NP180N04TUK

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Rev. 2.00
May 24, 2018

MOS FIELD EFFECT TRANSISTOR

Description

NP180N04TUK is N-channel MOS Field Effect Transistor designed for high current switching applications.

Features

- Super low on-state resistance
  $R_{DS(on)}$ = 1.05 mΩ MAX. (V_{GS} = 10 V, I_D = 90 A)
- Low Ciss   Ciss = 10500 pF TYP. (V_{DS} = 25 V)
- Designed for automotive application and AEC-Q101 qualified

Ordering Information

Part No.	Lead Plating	Packing		Package
NP180N04TUK-E1-AY *1	Pure Sn (Tin)	Tape 800 p/reel	Taping (E1 type)	TO-263-7pin(MP-25ZT)
NP180N04TUK-E2-AY *1			Taping (E2 type)	

Note: ∗1. Pb-free (This product does not contain Pb in the external electrode.)

Absolute Maximum Ratings (T_A=25°C)

Item	Symbol	Ratings	Unit
Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	40	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±20	V
Drain Current (DC) (T_C = 25 °C)	$I_{D(DC)}$	±180	A
Drain Current (pulse) *1, 3	$I_{D(pulse)}$	±720	A
Total Power Dissipation (T_C = 25 °C)	P_{T1}	348	W
Total Power Dissipation (T_A = 25 °C)	P_{T2}	1.8	W
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	-55 to 175	°C
Repetitive Avalanche Current *2, 3	I_{AR}	72	A
Repetitive Avalanche Energy *2, 3	E_{AR}	518	mJ

Thermal Resistance

Channel to Case Thermal Resistance	Rth(ch-C) *3	0.43	°C/W
Channel to Ambient Thermal Resistance	Rth(ch-A) *3	83.3	°C/W

Notes *1. TC = 25°C, PW ≤ 10 μ s, Duty Cycle ≤ 1%
*2. RG = 25 Ω, VGS = 20 → 0 V
*3. Not subject of production test. Verified by design/characterization.

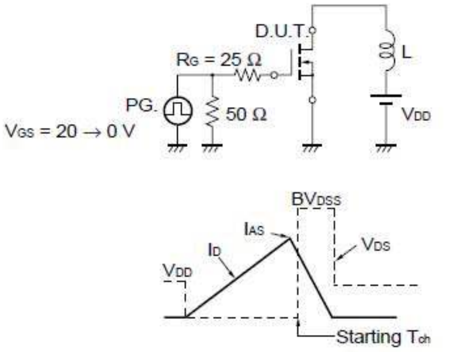
Electrical Characteristics (T_A=25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero Gate Voltage Drain Current	I_{DSS}			1	μA	V_{DS} = 40 V, V_{GS} = 0 V
Gate Leakage Current	I_{GSS}			±100	nA	V_{GS} = ± 20 V, V_{DS} = 0 V
Gate to Source Threshold Voltage	$V_{GS(th)}$	2.0	3.0	4.0	V	V_{DS} = V_{GS}, I_D = 250 μA
Forward Transfer Admittance *1	$\vert y_{fs} \vert$	75	150		S	V_{DS} = 5 V, I_D = 90 A
Drain to Source On-state Resistance *1	$R_{DS(on)}$		0.85	1.05	mΩ	V_{GS} = 10 V, I_D = 90 A
Input Capacitance *2	C_{iss}		10500	15750	pF	V_{DS} = 25 V
Output Capacitance *2	C_{oss}		1600	2400	pF	V_{GS} = 0 V
Reverse Transfer Capacitance *2	C_{rss}		540	980	pF	f = 1 MHz
Turn-on Delay Time *2	$t_{d(on)}$		38	90	ns	V_{DD} = 20 V, I_D = 90 A
Rise Time *2	t_r		22	60	ns	V_{GS} = 10 V
Turn-off Delay Time *2	$t_{d(off)}$		140	280	ns	R_G = 0 Ω
Fall Time *2	t_f		20	50	ns	
Total Gate Charge *2	Q_G		198	297	nC	V_{DD} = 32 V
Gate to Source Charge	Q_{GS}		50		nC	V_{GS} = 10 V
Gate to Drain Charge	Q_{GD}		48		nC	I_D = 180 A
Body Diode Forward Voltage *1	$V_{F(S-D)}$		0.9	1.5	V	I_F = 180 A, V_{GS} = 0 V
Reverse Recovery Time	t_{rr}		83		ns	I_F = 180 A, V_{GS} = 0 V
Reverse Recovery Charge	Q_{rr}		130		nC	di/dt = 100 A/μs

