



N-Channel Super Junction Power MOSFET II

General Description

The series of devices use advanced super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

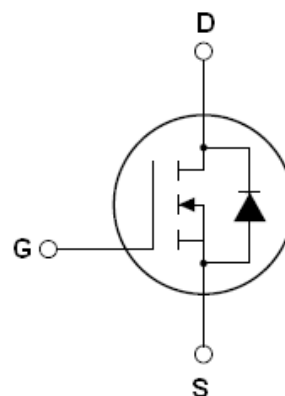
Features

- New technology for high voltage device
- Low on-resistance and low conduction losses
- small package
- Ultra Low Gate Charge cause lower driving requirements
- 100% Avalanche Tested
- ROHS compliant

Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)

$V_{DS}@T_{jmax}$	650	V
$R_{DS(ON)MAX}$	360	mΩ
I_D	11	A



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
TGD60R360K	TO-252	TGD60R360K



TO-252

Table 1. Absolute Maximum Ratings ($T_c=25^\circ\text{C}$)

Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	600	V
Gate-Source Voltage ($V_{DS}=0V$)	V_{GS}	± 30	V
Continuous Drain Current at $T_c=25^\circ\text{C}$	$I_{D(DC)}$	11	A
Continuous Drain Current at $T_c=100^\circ\text{C}$	$I_{D(DC)}$	7	A
Pulsed drain current (Note 1)	$I_{DM(pluse)}$	33	A
Maximum Power Dissipation($T_c=25^\circ\text{C}$)	P_D	121	W
Derate above 25°C		0.97	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note2)	E_{AS}	280	mJ
Avalanche current (Note 1)	I_{AR}	5.5	A
Repetitive Avalanche energy , t_{AR} limited by T_{jmax} (Note 1)	E_{AR}	0.5	mJ



Parameter	Symbol	Value		Unit
Drain Source voltage slope, $V_{DS} \leq 480V$,	dv/dt	50	V/ns	
Reverse diode dv/dt , $V_{DS} \leq 480V, I_{SD} < I_D$	dv/dt	15	V/ns	
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55...+150		°C

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	1.03	°C /W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62	°C /W

Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600			V
Zero Gate Voltage Drain Current($T_c=25^{\circ}C$)	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$		0.05	1	μA
Zero Gate Voltage Drain Current($T_c=125^{\circ}C$)	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$			100	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	3	3.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=7A$		300	360	m Ω
Dynamic Characteristics						
Forward Transconductance	g_{FS}	$V_{DS} = 20V, I_D = 7A$		8		S
Input Capacitance	C_{iss}	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$		1030		pF
Output Capacitance	C_{oss}			87		pF
Reverse Transfer Capacitance	C_{rss}			4.5		pF
Total Gate Charge	Q_g	$V_{DS}=480V, I_D=11A,$ $V_{GS}=10V$		23	40	nC
Gate-Source Charge	Q_{gs}			5.7		nC
Gate-Drain Charge	Q_{gd}			8		nC
Intrinsic gate resistance	R_G	$f = 1\text{ MHz open drain}$		2		Ω
Switching times						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=380V, I_D=5.5A,$ $R_G=6.8\Omega, V_{GS}=10V$		9		nS
Turn-on Rise Time	t_r			4		nS
Turn-Off Delay Time	$t_{d(off)}$			40	65	nS
Turn-Off Fall Time	t_f			4.5	8	nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}	$T_C=25^{\circ}C$			11	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				33	A
Forward on voltage	V_{SD}	$T_j=25^{\circ}C, I_{SD}=11A, V_{GS}=0V$		0.9	1.2	V
Reverse Recovery Time	t_{rr}	$T_j=25^{\circ}C, I_F=11A, di/dt=100A/\mu s$		245		nS
Reverse Recovery Charge	Q_{rr}			2.4		μC
Peak Reverse Recovery Current	I_{rrm}			20		A

Notes: 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2. $T_J=25^\circ C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area

