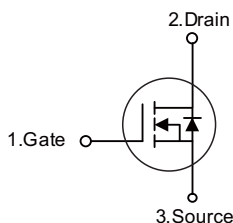


FEATURES

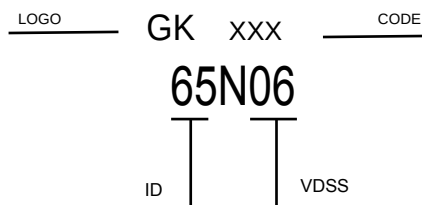
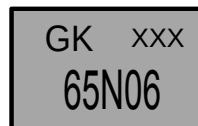
High density cell design for ultra low $R_{ds(on)}$
Fully characterized avalanche voltage and current
Good stability and uniformity with high E_{AS}
Excellent package for good heat dissipation
Special process technology for high ESD capability
Plane technology

APPLICATION

Power switching application
Hard switched and high frequency circuits
Uninterruptible power supply



V_{DSS} 60 V
 I_D 65 A
 $R_{DS(ON)}$ 16m Ω



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Maximum ratings ($T_a=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current	I_D	65	A
Pulsed Drain Current	I_{DM}	240	
Single Pulsed Avalanche Energy*	E_{AS}		
Power Dissipation	P_D	120	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-50 ~ +150	

* E_{AS} condition: $T_J=25^\circ\text{C}$, $V_{DD}=60\text{V}$, $L=0.5\text{mH}$, $R_G=25\Omega$, Starting $T_J = 25^\circ\text{C}$

Electrical characteristics (T_J=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	V _{(BR) DSS}	V _{GS} = 0V, I _D =250μA	60			V
Zero gate voltage drain current	I _{DSS}	V _{DS} =60V, V _{GS} =0V			1	μA
Gate-body leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
On characteristics (note1)						
Gate-threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250uA	2.0		3.0	V
Static drain-source on-resistance	R _{DS(on)}	V _{GS} =10V, I _D =20A		16	23	mΩ
Forward transconductance	g _{FS}	V _{DS} =25V, I _D =20A	17			S
Dynamic characteristics (note 2)						
Input capacitance	C _{iss}	V _{DS} =25V,V _{GS} =0V, f =1MHz		1500		pF
Output capacitance	C _{oss}			300		
Reverse transfer capacitance	C _{rss}			90		
Switching characteristics (note 2)						
Total gate charge	Q _g	V _{DS} =30V, V _{GS} =10V, I _D =60A		30		nC
Gate-source charge	Q _{gs}			10		
Gate-drain charge	Q _{gd}			11		
Turn-on delay time	t _{d(on)}	V _{DD} =30V,I _D =2A, V _{GS} =10V,R _G =2.5Ω, R _L =15Ω		22		ns
Turn-on rise time	t _r			70		
Turn-off delay time	t _{d(off)}			70		
Turn-off fall time	t _f			35		
Drain-Source Diode Characteristics						
Drain-source diode forward voltage(note1)	V _{SD}	V _{GS} =0V, I _S =40A			1.3	V
Continuous drain-source diode forward current	I _S				60	A
Pulsed drain-source diode forward current	I _{SM}				240	A

Notes:

