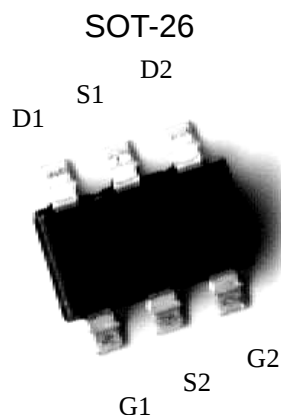


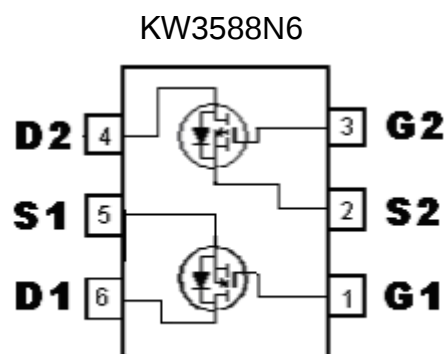
N- And P-Channel Enhancement Mode Power MOSFET

Features:

- Simple drive requirement
- Low gate charge
- Low on-resistance
- Fast switching speed
- Pb-free lead plating and halogen-free package



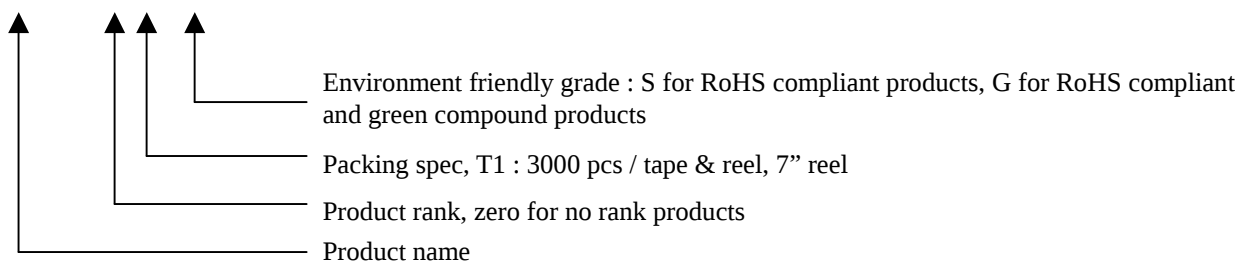
	N-CH	P-CH
BV _{DSS}	14V	-14V
I _D @ T _A =25 °C	5.4A(V _{GS} =4.5V)	-3.6A(V _{GS} =-4.5 V)
R _{DS(on)} (TYP.)	17.6mΩ (V _{GS} =4.5V)	45.1mΩ (V _{GS} =-4.5V)
	24.7mΩ (V _{GS} =2.5V)	65.6mΩ (V _{GS} =-2.5V)
	39.5mΩ (V _{GS} =1.8V)	88.5mΩ (V _{GS} =-1.8V)
	67.3mΩ (V _{GS} =1.5V)	154.3mΩ (V _{GS} =-1.5V)



G : Gate S : Source D : Drain

Ordering Information

Device	Package	Shipping
KW3588N6-0-T1-G	SOT-26 (Pb-free lead plating and halogen-free package)	3000 pcs / Tape & Reel



Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Limits		Unit
		N-channel	P-channel	
Drain-Source Breakdown Voltage	BV _{DSS}	14	-14	V
Gate-Source Voltage	V _{GS}	±8	±8	
Continuous Drain Current @T _A =25 °C (Note 1)	I _D	5.4	-3.6	A
Continuous Drain Current @T _A =70 °C (Note 1)		4.3	-2.9	
Pulsed Drain Current (Note 2)	I _{DM}	20	-20	
Total Power Dissipation (Note 1)	P _D	1.14		W
Linear Derating Factor		0.01		W / °C
Operating Junction and Storage Temperature	T _j , T _{stg}	-55~+150		°C

Note : 1.Surface mounted on 1 in² copper pad of FR-4 board, t≤5 sec.

2.Pulse width limited by maximum junction temperature.

N-Channel Electrical Characteristics (Tj=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	14	-	-	V	V _{GS} =0V, I _D =250μA
ΔBV _{DSS} /ΔT _j	-	8	-	mV/°C	Reference to 25°C, I _D =1mA
V _{GS(th)}	0.4	-	1.0	V	V _{DS} =V _{GS} , I _D =250μA
I _{GSS}	-	-	±100	nA	V _{GS} =±8V, V _{DS} =0V
I _{DSS}	-	-	1	μA	V _{DS} =12V, V _{GS} =0V
	-	-	10		V _{DS} =10V, V _{GS} =0V, T _j =70°C
*R _{DS(ON)}	-	17.6	25	mΩ	I _D =5A, V _{GS} =4.5V
	-	24.7	33		I _D =4.6A, V _{GS} =2.5V
	-	39.5	75		I _D =4.1A, V _{GS} =1.8V
	-	67.3	115		I _D =2A, V _{GS} =1.5V
*G _{FS}	-	5.6	-	S	V _{DS} =5V, I _D =3A
Dynamic					
C _{iss}	-	407	-	pF	V _{DS} =10V, V _{GS} =0V, f=1MHz
C _{oss}	-	115	-		
C _{rss}	-	100	-		
*t _{d(ON)}	-	5	-	ns	V _{DS} =10V, I _D =1A, V _{GS} =5V, R _G =3.3Ω
*t _r	-	18.8	-		
*t _{d(OFF)}	-	49.6	-		
*t _f	-	30.8	-		
*Q _g	-	6.5	-	nC	V _{DS} =10V, I _D =3A, V _{GS} =4.5V
*Q _{gs}	-	0.7	-		
*Q _{gd}	-	2.3	-		
R _g	-	1	-	Ω	f=1MHz
Source-Drain Diode					
*V _{SD}	-	0.87	1.2	V	V _{GS} =0V, I _S =5.2A
*t _{rr}	-	12	-	ns	I _F =3A, V _{GS} =0V, dI _F /dt=100A/μs
*Q _{rr}	-	2.3	-	nC	

*Pulse Test : Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$

P-Channel Electrical Characteristics (Tj=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	-14	-	-	V	V _{GS} =0V, I _D =-250 μ A
$\Delta\text{BV}_{\text{DSS}}/\Delta\text{Tj}$	-	-5	-	mV/°C	Reference to 25°C, I _D =-1mA
V _{GS(th)}	-0.4	-	-1.0	V	V _{DS} =V _{GS} , I _D =-250 μ A
I _{GSS}	-	-	± 100	nA	V _{GS} = ± 8 V, V _{DS} =0V
I _{DSS}	-	-	-1	μ A	V _{DS} =-12V, V _{GS} =0V
	-	-	-10		V _{DS} =-10V, V _{GS} =0, Tj=70°C
*R _{DS(ON)}	-	45.1	60	m Ω	I _D =-3.6A, V _{GS} =-4.5V
	-	65.6	87		I _D =-3.2A, V _{GS} =-2.5V
	-	88.5	178		I _D =-1A, V _{GS} =-1.8V
	-	154.3	305		I _D =-1A, V _{GS} =-1.5V
*G _{FS}	-	5.6	-	S	V _{DS} =-5V, I _D =-2A
Dynamic					
Ciss	-	561	-	pF	V _{DS} =-10V, V _{GS} =0V, f=1MHz
Coss	-	153	-		
Crss	-	142	-		
*t _{d(ON)}	-	5	-	ns	V _{DS} =-10V, I _D =-1A, V _{GS} =-5V, R _G =3.3 Ω
*t _r	-	18.8	-		
*t _{d(OFF)}	-	49.6	-		
*t _f	-	30.8	-		
*Q _g	-	8	-	nC	V _{DS} =-10V, I _D =-2A, V _{GS} =-4.5V
*Q _{gs}	-	1	-		
*Q _{gd}	-	2.8	-		
R _g	-	9.3	-	Ω	f=1MHz
Source-Drain Diode					
*V _{SD}	-	-0.9	-1.2	V	V _{GS} =0V, I _S =-3.4A
*t _{rr}	-	27	-	ns	I _F =-2A, V _{GS} =0V, dI _F /dt=100A/ μ s
*Q _{rr}	-	7	-	nC	