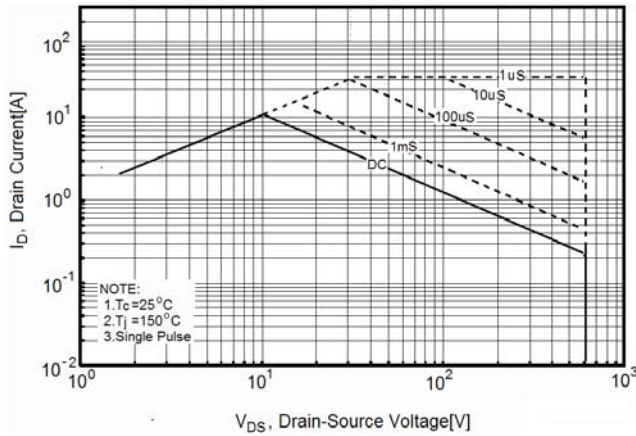


Figure2. Transient Thermal Impedance

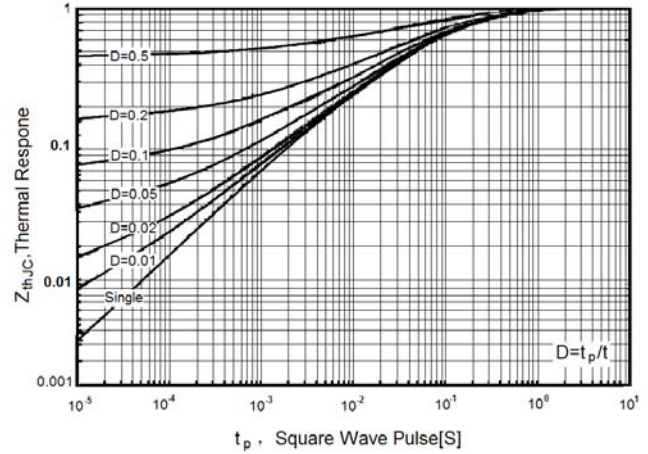


Figure3. Source-Drain Diode Forward Voltage

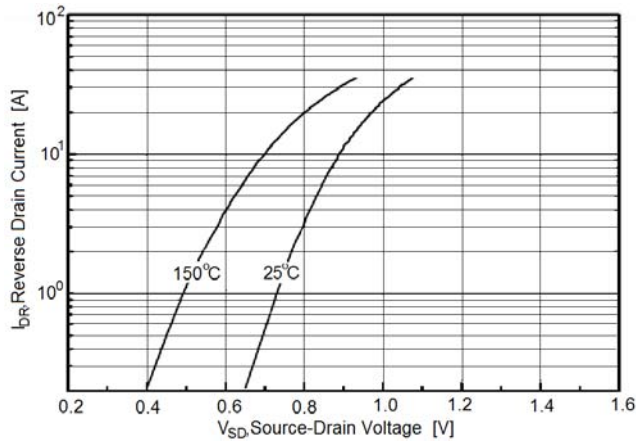


Figure4. Output characteristics

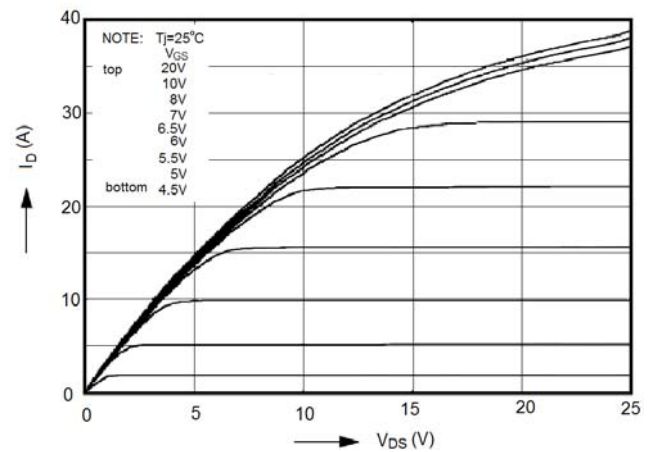


Figure5. Transfer characteristics

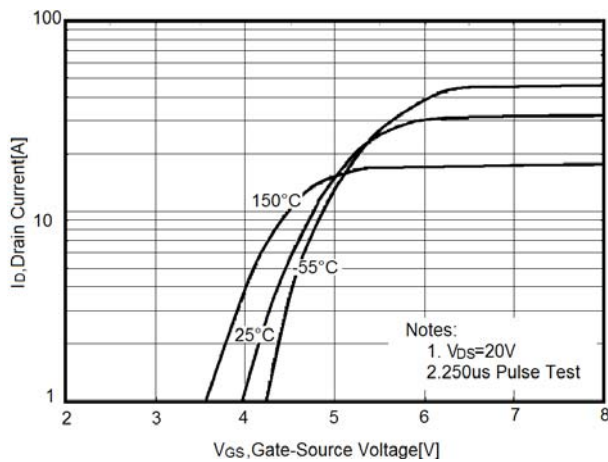