1. Pulse Test : Pulse Width≤300μs, duty cycle ≤2%.
2. Guaranteed by design, not subject to production.

RATING AND CHARACTERISTIC CURVES

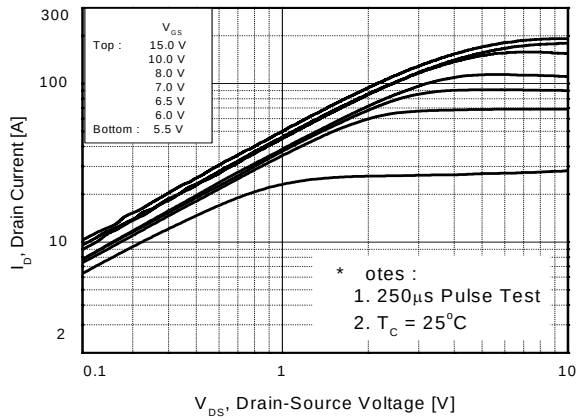


Figure 1. On-Region Characteristics

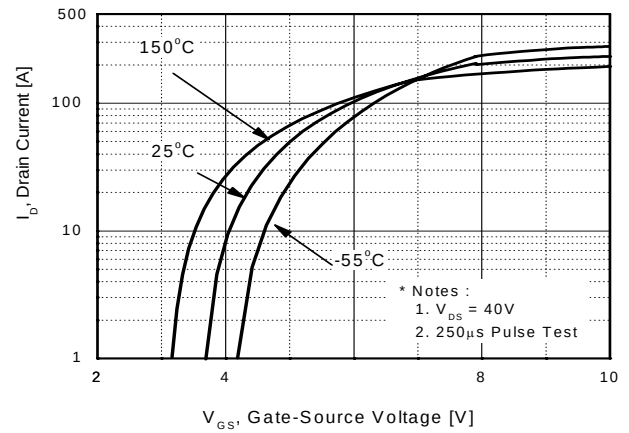


Figure 2. Transfer Characteristics

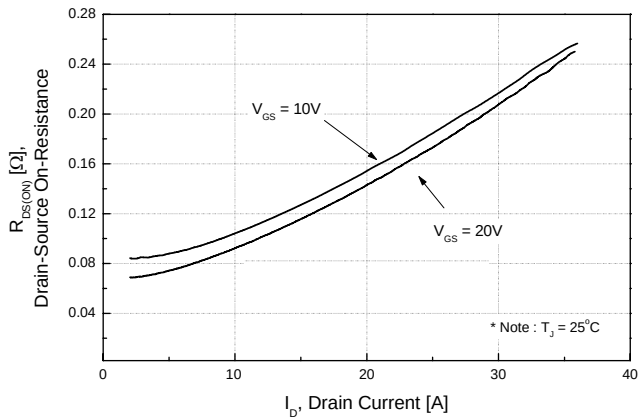


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

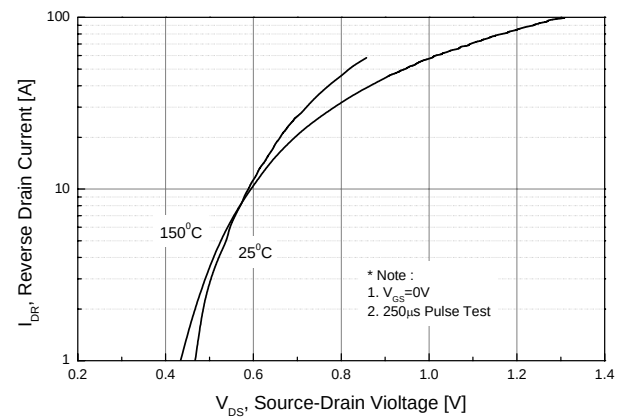


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

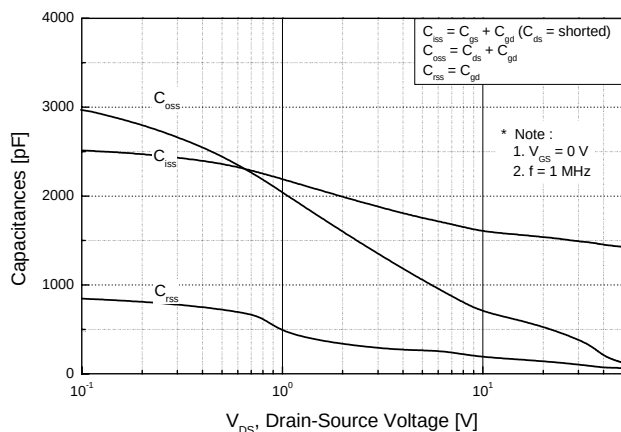