*Pulse Test : Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$

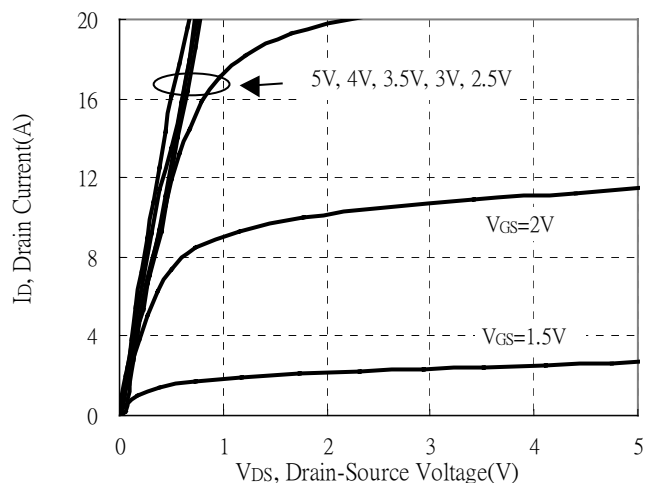
Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	R _{θJC}	80	°C/W
Thermal Resistance, Junction-to-ambient, max	R _{θJA}	110 (Note)	

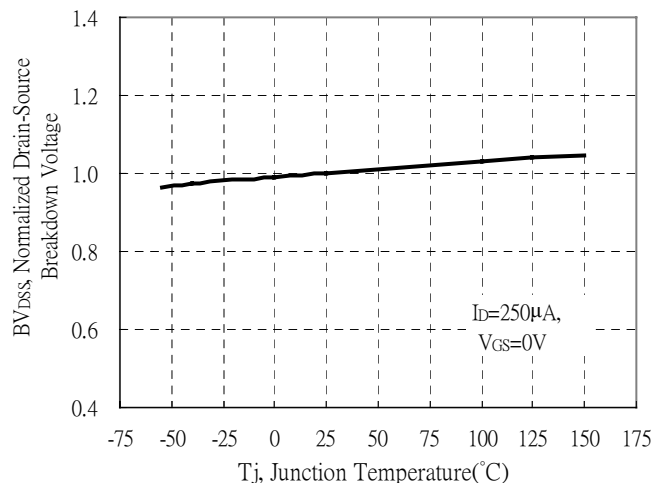
Note : Surface mounted on 1 in² copper pad of FR-4 board, t₅ sec; 180°C/W when mounted on minimum copper pad

N-channel Typical Characteristics

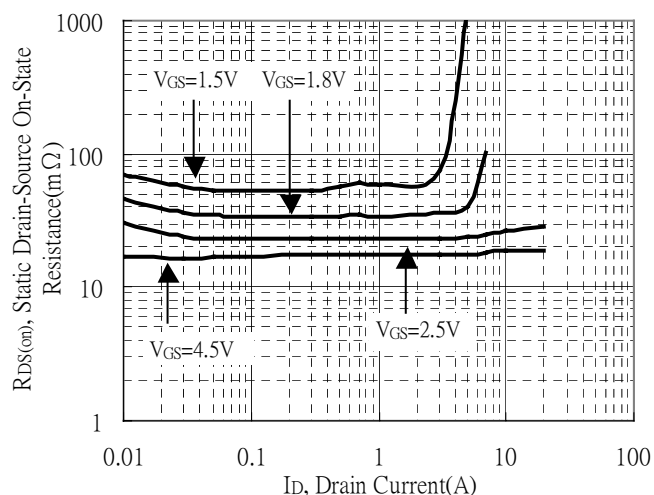
Typical Output Characteristics



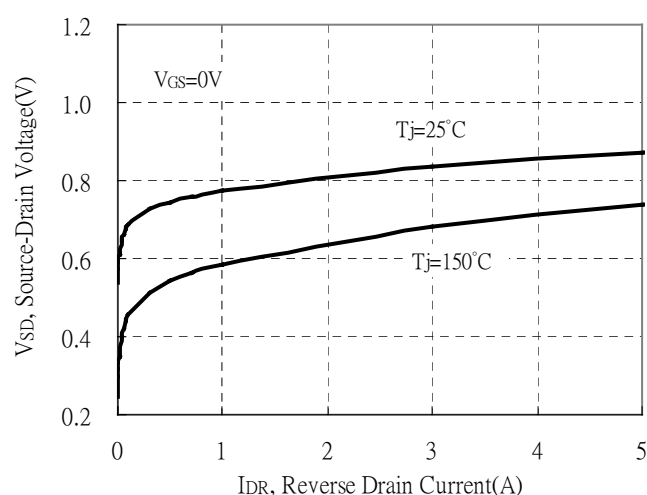
Breakdown Voltage vs Ambient Temperature



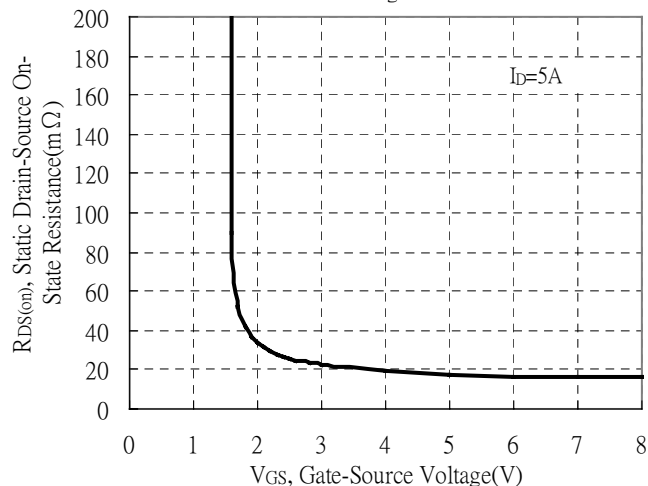
Static Drain-Source On-State resistance vs Drain Current



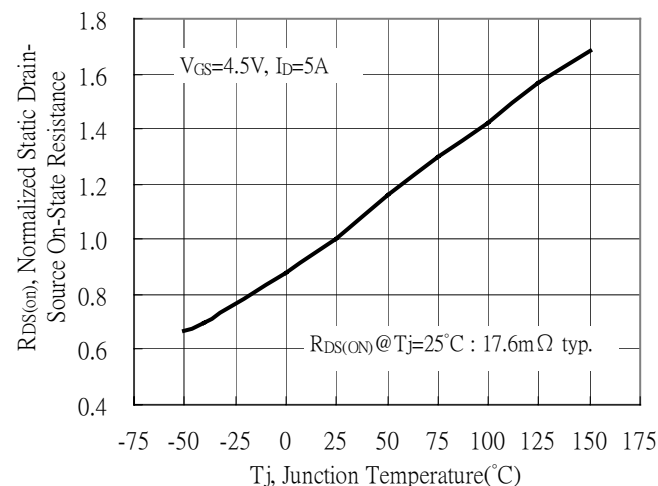
Reverse Drain Current vs Source-Drain Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