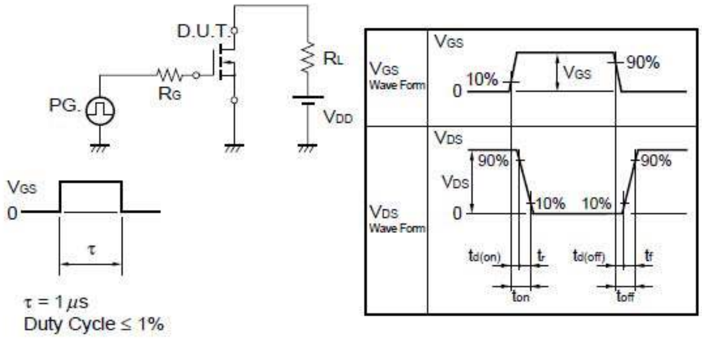
Note. *1 Pulse test

Note. *2 Not subject of production test. Verified by design/characterization.

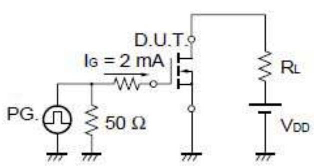
TEST CIRCUIT 1 AVALANCHE CAPABILITY



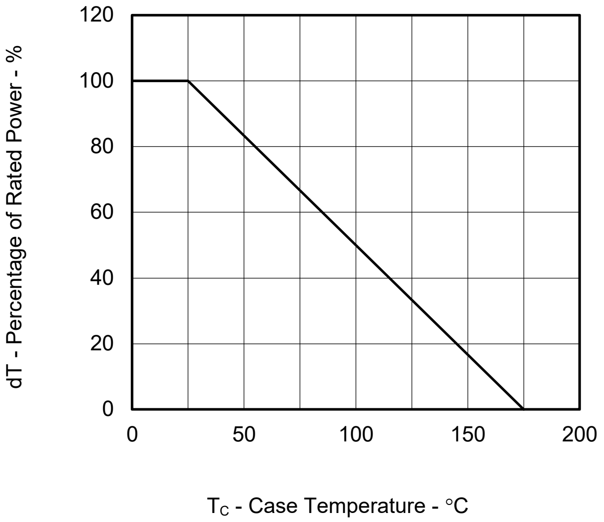
TEST CIRCUIT 2 SWITCHING TIME



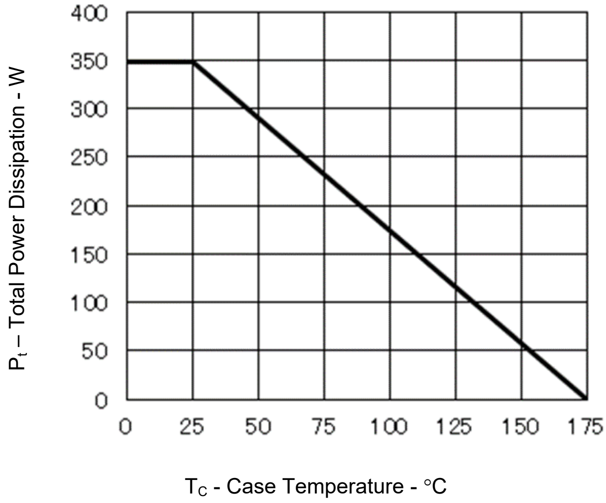
TEST CIRCUIT 3 GATE CHARGE



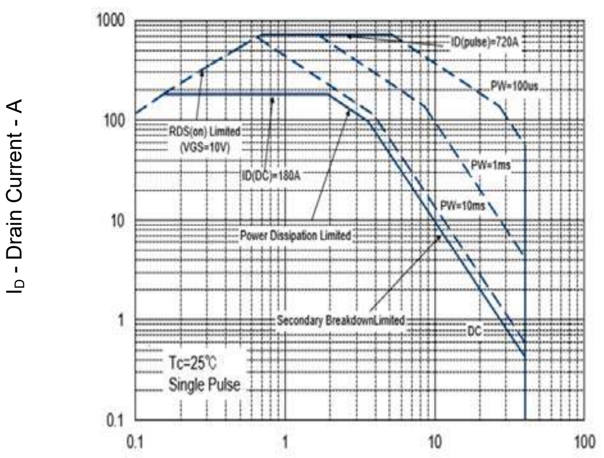
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



