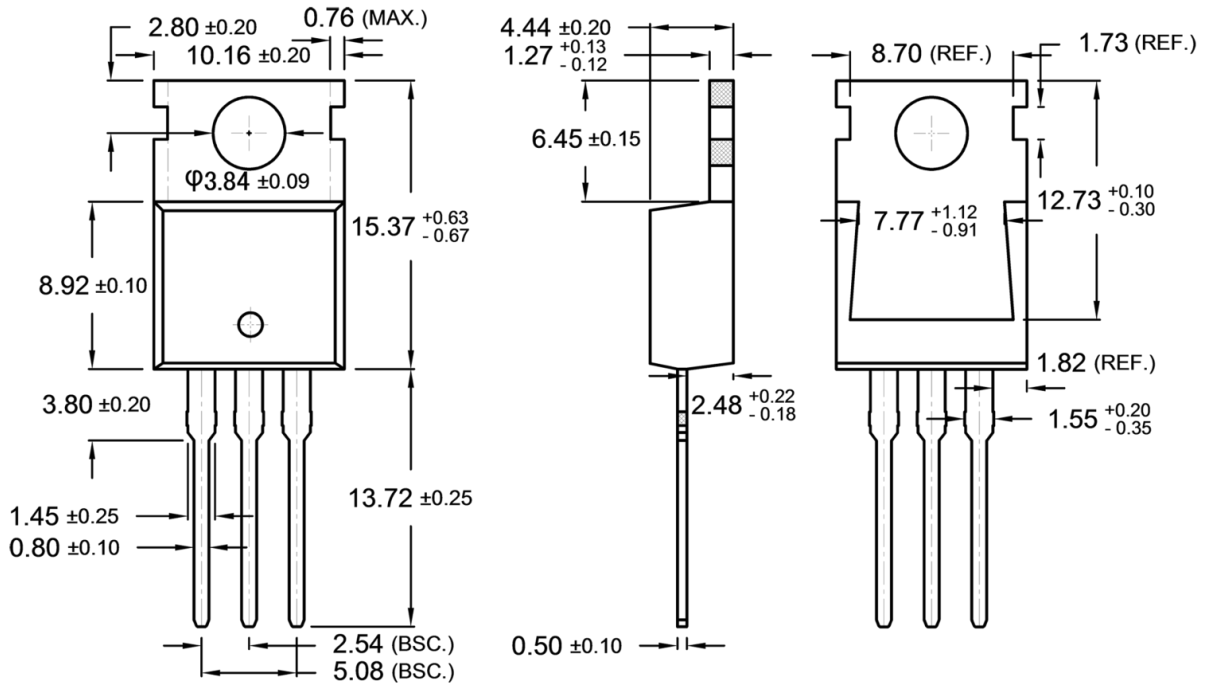
MARKING DIAGRAM

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

TSC
043NB04
YWWLF

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