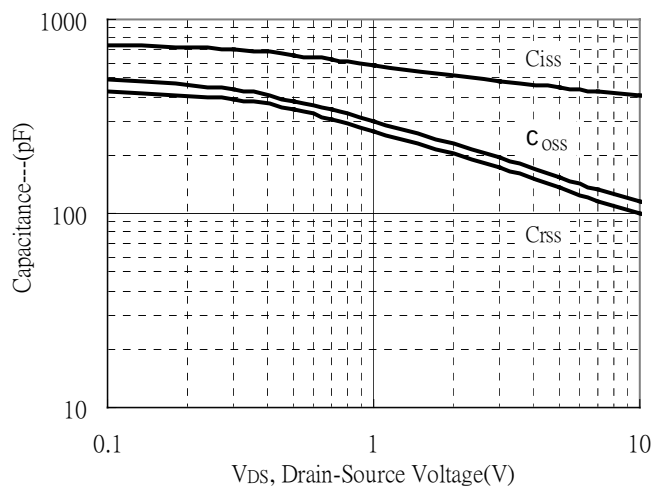


Drain-Source On-State Resistance vs Junction Temperature

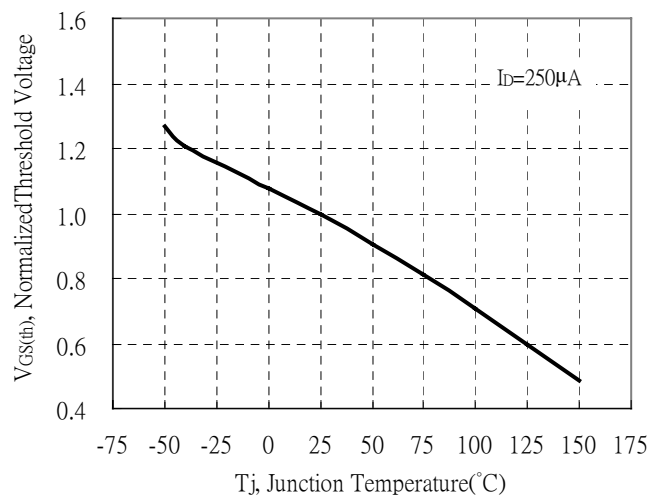


N-channel Typical Characteristics(Cont.)

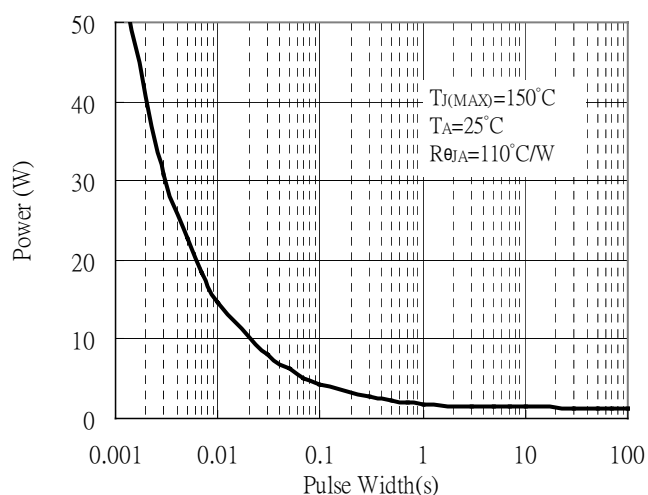
Capacitance vs Drain-to-Source Voltage



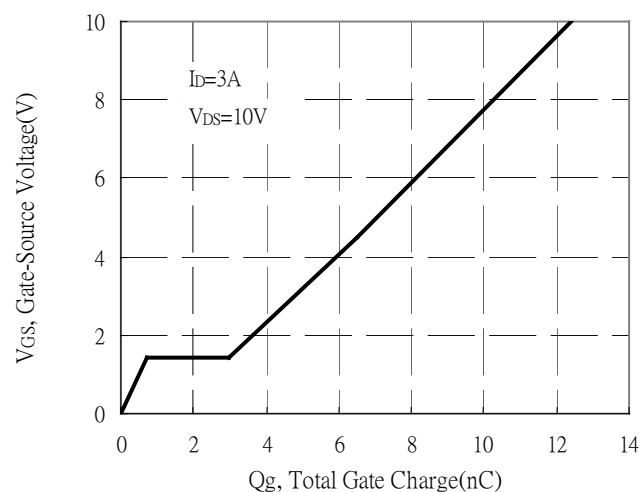
Threshold Voltage vs Junction Temperature



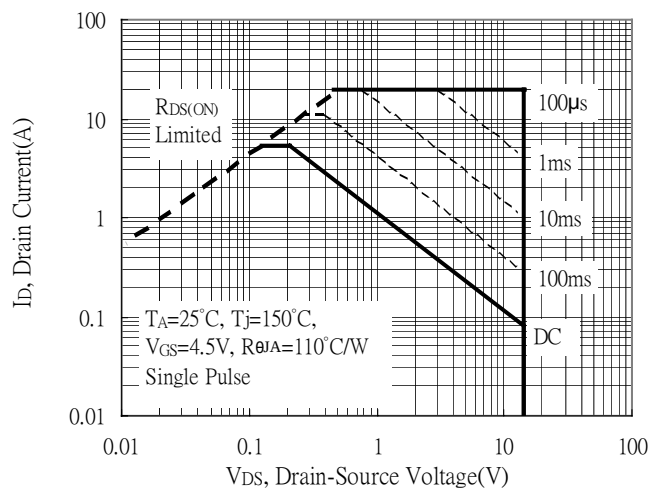
Single Pulse Power Rating, Junction to Ambient