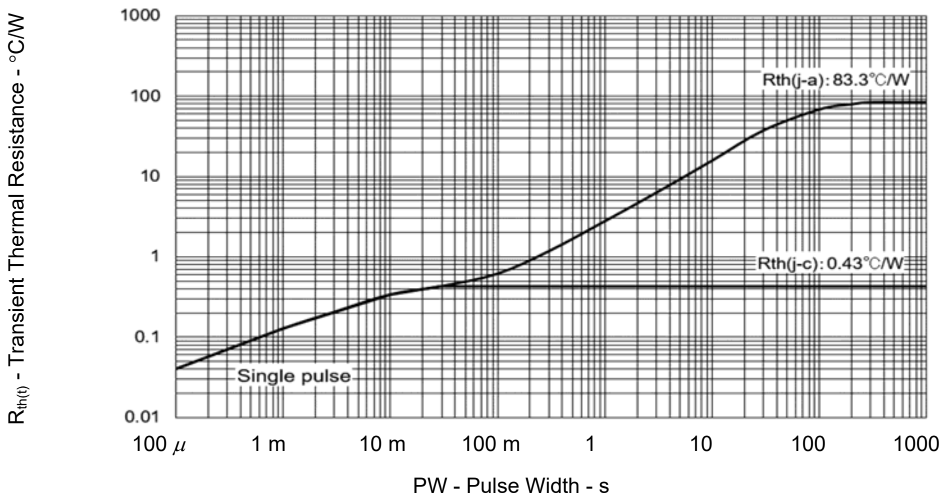
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



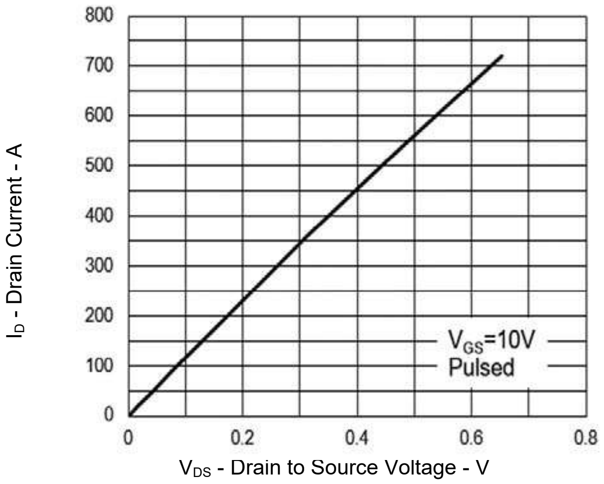
FORWARD BIAS SAFE OPERATING AREA



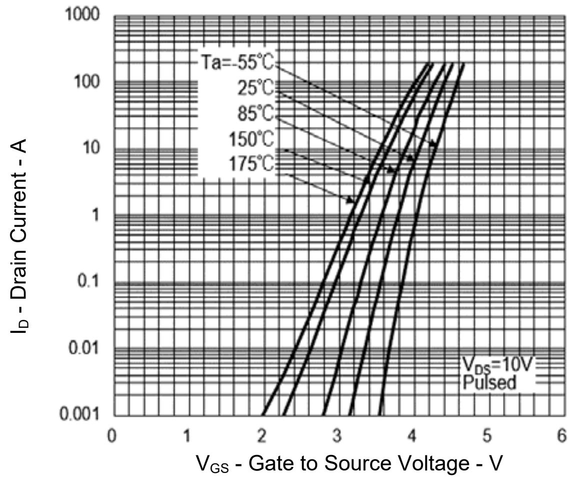
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