Figure6. Static drain-source on resistance

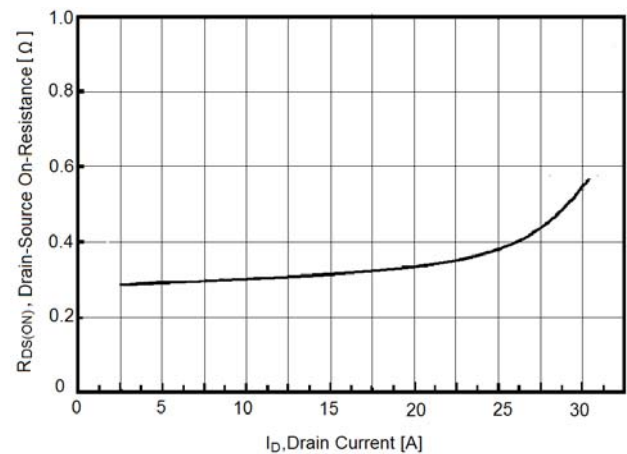
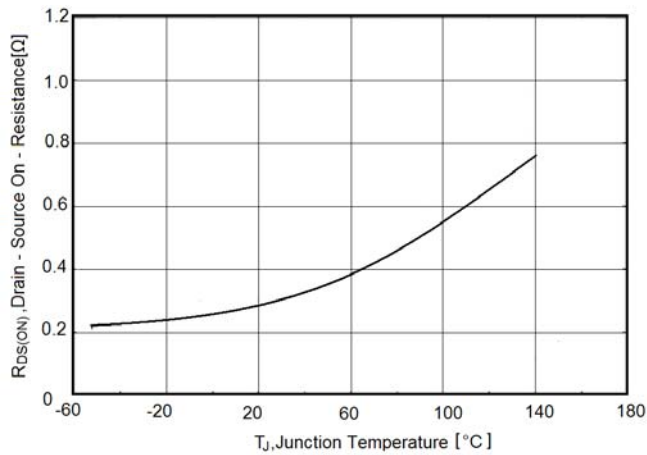
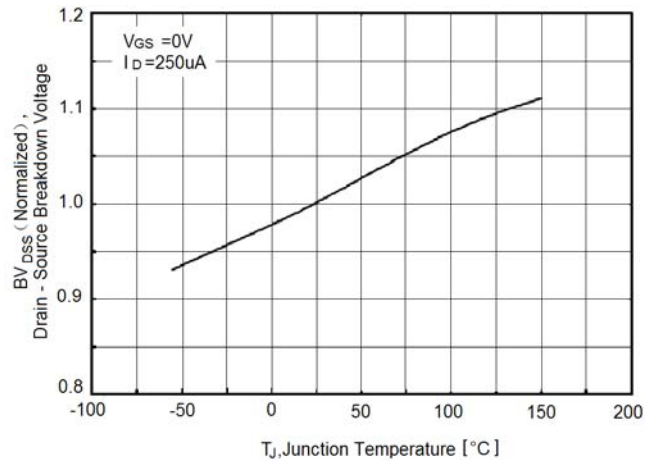
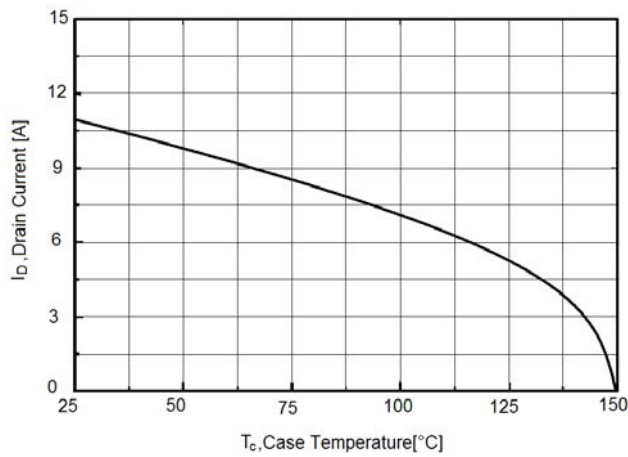
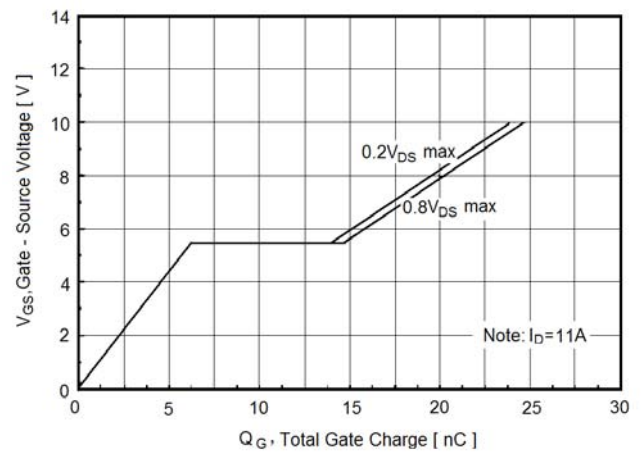
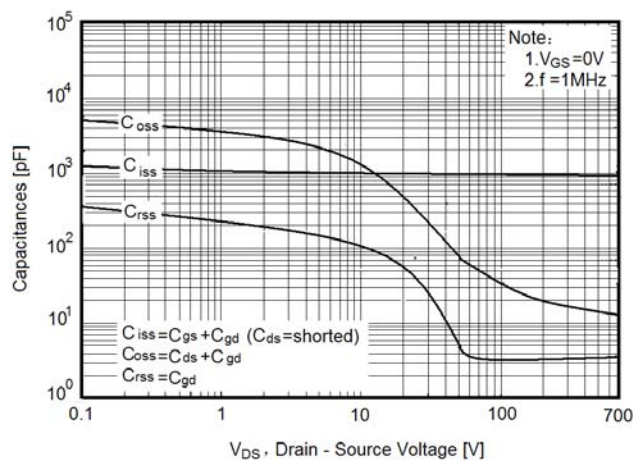
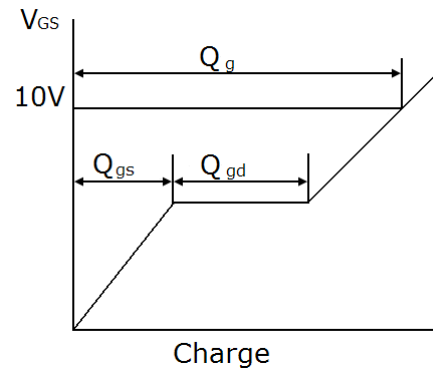
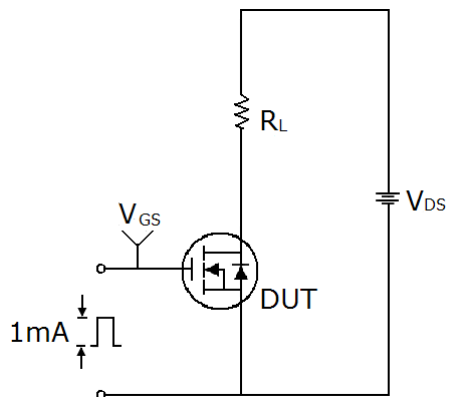