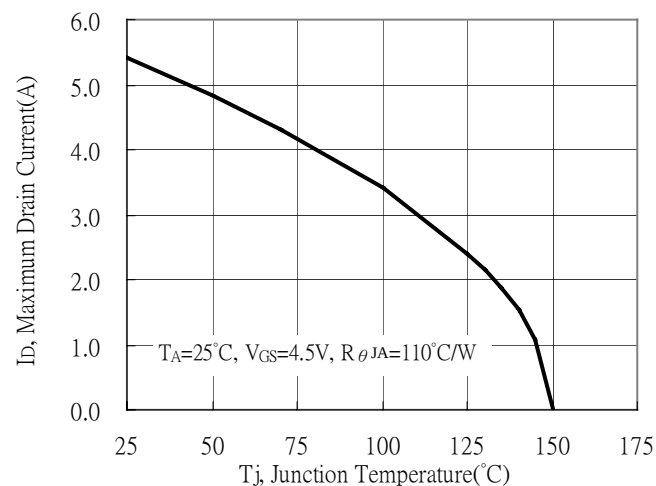
Gate Charge Characteristics



Maximum Safe Operating Area

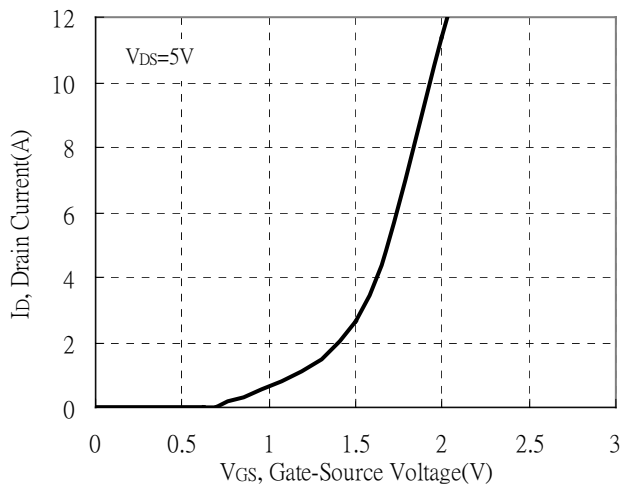


Maximum Drain Current vs Junction Temperature

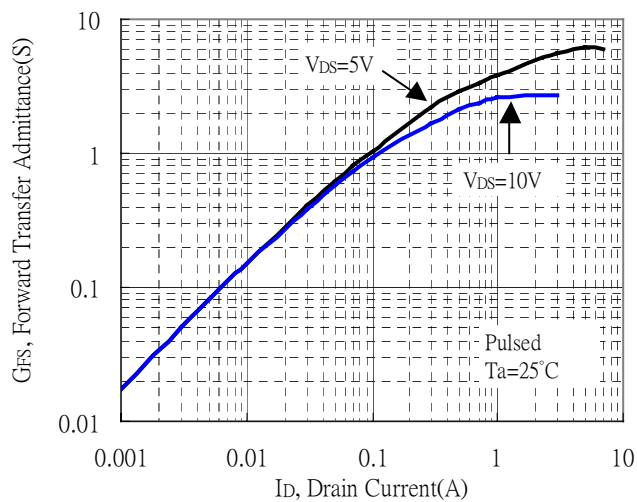


N-channel Typical Characteristics(Cont.)

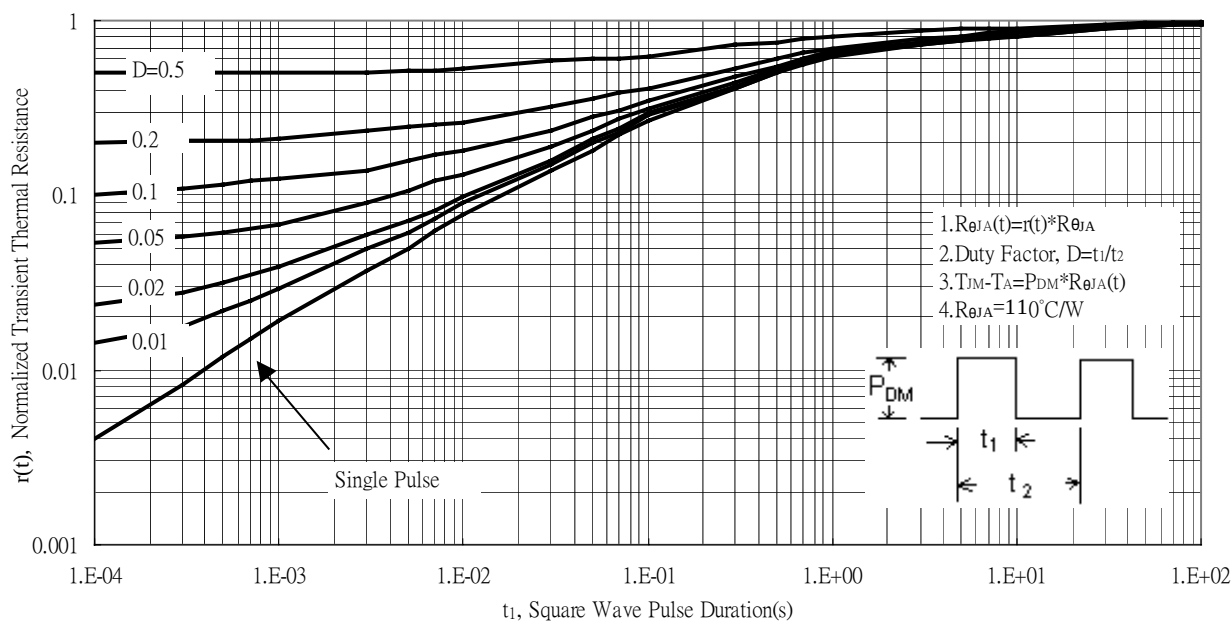
Typical Transfer Characteristics



Forward Transfer Admittance vs Drain Current

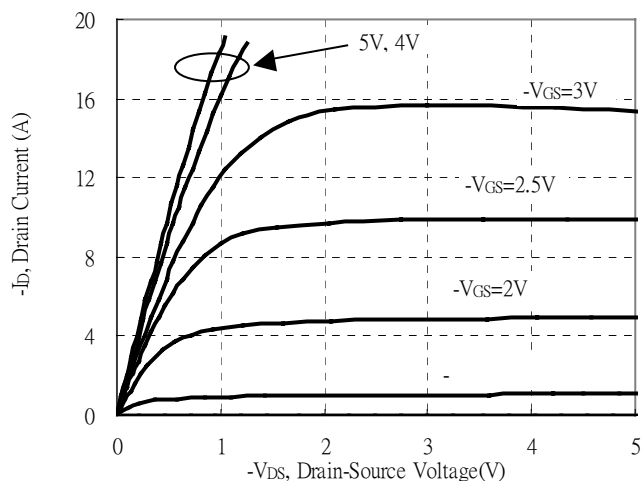


Transient Thermal Response Curves

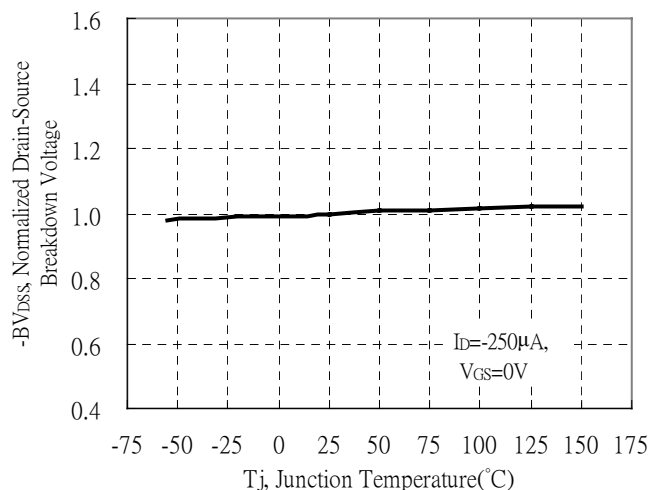


P-channel Typical Characteristics

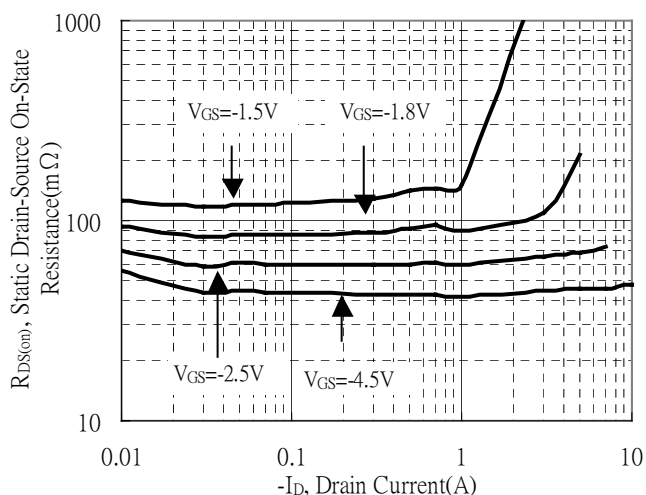
Typical Output Characteristics



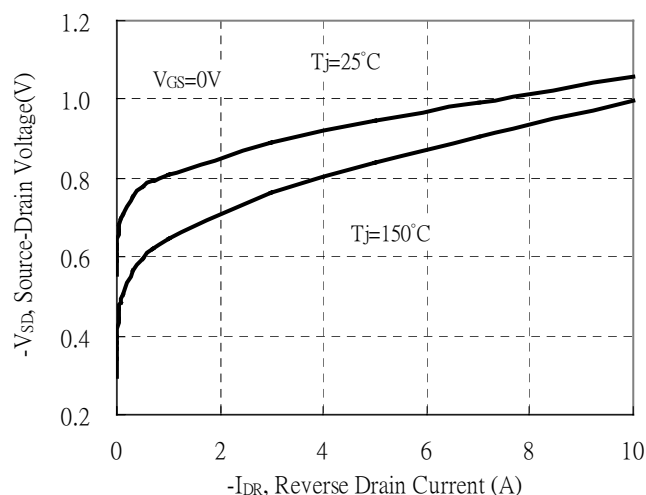
Breakdown Voltage vs Ambient Temperature