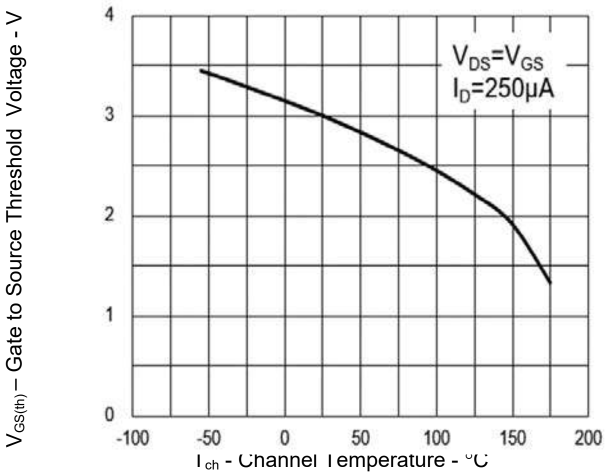
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



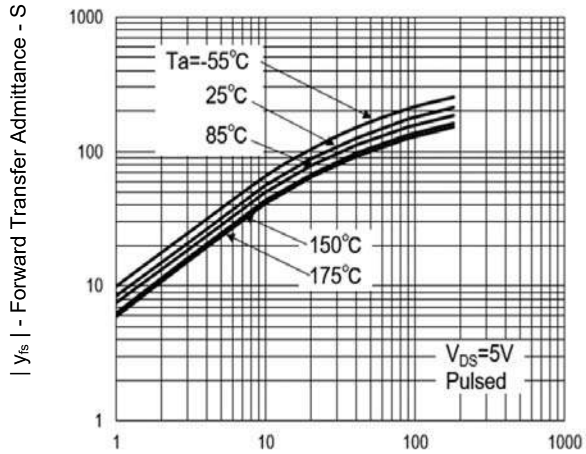
FORWARD TRANSFER CHARACTERISTICS



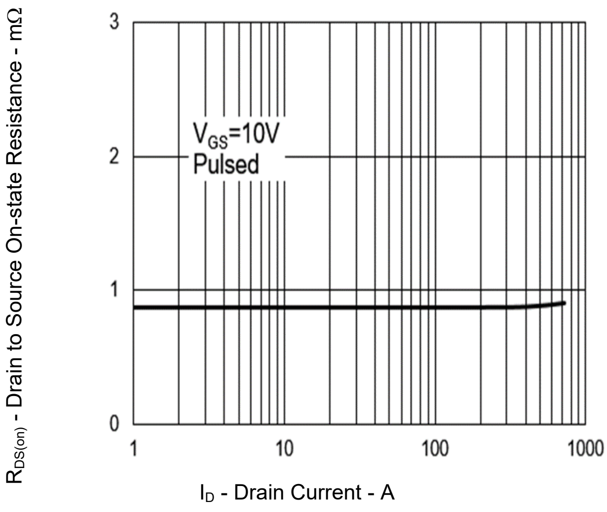
GATE TO SOURCE THRESHOLD VOLTAGE vs.
CHANNEL TEMPERATURE



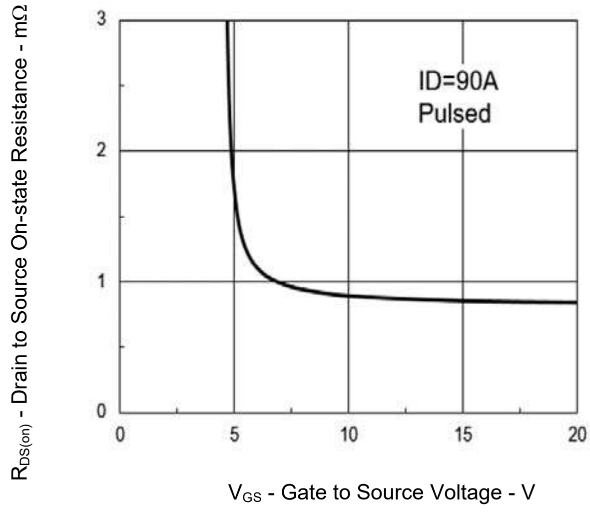
FORWARD TRANSFER ADMITTANCE vs. DRAIN
CURRENT