Figure 5. Capacitance Characteristics

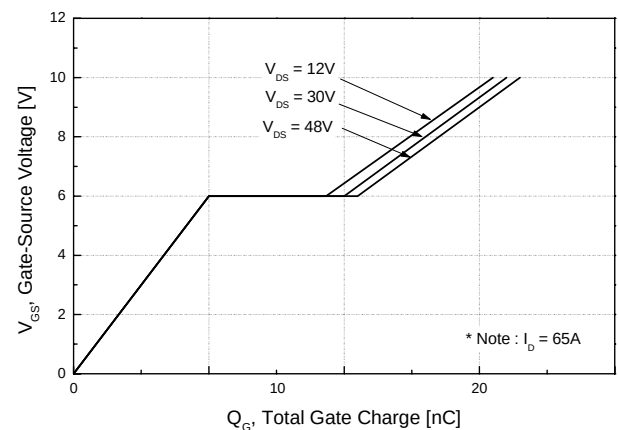


Figure 6. Gate Charge Characteristics

RATING AND CHARACTERISTIC CURVES

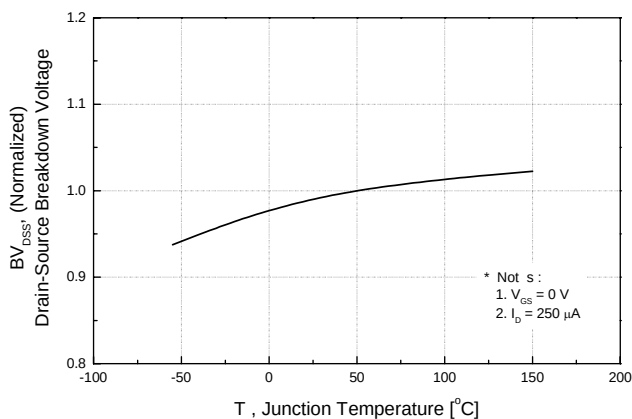


Figure 7. Breakdown Voltage Variation vs. Temperature

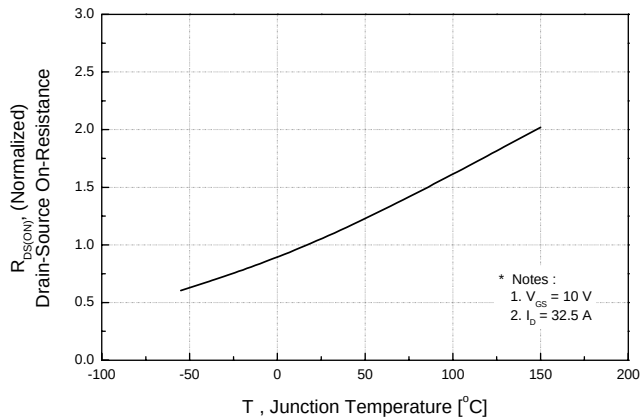


Figure 8. On-Resistance Variation vs. Temperature

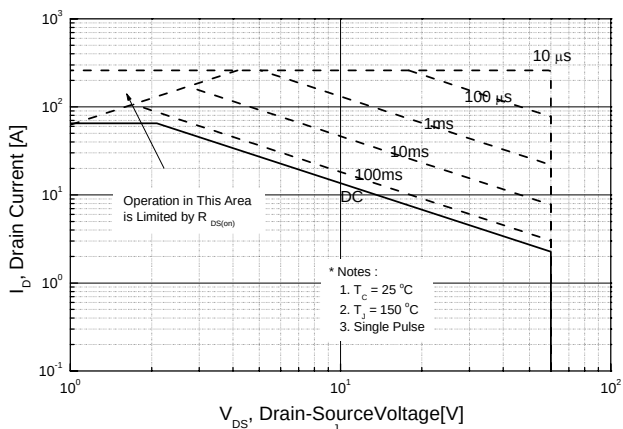


Figure 9. Maximum Safe Operating Area

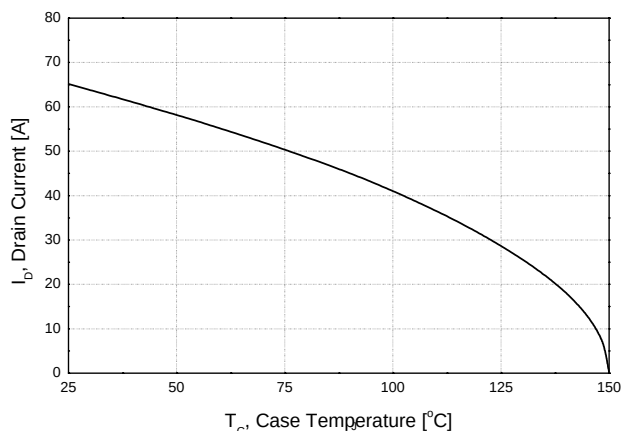


Figure 10. Maximum Drain Current vs. Case Temperature