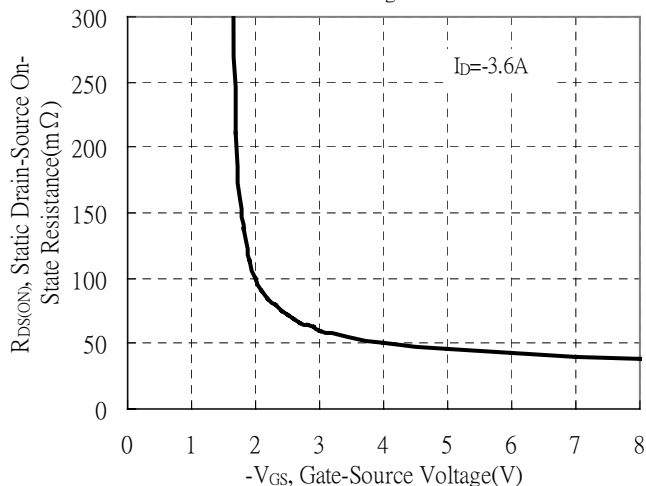
Static Drain-Source On-State resistance vs Drain Current



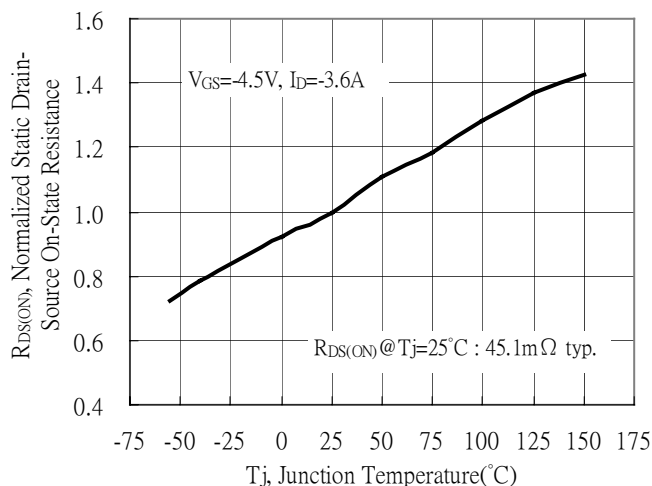
Reverse Drain Current vs Source-Drain Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

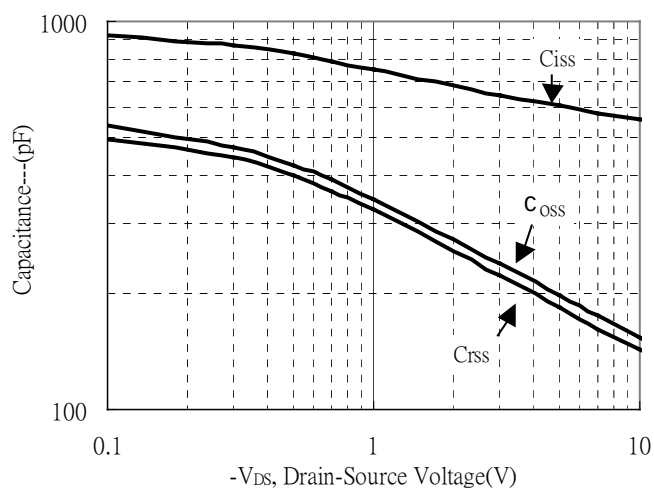


Drain-Source On-State Resistance vs Junction Temperature

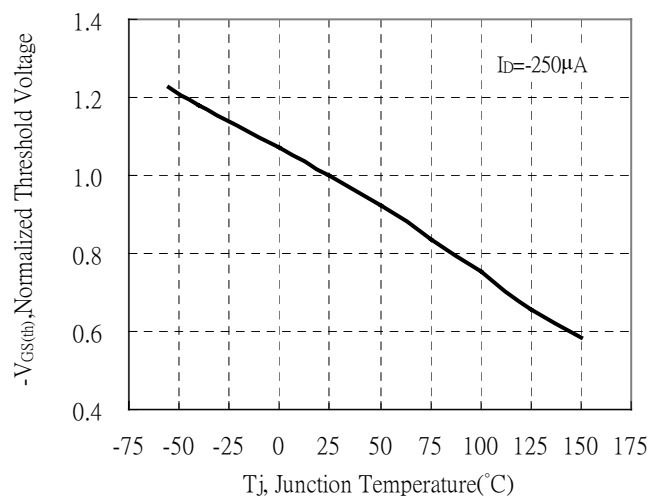


P-channel Typical Characteristics(Cont.)

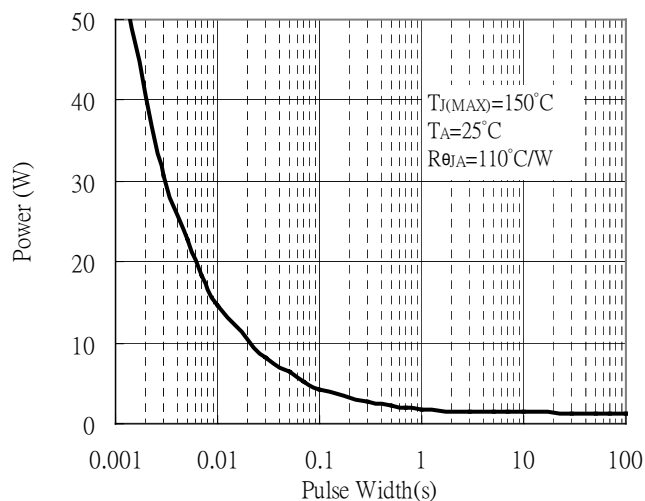
Capacitance vs Drain-to-Source Voltage



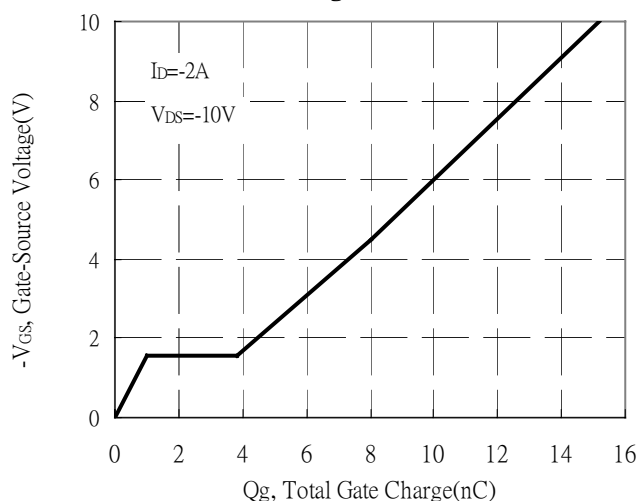
Threshold Voltage vs Junction Temperature