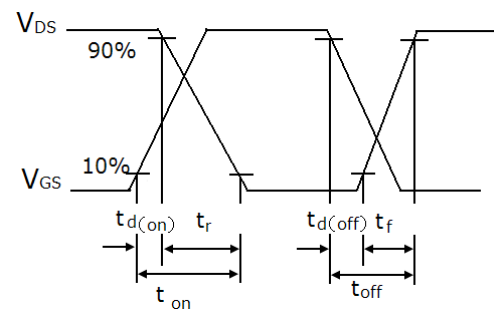
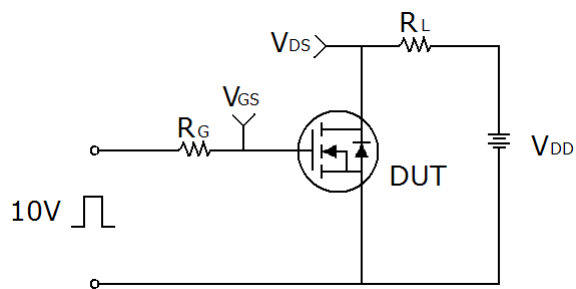
Figure7. $R_{DS(ON)}$ vs Junction Temperature

Figure8. BV_{DSS} vs Junction Temperature

Figure9. Maximum I_D vs Junction Temperature

Figure10. Gate charge waveforms

Figure11. Capacitance


Test circuit

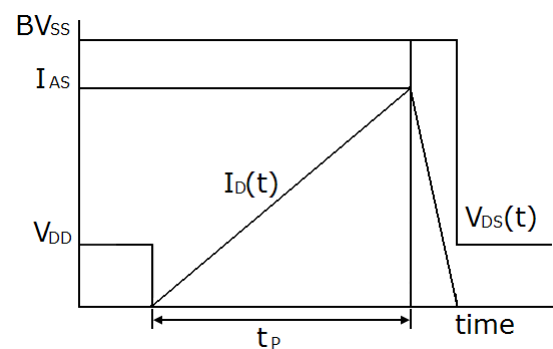
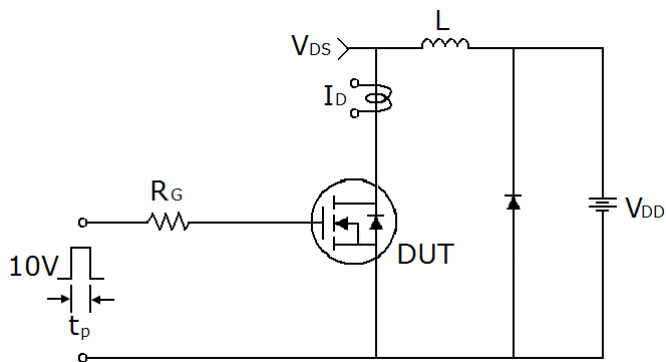
1) Gate charge test circuit & Waveform



2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms





TO-252 Package Information