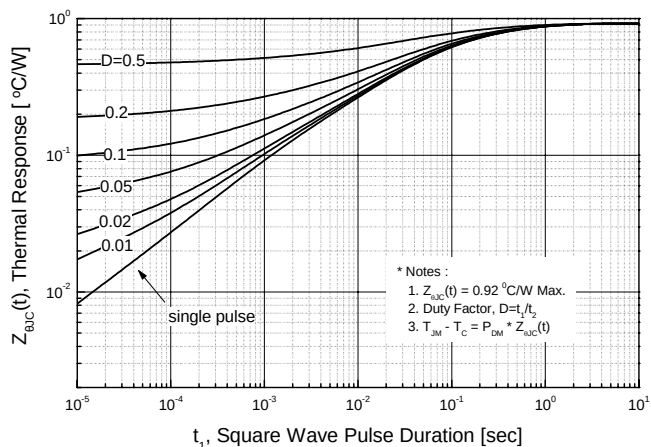


Figure 11. Transient Thermal Response Curve

TEST CIRCUIT

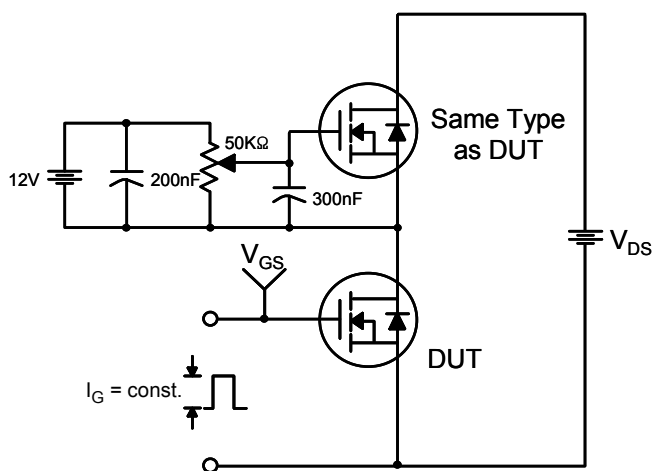


Figure 12. Gate Charge Test Circuit & Waveform

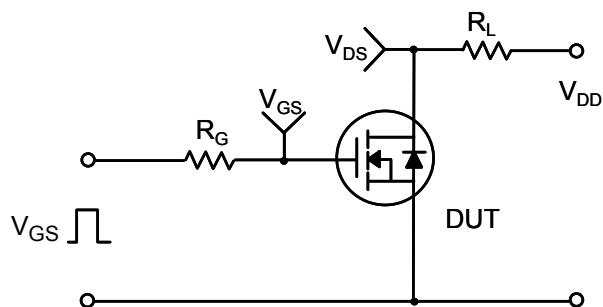


Figure 13. Resistive Switching Test Circuit & Waveforms

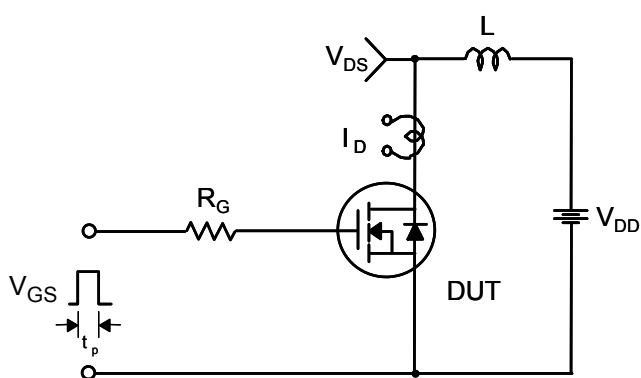
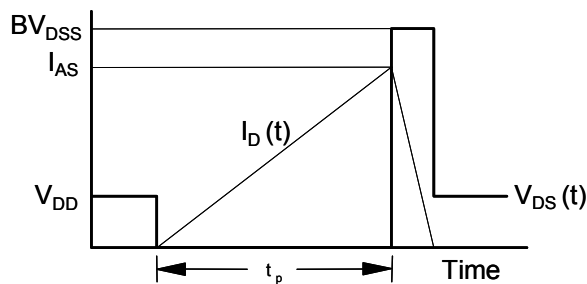


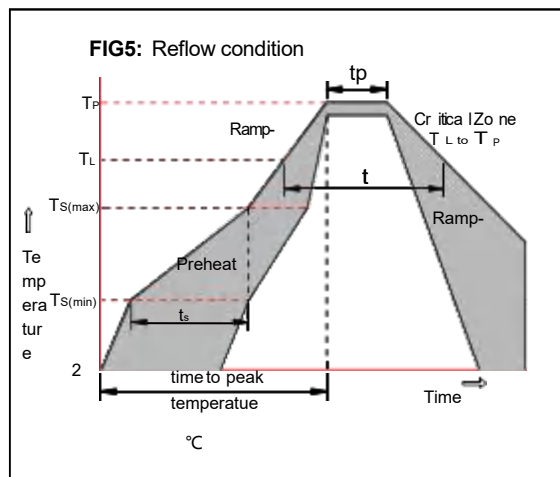
Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



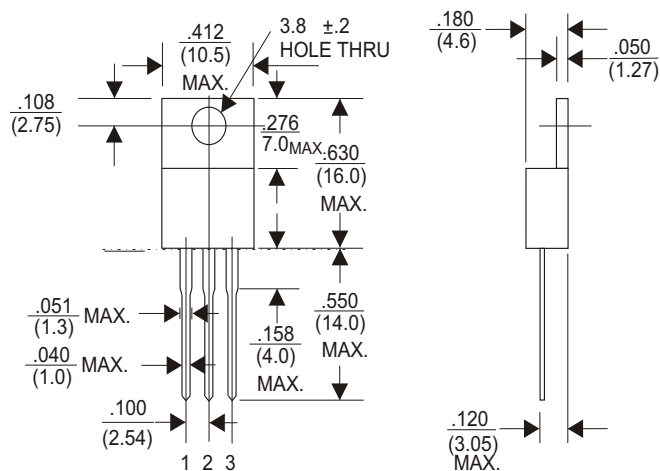
Soldering parameters

Reflow Condition		Pb-Free assembly (see as bellow)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150°C
	-Temperature Max($T_{s(max)}$)	+200°C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3°C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217°C
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_P)		+260(+0/-5)°C
Time within 5°C of actual Peak Temp (t_P)		30 secs. Max
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260°C



Package Dimensions & Suggested Pad Layout

TO-220



Dimensions in inches and (millimeters)