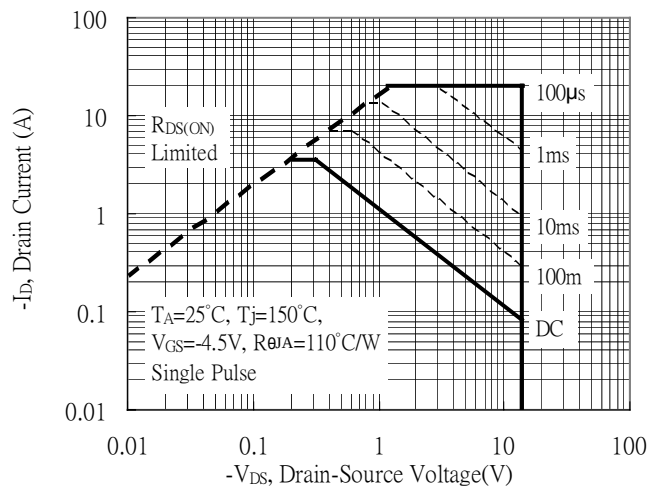
Single Pulse Power Rating, Junction to Ambient



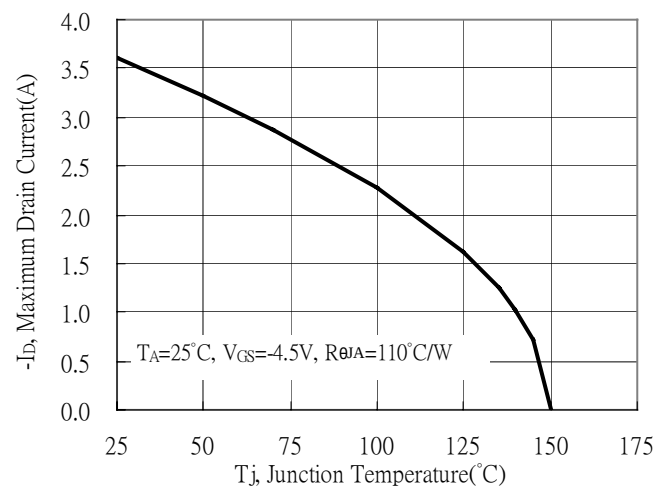
Gate Charge Characteristics



Maximum Safe Operating Area

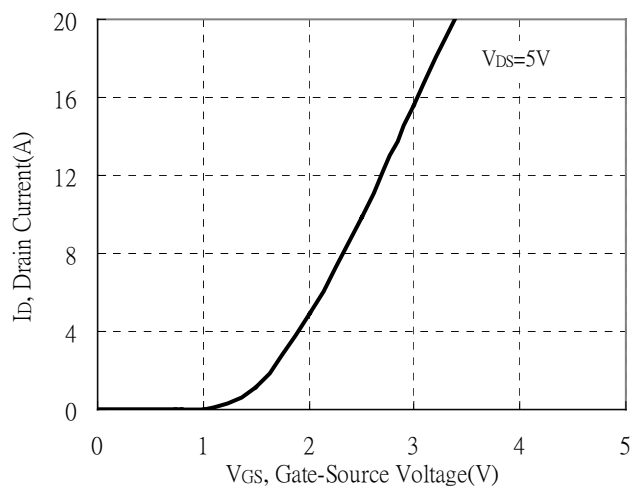


Maximum Drain Current vs Junction Temperature

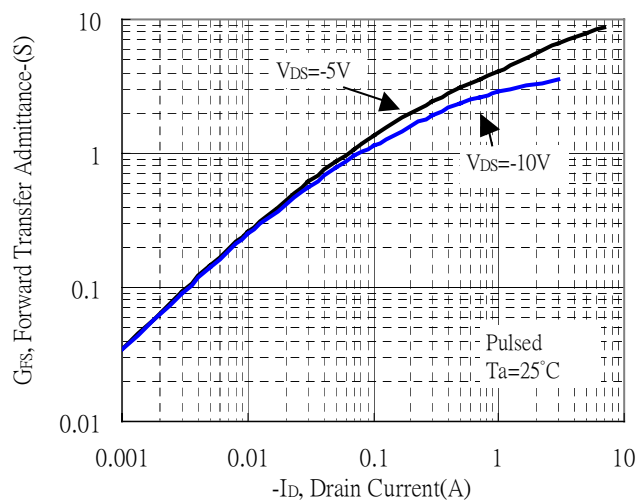


P-channel Typical Characteristics(Cont.)

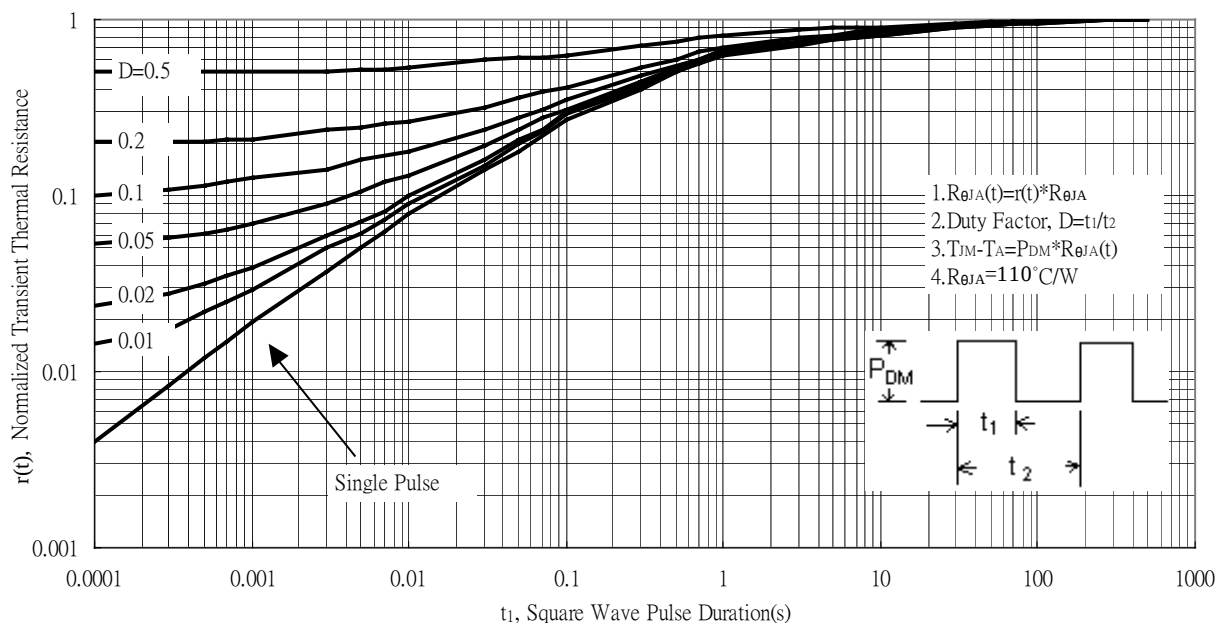
Typical Transfer Characteristics



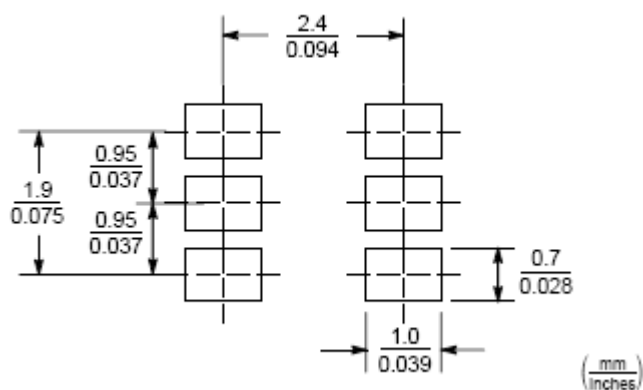
Forward Transfer Admittance vs Drain Current