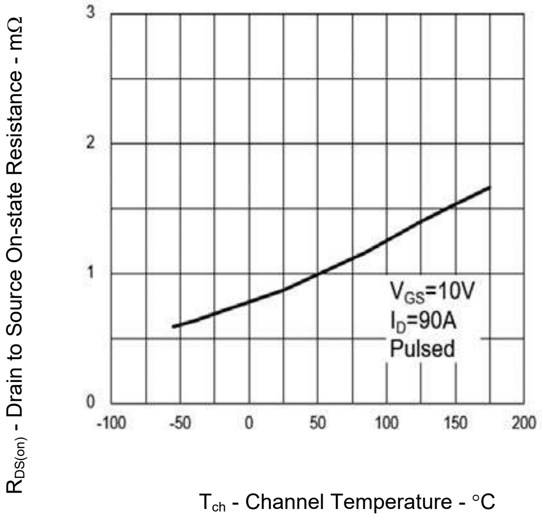
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



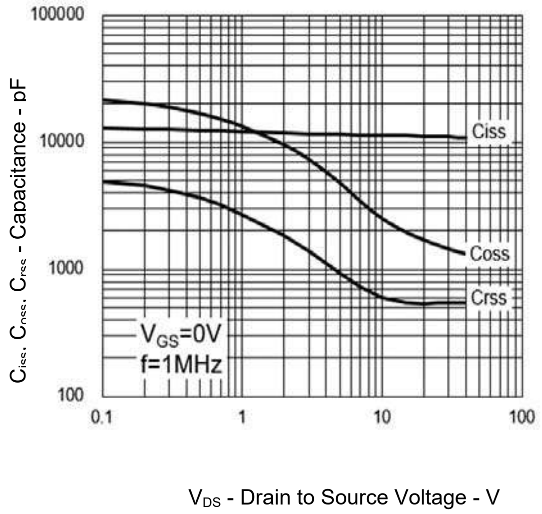
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



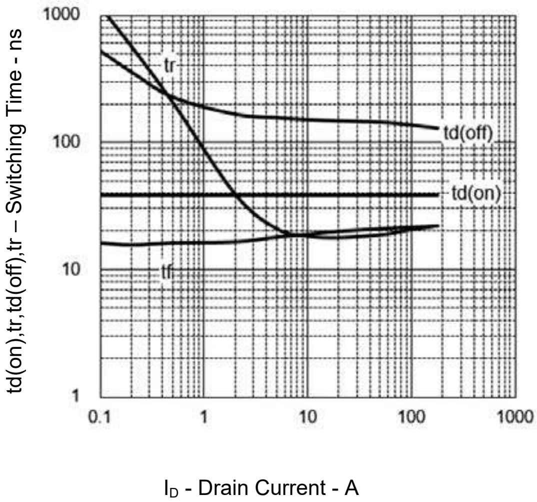
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



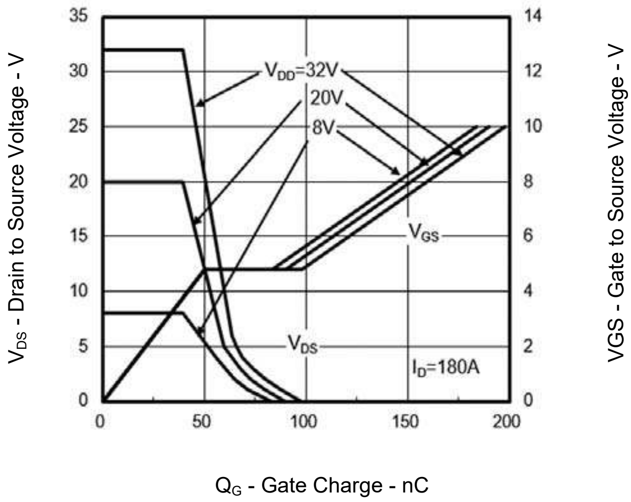
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