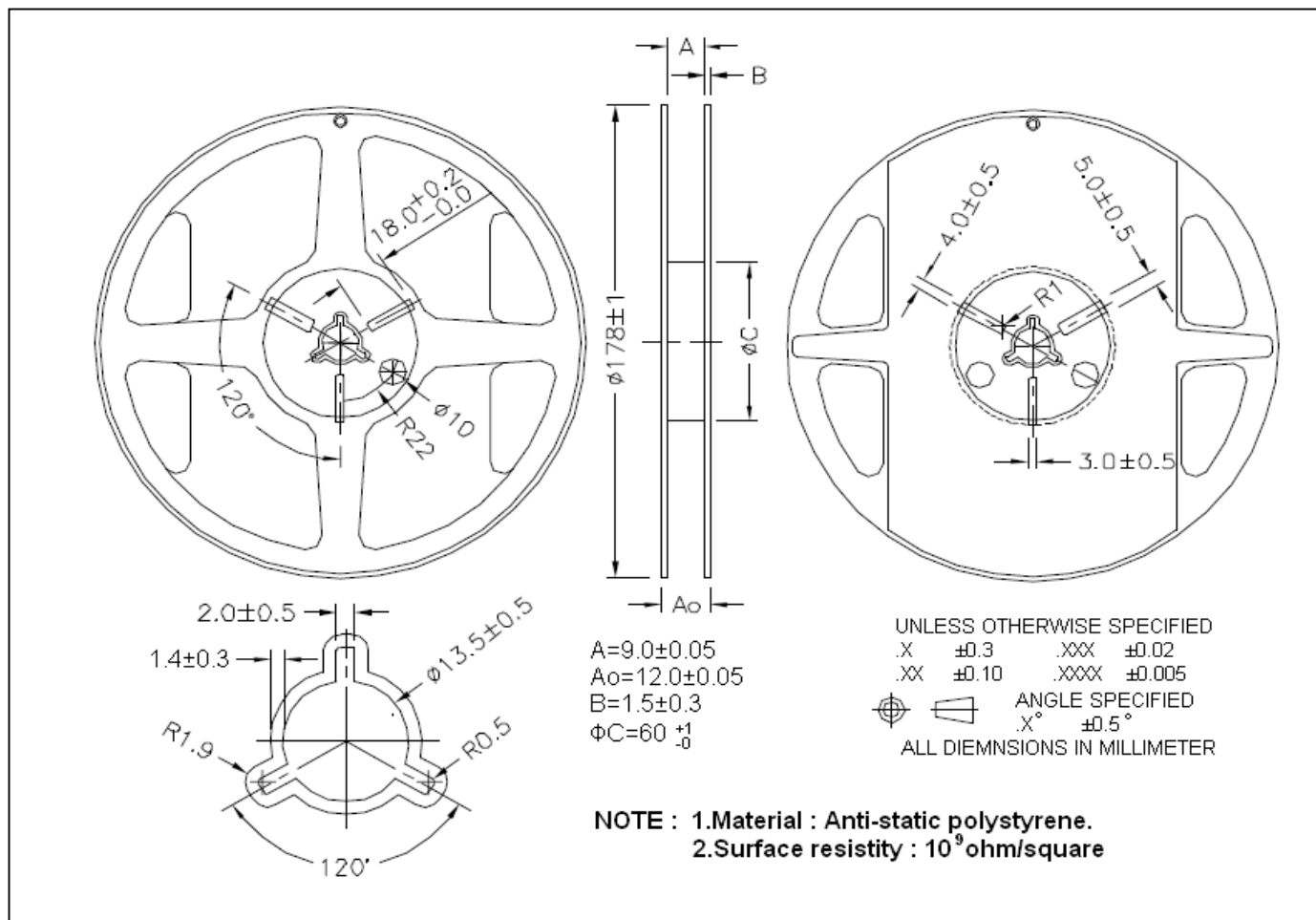
Transient Thermal Response Curves



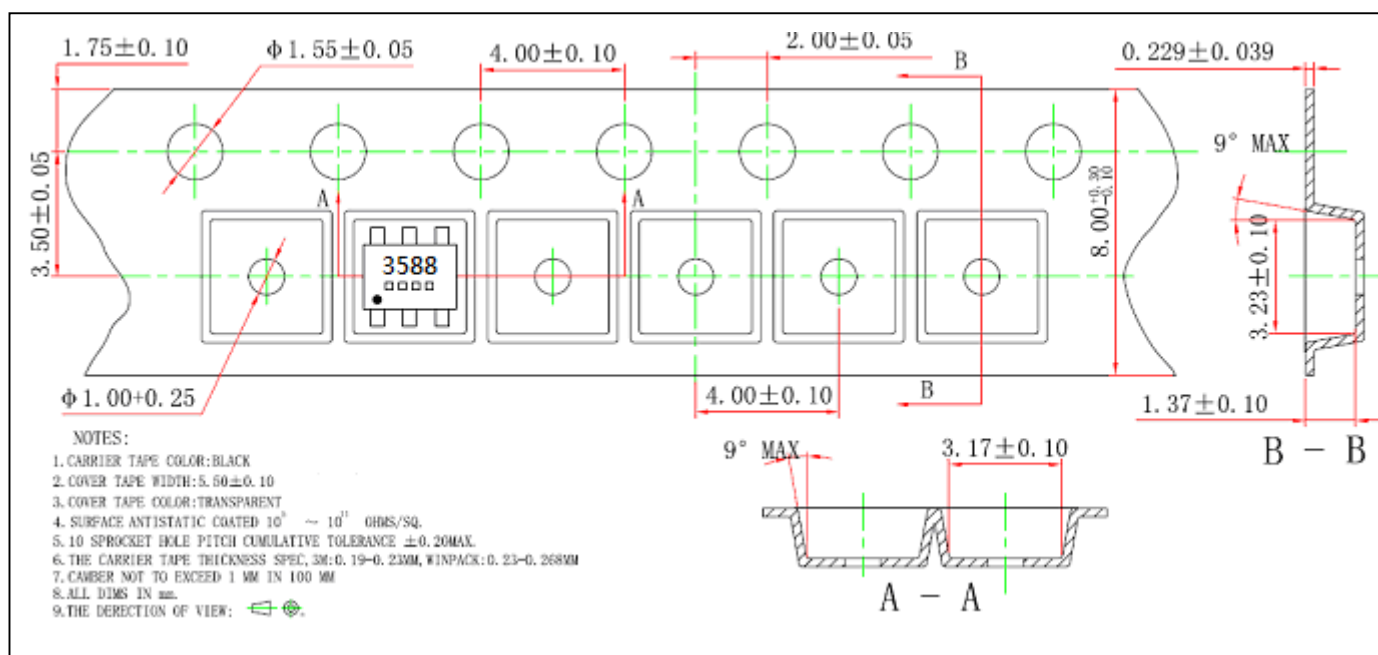
Recommended Soldering Footprint



Reel Dimension



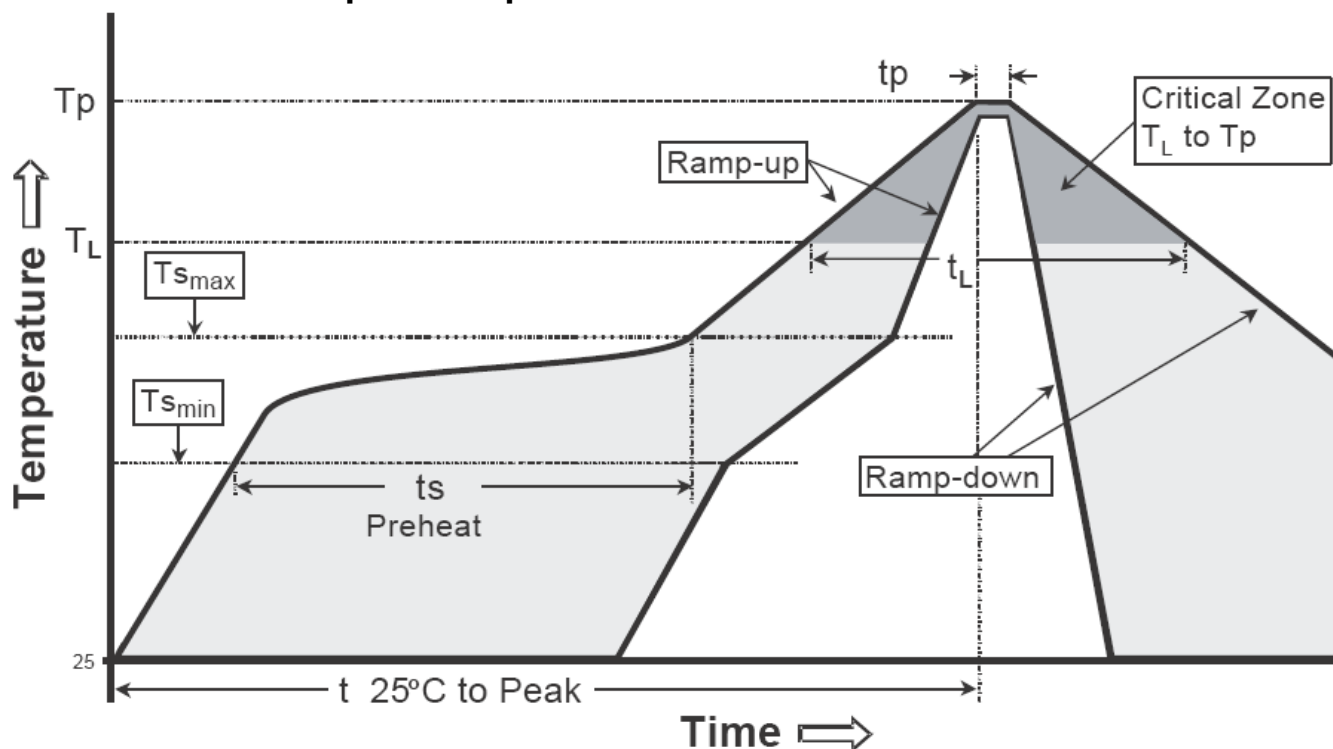
Carrier Tape Dimension



Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

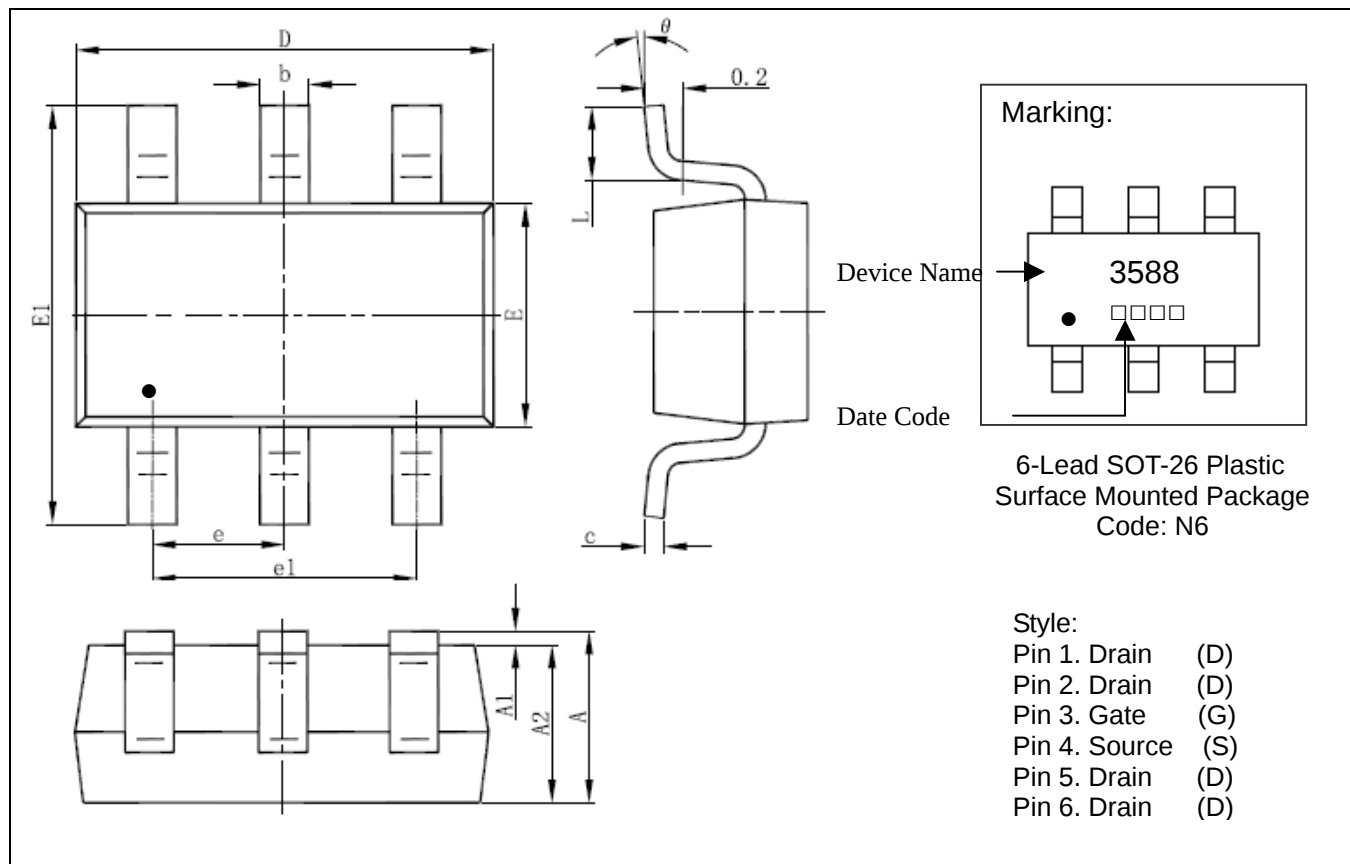
Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T_{smax} to T_p)	3°C/second max.	3°C/second max.
Preheat -Temperature Min(T_{smin}) -Temperature Max(T_{smax}) -Time(t_{smin} to t_{smax})	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (T_L) - Time (t_L)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(T_p)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(t_p)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

SOT-26 Dimension



DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049	E	1.500	1.700	0.059	0.067
A1	0.000	0.100	0.000	0.004	E1	2.650	2.950	0.104	0.116
A2	1.050	1.150	0.041	0.045	e	0.950 (BSC)		0.037 (BSC)	
b	0.300	0.500	0.012	0.020	e1	1.800	2.000	0.071	0.079
c	0.100	0.200	0.004	0.008	L	0.300	0.600	0.012	0.024
D	2.820	3.020	0.111	0.119	θ	0°	8°	0°	8°