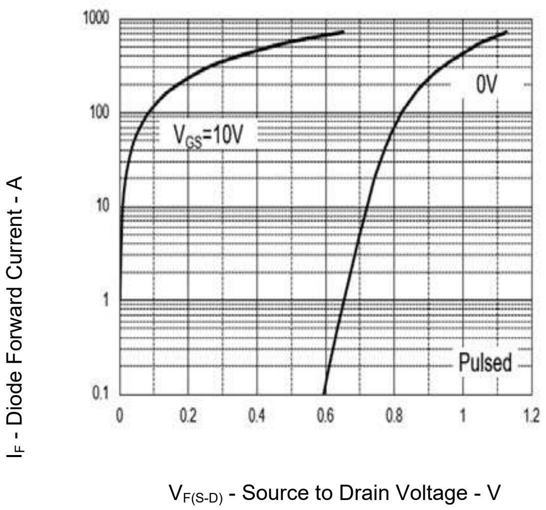
SWITCHING CHARACTERISTICS



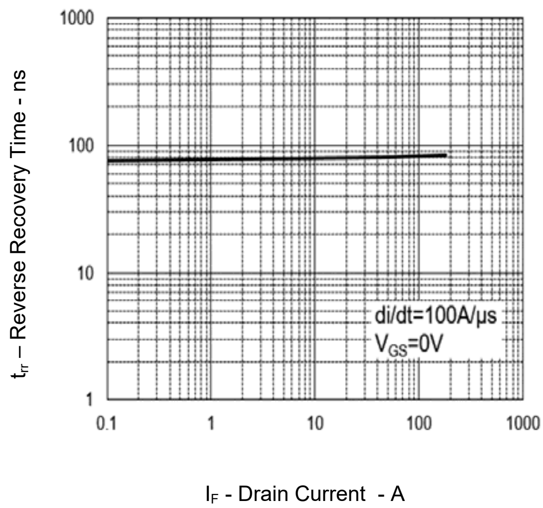
DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



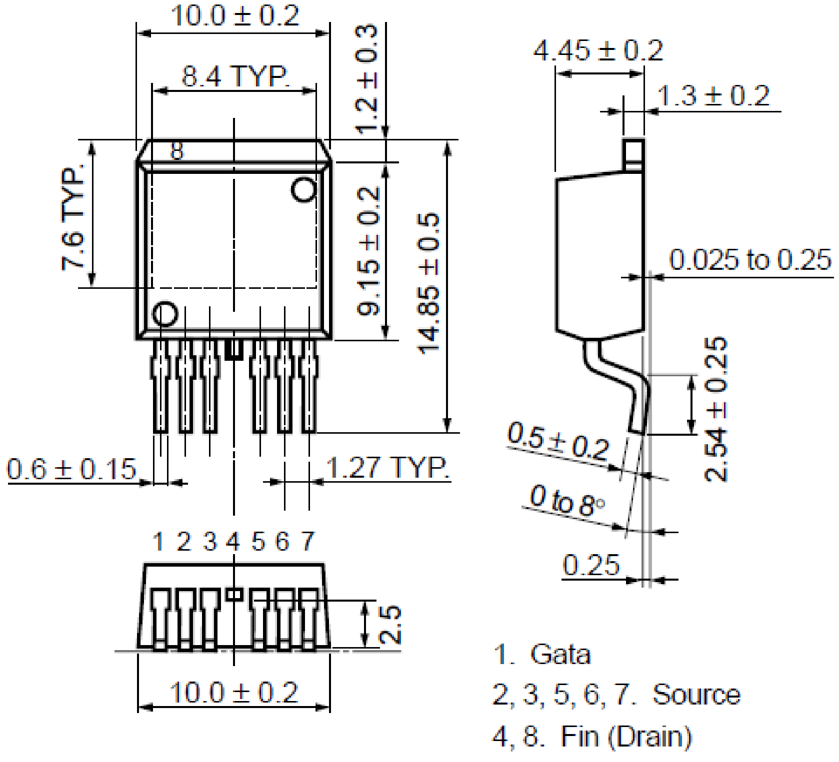
REVERSE RECOVERY TIME vs. DRAIN CURRENT

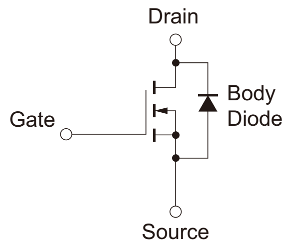


Package Dimensions

Package Name	MASS (Typ.)
TO-263-7pin (MP-25ZT)	-

Unit : mm





Equivalent circuit

Remark: Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

Revision History	NP180N04TUK Preliminary Datasheet

Rev.	Date	Description	
		Page	Summary
0.01	Apr 26, 2010	-	1st edition
2.00	May 24 ,2018	1	Note 3 was added
		2	Note 2 was added

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